

Workgroup 2 Report on Consumption Reduction Electricity Efficiency and Conservation Programs

Suggestions for the Commonwealth of Virginia
to the Virginia State Corporation Commission

Case Number PUE-2007-00049

October 1, 2007

Executive Summary

1. The SCC has asked for suggested programs to meet the General Assembly's Goal of Reducing State Electricity Consumption by 10% by 2022.

The Virginia General Assembly has stated that it is “in the public interest, and is consistent with the energy policy goals in § 67-102 of the Code of Virginia, to promote cost-effective conservation of energy through fair and effective demand side management, conservation, energy efficiency, and load management programs, including consumer education.” In support of this objective, the SCC was asked by the General Assembly to determine the feasibility of reducing state electricity consumption by 10 % (from 2006 baseline) by 2022. Workgroup 2 was asked to suggest potential programs that could be implemented in Virginia to help achieve that goal.

2. Workgroup 2 Agrees That Cost-Effective Efficiency and Conservation Programs Will Generate Benefits To Electric Ratepayers, The State Economy And The Environment.

Workgroup 2 supports the concept of introducing cost-effective energy efficiency programs and related initiatives in Virginia. Efficiency and conservation would generate benefits to ratepayers and the state economy by helping to offset future increases in energy costs, provide electric system reliability benefits, offer customers the ability to better manage their energy costs, and maintain a competitive regional economy as businesses look for robust, diverse energy supplies from both demand- and supply-side resources. Additionally, effective programs will help accelerate Virginia's environmental and air quality goals such as those stated in the Chesapeake Bay 2000 Agreement,¹ while helping to reduce the costs associated with future climate change policies.

¹ Signed by the Chesapeake Bay Commission, the state of Maryland, the Commonwealth of Pennsylvania, the Commonwealth of Virginia, the District of Columbia and the United States of America. Available at <http://www.chesapeakebay.net/agreement.htm>

3. Electric Rates in Virginia Have Been Relatively Low, Limiting Participation in Efficiency Programs, but For a Variety of Reasons, Rates Are Likely to Increase in the Future

Virginia has had electric rates in all classes of customers that are well below the national average, which has reduced participation and interest in electricity conservation programs. However, the combined effects of new facility costs, fuel costs and environmental restrictions, coupled with legislation removing Virginia's electricity price cap will cause electric rates to rise in the future.

4. The Group Suggests Several Programs for Further Review by the SCC

A variety of electricity conservation programs that could apply to Virginia's customers have been evaluated in other states and deemed cost-effective. Based on the experience in other states and the experience of team members, these programs are suggested for more detailed review by the SCC. Some can be applied to all sectors, while others are specific to residential, commercial, industrial or institutional applications. The team suggests that these programs, described in the report, be further assessed against Virginia's situation and needs as means for reaching the desired goal.

5. Active Market Intervention Programs Are Required To Overcome Barriers to the State's Goal

Public policy has driven the adoption of energy efficiency and conservation in states outside Virginia, via a combination of mandates that require the utilities to offset a percentage of their load growth through energy efficiency, consumer education programs, and customer incentives. Many of these states make extensive use of active, market-intervention programs, and we believe that they are necessary to overcome the knowledge and financial barriers that stand in the way of the State achieving the magnitude of energy reduction it seeks by 2022. The utilities (or in some cases public benefits corporations like NYSERDA in New York and WECC in Wisconsin) have developed comprehensive programs that address the needs of residential, commercial, industrial and institutional customer classes through customer education, technical assistance, and monetary incentives.

6. Critical Barriers Which Need To Be Addressed Include Regulation, Financial Policies, Market Conditions, Building Codes, Metering and Knowledge

While there are many programs that can aid in meeting Virginia's conservation goals and help to offset some of the need for new generation, Workgroup 2 had several important concerns that arose during discussions that must be addressed in order to ensure successful implementation of energy efficiency and conservation programs. Extensive information on program barriers is available in Appendix B of this report. Barriers include:

1. Regulatory and Rate Barriers including the current regulatory environment, program cost recovery, cross-subsidization of program costs, and rate design;

2. Financial Barriers including cost effectiveness;
3. Market Barriers including market potential, cost of electricity and acceptance of DSM/EE programs, lack of service providers, staffing for DSM/EE initiatives, and technology;
4. Building Codes and Standards for Retrofit and New Construction;
5. Metering Barriers, including measurement and verification (M&V);
6. Knowledge Barriers, including general program knowledge and consumer education.

These concerns would not necessarily prevent Virginia from moving forward with an efficiency or conservation goal, but should be addressed in order to fairly balance the needs of all Virginia ratepayers and energy users.

Process Overview and Selection Criteria for Program Suggestions

Workgroup 2 represents a diverse set of interests, including those of utility, industrial, vendor and environmental organizations. The work of the Group demonstrates that there can be broad-based support, at least from a conceptual standpoint, for conservation and efficiency programs for each customer class in Virginia.

Workgroup 2 was tasked with identifying effective potential electricity conservation and efficiency programs, considering the benefits of deploying advanced meter infrastructure technology (AMI) and importantly, considering a change in rate design so that programs could be implemented in Virginia. We have treated our work as a scoping exercise in order to aid the SCC staff in identifying the breadth of potentially cost-effective programs that could be implemented in Virginia. In keeping with Staff's request, Workgroup 2 has compiled a list of known electricity conservation and efficiency programs that have been effective in other states. In this report, we have grouped potential programs into those that could be implemented **immediately** (1-12 months) over the **mid-term** (1-5 years)², and over the **long-term** (beyond 5 years), and by four general customer classes (residential and small commercial, large commercial, industrial, and institutional).

It is our understanding that the SCC staff desires a list of programs that could be implemented in Virginia relatively quickly, with little or no regulatory or legislative action. Immediate deployment will serve two purposes in Virginia; 1) to educate Legislators and other elected officials about conservation and efficiency by demonstrating programs in action, and 2) to begin to meet Virginia's electricity reduction goal as quickly as possible in a systematic manner. In deciding on long term strategies, we considered such steps as updating programs with new technology and providing a steady source of funding for the continuation and expansion of programs that have proven to be successful in Virginia. The programs listed in this report have been nominated by individual Workgroup members based either on first-hand experience administering energy efficiency programs, or because the programs have been successful elsewhere. In compiling this list, we also considered Virginia's climate and population mix of both urban and rural residents.

Although Workgroup 2 was tasked to provide information on the customer acceptance rates in other states, there was no information on customer acceptance rates available to the workgroup.

The information in this report comes from a variety of sources, including the National Action Plan for Energy Efficiency (NAPTEE)³, the American Council for an Energy efficient Economy (ACEEE)⁴, and a recent report on Virginia's demand-side

³ www.epa.gov/solar/actionplan/eeactionplan.htm, Appendix C of this report contains the NAPTEE table 6-3 on Efficiency Measures of Electric and Combination Programs. Appendix D of this report contains the NAPTEE Table 6-10, Key Stakeholders, Barriers and Program Strategies by Customer Segment.

⁴ www.aceee.org

management potential by Summit Blue Consulting LLC⁵.

Workgroup 2 recognizes that any energy conservation or efficiency program, whether utility-sponsored or administered by a third party, will need to pass cost-effectiveness testing. Although the SCC has not yet decided which tests will be used, Workgroup 2 believes that the cost effectiveness of individual programs will likely differ from other states because of the lower average electricity rate that exists within Virginia as compared to other states. Although Workgroup 4 is charged with the cost-effectiveness issue, we recommend that the SCC include issues such as market potential, overall anticipated program costs, avoided cost, lost revenue and free-rider issues, among others, to ultimately determine program applicability in each utility's service territory. Publicly financed programs should be judged by taking into consideration the public interest in reducing external impacts of energy supply.

If effective programs are implemented, electricity efficiency and conservation can provide consumers with greater choice in meeting their individual electricity needs and can expand the market to include conservation and efficiency tools.

A Note about Electricity Rates

Cost-effective conservation programs coupled with properly designed electricity rates can be an integral part of meeting Virginia's ongoing electricity needs while mitigating upward pressure on electricity prices.

In recent years, the price of electricity in Virginia has been relatively low compared to prices in other states. The low cost of electricity has served the economy and electric customers of the Commonwealth well. However, this low cost of energy has minimized or eliminated the return on investment for many energy conservation and efficiency programs and resulted in a low level of customer acceptance. Recent legislation (HB3068/SB1416) re-regulates Virginia's electric utilities bringing an end to the capped rate period on December 31, 2008, and mandating biennial rate reviews with a floor and ceiling on returns. Renewable generation and other incentives for utilities were included in the legislation that will increase available power generation. The new Virginia legislation also allows for costs to be periodically reviewed by the SCC, and if approved, passed along to customers in the form of rate increases. Each of these changes will help avoid the market price instability seen in other states. However, costs will likely continue to rise primarily driven by increasing fuel costs, new generation requirements, environmental controls, transmission additions and sharply escalating material costs.

Current electricity rates are designed to recover utility fixed costs through both the customer service charge and the energy charge as part of the cost per kWh consumed. True cost-based rate structures provide better pricing signals to customers concerning the

⁵ http://www.pecva.org/downloads/longterm/Summit_Blue_Report.pdf. Summit Blue Consulting LLC estimates that Virginia could save 10% of base load GWh's at 2007 levels by 2017 (five years before the General Assembly's goal) though a portfolio of energy efficiency measures. Summit Blue was commissioned by the Piedmont Environmental Council to prepare this report.

cost of electricity. Allowing utilities to design and implement rates that will recover all of the utility's fixed cost as a part of the customer service charge, while allowing the ability to recover the demand and energy portions of the cost of service both separate and distinctly is critical to this effort. Further, facilitation and expedition of utility sponsored DSM programs could be accomplished by the VA SCC allowing DSM investment/expense recovery through a "fast-track" SCC approved rate procedure. This procedure would look at a particular program and would allow approval of a rider for each specifically affected rate class. Regardless of what this may look like, it is vital that the Commission adopt and approve true cost-based rate structures.

Suggested Programs for Consideration by SCC Staff

The US Department of Energy divides electricity consumption by customer class in Virginia into three categories. Residential customers account for 40% of electricity use, industrial customers account for 20%, and commercial/institutional users account for 40%.

Workgroup 2 suggests that the list of energy efficiency programs below be considered for implementation in Virginia. These programs are either being proposed or implemented in other states. The appearance of any particular program on the list below does not imply that it is endorsed by everyone in Workgroup 2 or the organizations which they represent. Though many of these programs have proven to be cost-effective in other states, they have not undergone any cost benefit analysis using conditions specific to Virginia. Therefore, some suggested programs may not be applicable in all areas of Virginia. Further, we have not addressed sources by which these programs might be funded, as it is the responsibility of Workgroup 4 to make those determinations.

All Sectors:

- Compact Florescent Lighting Quick Start Program
- High-Efficiency Lighting Programs
- High-Efficiency Appliance/Office Equipment Programs
- Solar Photovoltaic and/or Solar Hot Water Installation Program
- Data Collection
- Smart Equipment Choices

Residential Sector:

- Residential Energy Auditing Program
- Energy Audits for Existing Residential Properties Placed on the Market.
- Appliance Collection and Disposal Program
- HVAC Retrofit, Tune-Up, and Replacement Program – residential and commercial
- ENERGY STAR New Homes Program
- Weatherization Program
- ENERGY STAR Cool Roofs
- Pay-as-You-Save financing for ENERGY STAR appliances
- Manufactured Home Energy Efficiency Program

Commercial, Industrial, and Institutional Sectors:

- Energy Auditing & Retro-commissioning Programs
- Commercial Green Building New Construction Program
- Lighting Rebate Program
- Commercial Data Center Efficiency Program
- Industrial Compressed Air Program
- Industrial High-Efficiency Motor Program
- Energy Efficiency for K-12 Schools Program
- Energy Efficiency for Government & Higher Education Program
- State level advisory committee
- Loans to Save Taxes Programs
- Land Grant Institutions and County Economic Development
- Development of a state-level “green schools institute”
- High Performance/Green Buildings and Schools Program
- Photovoltaic Paneling Program
- Department of Energy’s Industrial Assessment Centers
- Combined Heat and Power
- Waste to Energy applications
- Solar Hot Water Installation Program
- Advanced Metering Infrastructure (AMI)

Program Descriptions

Workgroup 2 was charged with reviewing potential energy efficiency and conservation programs that may be applicable to Virginia consumers. The following are descriptions of programs that were suggested by members of Workgroup 2 which have been effective in at least one other state in reducing energy consumption. For simplicity, these programs have been sorted by both customer sector and implementation timeline. Additional information on several of the programs listed below is available in Appendix A of this report.

A . All Customer Sectors: Immediate (1-12 months)

1. Compact Florescent Light (CFL) “Quick Start” Program: Statewide programs should be implemented to encourage the purchase and distribution of ENERGY STAR® qualified CFL’s, which use up to 75 percent less energy than traditional incandescent light bulbs and can last up to 10 times as long on average.⁶ Program considerations should include 1) distribution by utilities; and 2) retail point-of-sale incentives.

Selected distribution of CFL’s targeting audiences, such as state employees and attendees at public events, would help spread CFL awareness to the general population while maintaining the value of the product. Distribution efforts should include consumer education materials and efforts to help combat the perception that CFL’s are not as bright as incandescent light bulbs or cast an unflattering light. Distribution should promote the notion that CFL’s achieve passive energy savings in those homes and businesses in which replacements are installed. If CFL’s were distributed for free, it is recognized that this concept could be problematic in that it is impossible to quantify how many CFL’s are in fact installed using this particular implementation strategy.

