REPORT OF THE
STATE CORPORATION COMMISSION

Staff's Report to the State Corporation Commission in preparation for the SCC's Report Required by the Third Enactment Clause of Chapter 933 (SB 1416) of the 2007 Acts of Assembly

TO THE GOVERNOR AND THE GENERAL ASSEMBLY OF VIRGINIA

SENATE DOCUMENT NO. 17

COMMONWEALTH OF VIRGINIA
RICHMOND 2007

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STATE CORPORATION COMMISSION

December 14, 2007

TO: The Honorable Timothy M. Kaine
Governor, Commonwealth of Virginia

Members of the General Assembly of Virginia

The State Corporation Commission (Commission) is pleased to transmit the attached document resulting from the proceeding initiated by the Commission as required by Enactment Clause 3 of Chapters 888 and 933 of the 2007 Acts of the General Assembly (Senate Bill 1416 and House Bill 3068) (Third Enactment Clause). The Third Enactment Clause directed the Commission: to conduct a proceeding on cost-effective conservation through fair and effective demand-side management, conservation, energy efficiency, and load management programs, including consumer education; to answer specific questions regarding the same; and, on or before December 15, 2007, to submit its findings and recommendations to the Governor and General Assembly.

The attached Staff Report describes the required proceeding conducted under the auspices of the Commission, explains the extensive and valuable participation by numerous stakeholders in this process, sets forth the results of such stakeholder participation, and specifically addresses questions in the Third Enactment Clause. The Report concludes, among other things, that the 10% electric energy consumption reduction goal is attainable. The Report further identifies alternatives for, and additional questions related to, implementing programs to achieve such result. The Report also concludes that the desired goals cannot be reached, and the implementation questions answered, absent significant additional cost data necessary to determined whether such programs are, as referenced in the Third Enactment Clause, "cost-effective," "fair," and "efficient[]."

The Commission transmits without endorsement the Staff Report, which includes the Subgroup Reports prepared by the various working groups comprised of numerous stakeholders. The Commission does note that the economic, legislative and regulatory actions necessary to achieve a 10% reduction in electricity consumption are substantial and likely to entail significant

impacts on various sectors of Virginia's economy and people. Whether specific necessary actions are "fair" are ultimately major policy decisions. The Commission will provide whatever assistance the General Assembly may request in making these policy decisions.

Finally, the Third Enactment Clause directs that the Commission "shall include recommendations for any additional legislation necessary to implement the plan to meet the energy consumption goal." A plan for "cost-effective" conservation cannot be implemented without a determination of how cost-effectiveness will be defined or measured. The attached Subgroup Reports and Staff Report address, among a host of other matters, issues regarding electricity pricing and utility costs – both of which may be relevant in determining cost-effectiveness. The Staff Report, however, further notes that data on marginal and avoided costs was not included by the participants as part of this proceeding, which could provide one means to measure cost-effectiveness. Accordingly, the General Assembly may wish to consider legislation (1) to address the recommendation in the Staff Report "that Virginia's major electric utilities be required to develop and file with the [Commission] rate element specific marginal cost of service studies and associated avoided electric supply cost forecasts" (Staff Report at 62), and/or (2) to define some other guideline or mechanism for declaring whether a specific conservation plan is "cost-effective."

Respectfully submitted,

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Chairman

Mark C. Christie
Commissioner

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Commonwealth of Virginia

State Corporation Commission

Staff's Report to the State Corporation Commission in preparation for the Commission's Report to the Governor and the General Assembly

As Required by the Third Enactment Clause of SB 1416, Enacted as Chapter 933 of the 2007 Acts of the General Assembly

November 16, 2007

Executive Summary *1*
Section I – Introduction and Background *14*
Section II – Process *19*
Synopsis of sub-group 1 – General **23**
Synopsis of sub-group 2 – Consumption reduction **27**
Synopsis of sub-group 3 – Demand/peak reduction **35**
Synopsis of sub-group 4 – Financial considerations **38**
Synopsis of sub-group 5 – Information **44**
Section III – Staff Analysis and Observations *51*
Section IV – Summary and Recommendations *61*
Attachment 1 – Rate Ranking *63*
Attachment 1A – for Industrial Customers **64**
Attachment 1B – for Commercial Customers **65**
Attachment 1C – for Residential Customers **66**
Attachment 1D – for Total Customers **67**
Attachment 2 – Review of Case No. PUE900070 ..... *68*
Attachment 3 – Summaries of other studies *74*
Summit Blue Report **75**
GDS Report **78**
Appendix I – Case No. PUE-2007-00049 ..... *81*
SCC Order **82**
Work-group Participants **88**
Sub-group Reports **90**
Subgroup 1 Report **1**
Subgroup 2 Report **1**
Subgroup 3 Report **1**
Subgroup 4 Report **1**
Subgroup 5 Report **1**

Executive Summary

The General Assembly of Virginia enacted on April 4, 2007, Chapter 933 of the 2007 Acts of Assembly ("Chapter 933")[1] that, among other provisions, established:[2]

> 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. These programs may include activities by electric utilities, public or private organizations, or both electric utilities and public or private organizations. The Commonwealth shall have a stated goal of reducing the consumption of electric energy by retail customers through the implementation of such programs by the year 2022 by an amount equal to ten percent of the amount of electric energy consumed by retail customers in 2006.

The Third Enactment Clause of this statute ("the Clause") directs the Virginia State Corporation Commission ("Commission" or "SCC") to "conduct a proceeding" and "submit its findings and recommendations to the Governor and General Assembly" on or before December 15, 2007. The Clause also directs the Commission to "include recommendations for any additional legislation necessary to implement the plan to meet the energy consumption reduction goal." The Staff tenders this report to assist the Commission as it responds to the legislative mandate set forth in the Third Enactment Clause of SB 1416.

In furtherance of its responsibilities under the Clause, the SCC convened a proceeding that enabled and encouraged extensive stakeholder participation. The primary purpose of this report is to pass along information collected by the Staff during the

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[1] Chapter 933 (SB 1416) amends and reenacts §§ 56-233.1, 56-234.2, 56-235.2, 56-235.6, 56-249.6, 56-576 through 56-581, 56-582, 56-584, 56-585, 56-587, 56-589, 56-590, and 56-594 of the Code of Virginia; amends the Code of Virginia by adding sections numbered 56-585.1, 56-585.2, and 56-585.3; and repeals §§ 56-581.1 and 56-583 of the Code of Virginia, relating to the regulation of electric utility service.

[2] Third Enactment Clause of SB 1416.

proceeding. Where appropriate, Staff also provides limited analysis of the information collected during the proceeding. Importantly, direct stakeholder work product is included in Appendix I in the form of five sub-group reports. The reports presented in Appendix I have not been edited and appear as they were submitted to Staff by each of the five sub-groups, except for minor formatting changes to include in this report.

The proceeding directed by the Clause requires the Commission to:[3]

(i) determine whether the ten percent electric energy consumption reduction goal can be achieved cost-effectively through the operation of such programs, and if not, determine the appropriate goal for the year 2022 relative to base year of 2006,

(ii) identify the mix of programs that should be implemented in the Commonwealth to cost-effectively achieve the defined electric energy consumption reduction goal by 2022, including but not limited to demand side management, conservation, energy efficiency, load management, real-time pricing, and consumer education,

(iii) develop a plan for the development and implementation of recommended programs, with incentives and alternative means of compliance to achieve such goals,

(iv) determine the entity or entities that could most efficiently deploy and administer various elements of the plan, and

(v) estimate the cost of attaining the energy consumption reduction goal.