The SCC could consider a retail point-of-sale program. This program could be implemented through a third party vendor and, to maximize impact, target “big-box” retailers that have high customer volume, such as Wal-Mart, Home Depot, Lowe’s, and Target. To obtain valuable implementation assistance, the program could establish partnerships with CFL manufacturers and retailers throughout the country that have significant experience in promoting CFL’s to consumers. A statewide CFL point-of-sale program should use multiple approaches to educate consumers, including advertising, rebate coupons, bills inserts, and in-store special events, to encourage customers to purchase energy-efficient CFL as replacements for incandescent bulbs. To dispel concerns, consumer materials should emphasize the significant improvements in recent years in CFL variety, quality, and color of light. The statewide program should also

⁶ U.S. Environmental Protection Agency and U.S. Department of Energy. 2007. *ENERGY STAR Change a Light, Change the World 2007 Campaign Facts and Assumptions Sheet*. Accessible at http://www.energystar.gov/ia/partners/promotions/change_light/downloads/CALFacts_and_Assumptions.pdf.

educate consumers on the mercury content of CFL's and provide information about proper recycling and disposal options.⁷

2. High-Efficiency Lighting Program: This program would offer pre-determined rebates based on specified energy efficient lighting installations. For standard fixtures, particularly for residential and small commercial, rebates could be obtained at the check-out counter. For large commercial and industrial, rebates could be processed by the utility or third party administrator depending upon program design, once the installation is complete. This is an easy program to put in place quickly and can be scaled based on current needs. The program may have a limited lifetime if the program is heavily used, so this program should be thought of as a jump start to stimulate interest in energy efficiency opportunities and to capture substantial savings in the next few years. Measures to be emphasized could include "Super T12" fluorescent lamps for industrial and commercial users, T-8 florescent lighting which do not require a change in light fixture (particularly in high-bay applications), high-output ballasts, and occupancy sensors, just to name a few.

3. High-Efficiency Appliance/Office Equipment Programs: Consider providing financial incentives and education to end-use customers to encourage the purchase and use of ENERGY STAR[®] qualified home appliances like refrigerators, washers, dryers, and window air conditioners; and office equipment like copiers, printers, fax machines, and water coolers. These products have significant energy savings potential for residential consumers. For example, by purchasing ENERGY STAR qualified home appliances in 2006, American consumers saved 1.4 billion kWh of electricity and \$289 million in electricity bills.⁸ Appliance and office equipment promotional programs can be enhanced by establishing partnering arrangements with the ENERGY STAR Program, product manufacturers and retailers, and other national and regional resources and expertise. These types of partnering arrangements can provide tools and strategies to help reduce DSM program costs and expedite implementations. In addition, these types of partnering arrangements can provide the added credibility needed to gain customer buy-in.

The Appliance Standards Awareness Project (ASAP)⁹ identifies products for which state standards would be appropriate and estimates the potential benefits of those standards. ASAP's March 2006 report, *Leading the Way: Continued Opportunities for New State Appliance and Equipment Efficiency Standards*, estimates that by 2020 Virginia could save 50.3 GWh of energy by implementing appliance standards for just two consumer product categories: (1) compact audio products, and (2) DVD players and recorders.¹⁰ The more standards enacted, the greater the energy savings.

4. Improved Building Codes: Virginia is among those states that have adopted or are considering adoption of the 2006 IECC¹¹ and the ASHRAE 90.1-2004¹²(the

⁷ Information available on CFL recycling at <http://www.epa.gov/bulbrecycling/>

⁸ D&R International, 2007 (calculated on behalf of the ENERGY STAR program). Applies to ENERGY STAR qualified clothes washers, dishwashers, refrigerators, and room air conditioners.

⁹ <http://www.standardsasap.org/>

¹⁰ http://www.standardsasap.org/documents/a062_va.pdf

¹¹ DOE's International Energy Conservation Code. More information available on DOE's website at http://www.energycodes.gov/training/onlinetraining/residential_2006IECC.stm

American Society of Heating, Refrigerating and Air-Conditioning Engineers). Many states and jurisdictions, however, have begun adopting building codes that include energy efficiency provisions which are more stringent than the 2006 IECC. While it may be too late to consider such provisions in Virginia's current code-adoption cycle, stricter energy-efficiency standards should be adopted at the earliest practicable date. Further, it may be appropriate for the General Assembly to authorize localities to adopt building codes that exceed the statewide standard, and to ensure that localities have the requisite code-enforcement tools.¹³ Inadequate enforcement due to lack of trained personnel and resources is a major impediment to achieving building efficiency and requires action.

In New York, several communities require newly-constructed homes to be built in accordance with ENERGY STAR standards. The DOE Building Energy Codes program is encouraging these state and municipal efforts by promoting stronger building energy codes and helping states adopt, implement, and enforce them.¹⁴

5. Data Collection: Create an independent group to collect and analyze electricity usage patterns, demand profiles, prices, forecasts and other data and provide an accessible data base of relevant Virginia and other information. Nationally recognized groups such as ACEEE support the funding of a non-profit National Energy Efficiency Data Center (NEEDC), "...whose purpose would be to collect, organize, disseminate and archive energy efficiency and social science statistics, particularly those related to public policies and programs."¹⁵ Such a similar organization in Virginia could help the Commonwealth's governments and educational institutions disseminate up to date information on efficiency programs to customers around the state.

6. Smart Equipment Choices: These technologies are defined as any device that can help reduce electricity use by 10% or more in all customer classes. For example, PowerCost Monitors, aimed at increasing customer awareness of the cost of energy consumed in real time, are an effective technology for changing usage patterns. Behavioral changes in the use of electricity by the residential consumer may result in 10 to 20% percent savings.¹⁶

PowerCost Monitor technology consists of two discrete functional units: (1) a detection unit, known as the sensor unit, is affixed to an existing household utility meter with a simple ring clamp. The sensor unit is compatible with digital and electromechanical meter types. This is the only component that is in direct physical contact with the utility's meter and the clamp mechanism allows it to be attached to the outside of the meter glass. It can also be quickly attached and detached without making any changes to the existing meter; (2) the display unit, located inside the home, receives a wireless signal from the

¹² Although ASHRAE standards continue to be upgraded, the 90.1-2004 standard is available at <http://www.ashrae.org/technology/page/548>

¹³ The General Assembly has taken steps in this direction already. Va. Code § 58.1-3221.2, enacted in 2007, authorizes localities to create a separate real estate classification and lower tax rate for buildings that are 30 percent more efficient than required by building code.

¹⁴ DOE's "Building Energy Codes Program" available at <http://www.energycodes.gov/>

¹⁵ Testimony of John "Skip" Laitner, Senior Economist for Technology Policy, ACEEE, before the Subcommittee on Research and Science Education House Committee on Science and Technology

¹⁶ www.bluelineinnovations.com/powercostmonitor.php

transmitter and displays the consumption information in real time in dollars and kWh for the end user. Other information is also displayed such as time and outside temperature.

Other technologies that can be encouraged through a Smart Equipment Choices program are devices like programmable thermostats and “vending miser” control devices for vending machines. Programmable thermostats automatically adjust a home’s temperature setting, allowing homeowners to reduce energy consumption during periods when the house is typically empty and/or its residents sleeping. According to ENERGY STAR, the cost of a programmable thermostat - generally between \$45 and \$110, plus associated installation costs, depending on the model’s complexity – can be offset by energy savings within a year of installation. Vending misers power down the operation of vending machines, including cooling cycles and surface lighting, until someone is detected near the machine and the unit returns to full operation.

B. Programs for the Residential & Small Commercial Sector **Immediate (1-12 months)**

1. Residential Energy Auditing Program: to develop baseline market profiles for residential and small business customers. These baseline profiles include current and forecast numbers of customers by market segment, electricity use profiles by segment, and characterizations of existing energy-using equipment and DSM measure saturations. Helping customers to better understand the cost of electricity can be a useful tool in promoting other market transformation programs. As a general rule, customers who receive energy audits obtain personalized recommendations for reducing consumption. These recommendations typically address insulation and air leakage, heating and cooling systems, and appliance and lighting. There are a wide variety of program designs for energy auditing programs, from self-directed audits (Appalachian Power Company currently has a Home Energy Calculator Appliance Calculator, and Lighting Calculator on its website¹⁷) to detailed on-site assessments that include sophisticated whole house diagnostics. To drive energy efficiency improvements from an audit program, it is imperative that the homeowner be given a means by which to implement the audit recommendations. To do so, the homeowner would be provided a list of pre-qualified service providers that could implement the recommendations. The auditing contractor could also be allowed to implement the recommendations if the owner so chooses. Consideration could be supported by coupons and discounts so that, for example, there is a monetary incentive to help offset the cost of installing energy conservation measures including HVAC equipment, increased insulation, and/or programmable thermostats. To add further incentive, the homeowner could be refunded their portion of the audit fee if the recommendations are implemented.

It is important to combine energy audit programs with installation programs so that found savings can actually be achieved. These two steps should be coupled to make the program more effective.

¹⁷ APCo Energy Calculator:
<https://www.appalachianpower.com/CustomerService/HelpfulInformation/SavingEnergy/Default.aspx#calcs>

2. Energy Audits for Existing Residential Properties Placed on the Market:

Energy audits are already being encouraged in Northern Virginia by county governments including Arlington's Fresh AIRE¹⁸ program and Fairfax's Cool Counties Initiative.¹⁹ Energy audits for existing residential properties are inspections that identify where energy is wasted and provide specific suggestions for how the property can become energy efficient. One concept which could be considered by the SCC is a "Truth in Energy Use" program for both potential buyers and sellers of a property. In a "Truth in Energy Use" program, the seller or buyer could use information about electricity use to make energy efficient improvements to the residence or small business building.

3. Appliance Collection and Disposal Program: Financial incentives and convenient pick-up programs can encourage consumers to safely and properly dispose of old, inefficient refrigerators, freezers, and room air conditioners. The EPA notes that the associated reduction in energy demand makes these appliance disposal programs highly cost-effective. On average, programs targeting refrigerators cost \$0.04 to reduce each kWh of demand, and lead to benefit-cost ratios of more than 3 to 1.²⁰

Collection and disposal programs may be established and operated by the utility, local or state government, or a third-party provider. According to the EPA, many utilities offer rebates of about \$35 for the collection of old units and/or provide rebates toward the purchase of a new unit that has earned the ENERGY STAR label.

4. HVAC Retrofit, Tune-Up and Replacement: Residential HVAC (Heating, Air Conditioning and Ventilation) retrofit and quality installation programs provide financial incentives to end-use customers to offset the incremental capital costs associated with installing high-efficiency residential and commercial HVAC. Upgrading HVAC equipment can produce kWh savings and reduce peak kW electric demand. A program could promote the use of ENERGY STAR HVAC equipment at the time of purchase and emphasize quality installation. Program components could include cooperative advertising with air conditioning distributors and contractors, training for salespersons on up-selling for high efficiency, financial incentives for high efficiency units, training for contractors in quality installation²¹ (such as proper sizing, refrigerant charge and airflow, and duct sealing), certification of quality installers based on both training and spot-checking.

5. ENERGY STAR New Homes Program: A multi-faceted incentive program could be established to encourage homeowners to incorporate energy efficiency into the design, construction, and operation of new or renovated homes. Financial incentives could be made available to offset the additional costs associated with the purchase and installation of approved energy-efficient equipment including HVAC systems, windows, insulation, and programmable thermostats. In addition, technical assistance could be

¹⁸ Arlington: <https://www.arlingtonva.us/portals/topics/Climate.aspx>

¹⁹ Fairfax: http://www.fairfaxcounty.gov/living/environment/coolcounties/energy_efficiency_template.pdf

²⁰ <http://www.epa.gov/ozone/snap/emissions/radp.html>

²¹ The Air Conditioning Contractors of America, in conjunction with ENERGY STAR, offers HVAC design and installation training and certification for contractors, instructors, technicians, government officials, and other interested parties. For more information, go to www.acca.org/training/technical.

available to help design and evaluate energy efficiency measures, and provide guidance for incorporating new and emerging energy-efficient technologies into projects. These programs could be enhanced by incorporating a demand response protocol that explicitly seeks to reduce electricity use during times of peak system demand by installing appropriate enabling technologies during the design and construction of new and substantially renovated homes.

As mentioned in #2 above, a major element of an ENERGY STAR New Homes Program could also be introducing the “Truth in Energy Use” rating system for homes. This rating system would help inform homebuyers and renters about the energy costs associated with a new residence prior to purchase or rental, similar to the “Energy Guide” found on all new appliances. Customers could use this information as an environmental or economic indicator when deciding whether to purchase or rent a new living space.

In addition, the program could offer incentives to builders to complete houses that meet ENERGY STAR standards and could provide cooperative marketing between Energy Star homes and certified ENERGY STAR Builders. The SCC could work to establish training and certificate programs for building designers and builders in cooperation with architects’ and homebuilders’ associations like the LEED’s Neighborhood Design standards.²²

6. Weatherization assistance: The SCC should consider an increase in state funding and expanded eligibility, for the state’s weatherization and air-infiltration programs. Weatherization programs tend to address deficient housing stock, thereby achieving significant reductions in energy consumption and costs for selected recipients. Utility-sponsored programs could be developed, similar to some pilot programs implemented during the early to mid 1990’s, that work in harmony with existing not-for-profit agencies programs and/or other third-party service providers.

The US Department of Energy provides funding and technical guidance to the states, but the states run their own weatherization programs. Virginia’s weatherization program is administered by the Virginia Department of Housing and Community Development through selected non-profit agencies. According to the DOE website, during the five-year period 2000-2005, Virginia weatherized a total of 8,463 homes – an average of 1,692 homes per year.²³ This yearly average represents just over 0.0005 percent of the estimated 3,174,708 housing units in Virginia as of 2005.²⁴

7. Program for Energy-Efficient Manufactured Homes: This program could provide financial incentives toward the purchase and installation of qualifying high-efficiency Energy Star heat pumps in manufactured housing. Eligible customers must own the manufactured home and presently utilize electric resistance heat as their primary

²² Leadership in Energy and Environmental Design Program for Neighborhood Design (<http://www.usgbc.org/DisplayPage.aspx?CMSPageID=148>)

²³ http://www.eere.energy.gov/weatherization/cfm/index.cfm/state_abbr=va

²⁴ <http://quickfacts.census.gov/qfd/states/51000.html>

heating source. Financial incentives could also be provided toward the purchase a new home with zone 3 insulation levels and a high efficiency Energy Star heat pump. Participating HVAC dealers and manufactured housing dealers may also receive a nominal financial incentive for promoting the program to prospective program participants.

8. ENERGY STAR Cool Roofs: Financial incentives can encourage – and eventually building code requirements can require – the installation of “cool roofs,” which reflect and emit the sun’s heat rather than transferring it to the building below.²⁵ According to EPA, which has instituted the ENERGY STAR Roof Product Program, cool roof systems with high reflectance and emittance stay up to 70°F (39°C) cooler than traditional materials during peak summer weather. Reductions in the roof-surface temperature reduce the heat transferred to the building below, thereby minimizing energy use and lowering energy and roof-maintenance costs. Related environmental benefits include reductions in urban heat-island effects and smog formation.

Rebates, tax savings, and other financial incentives should be established to encourage the purchase and installation of ENERGY STAR roof products, either for new roofs or retrofits.

9. Pay-as-You-Save financing for ENERGY STAR appliances²⁶: In other states, this program has been designed so that the utility finances a new appliance (or other measure) through the utility bill, with:

- a. A tariff assigned to a meter location, not to an individual customer;
- b. Billing and payment on the utility bill with disconnection for non-payment; and
- c. Independent certification that products are appropriate and savings estimates exceed payments.

The PAYS® system enables building owners or tenants to obtain and install money-saving resource efficiency products with no up-front payment and no debt obligation. Those who benefit from the savings pay for these products through a tariff charge on their utility bill, but only for as long as they occupy the location where the products were installed. The monthly charge is always lower than the product’s estimated savings and it remains on the bill for that location until all costs are recovered. Like a loan, PAYS® allows for payment over time, but unlike a loan the PAYS® obligation ends when occupancy ends or the product fails.

PAYS® can be tailored to individual states regardless of whether a state has initiated retail competition for electricity or gas. The PAYS America, Inc. program is committed to working with legislators, policymakers, energy efficiency and renewable energy

²⁵ According to the Cool Roof Rating Council, “coolness” is measured by two properties: solar reflectance and thermal emittance, each of which is measured from 0 to 1. The higher the value, the “cooler” the roof. Visit: www.coolroofs.org for more information.

²⁶ www.paysamerica.org

advocates, and regulators to construct a PAYS® infrastructure that effectively stimulates resource efficiency, renewable energy, and distributed generation purchases consistent with a state's economic realities and long-range plan.

Some of the utilities have expressed concerns with this program since, in its present form, the utilities would be responsible for the financing, accounting, collection, and debt, perhaps including uncollectible liabilities, associated with the PAYS® program. Although there are many obstacles, utilities are not presently staffed to finance individual equipment upgrades and, for some, it may not be deemed as a desired core business or long-term strategy. Some believe that any type of financing initiative, if deemed cost effective and appropriate, would be best implemented using a third party service provider who would qualify customers, provide financing, and assume all risk associated with default.

C. Residential and Small Commercial Efficiency and Conservation Programs: Mid-Term (1-5 years)

1. Increased Appliance Standards: Typically, state appliance efficiency standards establish minimum energy efficiency levels for appliances and other energy-consuming products not covered under Federal law. Over 10 states (Arizona, California, Connecticut, Maryland, Massachusetts, New Jersey, New York, Oregon, Rhode Island, and Washington) are implementing for 36 types of appliances and equipment efficiency standards, where cost-effective, for products that are not already covered by the federal government.²⁷ States are finding that appliance standards offer a cost-effective strategy for improving energy efficiency and lowering energy bills for businesses and consumers.

The Appliance Standards Awareness Project (ASAP)²⁸ identifies products for which state standards would be appropriate and estimates the potential benefits of those standards. ASAP's March 2006 report, *Leading the Way: Continued Opportunities for New State Appliance and Equipment Efficiency Standards*, estimates that by 2020 Virginia could save 50.3 GWh of energy by implementing appliance standards for just two consumer product categories: (1) compact audio products, and (2) DVD players and recorders.²⁹ The more standards enacted, the greater the energy savings.

2. High-performance green buildings (“beyond-code”): At a minimum, adoption of the 2006 IECC and the referenced ASHRAE 90.1-2004 have proven to be cost-effective in all of the states (approximately 16) that have recently or are in the process of adopting them. Virginia should consider accelerating adoption of future replacement code editions where possible. Many states and jurisdictions are also looking at “reach” codes that push those code levels to 15% higher than established building codes. For example, most of the towns on Long Island, NY have adopted ENERGY STAR as their Residential energy code, choosing to promote that level of efficiency and take advantage

²⁷ Clean Energy Guide to Action <http://www.epa.gov/solar/pdf/gta/executivesummary.pdf>

²⁸ <http://www.standardsasap.org/>

²⁹ www.standardsasap.org/documents/a062_va.pdf

of utility incentives for builders.³⁰ According to the Alliance to Save Energy,³¹ many builders are finding that after learning new methodologies brought by these reach codes, the reach is just a matter of changing cost centers.

D. Large Commercial Programs: Immediate (1-12 months)

1. Energy Auditing Program: Consider developing baseline market profiles for large commercial customers. These baseline profiles would include current and forecast numbers of customers by market segment, electricity use profiles by segment, and characterizations of existing energy-using equipment and DSM measure saturations. Once an audit is completed, the owner would be given a report of findings and recommendations. To drive energy efficiency improvements from an audit program, it is imperative that the building owner be informed of how the measures pay for themselves and how financing may be available to implement the audit recommendations. To do so, the building owner would be provided with a list of pre-qualified service providers that could implement the recommendations. The auditing contractor should also be allowed to implement the recommendations if the owner so chooses. The recommendations should be supported by coupons and discounts so that, for example, there is a monetary incentive to help offset the cost of installing a range of energy conservation measures from new HVAC equipment to vending machine controls (sometimes called “vending misers”) that power down vending machines when not in use. To add further incentive, the building owner would be refunded their portion of the audit fee if the recommendations are implemented.

2. HVAC Retrofit, Tune-Up and Replacement Program: Provides financial incentives to end-use customers to offset the incremental capital costs associated with installing high-efficiency residential and commercial HVAC (Heating, Air Conditioning and Ventilation) equipment that could both produce kWh savings and reduce peak kW electric demand. The program would promote use of ENERGY STAR HVAC equipment when new equipment is being purchased and emphasize quality installation. Program components include cooperative advertising with air conditioning distributors and contractors, training for salespersons on up-selling for high efficiency, financial incentives for high efficiency units, training for contractors in quality installation³² (such as proper sizing, refrigerant charge and airflow, and duct sealing), and certification of quality installers based on both training and spot-checking.

3. Commercial Building Retro-commissioning: This program would assist building owners and property management companies for large commercial buildings to tune up building systems and initiate on-going operations and maintenance programs. Savings of 10% or more are common with retro-commissioning since many buildings are badly out of tune. The program would include initial scoping studies to assess whether a

³⁰Green Building Petition for Dutchess County” (NY)
<http://www.petitiononline.com/greenbld/petition.html>

³¹ www.ase.org/

³² The Air Conditioning Contractors of America, in conjunction with ENERGY STAR, offers HVAC design and installation training and certification for contractors, instructors, technicians, government officials, and other interested parties. For more information, go to www.acca.org/training/technical.

building is a good candidate for retro-commissioning and commissioning services for buildings where appropriate, using experienced commissioning providers, technical and financial assistance for implementing commissioning recommendations, assistance developing on-going operations and maintenance procedures, and building operator training and certification.

4. High Efficiency Motor Program: Replacement or substitution of standard or lower efficiency motors with high efficiency units. Cost effectiveness of a motor replacement or substitution program depends on many factors including current motor stock and usage. Any proposed program must be further evaluated, but would most likely target the large commercial and industrial sectors.

5. Energy Efficiency Labeling program: Consistent with the 2007 Virginia Energy Plan³³ released on September 12, 2007, large commercial businesses should be encouraged to develop an energy labeling program to better familiarize consumers with energy efficient products for homes such as compact florescent light bulbs. An advertising push in Virginia could help residential and small business customers become more aware of ways to save money on their electricity bills.

E. Large Commercial: Mid-Term (1-5 years)

1. High Performance/ Green Building Program: The goal of a whole-building design approach is to create a high-performance energy efficient building by applying an integrated team approach during the project planning, design and construction phases. One aspect of the program will be to focus on achieving savings of around 30% per building, a level of performance that ASHRAE is targeting for its 2010 model building code. By familiarizing developers, architects, and engineers with this level of performance, Virginia can be an early adopter of the new ASHRAE standard³⁴. Elements include energy design assistance with an integrated approach, facilitated project charrettes (between architects, owners, and developers); design competitions, incentives for equipment that far exceed code. Benefits include positive public relations with media, ratepayers, and local governments; lower costs for owners and healthy and more comfortable environment for occupants; improved indoor air quality and increased productivity in the school or workplace. Green construction also can help Virginia's environmental compliance requirements in federal non-attainment areas.

2. Appliance Efficiency Standard Improvement: State appliance efficiency standards establish minimum energy efficiency levels for appliances and other energy-consuming products. Over 10 states (Arizona, California, Connecticut, Maryland, Massachusetts, New Jersey, New York, Oregon, Rhode Island, and Washington) are implementing for 36 types of appliances and equipment efficiency standards, where cost-effective, for products that are not already covered by the federal government.³⁵ States

³³ http://www.governor.virginia.gov/TempContent/2007_VA_Energy_Plan-Full_Document.pdf

³⁴ <http://www.ashrae.org/>

³⁵ EPA's Clean Energy Guide to Action <http://www.epa.gov/solar/pdf/gta/executivesummary.pdf>

are finding that appliance standards offer a cost-effective strategy for improving energy efficiency and lowering energy bills for businesses and consumers.

3. Commercial Data Center Efficiency Programs: Data Centers use substantial quantities of electricity to power their equipment and for their very high cooling needs. In 2006 data centers used 1.5% of ALL US electricity.³⁶ And, this usage level is expected to double by 2011 as this industry continues its high growth.

A recent *Information Week* article (Sept 3,2007) points out, data center electricity usage could be halved by using new more efficient equipment and more widely applying some of the best practices already developed in the industry.

Barriers include lack of sub-metering, lack of power usage data and lack of clear executive responsibility for energy costs fails to provide the information or responsibility required for action. Further, as *Information Week* reports, best practices on efficiency and their value to the bottom line are not well understood in the industry.

Since most data centers will need to enlarge and rebuild their facilities over the next few years to keep up with growing demand, there is a great opportunity to embed energy efficiency practices into these facilities.

Data centers are a major and growing industry in Virginia, and are cited as one of the primary reasons for needed to add new capacity to the electric system. Helping them to become more efficient can help their bottom lines, and improve the state's energy situation as well.

F. Industrial Efficiency and Conservation Programs: Short Term (1-12 months)

1. Lighting Rebate Program: This program would offer pre-determined rebates based on specified energy efficient lighting installations. For standard fixtures, rebates could be obtained at the check-out counter. This is an easy program to put in place quickly and can be scaled based on current needs. The program may have a limited lifetime if the program is heavily used, so this program should be thought of as a jump start to stimulate interest in energy efficiency opportunities and to capture substantial savings in the next few years. Measures to be emphasized could include T-8 or T-5 fluorescent lamps and high-output electronic ballasts, pulse and ceramic metal halide lamps, and occupancy sensors. These are significantly more efficient than the older, less-efficient T-12 lamps and magnetic ballasts that still exist in many commercial, industrial, and institutional buildings today.

2. High Efficiency Motor Program: Replacement or substitution of standard or lower efficiency motors with high efficiency units. Cost effectiveness of motor replacements or of substitution programs depends on many factors including current

³⁶ Information Week, Sept 3, 2007
www.informationweek.com/story/showarticle.jhtml?articleID=201803326

motor stock and usage. Any proposed program must be further evaluated, but would most likely target the large commercial and industrial sectors.

3. Compressed Air Program: designed to improve system performance in industrial applications by identifying and correcting compressed air leakage problems. Leaks in compressed air systems often waste 20-30% of the compressor's output; compressed air leaks can also contribute to problems with system operations.³⁷ A Compressed Air Program that coordinates its efforts with the Department of Energy's Compressed Air Challenge³⁸ could provide training to customers on the value of correcting problems, incentives to conduct audits, and incentives to implement recommendations from the audits. The program could also help utilities improve relations with industrial customers; reduce energy and repair costs in industrial facilities; improve manufacturing system reliability; and increase competitiveness and profitability of Virginia's manufacturing sector.