Work-group Efforts

As described below, the Commission initiated a proceeding pursuant to this legislative direction. That proceeding convened a large number of stakeholders who formed five self-directed sub-groups.[4] Each sub-group produced a report as final work

[3] *Ibid.*

[4] The five sub-groups were formed around the following issues: (1) general/summary issues, (2) consumption reduction, (3) demand/peak reduction, (4) financial considerations, and (5) information/consumer education.

product in addition to providing a wealth of information to Staff during three all-day meetings of the entire stakeholder group as well as in literally hundreds of e-mail exchanges. Sub-group reports are presented in their entirety in Appendix 1 of this report. We also incorporate or otherwise refer to stakeholder provided positions, comments, data and information in the body of our report, as appropriate. The comments of work-group participants, speaking as individuals or representatives of stakeholder entities, are posted on the Commission's website at http://www.scc.virginia.gov/division/eaf/conserve.htm. The Staff very much appreciates the hard work performed by proceeding participants over the past six months.

Although further details and explanations may be found within the synopsis of each sub-group work product in Section II of this report, as well as within the respective sub-group reports included in their entirety in Appendix I, it is important to note a few of the observations common to several of the sub-groups reports. Four of the five sub-groups acknowledged that while the legislation focuses on a reduced energy consumption goal, reducing peak demand is also an important consideration. The sub-groups generally agreed that to support the attainment of an energy savings goal, measurement and verification methods would be needed to measure the energy impacts of all programs. Demand and capacity impacts can also be estimated with such methods.

Most of the sub-groups reviewed energy savings goals set in other states and observed that while the various states' goals suggest a range of targets to frame the discussion, more detailed analysis is needed to develop a goal specific to Virginia. There appeared to be some agreement that a Commonwealth specific economic potential study should be conducted to determine Virginia's ultimate energy savings goal and its related

impact. There was consensus within sub-group 5 that not only is a 10% reduction in electricity consumption by the year 2022 highly achievable, but also that a reduction in consumption through conservation, energy efficiency, demand-side management and demand response programs, collectively referred to in this report as EE/DSM programs or more generally as DSM programs, is absolutely imperative.

Most sub-groups believed mass implementation of energy efficiency and conservation efforts 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. Additionally, effective programs could help accelerate Virginia's environmental and air quality goals while helping to reduce the costs associated with future climate change policies.

The sub-groups found that administration and implementation of programs in Virginia could rely on either or both utility and non-utility entities. Initiatives might also include broader policy avenues such as building codes and standards as well as tax incentives. Particularly for statewide market transformation and consumer education programs, there was significant support for a non-utility, third party administration approach, contingent on the funding and enforceability of such an approach.

Another generally agreed upon sub-group finding was that a review and redesign of Virginia electric utility rates is in order. Such a review and redesign would better match the price paid by a customer for electricity use with the cost of producing that power. This option is more fully described later in this report.

Sub-group 2 compiled a list of energy efficiency programs to be considered for implementation in Virginia immediately (1-12 months), over the mid-term (1-5 years), and over the long-term (beyond 5 years). Though many of these programs are said to be cost-effective in other states, they have not undergone any cost benefit analysis using conditions specific to Virginia. Sub-group 2 found that 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.

According to the work of sub-group 3, the history of demand response in Virginia has been one of missed opportunities over the last thirty years. The group holds that new opportunities exist to capture the potential for reductions in peak demand resulting from recent policy enhancements within the PJM Interconnection, advances in telecommunications allowing real-time communication, and improvements in the affordability and functionality of demand response technology. This sub-group found that increased deployment of demand response in the Commonwealth could yield substantial customer financial benefits and electric reliability benefits. Historically, the focus on the utility industry in Virginia, as in most jurisdictions, has been on supply-side, rather than demand-side, solutions to address peak demand. As a result, generating plants and transmission lines have been and continue to be relied upon to meet peak loads during the limited hours of the year in which these loads occur. As described later in this report, Staff believes that it is advisable for Virginia's electric utilities to develop a current integrated resource plan that considers supply and demand resources for the Commonwealth and to thus determine the value of avoided electrical supply costs.

After reviewing the status of load management and demand-side management programs in the Commonwealth, sub-group 3 developed a list of proposals to reduce the impediments to such programs and these proposals are described later in this report.

There appeared to be general agreement among the sub-groups that a utility should be able to fully recover its costs, including operating costs and a fair return of and on capital costs consistent with current law, through properly designed rate schedules. Regarding such cost recovery, most sub-groups believed that the costs associated with SCC approved or legislatively mandated energy efficiency and demand side-management programs should be considered on an equal footing with the costs of building, operating and maintaining new supply side options, and could include incentives.

Sub-group 4 recommended that the SCC review its policies and procedures related to changes in utilities' rate structures and rate design and consider establishing a limited, expedited, and revenue neutral regulatory procedure under which changes can be made to rate structures or rate designs outside a full general rate case. Sub-group 4 suggested the Commission consider revising the fuel cost recovery mechanism and the allocation of such costs among customer classes while continuing the policy of providing the utility with recovery of its actual fuel costs.

Revenue decoupling was viewed by sub-group 4 as another form of rate design that could be considered. Revenue decoupling is defined as a ratemaking methodology that separates utility revenues from its volume of sales. Revenue decoupling may be enacted to address a variety of issues such as lost sales due to utility energy efficiency programs. Sub-group 4 discussed that recovery of lost revenue may be needed to pay for required infrastructure even in times of decreasing sales.

Sub-group 4 believed that the current promotional allowance rules provide little guidance as to types of programs that may be acceptable within the rules, but that do not require prior regulatory approval. Given these circumstances, the sub-group suggested the Commission consider reviewing and updating the current promotional allowance rules to reflect changes occurring since 1992. Sub-group 4 recommended the SCC staff consider several issues with regard to incentives for utilities. These issues are described later in this report.

Sub-group 4 believes that if Virginia adopts policies whereby utilities collect money to finance a Public Benefits Fund ("PBF"), then a mechanism similar to the Electric Utility Consumption Tax (Code of Virginia § 58.1-2900) should be given strong consideration by the Commission. The structure of the consumption tax assigns the collected tax revenues proportionately to the State Consumption Tax (similar to a gross receipts or sales tax), Special Regulatory Tax (to fund certain operations of the State Corporation Commission), and Local Consumption Tax (similar to a Business, Professional, and Occupational License tax).

Sub-group 5 reached consensus that many consumer education programs currently offered in the Commonwealth provide important conservation and energy efficiency messages, but a new core program is urgently needed. The sub-group suggested that a new consumer education campaign should focus on simple, tiered behavioral changes in the home and at the office, based on no-cost, low-cost and high-cost efforts. The campaign should focus on helping homeowners identify what they can do, the efficiency savings available, and where they can begin. The goal of the energy consumer education program would be to increase energy efficiency awareness and generate behavioral change. The

sub-group recommended that Virginia take the approach that highly energy-efficient states have taken – a high-level consumer education program with a clear and concise message that is complemented and/or supplemented by corollary messages offered by other independent lower-level programs.

Sub-group 5 believed the Commonwealth of Virginia should be actively engaged in the development, management and delivery of the consumer education campaign for several reasons. Government involvement would ensure that all end users would have access to the same information and that such a program would be adequately funded. The sub-group believed that such an education campaign would be most efficiently managed either within the SCC or the Department of Mines, Minerals and Energy ("DMME"), or by an independent third-party entity with SCC or DMME oversight.

Sub-group 5 developed and unanimously recommended potential legislative proposals that could be delivered to the Virginia General Assembly. These proposals are described later in this report.

Staff Observations

Energy efficiency issues discussed in this report have gone hand-in-hand with the regulation of the electric power industry for at least thirty years. The SCC conducted extensive proceedings on these issues in the early 1990's.[5] Although the prior move to restructure the industry to introduce market competition for electric power served to create a ten to fifteen year "timeout" on energy efficiency regulatory proceedings, consideration of such issues continues to be controversial in Virginia as well as in many other state

[5] *See*, generally, VA SCC Case No. PUE900070, http://www.scc.virginia.gov/division/eaf/conserve.htm .

regulatory jurisdictions. Continued growth in consumers' electricity requirements, new concerns regarding electric power's high capital and operating costs, heightened interest in climate change and the perceived inability of electric industry restructuring to deal adequately with these challenges have brought renewed interest to electricity conservation issues here in Virginia as well as around the country.

The financial impacts of conservation and energy efficiency have been and continue to be especially controversial. As such, in many jurisdictions these matters have been subject to lengthy state regulatory commission adjudicatory processes including discovery, sworn testimony, evidentiary hearings, briefs and regulatory agency orders based on record evidence. Several such cases were conducted in Virginia during the early 1990's. Staff notes here that the legislative direction to produce a report by December 15, 2007, precluded this Commission from conducting a full evidentiary proceeding regarding these complex and controversial matters. Nevertheless, the availability of the Virginia Energy Plan ("the VEP" or "the Plan") in both draft and final versions, extensive study of related analyses for other jurisdictions, and the enthusiastic participation and efforts of many stakeholders allows Staff to provide a report on time and at considerably less expense than would have been the case if a formal proceeding had been undertaken.

Staff notes that the sub-group reports did not focus explicitly on the analysis required to determine if potential energy efficiency will be "cost-effective," "fair" and "efficient." Staff believes that these are crucial and desirable program attributes and that more attention is required to develop analysis tools that correctly make these determinations.

In direct response to the directives set forth in items (i) through (v) as set forth in the Third Enactment Clause, Staff responds as follows:

i. Based on the findings set forth in the Virginia Energy Plan, experience of other states, reports of the work-group and the relatively low retail electric rates persisting in many parts of the Commonwealth for many years, the Staff believes that the 10 percent electricity consumption reduction goal set forth by the General Assembly is achievable by 2022.

ii. A mix of programs that may be implemented in the Commonwealth to achieve the defined electric energy consumption reduction goal by 2022 is suggested in the VEP[6] and merits further exploration, including tests for cost-effectiveness. Additional programs are also identified by the stakeholder work-group convened pursuant to the Commission's proceeding related to this matter and merit further consideration.

iii. Due to the longstanding complexity and controversial nature of the issues at hand, in this report the Staff presents issues and provides options for the development and implementation of potential energy efficiency programs including the advisability of incentives and alternative means of compliance to achieve such goals.

iv. Again, due to the longstanding complexity and controversial nature of the issues at hand, the Staff presents issues and provides options regarding the entity or entities that could most efficiently deploy and administer various elements of the plan. Although a specific recommendation regarding whom or how to administer such a mix of programs is not evident, it appears that the SCC, the Department of Mines, Minerals, and Energy, or another third party could be established as the administrator.

v. Finally, we note that estimates of the cost of attaining the energy consumption reduction goal depend on how the Commonwealth goes about implementing any chosen set of programs and measures. The Virginia Energy Plan estimates that achieving the goal could cost around $300 million per year between 2008 and 2022, yet the Plan also finds that conservation costs considerably less than the cost of new electric supply.[7] If conservation is truly inexpensive, its deployment will not impose net costs on the Commonwealth. Rather, such cost effective programs will produce resource savings versus alternative means of serving the Commonwealth's electricity needs. Moreover, if conservation costs less that new electrical supply, it can be deployed without increasing electric rates for non-participant ratepayers.

The body of this report discusses four key interrelated areas:

[6] A list of potential program categories is found in the Virginia Energy Plan, pp. 146–147. Additionally, sub-group 2 (Consumption Reduction) provides an extensive list of potential electricity conservation programs beginning on page 7 of their report and is found in Appendix 1 of this report.
[7] Virginia Department of Mines, Minerals and Energy, *Virginia Energy Plan*, 2007, pp. 61-62, 146.

- The prices that consumers pay for electric service (electric "rate design") greatly impact consumer behavior, including consumers' willingness to purchase energy efficiency on their own and the result of those purchases on utility shareholders and other ratepayers. This is especially true over the long run. Because of electricity restructuring and resulting capped rates, little attention has focused on rate design issues over the last decade. The question here is to what, if any, extent should regulated retail electric prices in Virginia be used as a means to promote cost-effective conservation of energy through EE/DSM?
- Will participants pay for their own energy efficiency measures out of anticipated electric bill savings or will energy efficiency measures be funded out of a pool of money collected from the general body of ratepayers?
- Apart from pure peak reduction programs that must be administered by the system operator, will energy efficiency programs be administered by electric utilities, government agencies, commercial organizations, other types of third parties, or some combination of the entities listed here?
- In the Final Order in Case No. PUE-1990-0070 (dated March 27, 1992) the SCC found that it lacked authority to incorporate quantified environmental externalities into the regulatory process. Staff notes that the world has changed since 1992 and concern about the relationship between electricity production and climate change appears to be one of the primary drivers leading to the Third Enactment Clause of SB 1416 and this very report. As such, a key question is to what, if any, extent can or should the Commission incorporate quantified environmental externalities, or any other externalities, into the regulatory process?

Answers to these basic questions are necessary before detailed plans to achieve the electrical consumption reduction goal set forth in the Third Enactment Clause can be accomplished. How one defines potential programs as "cost-effective," "fair" and "efficient" is important and necessary.

The Staff believes that before we can be reasonably sure that "cost-effective," "fair," and "efficient" programs are to be implemented in Virginia, program designers require guidance or direction as to how to interpret these phrases. This report attempts to lay out the "pros" and "cons" of alternative answers related to the four key questions listed above. In addition, our stakeholder process and this resulting report were designed from the start as a conduit to pass on stakeholder positions on these key questions to Virginia's policymakers.

Most of Virginia has enjoyed low electric prices for many years. Low electric prices are good for economic growth, and economic growth leads to higher levels of electricity consumption. Virginia now seeks to reduce the rate of growth in electricity, yet still keep electricity prices low. Staff believes that the price mechanism can be the most efficient and thus "cost-effective" allocator of goods and services in our economy. Unless the demand for electric service is totally insensitive to its price, *increasing* electricity prices will reduce demand, other factors held constant. Given historically low prices and the above stated economic law of demand (i.e. price goes up, usage goes down – holding other factors constant), the 10% goal is achievable by raising electricity prices and then allowing customers to react to those prices.

The Staff's single recommendation is that Virginia's electric utilities should provide the Commission and stakeholder community with complete information[8] regarding each utility's expansion plan and the avoided costs that accrue if load is less than it would have been due to the implementation of a demand-side efficiency program. Such information is

[8] This information may be considered commercially sensitive but its dissemination also has public policy ramifications. The Commission should evaluate any claims regarding the degree of data dissemination in the appropriate proceeding, if any.

necessary to evaluate "cost-effectiveness" regardless of what working definition of that term is eventually adopted in the Commonwealth.