G. Industrial Efficiency and Conservation Programs: Intermediate Term (1-5 years)

1. Department of Energy's Industrial Assessment Centers: This free federal program could be marketed aggressively in Virginia. North Carolina State University (NCSU) and West Virginia University are the two Industrial Assessment Centers (IAC's) that currently serve Virginia. There are no Virginia schools that currently have an IAC program in operation. In contrast, the NCSU IAC team will come to any industrial plant and perform a free industrial class energy audit to identify opportunities for greater energy efficiencies in their process for the purpose of overall operational energy savings. Each industry which receives such an audit receives a report (usually 50+ pages) identifying the opportunities, quantifying the energy unit savings potentials, costs to implement and payback calculations. Virginia's Philpot Manufacturing Extension Program (VPMEP) has recently partnered with the NCSU IAC Team to work with assessed industrial clients on implementing the opportunities identified, as well as other operational efficiency initiatives such as the management's training in techniques from BlackBelt, Six Sigma, Lean Manufacturing, etc.³⁹ The VPMEP also helps the industry with equipment, installers, and financing vendors as well as assisting in drafting the business plan which supports the implantations of efficiency.⁴⁰

2. Combined Heat and Power: Combined heat and power (CHP), also known as cogeneration, is the simultaneous production of electricity and heat from a single fuel source, such as: natural gas, biomass (plant material, vegetation, or agricultural waste), biogas (methane produced by the aerobic or anaerobic digestion of biomass, such as commonly found in landfills), coal, waste heat, oil, or from waste from industrial processes.

³⁷ http://www.energystar.gov/ia/business/industry/compressed_air3.pdf

³⁸ http://www.compressedairchallenge.org/content/library/docs/CACEval_article113004.doc

³⁹ <http://www.vpmep.org/what-we-do.html>

⁴⁰ More info on VPMEP: <http://www.vpmep.org/what-we-do.html>

By using waste heat recovery technology to capture a significant proportion of this wasted heat, CHP systems typically achieve total system efficiencies of 60 to 80 percent for producing electricity and thermal energy.⁴¹ CHP is not a single technology, but an integrated energy system that can be modified depending upon the needs of the energy end user.

3. Waste to Heat: Production of heat and electricity has to begin with a fuel source. Many processes of our society produce waste streams of material. Much of that material is a potential fuel source. Landfills with enough carbon based matter, decay to produce supplies of methane gas. Agricultural processes often produce large quantities of waste plant material ripe with BTU content to be extracted. Wastewater treatment facilities produce sludge which can be dried and incinerated, and, depending upon the process used, can produce harvestable methane gas for fuel. Many manufacturing processes produce large quantities of various materials, which can be used as fuel sources. Land cleared for development leaves behind wood products which can be burned for fuel. Exploring the feasibility of different wasted materials from a multitude of processes for the purpose of use as fuel should not be overlooked by Virginia. These alternate fuel sources may be available, but they are not immune from the barriers mentioned in later sections of this report, such as capital costs, emissions, longevity of fuel supply, and more.

4. Waste Heat Reclamation⁴²: Heat reclamation is the recovery and utilization of heat energy that is otherwise rejected as waste. Sources of this waste heat include exhaust air, lights, equipment, and people. Heat reclamation systems recover waste heat to satisfy part of the heat energy needs for heating, cooling, and domestic hot water systems. Heat recovery conserves energy, reduces operating costs, and reduces peak loads.

The performance of any heat recovery system depends upon the following factors: non-contaminated exhaust source; temperature difference between the heat source and heat sink; latent heat difference between the heat source and sink; mass flow multiplied by specific heat of each source and sink; efficiency of the heat-transfer device; extra energy input required to operate the heat recovery device; fan or pump energy absorbed as heat by the heat-transfer device; and service capability of the maintenance staff, which can enhance or detract from the performance. Some examples of heat reclamation processes currently being used are Heat Wheels, Heat Pipe Systems, Plate Heat Exchangers, and Thermal Storage Systems.

H. Institutional Efficiency and Conservation Programs

In Virginia, Public Authority (PA) accounts, such as schools, city and county buildings, and Commonwealth of Virginia (CV) accounts, such as state buildings and other state accounts, are not governed by, or under the jurisdiction of, the VA SCC. Rates for PA and CV accounts are negotiated between the utility and these respective groups. Therefore, some of the programs for these customers may have to be funded by the

⁴¹ <http://www.vpmep.org/what-we-do.html>

⁴² [//orf.od.nih.gov/PoliciesAndGuidelines/DesignPolicy/HTMLVer/Voume4/SustainableDesign.htm#b3](http://orf.od.nih.gov/PoliciesAndGuidelines/DesignPolicy/HTMLVer/Voume4/SustainableDesign.htm#b3)

customers of the PA and CV entities. If PA or CV entities, or their customers, wish to pursue utility-sponsored energy efficiency or conservation programs, those negotiations would have to take place between the utility and those entities. It may be inappropriate for utility ratepayers to fund programs that are not under VA SCC jurisdiction. Likewise, any wholesale accounts, which would be under FERC jurisdiction rather than VA SCC jurisdiction, would not qualify for any utility-sponsored incentives.

Virginia is home to a large proportion of our nation's federal facilities due to its close proximity to Washington DC, representing a significant portion of our nation's federal government buildings. Virginia should review what ability the state has over federal facilities so that they may participate in energy efficiency and conservation initiatives in Virginia. The state should work with our representatives in Congress to address these issues, and where suitable should encourage federal institutions residing in Virginia to show leadership in implementing programs.

Because of Virginia's diverse communities, program design should be conscious of both urban and rural area school systems and county governments. The Virginia SCC should consider conducting pilot programs in both urban and rural counties for programs that require a test market.

I. Institutional Efficiency and Conservation Programs Immediate (1-12 months)

The following list includes sector-specific programs for schools; city, county and state government agencies; and higher education.

1. Energy Efficiency for K-12 Schools Market Transformation Program: The program represents a comprehensive 5-step approach to energy efficiency in schools. This program would include energy performance benchmarking, energy master planning, technical assistance, communications support and cash incentives. The goal of the program would be to create sustainable improvement in school operations by teaching decision-makers how to plan and execute energy efficiency upgrades over a multi-year period. Schools could save money that can be invested in teacher salaries, equipment, etc; utilities shave peak kW demand, local taxes can be lowered as schools pay for their needs out of the energy savings. A comprehensive program such as this would need dedicated funding to help offset the cost of program design, implementation, and customer rebates for technologies ranging from high-efficiency lighting, to building controls, to ENERGY STAR office equipment.

2. Energy Efficiency for Government & Higher Education Market Transformation Program: Comprehensive 5-step approach to energy efficiency in Local Governments. This program could include energy performance benchmarking, energy master planning, technical assistance, communications support and cash incentives and creates sustainable improvement in public building operations by teaching decision-makers how to plan and execute energy efficiency upgrades over a multi-year period. Cities/counties would save money that can be invested in personnel, equipment, etc, while utilities shave peak kW demand. Local taxes could be lowered as local governments pay for their needs out of the energy savings. This comprehensive program

would have dedicated funding to help offset the cost of program design, implementation, and customer rebates for technologies ranging from high-efficiency lighting, to building controls, to ENERGY STAR office equipment.

3. Develop a state level advisory committee: A committee would work with Virginia's Department of Education on energy efficiency initiatives in school districts and colleges/universities, looking at options for efficient new school construction, integrating energy efficiency into instruction and integrating strategic energy planning.

4. Loans to Save Taxes Programs: such as Texas LoanSTAR⁴³ program which provides grants to schools to make efficiency upgrades such as lighting replacement and HVAC retrofits. Texas LoanSTAR provides funding for energy assessments, training energy engineering consulting firms on audit techniques and guidelines, developing methods to monitor and meter pre and post retrofit energy consumption, and develops methods of analyzing energy savings that can be attributed to building retrofits.

5. Land Grant Institutions and County Economic Development: Virginia could engage the Commonwealth's Land Grant Institutions, such as Virginia Tech and Virginia State, to include energy efficiency education/audits with small businesses and homeowners through their existing extension service offices. This program could be facilitated very quickly and have lasting benefits with no additional costs. Not only could extension service offices offer these programs, but county economic development offices could include information on how small businesses can become more energy efficient. If this program is deployed, economic development offices should include information on energy efficient building materials, retrofits and local vendors for energy efficient upgrades as part of the information that is available to new business owners in Virginia's communities. Low cost energy is one of three business costs that make Virginia #1 in the country, so there is an inextricable linkage in offering it to business owners.

J. Institutional Efficiency and Conservation Programs: Mid-Term (1-5 years)

1. Development of a state-level "green schools institute": to provide a venue and structure for training and support of energy efficiency at both the K-12 and post-secondary levels. This program could have tracks focused on new school construction, school/campus building commissioning, teacher training, student leadership, etc. The Alliance to Save Energy⁴⁴ based in Washington DC has a model Green Schools Program which educates K-12 students about energy and the link between energy efficiency, while at the same time saving energy in schools by engaging students in energy-saving service learning projects. Some states already have SOL's on environmental decision-making. Virginia should consider including energy efficiency in an environmental SOL program.

⁴³ Texas LoanSTAR, also known as the Loans to Save Taxes and Resources program, began in 1988 as a \$98.6 million retrofit program for energy efficiency in buildings (primarily public buildings such as state agencies, local governments, and school districts). To find out more visit: www.eere.energy.gov/state_energy_program/feature_detail_info.cfm/fid=45 The program is now funded at a minimum of \$95 million annually. The original funding for the program was from PVE funds. The Texas State Energy Conservation Office (SECO) administers the funds through DOE's State Energy Pro

⁴⁴ <http://www.ase.org/section/program/greenschl/>

A statewide program could help schools develop a baseline of energy use and calculate savings from student-initiated activities. High school students would be trained to conduct school energy audits and present recommendations on efficiency retrofits to their school boards. Energy savings from student activities at “Green Schools” tend to be in the range of five to 15 percent⁴⁵

2. High Performance/Green Buildings and Schools Program: Anyone building a new building should be encouraged to build it as energy efficient and environmentally sensitive as possible. A program could be designed to promote energy efficiency only, or could be made a part of a broader green building initiative that includes all of the necessary steps for a building to receive LEED certification from the US Green Buildings Council (USGBC). The goal of a whole-building design approach is to create a high-performance energy efficient building by applying an integrated team approach during the project planning, design and construction phases. One aspect of the program would be to focus on achieving savings of around 30% per building, a level of performance that ASHRAE is targeting for its 2010 model building code. By familiarizing developers, architects, and engineers with this level of performance, Virginia could be an early adopter of the new ASHRAE standard. Elements include energy design assistance with an integrated approach, facilitated project charrettes (between architects, owners, and developers); design competitions, incentives for equipment that far exceed code. Benefits include positive public relations with media, ratepayers, and local governments; lower costs for owners and healthy and more comfortable environment for occupants; improved indoor air quality and increased productivity in the school or workplace. Green construction also can help Virginia’s environmental compliance requirements in federal non-attainment areas. Retrofits include vending misers, lighting and HVAC upgrades, landscaping, and passive solar design for school sites:

As a strategy to achieve high-performance/green buildings, the state could adopt a “beyond-code” which, at a minimum, would be the 2006 IECC and the referenced ASHRAE 90.1-2004.

K. Long Term Implementation: All Customer Classes (Beyond 5 years)

Programs will need a steady stream of funding to be useful beyond five years. Programs should be updated with new technologies as they become available. In particular, three technologies should be pursued in Virginia for all customer classes once these technologies become cost effective to deploy.

1. Photovoltaic Paneling: While solar panels, like PVs, are not traditionally thought of as energy efficiency or conservation tools, the use of these technologies can:

- 1) Reduce the amount of electricity needed from the supply-side/demand on the transmission grid, and, 2) Reduce the need for new generation facilities and overall emissions.

⁴⁵ <http://www.ase.org/content/article/detail/2977>

Large commercial properties should be allowed to consider these technologies as a conservation choice. Large chain big box stores such as Wal-Mart are choosing to use solar panels in their new constructions. Not only are newly constructed small shopping plazas being built in California using solar panels that appear like a roof, but Safeway is installing 23 California stores with solar panels which will provide 48% of their electricity during peak hours of 10am to 4pm daily.⁴⁶

The SCC should consider assisting homes and businesses to implement PV by offering financial incentives to help offset first cost in all customer sectors. Large "big-box" retailers should be targeted as prospective buildings to install solar photovoltaics.

2. Solar Hot Water Installation Program: Solar water heating systems can be cost effective and can be used in any climate. These technologies are included in EPA's EERE (Energy Efficiency and Renewable Energy) consumer guide. While these solar hot water systems have a higher purchase and installation cost, they save money in the long term. Water heating bills on the average drop 50 percent to 80 percent.⁴⁷ And because the sun is free consumers are protected from fuel shortages and price hikes.

New homes or refinances can include the price of solar water heaters in new 30-year mortgages. This usually amounts to between \$13 and \$20 per month. The federal income tax deduction for mortgage interest attributable to a solar domestic hot water system reduces that by about \$3 to \$5 per month.⁴⁸ So if a consumer fuel savings is more than \$15 per month, the solar investment is profitable immediately. On a monthly basis, the consumer saves more than he/she pays.

3. Advanced Metering Infrastructure (AMI): AMI is essential to state efforts to reduce energy consumption. The metering and communications capability inherent in AMI helps ensure that consumers receive the information they need – including consumption data and price signals – to evaluate and adjust their energy consumption. It also permits the introduction of innovative pricing plans, including real-time and critical peak pricing. Further, AMI facilitates "smart" home energy management systems that allow customers to assess their energy use and to control usage remotely and/or automatically.