This report consists of the following four sections and appendix:

- Section I discusses various background information, including the relationship of this report to the Virginia Energy Plan. We also summarize past Commission proceedings regarding these matters conducted in the early 1990's.
- Section II provides a description of the process adopted by the Commission in meeting its legislative mandate to conduct a proceeding regarding these matters. The work-group process is described and the results of the work-group and sub-work groups are summarized.
- Section III provides the Staff's analysis of the issues at hand as well as the basis for the conclusion that the goal is attainable. The Staff presents issues regarding how the goal might be obtained.
- Section IV provides a brief concluding summary discussion and sets forth the Staff's recommendation that Virginia's electric utilities be required to develop and file with the SCC rate element specific marginal cost of service studies and associated avoided electric supply cost forecasts. While we recognize that such an undertaking is difficult to do correctly, such information is absolutely necessary, although not necessarily sufficient, in determining the cost-effectiveness of DSM programs.
- Appendix 1 contains work-group and sub-group work product as produced in this process. The Staff, as well as the Commission, was clear in that one of the goals of the proceeding was to provide a conduit so that stakeholder views could be presented to policymakers. This Appendix is intended to be that conduit for stakeholder information.

Section I – Introduction and Background

In preparing this report, the Commission Staff, as directed by the Third Enactment Clause, takes note of important energy policy goals pertaining to the Commonwealth's energy policy as set forth in §§ 67-100, 67-101 and 67-102 of the Code of Virginia. While many of those who provided valuable input during the Commission proceeding tended to focus on energy production and consumption as an activity producing environmental "bads" requiring curtailment at almost any cost, the energy policy of the Commonwealth notes that sufficient and reasonably priced energy supplies are necessary to ensure Virginia's continued economic growth. It is important to note that economic growth produces "goods" that improve the well being of Virginia's citizens. Thus, in effect, energy policy should be balanced such that all the costs of implementing a particular energy policy do not exceed all the benefits that result from that policy. This report strives to keep that balancing act front and center.

Sections 67-100, 67-101 and 67-102 of the Code of Virginia contain the following statements:

<u>§ 67-100</u>

The General Assembly hereby finds that:

> 1. Energy is essential to the health, safety, and welfare of the people of this Commonwealth and to the Commonwealth's economy;
>
> 2. The state government should facilitate the availability and delivery of reliable and adequate supplies of energy to industrial, commercial, and residential users at reasonable costs such that these users and the Commonwealth's economy are able to be productive; and
>
> 3. The Commonwealth would benefit from articulating clear objectives pertaining to energy issues, adopting an energy policy that advances these objectives, and establishing a procedure for measuring the implementation of these policies.

§ 67-101

Energy objectives.

The Commonwealth recognizes each of the following objectives pertaining to energy issues will advance the health, welfare, and safety of the residents of the Commonwealth:

1. Ensuring the availability of reliable energy at costs that are reasonable and in quantities that will support the Commonwealth's economy;

2. Managing the rate of consumption of existing energy resources in relation to economic growth;

3. Establishing sufficient supply and delivery infrastructure to maintain reliable energy availability in the event of a disruption occurring to a portion of the Commonwealth's energy matrix;

4. Using energy resources more efficiently;

5. Facilitating conservation;

6. Optimizing intrastate and interstate use of energy supply and delivery to maximize energy availability, reliability, and price opportunities to the benefit of all user classes and the Commonwealth's economy as stated in subdivision 2 of § 67-100;

7. Increasing Virginia's reliance on sources of energy that, compared to traditional energy resources, are less polluting of the Commonwealth's air and waters;

8. Researching the efficacy, cost, and benefits of reducing, avoiding, or sequestering the emissions of greenhouse gases produced in connection with the generation of energy;

9. Removing impediments to the use of abundant low-cost energy resources located within and outside the Commonwealth and ensuring the economic viability of the producers, especially those in the Commonwealth, of such resources;

10. Developing energy resources and facilities in a manner that does not impose a disproportionate adverse impact on economically disadvantaged or minority communities;

11. Recognizing the need to foster those economically developable alternative sources of energy that can be provided at market prices as vital components of a diversified portfolio of energy resources; and

12. Increasing Virginia's reliance on biodiesel and ethanol produced from corn, soybeans, hulless barley, and other suitable crops grown in the Commonwealth that will create jobs and income, produce clean-burning fuels that will help to improve air quality, and provide the new markets for Virginia's agricultural products needed to preserve farm employment, conserve farmland, and help pay for agricultural best management practices to protect water quality.

Nothing in this section shall be deemed to abrogate or modify in any way the provisions of the Virginia Electric Utility Restructuring Act (§ 56-576 et seq.).

§ 67-102[9]

Commonwealth Energy Policy.

A. To achieve the objectives enumerated in § 67-101, it shall be the policy of the Commonwealth to:

1. Support research and development of, and promote the use of, renewable energy sources;

2. Ensure that the combination of energy supplies and energy-saving systems are sufficient to support the demands of economic growth;

3. Promote research and development of clean coal technologies, including but not limited to integrated gasification combined cycle systems;

4. Promote cost-effective conservation of energy and fuel supplies;

6. Promote the generation of electricity through technologies that do not contribute to greenhouse gases and global warming;

8. Promote the use of motor vehicles that utilize alternate fuels and are highly energy efficient;

11. Ensure that development of new, or expansion of existing, energy resources or facilities does not have a disproportionate adverse impact on economically disadvantaged or minority communities; and

12. Ensure that energy generation and delivery systems that may be approved for development in the Commonwealth, including liquefied natural gas and related delivery and storage systems, should be located so as to minimize impacts to pristine natural areas and other significant onshore natural resources, and as near to compatible development as possible.

[9] Language not directly related to electric service has been omitted.

> B. The elements of the policy set forth in subsection A shall be referred to collectively in this title as the Commonwealth Energy Policy.
>
> C. All agencies and political subdivisions of the Commonwealth, in taking discretionary action with regard to energy issues, shall recognize the elements of the Commonwealth Energy Policy and where appropriate, shall act in a manner consistent therewith.
>
> D. The Commonwealth Energy Policy is intended to provide guidance to the agencies and political subdivisions of the Commonwealth in taking discretionary action with regard to energy issues, and shall not be construed to amend, repeal, or override any contrary provision of applicable law. The failure or refusal of any person to recognize the elements of the Commonwealth Energy Policy, to act in a manner consistent with the Commonwealth Energy Policy, or to take any other action whatsoever, shall not create any right, action, or cause of action or provide standing for any person to challenge the action of the Commonwealth or any of its agencies or political subdivisions.

The Staff reads the legislative findings (§ 67-100), energy objectives (§ 67-101) and the Commonwealth Energy Policy itself (§ 67-102) to clearly direct that implemented policy balance through time all of the costs with all the benefits (as best as both can be discerned) of electricity production, transport and consumption. Staff's report strives to point out the needs and implications of a balanced policy as it pertains to electric energy's production and consumption in and about this Commonwealth.

Prior to the instant proceeding, the Commonwealth rigorously studied, yet minimally implemented, administratively determined electricity conservation programs. As this history is relevant to today's discussions, Staff's review looked back on work done on this topic in Virginia in the early 1990's. Staff reviewed two prior Commission Orders and respective Staff reports related to the investigation to consider the subject of conservation and load management ("CLM") that was initiated by the Commission on January 7, 1991,

in Case No. PUE-1990-00070. Staff believes this material is still applicable today and is summarized in Attachment 2.[10]

So that Staff may obtain a more current perspective, we also reviewed two recent studies regarding implementation of DSM and conservation efforts. These reports are often referred to as the Summit Blue Report and the GDS Report. The Summit Blue Report was prepared for Piedmont Environmental Council and purports to quantify Virginia's electricity conservation "resource." The GDS Report was produced for the Vermont Department of Public Service and purports to quantify additional conservation "resources" available to Vermont. We note that GDS provided consulting support services to the development of the Virginia Energy Plan. A summary of each of these studies is included in Attachment 3.

[10] The entire SCC Final Orders and respective Staff reports in Case No. PUE-1990-00070, are available at: http://www.scc.virginia.gov/division/eaf/conserve.htm .

Section II – Process

This section provides a description of the process adopted by the Commission in meeting its legislative mandate to conduct a proceeding regarding these matters. The Commission established a proceeding in its Order of June 8, 2007, Case No. PUE-2007-00049, to respond to the legislative directive. The Staff invited input from interested parties (including electric and natural gas utilities, competitive service providers, retail customers, appropriate state agencies, environmental and consumer organizations, and business associations) to assist in developing a comprehensive review of ideas that may be considered for inclusion in the Commission's Report to the Governor and General Assembly by December 15, 2007. Response to this solicitation was overwhelming, as 166 individuals representing 111 entities or interests participated in three all-day work-group meetings. This cross-section of volunteers spanned representatives from large investor-owned utilities to individual residential customers as shown in Appendix I.

The kick-off meeting was held on July 19, 2007, in the Commission's Courtroom. The first meeting welcomed public comment from those not able to commit to participate with the work-group, as well as for initial comments from participants. Staff used the time to describe its intended process to entertain ideas regarding (1) short-term and long-term strategies for program implementation; (2) advancement of technologies; (3) consumer education efforts; (4) the need for and amount of incentives; (5) measurement and verification of results; (6) decreasing energy consumption within a rapidly growing demand for energy; and (7) the associated costs and benefits of such programs, to aid Staff in its search to determine how to assemble a portfolio to meet the goal cost-effectively.

Staff also requested that anyone currently offering any such program to provide a summary detailing the costs, benefits, response level, incentives, measures and verifiable data results, and specific plans to continue and enhance such program. Additionally, Staff sought input regarding the next steps to fully implement the appropriate mix of programs in the Commonwealth and reach legislative targets, including efforts within PJM, and how to integrate programs in Virginia into such PJM efforts.

Participants were encouraged to take advantage of this opportunity and submit in writing any comments and ideas to facilitate obtaining the goals of the Clause. Staff advised the work-group that its report would provide an avenue for participants to voice their comments and opinions regarding the issues surrounding the achievement of these goals by posting such written comments to the Commission's website and by attaching or referencing such written comments to its report.

It became apparent during discussions at the kickoff meeting that there was a voluminous amount of information currently available or under development. To better manage the enormous undertaking by the work-group to meet a very short deadline, the participants identified and sorted major topics to be further addressed by five sub-groups. Again, there was an overwhelming response by the participants to volunteer to work offline over a period of several weeks to address particular topics and produce sub-group reports of findings to provide Staff with more specificity to include in Staff's report to the Commission for consideration in the final Report to the Governor. Staff's letter of August 3, 2007, outlined the focus topics for each of the five sub-groups as shown below:

Work-Group Focus Topics

Sub-group #1 - General

• Goal: reasonable? exceed? (define target, components, measures)

• Implementation/Administration (who administers, accountability)

• Cost Effectiveness Criteria (consider industry structure, market conditions, PJM)

• Measurement and Verification (standards, what, how, existing programs, account for growth effects, enforcement)

• Affected customers (jurisdictional, non-jurisdictional, municipalities, government)

• Level playing field for alternatives (Demand options equivalent to Supply options)

• Interaction between PJM and VA programs (how to design to complement rather than conflict)

Sub-group # 2 – Consumption reduction

• Conservation Programs (existing, short-, mid-, long-term strategy)

• Efficiency Programs (existing, short-, mid-, long-term strategy)

• Metering (more advanced needed?)

• Codes (building, appliance, equipment, Energy Star, enforcement)

• Cost elements, costs, cost ranking

• Penetration rates, experience

Sub-group # 3 – Demand/peak reduction

• Programs (existing, short-, mid-, long-term strategy)

    • Metering (extent of AMI)

    • Demand Response

    • Rate design/Pricing for Consumers (RTP,CPP,TOU)

    • Distributed generation

    • Communications/signals

• Cost elements, costs, cost ranking

• Penetration rates, experience

Sub-group # 4 – Financial considerations

• Regulatory/market incentives for utilities

• Utility revenue decoupling

• Regulatory/market incentives for market providers

• Customer incentives / rebates

• Public benefit funds (how much, how accumulated, how allocated?)

• Carve-outs for existing participants?

Sub-group # 5 - Information

• Consumer education

• Marketing

• Who provides, how provided, target audiences, cost, funding?

The co-chairs of each sub-group effectively worked with its volunteers via email, teleconferencing, and face-to-face meetings over a period of about 8 weeks to provide informative and helpful reports to Staff to consider for its report to the Commission. The co-chairs copied each other as well as Staff on all correspondence to keep everyone informed of the progress of each sub-group. Staff facilitated additional meetings on August 23, 2007, and September 14, 2007, to provide time and space for the sub-groups to work face-to-face and to apprise the whole work-group of its plan for a final work product.

Each sub-group was charged to identify any needed clarification of legislation or further legislative changes to include in Staff's report for consideration during the next session of the General Assembly. Additionally, each sub-group was asked to develop a priority list of actions or programs categorized by those that may occur immediately, in the short-term, mid-term, and long-term as well as those having zero or minimal costs to those reflecting higher costs to implement. The sub-groups were also asked to identify needed infrastructure requiring some lead time to implement future programs.

Staff wishes to thank each participant for the diligent efforts to provide input to each of the sub-group reports, and a special thanks to each co-chair for directing and coordinating the sub-groups' activities to provide Staff with invaluable information and

meet its tight timeframe. The remainder of this section summarizes the work product of each sub-group for the convenience of the reader. The views expressed are those of the sub-groups and not necessarily those of the Staff. In order to precisely include sub-group input in this report, each sub-group report is included in its entirety in Appendix I.

Synopsis of sub-group 1 – General

Sub-group 1 was charged with developing recommendations on issues concerning the statutory goal to achieve savings of 10% of Virginia's 2006 electricity sales by the year 2022. This group was asked to address the following issues:

- Determination of the appropriateness of the statutorily-defined goal, or a different goal based upon cost effectiveness test(s)
- Selection of cost-effectiveness test(s) and criteria to be applied
- Measurement and verification of standards to be applied
- Level playing field applicability
- Customers for which a goal should be applied
- Interaction between PJM and Virginia programs
- Determination of whether goal is to be achieved by utility-sponsored programs only or a combination of utility-sponsored and non-utility sponsored programs.

The sub-group acknowledged that while the legislation focuses on an energy consumption goal, reducing peak demand is also an important consideration. There was no consensus on whether to set goals in both capacity and energy terms.[11] The sub-group

[11] "Energy demand" or just "energy" as used in this report refers to electrical energy consumption without regard to the timing of that demand. On the other hand, electrical "capacity" requirements are a function of the timing of electrical consumtion and specify the extra requirements that such timing places on grid generation and delivery infrastructure. There is a "capacity" difference between using ten 100 watt lightbulbs for one hour and using one 100 watt bulb for ten hours. Although both situations consume 1,000 kWh of electrical energy, the prior situation requires ten times the electrical capacity than the former. In simplest terms, timing of electricity use raises issues related to but partially separate from how much electricity is

generally agreed that to support the attainment of an energy savings goal, measurement and verification methods will need to measure the energy impacts of all programs and that demand and capacity impacts can also be estimated in such methods.