The benefits of DSM, efficiency and conservation programs can be enhanced further when combined with innovative rates designed to shift energy use from high-cost periods to lower-cost periods, and other differentiated rates that support DSM. Regulators, utility executives, and other industry stakeholders are increasingly pursuing these combined approaches as reflected in recent requests for regulatory approval of advanced metering infrastructure and DSM programs designed to incorporate sophisticated enabling technologies to enhance demand responsiveness. Advanced metering will enable

⁴⁶ Article reference available at <http://www.environmentalleader.com/2007/09/14/safeway-to-install-solar-power-panels-on-23-stores/>

⁴⁷ EERE Consumer Guide www.eere.energy.gov

⁴⁸ http://www.eere.energy.gov/consumer/your_home/water_heating/index.cfm

Virginians to manage their energy costs more effectively by being able to control appliances remotely.

The societal and operational benefits attributable to AMI have led to deployment nationwide. In the last several years, California state utility regulators, which have addressed AMI issues in depth, determined that the AMI plans of two of its largest utilities are cost-effective and approved mass deployment. In addition to California, large-scale AMI deployment is underway in Pennsylvania, Wisconsin, Connecticut, Kansas, Idaho, and Illinois; other jurisdictions, like the District of Columbia, are introducing pilots.

Examples of AMI that should be investigated for appropriateness in Virginia could include programs such as Southern California Edison's Advanced Metering Program. In Illinois, the two largest utilities (ComEd and Ameren) have already taken steps to make these rates available and have hired implementation contractors to administer the residential real-time program applicable to all residential customers by amendment to its Public Utilities Act.

Conclusion

In conclusion, Workgroup 2 agrees that cost-effective efficiency and conservation programs will generate benefits to electric ratepayers, the state economy and the environment. However, because electric rates in Virginia have been relatively low, there has been limited participation in efficiency programs. Critical barriers need to be addressed in order for efficiency and conservation programs to be implemented in Virginia. Those barriers include regulation, financial policies, market conditions, building codes, metering and knowledge. Workgroup 2 recommends that the SCC give consideration to the effectiveness of programs listed in this report for Virginia.

Appendices

1. Appendix A: Additional Information on Selected Programs
2. Appendix B: Extended Current Barriers
4. Appendix C: NAPEE Table 6-3
3. Appendix D: NAPEE Table 6-10

Appendix A- Additional Information on Model Programs

1. Compact Florescent Lighting Quick Start Program – all sectors

Wal-Mart's new program will move over 100 million CFL's by the end of 2007 at \$7.58 per 4 pack.

Wisconsin Focus on Energy, a statewide energy efficiency organization, has implemented a successful CFL rebate program for several years. The program successfully tracks CFL sales throughout the state at a wide variety of retail locations. For more information, go to www.focusonenergy.com.

The Northwest Energy Efficiency Alliance, a non-profit organization funded by utilities in the Pacific Northwest, has successfully promoted CFL's for several years. NW Alliance programs have been a key factor behind the region's high market share for CFL's, with extensive evaluation studies of how the regional light bulb market is being transformed. More information can be found at www.northwestenergystar.com and www.nwalliance.org.

Georgia Power, an investor-owned utility, has recently begun its CFL promotional efforts with free bulb distribution to targeted audiences and promotional events in Home Depot stores. For more information, go to www.georgiapower.com/energystar/lighting.asp.

Sacramento Municipal Utility District (SMUD) has implemented a successful CFL buy-down program to promote low CFL prices at multiple retail locations. SMUD emphasizes the development of retailer-manufacturer partnerships in its programs. For more information, go to www.smud.org/rebates.

2. Improved Building Codes

California's Title 24 may be the most well-known of the building codes that incorporate strict energy-efficiency standards. According to the California Energy Commission, since 1978 the state's building efficiency standards (applicable to both residential and non-residential buildings), in conjunction with its appliance standards, have saved more than \$56 billion in electricity and natural gas costs, with an estimated additional savings of \$23 billion projected by 2013. For more information visit: <http://www.energy.ca.gov/title24/>.

States like New York are including building codes, appliance standards, and other statewide policies to complement utility programs, consumer education and customer incentives. In California, which has been pursuing these policies longer than any state, it is estimated that significant energy savings have been attained through building codes and appliance standards. California has a uniquely aggressive set of policies in these areas, however, and it is uncertain that Virginia could realize a similar proportion of savings. Nonetheless, we suggest that initiatives that address codes and standards be

implemented, in addition to energy efficiency programs, in order to achieve the goal. Other complementary initiatives can include state and local government energy efficiency requirements for their own buildings, and sales tax holidays that encourage consumers to buy higher efficiency appliances, as have been advocated by the Virginia Energy Plan⁴⁹.

Not every initiative that helps support the success of an energy efficiency program, such as improved building codes and consumer education programs, can be analyzed through a cost benefit analysis. Similarly, a statewide advertising campaign to educate consumers about the benefits of energy conservation will be an integral part of the success of any program that is deployed in Virginia and therefore receives the support of Workgroup 2.

3. High-Efficiency Lighting Programs – all sectors

a. Utility-sponsored CFL rebate or incentive programs:

- NorthWestern Energy (MT) Home Lighting Rebate Program provides \$2 rebates for Energy Star CFL's and \$10 rebates for Energy Star hard-wired CFL fixtures, with certain restrictions.
http://www.northwesternenergy.com/documents/E+_lighting_rebate.pdf?M=2&I=521
- Public Service of New Hampshire Energy Star Lighting Program offers rebate coupons ranging from \$1 to \$10.
http://www.psnh.com/Energy/Home_Efficiency/Residential_Lighting.asp
- Chippewa Valley (WI) Electric Cooperative CFL Rebate Program offers a \$2 rebate per bulb, for up to 5 CFL's per calendar year. (<http://cvcoop.com/forms/CFL.pdf>).

b. California Residential Lighting Incentive Programs

- Programs reduce the wholesale price to qualifying retailers in the applicable utility's service territory. As a result, the retail price paid by the end-user for designated products already includes the rebate.
- For an overview, see "California Statewide Residential Lighting Programs" at http://www.energystar.gov/ia/partners/downloads/meetings/2005_CALightingPrograms_Greenburg.pdf.
 - For a consumer-oriented explanation see <http://www.pge.com/res/rebates/lighting/>.
 - Information regarding the manufacturer component is available at http://www.energystar.gov/index.cfm?fuseaction=activity_search.displayimage&pact_id=1009049.

c. Commercial and industrial incentive programs

- Columbia (MO) Water and Light Lighting Incentive Program (<http://www.gocolumbiamo.com/WaterandLight/Business/lightincentive.php>).

⁴⁹ http://www.governor.virginia.gov/TempContent/2007_VA_Energy_Plan-Full_Document.pdf

- The program provides an incentive rebate payment of one-half the cost of a lighting retrofit, or \$100 per kilowatt (KW) of reduction, whichever is less (up to a maximum of \$5,000) for retrofits that result in a minimum 10 kilowatt reduction.
- Montana-Dakota Utilities Commercial Lighting Incentive Program (<http://www.montana-dakota.com/topical/incentives.htm>).
- The program, open to all existing commercial facilities with an active Montana-Dakota Utilities Co. electric account in the states of North Dakota, South Dakota, and Wyoming, applies to new installations only.
- Duke Energy (KY) Energy Efficiency Incentive Program (<http://www.duke-energy.com/kentucky-business/energy-management/energy-efficiency-incentives.asp>).
- Lighting incentives are limited to \$50,000 per fiscal year; other restrictions are listed on p.2 of the application form, available at http://www.duke-energy.com/pdfs/KY_lighting_appl_pack_07.pdf.

4. High-Efficiency Appliance/Office Equipment Programs - all sectors

Wisconsin Focus on Energy has implemented successful appliance rebates for several years. In future years, due to the success in increasing the market share of ENERGY STAR qualified products, the program's focus will shift from rebates to retail staff training, cooperative advertising, and other promotional efforts. For more information, go to www.focusonenergy.com.

The Northeast Energy Efficiency Partnership, a stakeholder group of utilities and other partners in the northeast states, has established a successful appliance rebate and promotion program coordinated among multiple utilities. For more information, go to www.myenergystar.com.

The Southern Minnesota Municipal Power Agency (SMMPA) works with 18 member municipal utilities to promote ENERGY STAR qualified appliances through rebates, marketing and consumer education, retail staff training, and other methods. To review individual utility programs, go to www.smmpa.org/members.asp.

Rocky Mountain Power, an investor-owned utility owned by PacifiCorp, has recently initiated a Home Energy Savings Program, offering rebates on ENERGY STAR qualified appliances in Idaho and Utah. For more information, go to www.rockymtnpower.net

Other Suggestions:

- Residential sector:
- Government-sponsored programs:
- Pennsylvania Energy Independence "Cool Appliance Swap" program is a \$44 million program that provides rebates to Pennsylvania retailers to enable residential (and small business) customers to replace their inefficient room air conditioners and

refrigerators with energy-efficient appliances.

(<http://www.depweb.state.pa.us/energyindependent/lib/energyindependent/documents/fs-coolapplianceswap.pdf>)

- Utility-sponsored programs:
- Eugene (OR) Water and Electric Board Home Appliance Rebate Program provides rebates ranging from \$15 to \$70 dollars for the purchase and installation of certain water heaters and ENERGY STAR appliances.
(<http://www.eweb.org/home/energy/appliances/index.htm>)

5. Residential Energy Auditing Program

Kentucky Power's Modified Energy Fitness Program:

http://www.arkansas.gov/psc/EEInfo/KY_AEP-DSM.pdf

Austin Energy offers residential energy auditing under the Home Performance with ENERGY STAR program. For more information, go to www.austinenergy.com.

Government-sponsored programs:

- Boulder County (CO) and participating cities in Boulder County Residential Energy Audit Program
(http://www.conservationcenter.org/Energy_Audit_Pilot_Program.htm)

Utility-sponsored in-home energy audit:

- CenterPoint Energy (MN) offers two categories of in-home energy audits (http://mn.centerpointenergy.com/for_your_home/energy_your_home/heating/audit.asp).
 - The Standard Audit, which costs \$25, addresses heating and structural efficiencies; it also may include (at no cost) up to \$25 worth of basic weatherization materials.
 - The Home Performance Audit, which costs \$100, takes a more thorough look into a home's energy situation, providing detailed information for greater potential energy savings.
- Louisville Gas & Electric (KY), a wholly-owned subsidiary of E.ON U.S. LLC, offers an in-home energy audit for \$15.

Utility-sponsored on-line home energy audit:

- Southern Maryland Electric Cooperative OnLine Home Energy Audit
(<http://www.smeco.com/customer/audit/index.html>)
- City of Ocala (FL) Electric Utility "Energy Depot" tools
(<http://www.ocalaelectric.com/OEU.aspx?id=226>)
- Rocky Mountain Power provides "on-line energy analysis" to its customers in Idaho, Utah, and Wyoming
(<http://www.rockymtnpower.net/Homepage/Homepage35890.html>)

6. HVAC Retrofit, Tune-Up, and Replacement Program – residential and commercial

ENERGY STAR for Light Commercial HVAC Fact Sheet for Building Owners and Property Managers:

http://www.energystar.gov/ia/partners/manuf_res/LCHVACFS3.pdf

- Utility-sponsored residential programs:
 - Connecticut Light & Power Air Conditioning/HVAC Rebate Program provides incentives of up to \$500 for the installation of central air conditioning or heat pump systems that have a SEER rating of 15 or higher. (<http://www.clp.com/clmres/energy/air/indexair.asp>)
 - Austin (TX) Energy's Power Saver Program offers rebates on A/C units with a SEER-rating of 14.0 or higher. (<http://www.austinenergy.com/Energy%20Efficiency/Programs/Rebates/Residential/Air%20Conditioner/index.htm>)
- Utility-sponsored commercial programs:
 - Alliant Energy serves more than 1.4 million customers in Iowa, Minnesota and Wisconsin. It offers its commercial customers a number of programs designed to improve the efficiency of their HVAC systems (<http://www.alliantenergy.com/docs/groups/public/documents/pub/p014841.hcsp>).
 - Program availability depends on the state in which the customer is located. (Programs for Iowa business customers are listed at <http://www.alliantenergy.com/docs/groups/public/documents/pub/p014860.hcsp>.)
 - Progress Energy, which holds two electric utilities serving approximately 3.1 million customers in North Carolina, South Carolina, and Florida, offers a number of programs to increase the efficiency of its business customers' HVAC equipment and systems (in addition to building envelope and lighting programs). These programs are limited to retrofits; new installations do not qualify. (http://www.pse.com/solutions/ForBusiness_EfficiencyPrograms.aspx)

7. ENERGY STAR New Homes Program

http://www.energystar.gov/index.cfm?c=new_homes.hm_index

- State-sponsored programs:
 - NYSERDA's Energy Star Labeled Home Builders Program offers builders technical assistance, financial incentives, and marketing and sales support (<http://www.getenergysmart.org/ContractorsPartners/builders/overview.asp>).
 - Builders must sign a Partnership Agreement with the EPA and NYSERDA, and have their building plans and homes reviewed by an independent third-party Home

Energy Rater who is also certified under NYSEERDA's program.
(<http://www.getenergysmart.org/ContractorsPartners/builders/supportIncentives.asp>)

- Utility-sponsored programs:
 - Customers of four New Hampshire electric utilities, including NationalGrid and Unitil Energy Systems, are eligible to receive incentives of up to \$3,000 when building (or completely renovating) a residence.
(<http://www.nhsaves.com/residential/homes.html>)
 - Incentives are provided via "NHSaves.com," a collaborative effort between the state's electric utilities, the NH Public Utilities Commission and other interested parties.
 - Rocky Mountain Power provides financial and marketing incentives to Utah home-builders that building Energy Star homes. Single-family homes qualify for a \$350 incentive; multi-family homes qualify for \$250 or more
(<http://www.utahenergystar.com/builders/index.html>).