Sub-group 1 reviewed energy savings goals set in other states and suggested that while the various states' range of targets frame the discussion, more detailed analysis is needed to develop a goal specific to Virginia. There was substantial agreement that an economic potential study should be conducted to determine Virginia's ultimate energy savings goal. The 10% goal is included in the Virginia Energy Plan, and some members of the sub-group expressed that the goal is modest. Others raise the possibility that it could be too high and say more information is needed before concluding that the 10% goal is cost-effective for Virginia. One member presented information suggesting that a cost-effectiveness analysis could yield a considerably lower goal than 10%.

The sub-group found that savings targets in the other states examined were in many cases based on energy efficiency potential studies. Such studies typically entail analysis of current market and technology conditions, identification of efficiency measures applicable to specific end-users, estimation of energy savings performance and installation of costs for measures, economic screening of measures using avoided cost parameters, bundling of measures into typical sets likely to be used in efficiency programs, and estimates of market penetration of such measures in targeted end-use markets. Sub-group 1 discussed setting a range of efficiency targets in the 5-15% range. Given the diversity of views within the group, it suggested that a Virginia-specific potential study would be helpful in determining whether the legislated 10% goal is appropriate.

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used.

The sub-group explored various policy and program channels for attaining the efficiency goal. For the administration and implementation of programs, the sub-group found two choices (1) whether to rely solely on utility-sector programs or to include broader policy avenues such as building codes, standards and tax incentives, and (2) in the utility sector, whether to rely solely on direct utility administration or use of a third party. For statewide market transformation and consumer education programs, there was a preponderance of support in the group for a non-utility, third-party administration approach. This approach would be contingent on the collection of a public benefits fund on utility bills and administered through third parties.

Sub-group 1 recommended that non-utility sponsored programs be implemented to contribute to achievement of the goal. In addition to strengthening and enforcing building codes and appliance standards, state and local governments can, for instance, set energy efficiency requirements for their own buildings, or offer sales tax holidays for customers to buy higher efficiency appliances, etc., as advocated by the Virginia Energy Plan.

The sub-group also suggested that to the extent that utilities administer efficiency programs, the state should consider new business/regulatory models that provide the cost recovery, revenue stability, and shareholder returns that are necessary to make demand-side investments attractive to utility shareholders.

For program approaches, especially market transformation, defined as broader, longer term efforts to change markets without primarily targeting individual customer transactions, the sub-group recommended the SCC consider several alternative arrangements. A low income/weatherization program was one the group discussed for possible third-party, state-wide administration. Also suggested was a third-party

administrator for state-wide consumer education. Third parties could include state agencies, non-profit organizations or private contractors. The sub-group suggested that utilities are best suited to administer programs that are based on specific geographic areas and customer segments.

It was stressed that given the 15-year time horizon to achieve the goal, one or more state agencies must be tasked and funded sufficiently to play an effective role in sustaining the various efforts needed to reach the overall goal. The state needs to establish a cost-effectiveness framework and specific tests for determining which efficiency programs and policies are cost-effective for purposes of establishing an appropriate efficiency goal.

Sub-group 1 stated that conducting a statewide energy efficiency potential study would be helpful to guide program design and targeting. The National Energy Action Plan for Energy Efficiency is developing a guidebook for states on this subject. Several tests have been used by other state utility commissions in setting programs and targets.

The sub-group discussed whether or not the state should assess cost-effectiveness on a portfolio basis rather than assess individual technologies, measures or programs. Even though the entire portfolio may be deemed cost effective, implementing demand-side management and/or energy efficiency initiatives that are not cost effective is not in the best interest of the Commonwealth. Sub-group 1 believed that programs should be provided on a priority basis with those deemed to have the most significant potential energy impacts implemented first. It is also suggested that the state consider including risk assessment and uncertainty analysis in its cost-effectiveness approach.

It is suggested by the sub-group that the state needs some flexibility in planning for resource acquisition and cost recovery over a 10-15 year planning horizon.

Measurement and verification ("M&V") issues were discussed on two levels:

- Macro level – measuring progress toward the goal
- Micro level - involves more detailed measurement and verification of program and measures and requires more technical specificity. Four major types of M&V techniques discussed were:
    1. Project M&V – This involves customized plans for major projects typically at larger customer sites or multiple sites.
    2. Market Transformation – This approach typically uses market share benchmarking methods.
    3. Measure deemed savings – This applies to simple, common measures like typical lighting fixtures.
    4. Simulation – Software simulation is the typical approach used for new building energy savings calculations.

The sub-group discussed metering issues and suggested that metering policies and practices in Virginia will need clear and consistent policies on technical specs, so that needs match capabilities over the mid- and long-term. Finally, sub-group 1 recommended that the state draw on national best practice resources in developing its M&V procedures.

Synopsis of sub-group 2 – Consumption reduction

Sub-group 2 believed mass implementation of energy efficiency and conservation efforts 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,[12] while helping to reduce the costs associated with future climate change policies.

Virginia has enjoyed electric rates for all customer classes that are well below the national average, but which have 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.

A variety of electricity conservation programs that could apply to Virginia's customers have been evaluated in other states and been deemed cost-effective.[13] 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 sub-group suggests that these programs, described in the report, be further assessed against Virginia's situation and needs as means for reaching the desired 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, implement consumer education programs, and provide customer incentives. Many of these states make extensive use of active, market-intervention programs, and the sub-group believed that such programs were

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[12] 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. This is available at http://www.chesapeakebay.net/agreement.htm .

[13] SCC Staff notes that there potentially exits a difference between being "deemed" cost-effective and being cost-effective.

necessary to overcome the knowledge and financial barriers that stand in the way of Virginia achieving the magnitude of energy reduction it seeks by 2022. Utilities (or in some cases public benefit corporations) in other states have developed comprehensive programs that address the needs of residential, commercial, industrial and institutional customer classes through customer education, technical assistance, and monetary incentives.

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, sub-group 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 sub-group report. Barriers include:

- Regulatory and Rate Barriers including the current regulatory environment, program cost recovery, cross-subsidization of program costs, and rate design;
- Financial Barriers including cost effectiveness;
- 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;
- Building Codes and Standards for Retrofit and New Construction;
- Metering Barriers, including measurement and verification (M&V);
- 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 balance the needs of all Virginia ratepayers and energy users fairly.

Sub-group 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.

Sub-group 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. It treated its 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, sub-group 2 compiled a list of known electricity conservation and efficiency programs that have been effective in other states. Potential programs were grouped into those that could be implemented **immediately** (1-12 months) over the **mid-term** (1-5 years), and over the **long-term** (beyond 5 years), and by four general customer classes (residential and small commercial, large commercial, industrial, and institutional).

It was their understanding that the SCC staff desired 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, the sub-group 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 sub-group members based either on first-hand experience administering energy efficiency programs, or because the programs have been successful elsewhere. The list also considers Virginia's climate and population mix of both urban and rural residents.

Although sub-group 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 sub-group.

Sub-group 2 recognized 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, sub-group 2 believed 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 sub-group 4 was charged with the cost-effectiveness issue, sub-group 2 recommended that the SCC include issues such as market potential, overall anticipated program costs, avoided cost, lost revenue and free-rider issues, among others, to 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.

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 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 viewed as critical to this effort by the sub-group. Further, facilitation and expedition of utility sponsored EE/DSM programs could be accomplished by the SCC allowing EE/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.

The United States 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%.

Sub-group 2 suggested 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 sub-group 2 or the organizations 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, the sub-group did not address sources by which these programs might be funded, as it is the responsibility of another sub-group to explore such determinations. Additionally, Appendix C and D of the sub-group report displays a matrix comparing results of similar programs in five other states.

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)

In conclusion, sub-group 2 agreed 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. Sub-group 2 recommended that the SCC give consideration to the effectiveness of programs listed in its report for Virginia.

Synopsis of sub-group 3 – Demand/peak reduction

According to this sub-group's report, the history of demand response[14] in Virginia has been one of missed opportunities. Policy makers recognized the importance of demand response and its benefits more than thirty years ago; however, comprehensive policies have not been initiated to address the issue. Many states initiated aggressive and effective demand response programs beginning in the 1970s, but Virginia has continued to lag behind.

The need for action is more pressing now than ever and new opportunities are now available to capture potential reductions in peak demand. These new opportunities are the result of (1) development of new policies in the PJM Interconnection; (2) advances in

[14] The sub-group noted that "demand response" is a more recent term for the concept of load management or demand reduction and, by any name, has the potential to provide numerous benefits to electricity consumers in Virginia.

telecommunications that allow real-time communication between suppliers and customers; and (3) improvements in the affordability and functionality of demand response technology. The sub-group recommended the immediate implementation of regulatory reforms that will spur reductions in peak load demand.

This sub-group believed that increased deployment of demand response in the Commonwealth would yield substantial customer financial benefits and electric reliability benefits. Individual customers could receive savings on their energy bills and incentive payments by adjusting their electric demand in response to time-of-use electric rates and incentive-based programs. Demand response programs also serve to reduce wholesale market prices by averting the need to run the most costly power plants during periods of otherwise high demand. These programs also help to mitigate latent market power present in wholesale power markets. This will drive generation costs down and, in turn, prices for purchasers of wholesale electricity. Moreover, over the longer term, sustained and targeted demand response lowers the need to build new generating, transmission, and distribution system capacity. Demand response also lowers the likelihood and consequences of forced outages on the electric grid.

Relatively low rates in recent years have contributed to limited interest in energy efficiency and demand response in Virginia; however, the Commonwealth's power companies are now facing a period of rising electricity costs. These rising costs stem from a combination of rising consumption, necessitating new investment in generation and transmission, projected increases in fuel costs, and the potential for additional environmental restrictions. The elimination of price caps and potentially higher fuel price

adjustments may likely translate these rising costs into higher electricity prices to customers in the coming years.

There are currently a few peak reduction programs in Virginia such as the PJM Interconnection peak reduction program for large industrial and commercial customers. Some of these programs utilize time-based rates or residential control systems for demand response; yet given low average rates, rate design, and limited promotion by utility sponsors, current program investment and customer participation in Virginia significantly lags many other states.

Historically, the focus of the utility industry in Virginia, as in most jurisdictions, has been on supply-side solutions to address peak demand, rather than demand-side approaches. As a result, generating plants and transmission lines have been and continue to be relied upon to meet peak loads during the limited number hours of the year in which they occur.

Sub-group 3 suggested a number of factors have contributed to the focus on supply-side approached in the Commonwealth. These include:

- cost recovery approaches that have provided a disincentive for utilities to pursue demand response programs;
- institutional and infrastructure barriers;
- lack of consumer awareness;
- limited rate design option;
- barriers to allowing third party provision of demand response;
- measurement and verification challenges; and
- the lack of consensus in determining procedures for the determination of cost-effective programs.

Reducing electricity use during periods of very high demand levels could be less costly and more reliable than adding to expensive infrastructure and relying on high-cost fuels. Demand reduction programs make sense and should be encouraged.

Sub-group 3 suggested that aggressive programs on the level of the Commonwealth and/or utility are needed to take advantage of all opportunities to reduce future costs of supply. Illustrative examples of the magnitude of potential benefits are provided in the sub-group report. Absent any additional demand-side programs, utilities in Virginia expect to add over 5,000 megawatts of generation capacity over the next ten years.

After reviewing the status of load management and demand-side management programs in the Commonwealth, sub-group 3 developed a list of proposals to reduce the impediments to these programs. These proposals would:

- Establish quantified goals for DR and track them on an annual basis;
- Establish policies for utility cost recovery and profit such that demand response programs will have at least the equivalent value as those of supply-side resources;
- Implement a consumer education program;
- Begin to evaluate the potential benefits of advanced metering infrastructure;
- Establish policies to improve the use customer-owned generation equipment during critical peak times;
- Consider the qualification of "clean" demand response options as renewable;
- Continue the work-group to develop a Virginia Energy Action Plan;
- Evaluate the adequacy of State Corporation Commission resources to accomplish the recommendations of this report.

Synopsis of sub-group 4 – Financial considerations

The focus topics for sub-group 4 included the following: regulatory/market incentives for utilities and market providers, customer incentives and rebates, utility revenue decoupling, public benefits funds and carve out for existing participants. The sub-group offered the following observations and suggestions:

- The SCC should provide guidance on its authority under existing law over conservation, energy efficiency and demand side/load management (EE/DSM) programs that could be implemented by electric utilities pursuant to SCC approval or direction.
- The SCC should also state its position with respect to programs that should be implemented by it, by other state or local governing bodies, or by other entities that are generally associated with providing products in open and competitive markets.
- Most importantly, the Commission should provide direction and guidance on how it expects to carry out its authority and responsibilities with respect to full cost recovery and other regulatory treatment of EE/DSM programs consistent with current statutes. Such guidance will provide important information to utilities, consumers and stakeholders, as well as to the legislature and other policy making bodies.

There was wide agreement within the sub-group that a utility should be able to fully recover its costs, including operating costs and a return of and on capital costs consistent with current law, through properly designed rate schedules.

With respect to cost recovery, the sub-group believed that costs associated with SCC approved or legislatively mandated EE/DSM programs should be considered on an equal footing with the costs of building, operating and maintaining new supply side options. This may include incentive rates.

The sub-group recommended that the Commission review its existing general authority to determine and report on whether and under what terms the Commission, as part

of its review and approval of a proposed EE/DSM program, will provide for full contemporaneous cost recovery or whether any periodic under-recovery of costs may be deferred and amortized, along with allowance of appropriate carrying costs on such deferrals, for subsequent recovery in rates. Since the costs associated with general rate case filings are large, it would be useful for the SCC to issue rules or guidance as to the nature of which EE/DSM programs, if any, are considered to be pre-approved in general, and which types of programs are encouraged and the cost recovery policies it intends to follow consistent with current law.

The sub-group recommended that the SCC review its policies and procedures related to changes in utilities' rate structures and rate design and consider establishing a limited, expedited, and revenue neutral regulatory procedure under which changes can be made to rate structures or rate designs outside of a full general rate case. Such a limited rate proceeding should be available so that rates and rate structures can be reviewed and modified more frequently and more efficiently to assure that customers receive appropriate price signals.

Sub-group 4 suggested the Commission should consider revising the fuel cost recovery mechanism and the allocation of such costs to the customer classes while continuing the policy of providing the utility with recovery of its actual fuel costs. Examples of how this can be accomplished include the development of voltage differentiated fuel factor rates or by time of use rates that include a differentiated fuel component.