8. Appliance Collection and Disposal Program

No- or low-cost pick-up and disposal services for outdated but working major appliances, particularly refrigerators and freezers; programs may include cash incentives

- Sierra Pacific Power (NV) Refrigerator Recycling
(http://www.sierrapacific.com/conservation/home/home_rebates/refrigerator_recycling.cfm)
- Austin Energy (TX) Refrigerator/Freezer Recycling Program
(<http://www.austinenergy.com/Energy%20Efficiency/Programs/Refrigerator%20Recycling/index.htm>)
- Snohomish County (WA) Public Utility District (PUD) refrigerator and freezer recycling program, operated in conjunction with JACO Environmental, a local appliance recycler (<http://www.snopud.com/energy/home/econpgms/recycle.ashx?p=2543>)

9. ENERGY STAR "Cool Roofs"

Rebates or incentives to install reflective Energy Star "cool roofs"

- Florida Power & Light Residential Building Envelope Program
(http://www.fpl.com/doingbusiness/contractors/pdf/residential_building_envelope.pdf)
- California:
 - Pacific Gas & Electric Cool Roof Rebate Program
(http://www.pge.com/res/rebates/cool_roof/index.html)
 - Southern California Edison Cool Roof Rebate Program
(<http://www.sce.com/RebatesandSavings/Residential/Heating+and+Cooling/CoolRoof/>)

10. Smart Energy Choices: Programmable Thermostats

. Rebates or incentives for the purchase of programmable thermostats; may include other energy-saving devices

- Government sponsorship:
 - City of Charlottesville (VA) Programmable Thermostat Cash-Back Rebate Offer (up to \$100) (<http://www.charlottesville.org/Index.aspx?page=680>)
- Joint sponsorship:
 - Energy Star Programmable Thermostat Rebate Program, jointly funded by Excel Energy (ND) and North Dakota Division of Community Services (\$30) (<http://www.nd.gov/dcs/energy/docs/EnergyStarRebates.pdf>)
- Utility sponsorship:
 - Puget Sound Energy (WA) Programmable Thermostat Rebate (\$50) (<http://www.pse.com/solutions/rebateThermostat.aspx>)

11. Pay-as-You-Save financing for ENERGY STAR appliances

PAYS® was created by Harlan Lachman and Paul Cillo of the Energy Efficiency Institute, Inc. PAYS America, Inc. makes the PAYS® trademark available at little or no cost to state regulators who wish to implement a PAYS® market.

Apparently this concept has been pushed since 1999 by energy groups in Vermont, the Regulatory Assistance Project, and others. Hawaii and Michigan are doing pilot programs.

12. Energy Auditing & Retro-commissioning Programs – commercial, industrial, institutional

- State-sponsored:
 - Minnesota’s Plant Management Division offers nine different energy-savings programs to all Minnesota state agencies and Minnesota State Colleges and Universities (http://www.admin.state.mn.us/pmd/energy/2-0_services.htm).
 - The nine programs described on the Division website include: “Guaranteed Energy Savings,” “Shared Energy Savings,” “Utility Rebate,” “Utility Rate Evaluation and Analysis,” and “Energy Monitoring.

13. Commercial Green Building New Construction Program - commercial, industrial, institutional

Building Codes Assistance Project (see www.bcap-energy.org)

14. Appliance Efficiency Standard Improvement
http://www.standardsasap.org/documents/a062_va.pdf

14. Combined Heat and Air Programs

- Onsite generation of electrical and/or mechanical power.
- Waste-heat recovery for heating, cooling, dehumidification, or process applications.
- Seamless system integration for a variety of technologies, thermal applications, and fuel types into existing building infrastructure.

Because CHP is more efficient, less fuel is required to produce a given energy output than with separate heat and power. Higher efficiency translates into:

- Lower operating costs
- Reduced emissions of all pollutants
- Increased reliability and power quality
- Reduced grid congestion and avoided distribution losses
- No transportation costs due to onsite generation
- CHP reduces air pollution and greenhouse gas emissions
- Requires less fuel to produce a given energy output by reducing electric transmission and distribution losses

<http://www.epa.gov/chp/>

15. Advanced Metering Infrastructure

- Pennsylvania:
 - PPL Electric: In late 2006, we added the capability to store and access hourly usage information from all of our 1.4 million meters. According to PLL, these advanced meters have virtually eliminated the estimated bill; today, more than 99.8 percent of its customers' bills are based on actual electricity use. (www.pplelectric.com/Residential+Customers/Learning+Center/About+My+Meter/)
 - Pennsylvania Energy Independence Smart Meters (<http://www.depweb.state.pa.us/energIndependent/lib/energIndependent/documents/fs-smartmeters.pdf>)
- California:
 - Pacific Gas & Electric (implementing retrofits): Program is scheduled to be completed by the end of 2011. Once operational, PGE anticipates collecting residential electricity usage data on an hourly basis. (http://www.pge.com/customer_service/ami/)
 - San Diego Gas & Electric (implementing new technology): SDG&E anticipates completing its program by 1st Quarter 2011. (<http://www.sdge.com/smartmeterv2/index.shtml>)

Southern California Edison's Advanced Metering Program:

<http://www.sce.com/PowerandEnvironment/ami/default.htm?from=redirect>

16. Solar Photovoltaic and/or Solar Hot Water Installation

Ken Sheinkopf, a communications specialist with the American Solar Energy Society, stated “Thanks to the Energy Policy Act of 2005, there are now a number of federal incentives for the purchase of renewable energy systems and energy efficiency products. These include solar water heaters, one of the most practical, proven and economic of all renewable energy systems on the market. The act establishes federal tax credits of 30 percent of the qualified solar system cost up to a maximum tax credit of \$2,000. In addition, about half the states have their own state tax credits ranging from 5 or 10 percent to as high as 35 percent, so you can get a big chunk of a solar system cost paid by the government. One of the big reasons solar water heating systems were included in this package of incentives is the simple fact that they save energy and save money. They work on a very simple principle of using the sun to heat water flowing through tubes or other types of solar collectors usually located on the roof of the house, and then this heated water flows into a well-insulated storage tank in your house where it is ready when you need it.”

Austin Energy, the municipal utility of Austin, Texas, offers solar photovoltaic and water heater rebates. The utility is driven by a municipal mandate to create 100 MW of solar energy by 2020. For more information, go to www.austinenergy.com.

Safeway has installed more than 1,000 solar panels on the roof of its store in Dublin, California. This location is the first of 23 Safeway stores in California that will have solar-power-generating rooftops. The additional stores will have solar panels installed within a year. The Dublin Safeway will generate about 7,500 megawatt hours of electricity per year, about 20 percent of store average power usage.

- The Solar Guide a website that makes solar energy both accessible and understandable. Its aim is to give consumers the practical information they want about buying solar and renewable energy systems including small wind powered systems that are sized for homes, farms and small businesses. thesolarguide.com
- Renewable Energy Access a website that provides solar, small wind and other renewable energy news, products, pod casts, interactive news commentary, companies and services, and offers a free weekly e-Newsletter. Renewableenergyaccess.com
- The Stella Group, Ltd. is a strategic marketing and policy firm facilitating distributed energy generation which leverages key partners, financing and unique customer relationships for applications utilizing advanced batteries, concentrated solar energy, fuel cells, micro generators, modular biomass, photovoltaics, small wind and "smart" interconnection. TheStellaGroupLtd.com and StellaCapitalLLC.com
- The American Solar Energy Society: www.ases.org

Appendix B- Current Barriers to Program Implementation in Virginia

In a 2006 survey of energy efficiency policies and programs, Virginia was ranked 38th out of 50 states plus the District of Columbia.⁵⁰ Barriers that have, up to this point, prevented Virginia's homes and businesses from implementing energy efficiency improvements on a wide scale include: the perception that the relatively low electricity prices in Virginia make energy efficiency improvements less cost-effective; limited customer knowledge about the availability of energy efficiency technologies; the need for regulation and rate structures enabling utilities to recover the costs of offering energy efficiency programs; and the absence of a funding mechanism with which to fund energy efficiency program development and implementation. Experience in other states and cities indicate that currently available technology and existing energy efficiency programs can effectively reduce usage and lower future costs for electricity.

This section of the report identifies the barriers, to the extent possible given the time allowed during this process, for VA SCC consideration. For simplicity, these barriers have been listed under specific categories.

I. Regulatory and Rate Barriers

A. Current Regulatory Environment

Following passage of the Re-regulation legislation during the 2007 Legislative Session, not all utilities in Virginia may seek base rate adjustments before January 1, 2009, the date the new legislation's provisions for biennial rate review will begin. Appropriate approval by the SCC of any demand side management (DSM) and energy efficiency (EE) initiatives will be required before implementation of programs can begin, which could be a lengthy process. All utilities can move ahead to study, assess, design and prepare for DSM/EE programs, and indeed many are now making plans for their programs. For those utilities which do have an opportunity to file for base rate adjustments prior to 2009, utilizing that opportunity to seek approval of cost effective DSM/EE programs may or may not be appropriate. Unless an expedited process is approved by the VA SCC, utilities may have to wait until at least early 2009 before programs can be submitted and approved.

A recent application by Dominion Virginia Power indicates that these barriers may not be insurmountable. On September 18, 2007, Dominion filed an application with the SCC for authority to establish and implement several energy-efficiency, conservation, and demand-response pilot programs. Dominion's application may encourage other utilities to follow suit.

⁵⁰ American Council for an Energy-Efficient Economy (ACEEE). 2007. *The State Energy Efficiency Scorecard for 2006*. Available at <http://www.aceee.org/getfile.cfm?publicationid=88> (free registration required).

B. Program Cost Recovery

Under the current regulatory process, utilities are not compensated for energy or demand reductions as a part of any comprehensive DSM/EE initiative. It may be appropriate to consider whether demand side options, as an integral part of Virginia's electric energy portfolio, should be treated similarly to supply side options. Issues include the extent to which utilities should recover program costs including a return on, and of, the expenditure as well as net lost revenues. Arguably, this type of return provides incentives for utilities to more fully pursue DSM/EE, and is analogous to the return earned on supply-side investments.

C. Cross-Subsidization of Program Costs

The Virginia Manufacturers Association (VMA) strongly believes that the issue of cross-subsidization of program costs between customer classes should be resolved as a prerequisite to any program adoption or regulation in the Commonwealth. According to the VMA, manufacturers nationally have nearly doubled production with only an 18% increase in overall energy consumption. This customer class has also benefited from nearly a decade of energy audit programs and energy efficiency measures, largely unregulated, because the international market dictates they must cut every cost, and wasted energy is a huge cost. The industrials have, in many respects, already invested in energy efficiency technologies and improvements to maintain its competitiveness in the global marketplace. The VMA indicates it would be a significant competitive disadvantage for industrial class customers to fund energy efficiency and conservation programs that are targeted to other customer classes. The VMA's arguments and position are valid concerns and must be considered by the VA SCC. However, it is up to Workgroup 4 to make that and other financial determinations among its recommendations on program funding.

D. Rate Design

In order for any energy efficiency or conservation program to be successfully implemented by the local distribution entity, the allocation of costs must be properly aligned in a cost-based rate structure. Historically, the retail rates as approved by the VA SCC do not allow the utilities to collect all of their fixed costs in the customer charge. Many commissions, including Virginia, have approved rate structures that collected more in the energy charge than variable costs, especially for residential customers. Therefore a reduction in usage would reduce revenues collected from customers that apply to fixed costs, thus reducing the margins earned by utilities. True cost-based rate structures provide better pricing signals to customers concerning the cost of electricity. However, simply collecting the revenues in the right "buckets" still may not prevent a utility from being financially affected. Likewise, any demand reduction programs would also adversely affect the utility's ability to collect its fixed costs. One way that the VA SCC may consider accomplishing this is by allowing DSM investment/expense recovery through a "fast-track" SCC approved rate procedure that looks only at that particular program and approves a rider for each specifically affected rate class. Regardless of what

this may look like, it is vital that the Commission adopt and approve true cost-based rate structures.

II. Financial Barriers

A. Cost Effectiveness

It is recognized that any programs ultimately implemented in Virginia must be cost effective for the respective jurisdiction. Program design, implementation plans, overhead costs, incentive levels and other related factors will play a major role in determining the overall cost effectiveness of any energy efficiency measure or group of measures. Further, a program that has been determined to be cost effective in one state or location will not necessarily be cost effective for Virginia, particularly as substantial differences may exist from state to state – e.g., the average price of electricity for a residential customer in New York is 16.82 cents, compared to 8.47 cents (or less) in Virginia⁵¹ – and these differences must at least be acknowledged as comparisons and evaluations are made. Each utility likely will want to model energy efficiency measures and programs based on their market potential, overall anticipated program costs, avoided cost, current maturation of proposed or similar programs, and other factors to ultimately assess cost-effectiveness in its service territory. Meanwhile, other factors as set forth in the economic test (e.g., total resource or societal test) must also be considered. It is recognized that Subgroup 1 will be making specific recommendations regarding cost effectiveness as well as the various tests to be employed for programs in the Commonwealth.

States across the U.S. have been able to deliver effective programs at a cost averaging \$0.02- 0.03 per lifetime kWh⁵² while targeting a minimum of a 1% decrease per year in energy use and peak demand.⁵³ In contrast, the costs associated with developing and constructing traditional supply-side resources typically range from \$0.04/kWh to \$0.10/kWh depending on fuel source and region.⁵⁴ A study of utility energy efficiency programs in 2004 found that, in 2000, utilities achieved 1.2 quads of energy savings through appliance efficiency standards at a cost of 3.8 cents per kWh, about half the average retail cost of electricity in 2000 of 7.4 cents per kWh.⁵⁵ In Texas, a variety of standard-offer and market transformation energy efficiency programs are implemented cost-effectively when compared to the marginal cost of new generation. The Texas utilities spent \$78 million on energy efficiency measures which, according to the Public Utility Commission of Texas, will provide customers a total energy cost savings of \$290 million over the ten-year project life of the efficiency measures.⁵⁶ Studies by the

⁵¹ http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_b.html

⁵² NAPEE Chapter 6, page 6-5

⁵³ State of Delaware, Sustainable Energy Utility Task Force Briefing Book, available at <http://www.seu-de.org/documents.html>

⁵⁴ Summit Blue Report, page 5 http://www.pecva.org/downloads/longterm/Summit_Blue_Report.pdf

⁵⁵ Gillingham, Kenneth, Richard G. Newell, and Karen Palmer. 2004. *Retrospective Examination of Demand-Side Energy Efficiency Policies*. Washington, DC: Resources for the Future. Accessible at <http://www.rff.org/rff/Documents/RFF-DP-04-19REV.pdf>.

⁵⁶ Public Utility Commission of Texas. 2007. *Scope of Competition in Electric Markets in Texas*. Pages 78-79. Accessible at http://www.puc.state.tx.us/electric/reports/scope/2007/2007scope_elec.pdf

American Council for an Energy Efficient Economy (ACEEE) and others “have repeatedly shown that the United States can cost-effectively reduce energy use 25 percent or more over the next 15-20 years in ways that *increase* overall productivity.”⁵⁷ For Virginia, we feel that independent monitoring systems and organizations should be used to provide useful periodic information on how well programs are working, comparisons to best practices elsewhere and recommendations for improvement.

III. Market Barriers

A. Market Potential

At this time, it is difficult to determine the true market potential of specific DSM programs in the Commonwealth. Energy Efficiency market potential studies provide guidance for policymakers to help establish the level of energy efficiency they wish to pursue. These studies provide information on available energy efficiency measures, their impacts based on unique characteristics of the market being evaluated, costs relative to supply alternatives, current market saturation or opportunity, and market attitudes relative to energy efficiency. This information is gathered through engineering studies, peer efficiency studies, market statistics, and customer surveys. Potential studies typically describe four amounts of energy efficiency: technical potential, economic potential, achievable potential, and program potential. Technical potential describes the amount of energy efficiency that could be achieved, regardless economic and practical factors. Economic potential is the subset of the technical potential that can be achieved cost effectively, which further depends on how that is defined. The achievable potential is the amount of economic potential that can be realized given an aggressive or maximum effort and is often called the "maximum achievable". The program potential is the last subset which further accounts for practical considerations such as budget size. Thus, potential studies will often have several numbers which must be understood, with the ultimate program potential being the smallest of the four.

A market study may ultimately be required for specific measures, groups of measures or programs.

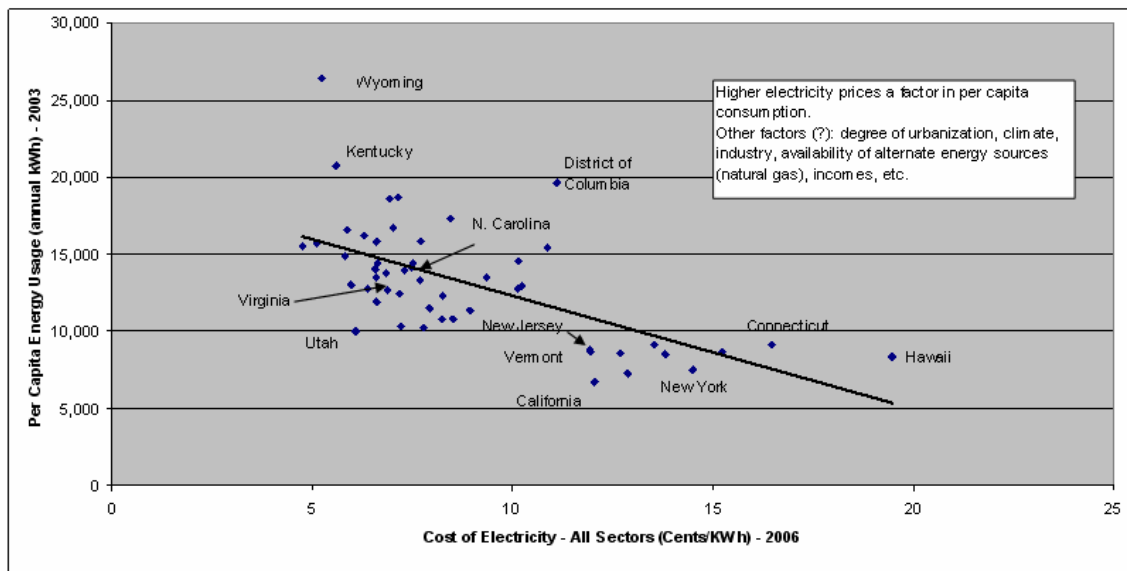
B. Cost of Electricity and Acceptance of DSM/EE Improvements

For those states, including Virginia where the cost of electricity is low, and in many cases well below the national average, customers may be reluctant to pursue energy efficiency and conservation programs on their own. DSM/EE measures must be both cost-effective and attractive to achieve widespread adoption. Consequently, achieving large scale energy efficiency gains may require larger incentives for customers to embrace DSM/EE in Virginia and may limit the number of available measures, at least from a simple payback strategy. Consumers in higher cost states, on the other hand, are typically more inclined to adopt a larger percentage of efficiency measures, with less required financial

⁵⁷ Testimony of John “Skip” Laitner , Senior Economist for Technology Policy, ACEEE, before the Subcommittee on Research and Science Education House Committee on Science and Technology, page 5. Testimony available at http://www.aceee.org/tstimony/0709HouseScience_Laitner.pdf

incentive, and can do so from a larger pool of available cost-effective measures. As prices rise, as they are expected to in Virginia, and as the utilities' avoided costs increase over time, more energy efficiency and conservation measures will become available to employ.

When comparing Virginia to other states, it's clear that Virginia currently has a low cost supply of electric energy. As prices increase, consumers will look for additional ways to improve efficiency of their homes and appliances and, if the cost is high enough, customer usage habits may even change. The following graph illustrates the per capita electricity consumption as a function of price for various states⁵⁸. As shown, many of the lower cost states typically have a higher average annual kWh usage than, for example, New York, California, and many of the northeastern states. This could be for a number of reasons including, but not limited to, awareness of energy conservation and its benefits, cost of energy, availability of alternative energy sources, climate, and income.



C. Lack of Service Providers

In states where DSM/EE programs are active, consultants, vendors and third party providers are prevalent. However, in Virginia, where DSM and conservation initiatives have not been actively pursued, in recent years, it is doubtful that many such providers (although recognizing there are some – but not enough) have established offices or staff since business is elsewhere. As DSM/EE is ramped up in the state, it will take some time for these providers to establish their business operations in Virginia. If the opportunities are there, and there is money to be made providing energy efficiency or conservation services, these providers will come to Virginia. However, it is difficult to judge exactly how much time this shift will require. Therefore, Subgroup 2 recognizes this as a potential barrier to effective program implementation of programs in the Commonwealth.

⁵⁸ Per Capita Data: http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_b.html
State Electricity Rates: Energy Information Administration, Form EIA-826

D. Who Will Administer DSM/EE Initiatives? Utility or Third-Party?

Subgroup 2 recognizes that staffing for the effective implementation of DSM/EE programs is an issue that needs to be resolved. Programs could be administered by the utility, the government or a government-sponsored third-party, or by a combination of utility and government or third-party personnel.

For utility-sponsored and administered programs, each utility would have to determine, based on perceived needs of the consumer and the long-term strategy of the utility, the least cost and most effective methods to deploy energy efficiency and conservation programs. Methods of deployment could vary from utility to utility within the Commonwealth. To provide full scale DSM/EE programs, a utility would have to staff appropriately and provide necessary training specific to program requirements. In many cases, the utility, at least in the short term, does not presently have adequate staff, training or expertise to perform large scale energy efficiency and conservation efforts to provide turn-key services. Liability related to direct installation of measures is also a concern. In the 1980's and 1990's, some utilities developed separate subsidiaries to perform these services. However, for the most part and for various reasons, these subsidiaries have been eliminated or significantly downsized.

Using a third-party contractor for larger turn-key projects, with administration and oversight by the utility or government, provides some immediate benefits. These third-party providers are familiar with the requirements of a large-scale DSM/EE initiative and can, except for certain program administration requirements, some advertising and various program evaluation requirements, quickly "set up shop" in the utility's service territories, hire, train and certify installers, qualify program participants, establish customer appointments, gather necessary data for program evaluation, install DSM/EE measures, provide face-to-face consumer education, address customer complaints and concerns, and perform quality inspections of work performed. These third-party contractors would be selected by the utility or government through a competitive bidding process based on the overall scope and requirements of the specific program. This method worked well for pilot programs in the Commonwealth during the 1990's.

Virginia may also choose to implement programs on a statewide level using a selected government agency or agencies. This approach may be beneficial for statewide programs where economies of scale and difficulty measuring and verifying energy savings are a factor, such as statewide education programs. Some other states have utilized this method with success. Some Subgroup members have concerns with this approach, but it is certainly an option the VA SCC could consider.

It should also be noted that DSM/EE programs may raise administration (and staffing) issues for certain categories of customers, such as institutional customers that have a limited ability to authorize and fund the hiring of new personnel. Other programs may be best implemented using existing, or somewhat increased, resources of the utility. The utilities would need to fully evaluate such options to determine, among other things, the lowest cost and most effective program implementation strategies.

E. Technology

We believe there may be various technological barriers in Virginia to encourage ongoing long-term energy conservation. One suggestion was to require the Virginia Department of Mines, Minerals and Energy, as well as our institutions of higher education, to produce a consumer education resource that better informs the four primary consumer classes about cost-effective technologies including, but not limited to, lighting, air handling, refrigeration, HVAC, and weatherization. Another suggestion was to direct Virginia's higher education institutions to focus additional R&D efforts to produce more energy efficient products.

The VMA indicates there is a substantial barrier in the Commonwealth to get businesses to collaborate with state universities in sponsored research. They believe Virginia's Byzantine intellectual property statute and university culture may encourage many businesses to engage in sponsored research out of state rather than in-state. The VMA also indicates there are often regulatory barriers to allow industrials to experiment with more energy efficient products due to emissions and effluent regulations. The VMA believes it would be an appropriate incentive to re-examine these barriers for industrial and other large customers who are willing to experiment with more efficient systems in order to achieve win-win results; alternatives - such as a Fast-Track Permitting process - may be able to provide opportunities, rather than barriers, to technology experimentation.

IV. Building Codes and Standards – Retrofit and New Construction

As mentioned in this report, other states, including New York, are including building codes, appliance standards, and other statewide policies to complement utility programs. In California, which has been pursuing these policies longer than any state, it is estimated that almost half of total energy savings over the last 30 years have been attained through building codes and appliance standards (reference?). California has a uniquely aggressive set of policies in these areas, however, and it is uncertain that Virginia could realize a similar proportion of savings. Nonetheless, we strongly recommend these types of non-utility sponsored programs also be implemented to contribute to the achievement of the goal. In addition to strengthening and enforcing building codes and appliance standards, state and local governments can set energy efficiency requirements for their own buildings, can offer sales tax holidays for customers to buy higher efficiency appliances, etc., as advocated by the Virginia Energy Plan. Necessary funding would be required to ensure that adequate local government personnel are available to comply with expanded code enforcement regulations.

V. Metering Barriers

A. Measurement and Verification (M&V)

Measurement and verification (M&V) is a critical component of a well-managed DSM/EE program. However, it is extremely important that a system or process is not created that makes M&V onerous and expensive resulting in funds being diverted from

program implementation to program overhead. Many utilities support the use of pre-determined impacts using industry norms for measurement and verification at the inception of an Energy Efficiency program with prospective sample testing of actual results from implemented programs and verification of subsequent program modifications based on sample results. In addition, there may be benefits to pooling utility resources to conduct M&V for programs that are common to more than one utility. It is recognized that not all programs, such as a comprehensive Compact Fluorescent Light (CFL) initiative, may require M&V. It is also recognized that M&V is a program cost and, to the extent a utility bears M&V responsibility, appropriate M&V costs could be included in the utility's cost recovery efforts. Furthermore, it may be appropriate to consider a reasonable "no look back" provision within the M&V process for prudent DSM/EE utility programs implemented but later shown to fail the cost effectiveness test(s), meaning cost recovery of prudent programs is assured during the implementation period.

In addition, Advanced Metering Infrastructure (AMI), when deployed, can assist in the overall M&V effort. For example, some utilities who are currently utilizing direct load control of equipment, such as air conditioners, water heaters and pool pumps, for example, may not have a reasonable method to verify that consumers are actually receiving the direct load control signal. Effective AMI technology could aid in this process, however, it is understood the full-scale deployment of AMI technology will be expensive. Danville Utilities roughly estimates this, along with the fiber optic and other required infrastructure improvements, could cost \$40 million or more for its customer base of 47,000 customer accounts in a 500 square mile territory. AEP and Dominion are also currently evaluating this opportunity to identify the appropriate and most cost-effective technology for its system. Indiana and Michigan Power (I&M), an operating subsidiary of AEP, will invest approximately \$7 million, which includes IT system integration cost, to pilot Smart Metering technology and distribution automation. It is expected this endeavor will cover approximately 10,000 homes during calendar year 2008. I&M also expects that time of use rates, direct load control, pre-paid metering and distribution automation will be included in the pilot. In summary, prior to approving AMI deployment, the SCC and utilities will need to fully evaluate the cost-effectiveness of AMI, the benefits it may provide (in addition to direct load control initiatives), including those benefits relating to operation and maintenance (O&M), and the ultimate technology to be deployed.

As a side note, Cyber Security issues may also become an ongoing O&M expense. Cyber Security provides confidentiality, integrity and availability of customer private information and enables the timely, uninterrupted and trusted nature of services. Furthermore, cost-effective cyber security controls must be in place to assure protection of automated information systems from financial fraud, waste and abuse.

It is our understanding that M&V issues will be addressed in more detail by Subgroup 1.

VI. Knowledge Barriers

A. General and Program Consumer Education

Although Consumer Education is the directive of Subgroup 5, we believe that general consumer education, as well as education related to a specific DSM/EE initiative, is extremely critical as consumers will drive the success of the programs. Without customer buy-in, programs cannot and will not reach their full potential.

Properly designed and effectively communicated education will in many respects encourage some customers to embrace energy efficiency on their own without programs or incentives. In addition to a statewide advertising campaign, the Commonwealth may also consider a separate website, as it did for Electric Industry Restructuring but on a much more aggressive level, to broadcast the benefits of energy efficiency and conservation improvements as well as provide valuable information to consumers on energy saving tips and other recommendations. Any and all education and communication efforts must be consistent, clearly and concisely convey the financial and altruistic benefits for the individual consumer when they implement conservation and efficiency measures. Clear communication and examples of the soon, certain and positive personal benefits to the customer is critical to the success of the education and communication effort. In addition, to support the programs there should be a public awareness campaign that promotes energy education through mass media, utility bill stuffers and other communications means to ensure that all energy users in the state are well informed as to the financial and societal benefits of saving energy. All customer sectors, especially residential users would greatly benefit from financial incentives to reduce electricity use.

Workgroup 2 believes that all customers can benefit from general energy efficiency and conservation education. Education should be targeted to the specific groups of customers (i.e., residential, commercial, industrial or institutional) that can benefit from a wide variety of measures or programs. It is believed that education for residential customers will be much different than for other customer classes, or even between individual customer classes. Residential customers may not fully understand the concept of “phantom load”, or energy use that they do not perceive as wasteful or having the potential to be reduced. Non-residential customers may understand the benefits of a new energy efficiency concept, but if building maintenance personnel are not educated, installation of energy efficiency equipment may not reach its full potential (i.e., equipment may not be operated properly or perhaps bypassed the first time something fails). It is imperative that educational material be diverse so that, in the long-term, all consumers are encouraged to embrace the benefits and money-saving advantages of cost-effective DSM/EE measures.

Appendix C: NAPEE Table 6-3, Efficiency Measures of Electric and Combination Programs

	NYSERDA (NY)	Efficiency Vermont (VT)	MA Utilities (MA)	WI Department of Administration ¹²	CA Utilities (CA)
Policy Model	SBC w/State Admin	SBC w/3 rd Party Admin	SBC w/Utility Admin	SBC w/State Admin	SBC w/Utility Admin & Portfolio Standard
Period	2005	2004	2002	2005	2004
Program Funding					
Spending on Electric Energy Efficiency (\$MM) ¹	138	14	123	63	317
Budget as % of Electric Revenue ²	1.3%	3.3%	3.0%	1.4%	1.5%
Avg Annual Budget Gas (\$MM)	NR ¹⁰	NA	3 ¹¹	NA	NA
% of Gas Revenue	NR ¹⁰	NA	NA	NA	NA
Benefits					
Annual MWh Saved / MWh Sales ^{3,4}	0.2%	0.9%	0.4%	0.1%	1.0%
Lifetime MWh Saved ⁵ (000s MWh)	6,216	700	3,428	1,170	22,130
Annual MW Reduction	172	15	48	81	377
Lifetime MMBtu Saved ⁵ (000s MMBtu)	17,124	470	850	11,130	43,410
Annual MMBtu Saved (000s MMBtu)	1,427	40	70	930	3,620
Non-Energy Benefits	\$79M bill reduction	37,200 CCF of water	\$21M bill reduction 2,090 new jobs created	Value of non-energy benefits: Residential: \$6M C/I: \$36M	NR
Avoided Emissions (tons/yr for 1 program year) (could include benefits from load response, renewable, and DG programs)	NO _x : 470 SO ₂ : 850 CO ₂ : 400,000	Unspecified pollutants: 460,000 over lifetime	NO _x : 135 SO ₂ : 395 CO ₂ : 161,205	NO _x : 2,167 SO ₂ : 4,270 CO ₂ : 977,836 (annual savings from 5 program years)	NR
Cost-Effectiveness					
Cost of Energy Efficiency					
\$/lifetime (kWh) ⁶	0.02	0.02	0.03	0.05	0.01
\$/lifetime (MMBtu)	NA	NA	0.32	NA	NA
Retail Electricity Prices (\$/kWh)	0.13	0.11	0.11	0.07	0.13
Retail Gas Prices (\$/mcf)	NA	NA	NR	NA	NA
Avoided Costs (2005\$) ^{7,8}					
Energy (\$/kWh)	0.03	0.07	0.07	0.02 to 0.06 ¹³	0.06
Capacity (\$/kW)⁹	28.20	3.62	6.64		
On-Peak Energy (\$/kWh)			0.08		
Off-Peak Energy (\$/kWh)			0.06		
Cost of Energy Efficiency as % Avoided Energy Cost	89%	29%	10%	90%	23%

C/I = Commercial and Industrial; CO₂ = Carbon Dioxide; \$MM = Million Dollars; N/A = Not Applicable; NR = Not Reported; NO_x = Nitrogen Oxides; SO₂ = Sulfur Dioxide

¹ NYSERDA 2005 spending derived from subtracting cumulative 2004 spending from cumulative 2005 spending; includes demand response and research and development (R&D).

² ACEEE, 2004; Seattle City Light, 2005.

³ Annual MWh Saved averaged over program periods for Wisconsin and California Utilities. NYSERDA 2005 energy efficiency savings derived from subtracting cumulative 2004 savings from 2005 cumulative reported savings.

⁴ EIA, 2006; Austin Energy, 2004; Seattle City Light, 2005. Total sales for California Utilities in 2003 and SMUD in 2004 were derived based on growth in total California retail sales as reported by EIA.

⁵ Lifetime MWh savings based on 12 years effective life of installed equipment where not reported for NYSERDA, Wisconsin, Nevada, SMUD, BPA, and Minnesota. Lifetime MMBtu savings based on 12 years effective life of installed equipment.

Appendix C: NAPEE Table 6-3, continued

Nevada	CT Utilities (CT)	SMUD (CA)	Seattle City Light (WA)	Austin Energy	Bonneville Power Administration (ID, MT, OR, WA)	MN Electric and Gas Investor-Owned Utilities (MN)
IRP with Portfolio Standard	SBC w/Utility Admin & Portfolio Standard	Municipal Utility	Municipal Utility	Municipal Utility	Regional Planning	IRP and Conservation Improvement Program
2003	2005	2004	2004	2005	2004	2003
Program Funding						
11	65	30	20	25	78	52
0.5%	3.1%	1.5%	3.4%	1.9%	NR	NR
NA	NA	NA	NA	NA	NA	\$14
NA	NA	NA	NA	NA	NA	0.50%
Benefits						
0.1%	1.0%	0.5%	0.7%	0.9%		0.5%
420	4,400	630	1,000	930	3,080	3,940
16	135	14	7	50	47.2	129
NA	NA	NA	NA	10,777	NA	22,010
NA	NA	NA	NA	1,268	NA	1,830
NR	lifetime savings of \$550M on bills	NR	lifetime savings of \$430M on bills created	Potentially over 900 jobs created Residential: \$6M C/I: \$36M	NR	NR
NR	NO _x : 334 SO ₂ : 123 CO ₂ : 198,586	NO _x : 18	CO ₂ : 353,100 (cumulative annual savings for 13 years)	NO _x : 640 SO ₂ : 104 CO ₂ : 680,000 over lifetime	NR	NR
Cost-Effectiveness						
0.03	0.01	0.03	0.02	0.03	0.03	0.01
NA	NA	NA	NA	2.32	NA	0.06
0.09	0.10	0.10	0.06	0.12	Wholesaler - NA	0.06
NA	NA	NA	NA	NA	NA	5.80
	0.07		NR	NR	Wholesaler - NA	NR
36.06	20.33					
		0.08				
		0.06				
Not calculated	21%	63%		Not calculated	Not calculated	Not calculated

⁶ Calculated for all cases except SMUD; SMUD data provided by J. Parks, Manager, Energy Efficiency and Customer R&D, Sacramento Municipal Utility District (personal communication, May 19, 2006).

⁷ Avoided cost reported as a consumption (\$/kWh) not a demand (kW) figure.

⁸ Total NSTAR avoided cost for 2006.

⁹ Avoided capacity reported by NYSERDA as the three-year averaged hourly wholesale bid price per MWh.

¹⁰ NYSERDA does not separately track gas-related project budget, revenue, or benefits.

¹¹ NSTAR Gas only.

¹² Wisconsin has a portfolio that includes renewable distributed generation; some comparisons might not be appropriate.

¹³ Range based on credits given for renewable distributed generation.

Appendix D: NAPEE Table 6-10, Key Stakeholders, Barriers and Program Strategies by Customer Segment

Customer Segment	Key Stakeholders	Key Program Barriers	Key Program Strategies
Large Commercial & Industrial Retrofit	<ul style="list-style-type: none"> • Contractors • Building owners and operators • Distributors: lighting, HVAC, motors, other • Product manufacturers • Engineers • Energy services companies 	<ul style="list-style-type: none"> • Access to capital • Competing priorities • Lack of information • Short-term payback (<2 yr) mentality 	<ul style="list-style-type: none"> • Financial incentives (rebates) • Performance contracting • Performance benchmarking • Partnership with ENERGY STAR • Low interest financing • Information from unbiased sources • Technical assistance • Operations and maintenance training
Small Commercial	<ul style="list-style-type: none"> • Distributors: lighting, HVAC, other • Building owners • Business owners • Local independent trades 	<ul style="list-style-type: none"> • Access to capital • Competing priorities • Lack of information 	<ul style="list-style-type: none"> • Financial incentives (rebates) • Information from unbiased sources • Direct installation • Partnership with ENERGY STAR
Commercial & Industrial New Construction	<ul style="list-style-type: none"> • Architects • Engineers • Building and energy code officials • Building owners • Potential occupants 	<ul style="list-style-type: none"> • Project/program timing • Competing priorities • Split incentives (for rental property) • Lack of information • Higher initial cost 	<ul style="list-style-type: none"> • Early intervention (ID requests for hook-up) • Design assistance • Performance targeting/benchmarking • Partnership with ENERGY STAR • Training of architects and engineers • Visible and ongoing presence in design community • Education on life cycle costs
Residential Existing Homes	<ul style="list-style-type: none"> • Distributors: appliances, HVAC, lighting • Retailers: appliance, lighting, windows • Contractors: HVAC, insulation, remodeling • Homeowners 	<ul style="list-style-type: none"> • Higher initial cost • Lack of information • Competing priorities • Inexperience or prior negative experience w/technology (e.g., early compact florescent lighting) • Emergency replacements 	<ul style="list-style-type: none"> • Financial incentives • Partnership with ENERGY STAR • Information on utility Web sites, bill inserts, and at retailers • Coordination with retailers and contractors
Residential New Homes	<ul style="list-style-type: none"> • Contractors: general and HVAC • Architects • Code officials • Builders • Home buyers • Real estate agents • Financial institutions 	<ul style="list-style-type: none"> • Higher initial cost • Split incentives: builder is not the occupant 	<ul style="list-style-type: none"> • Partnership with ENERGY STAR • Linking efficiency to quality • Working with builders • Building code education & compliance • Energy efficient mortgages
Multifamily	<ul style="list-style-type: none"> • Owners and operators • Contractors • Code officials • Tenants 	<ul style="list-style-type: none"> • Split incentives • Lack of awareness 	<ul style="list-style-type: none"> • Financial incentives • Marketing through owner and operator associations
Low Income	<ul style="list-style-type: none"> • Service providers: Weatherization Assistance Program (WAP), Low-Income Home Energy Assistance Program (LIHEAP) • Social service providers: state and local agencies • NGOs and advocacy groups • Credit counseling organizations • Tenants 	<ul style="list-style-type: none"> • Program funding • Program awareness • Bureaucratic challenges 	<ul style="list-style-type: none"> • Consistent eligibility requirements with existing programs • Direct installation • Leveraging existing customer channels for promotion and delivery • Fuel blind approach

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