Revenue decoupling was viewed by the sub-group as another form of rate design that could be considered. Revenue decoupling is defined as a ratemaking methodology that

separates utility revenues from volume of sales. Revenue decoupling may be enacted to address a variety of issues such as lost sales due to utility energy efficiency programs. Lost revenue recovery may be needed to pay for infrastructure in times of decreasing sales.

The sub-group believed that since the provisions of the law recently enacted in 2007 have not been implemented or evaluated, any new efforts on electric rate decoupling may need to be deferred until Virginia has the opportunity to evaluate the effect of these new measures. At this point, a minimum policy requirement would be to remove any disincentives associated with a utility implementing conservation and EE/DSM programs including but not limited to the recognition of the possibility that lost revenue associated with the reduction in sales due to such programs may detrimentally impact the recovery of the utility's fixed costs.

In the fifteen years since the Commission last reviewed and revised its promotional allowance rules, there has been an increase in the variety and range of energy conservation and load management programs that could be developed and offered by utilities. Potential programs include rebates, special rates or other incentives offered to all customers or to selected customer groups. Consequently, the current promotional allowance program standards may be too restrictive, or otherwise function as a perceived regulatory barrier to viable programs offerings.

The current rules provide little guidance as to types of programs that may be acceptable within the rules without requiring prior regulatory approval. Given these circumstances, the Commission should consider reviewing and updating the current promotional allowance rules to reflect changes occurring since 1992.

Sub-group 4 recommended the Staff consider the following incentives for utilities:

- There should be full and timely cost recovery of, and an appropriate return on, capital investment in rate base along with full and timely recovery of expenses to implement and operate conservation and DSM programs.
- Expenses allowable for recovery should include but not be limited to operations and maintenance expenses, general and administrative expenses and advertising, promotional and education expenses. In addition, if funding of a non-utility third party administrator or public benefit fund is determined by policy and regulation to be collected as part of a utility's cost of service, then such expense should be granted full recovery based on actual payments to the administrator or fund.
- Incentive treatment for the recovery of expenses (excluding non-utility third party administration or public benefit funds) is an appropriate policy to implement for utilities seeking to undertake conservation and DSM programs. An incentive based policy would establish the up front understanding that cost associated with programs approved by the Commission for implementation would be fully recovered. Among such incentive treatment options may be an approach that provides for deferred accounting treatment of prudent and reasonable expenses for Commission-approved programs. As an incentive, such expenses that have been incurred could have an appropriate carrying charge applied to the unamortized balance of the deferred account.
- Investments in conservation and DSM and investments in generation supply should be treated on a comparable basis in terms of the opportunity to earn a fair return consistent with current statutory provisions for establishing general rate of return on a utility's rate base. Section 56-585.1.A.6 of the Code of Virginia provides for basis points to be added to the utility's general rate of return to provide for an enhanced rate of return on common equity for specific types of generation facilities. A similar incentive for investment in rate base for conservation and DSM programs should be applied and would provide comparable treatment for recovery from supply side and demand side options.

Public Benefits Fund

This issue proved to be the most controversial for sub-group 4 and therefore may need targeted study by SCC Staff. Individual organization-filed comments should be referenced to gain an appreciation for each member's views on this topic as this text does not represent a consensus opinion.

If Virginia adopts a policy to have utilities collect money to finance a public benefits fund ("PBF"), a mechanism similar to the Electric Utility Consumption Tax (Code of Virginia § 58.1-2900) should be given strong consideration by the Commission. The structure of the consumption tax assigns the collected tax revenues proportionately to the State consumption tax (similar to a gross receipts or sales tax), Special regulatory tax (to fund the operation of the State Corporation Commission), and Local consumption tax (similar to a Business, Professional, and Occupational License tax).

Finally sub-group 4 recommended the SCC staff consider the following with regards to a public benefits fund:

- The Commission and the stakeholders should consider whether energy conservation goals are best achieved through the public benefits fund or the utility sponsored EE program mechanisms or a combination of both.
- If the utilities are going to be held accountable for the energy consumption goals then they are best served by programs that are under their control. If the public benefit fund is used then the utilities should not be held accountable for the energy consumption reductions, since they will only have limited control over the implementation of the programs.
- PBF's can be utilized effectively for efforts that are universal to all the utilities and are not utility-specific, such as general EE education for consumers. This is a good example of a program that lends itself to the public benefits fund, as impacts cannot be as easily measured as other energy efficiency programs.

- Utility-specific sponsored programs are preferable for EE efforts that are tailored to each state utility's service territory, and unique circumstances of the utility such as demand control programs.
- PBF's require oversight for program funding and spending. Regardless of which approach is taken or if it is a combination of the two – PBF and utility sponsored programs - such programs need to be cost-effective and provide for lasting reduction impacts. The programs should be subject to measurement and verification and be periodically monitored for cost effectiveness.
- Utilities, by hiring outside contractors to implement their EE programs, can limit their workforce investment.
- The financial disincentive to promote reduced consumption by customers can be addressed by providing appropriate cost recovery to place EE investments on equal footing with supply side investments in the form of cost recovery of program costs, net lost revenues (i.e., fixed costs) between rate cases and a financial return.
- Using third-party administration (which often accompanies PBF's) is an option to consider. Such an arrangement should come with proper measurement, verification and oversight.
- It may be appropriate to have the PBF be subject to a "sunset provision" and a blocked tier structure or other capping mechanism to address the competitive issues raised by industrial customers.

Synopsis of sub-group 5 – Information

Sub-group 5 was asked to consider how information and consumer education fit within the overall goal of reducing consumption. The Staff suggested the following topics: (i) how information and consumer education fit within the overall goal of reducing consumption; (ii) what justification exists for a new program; (iii) what are the impediments to implementation; (iv) what market research is needed; (v) what are effective ways to design and deliver information in a consumer education campaign; (vi) how can we

enable consumers to make changes in behavior and decision-making; (vii) what are some immediate, short-term, mid-term and long-term education components; (viii) what entity or entities should oversee and implement the program; (ix) how much it might cost and how it could be funded; (x) what legislative action is necessary; and (xi) what further consumer education recommendations, if any, could be made, given the conservation, energy efficiency, demand-side management and demand response programs recommended by sub-groups 2 and 3.

The sub-group reached consensus that many consumer education programs currently offered in the Commonwealth provide important conservation and energy efficiency messages, but a new core program is urgently needed.

The sub-group suggested that the consumer education campaign should focus on simple behavioral changes in the home and at the office, which could be tiered based on no-cost, low-cost and high-cost efforts. The campaign should focus on helping homeowners identify what they can do, the efficiency savings available, and where they can begin. The group recognized that there are a number of ways the Commonwealth-wide consumer education campaign can be effectively managed, but believed that the program would be most efficiently managed either within the SCC or within the DMME, or by an independent third-party entity with SCC or DMME oversight.

The sub-group recognized that new legislation may be required to establish and fund the Commonwealth-wide consumer education program. New legislation would also be needed to create a K-12 energy education curriculum for all public schools in the Commonwealth.

There was consensus within the sub-group that not only is a 10% reduction in electricity consumption by the year 2022 highly achievable, but also that a reduction in consumption through conservation, energy efficiency, demand-side management and demand response programs is absolutely imperative.

Sub-group 5 identified the following impediments:

- Limited availability of market research that tracks and measures results from statewide programs
- Apathy (perceived or real) of consumers toward consumer education in general
- Lack of immediate positive feedback from their energy-efficient actions
- Cost of a consumer education program
- Lack of funding for a consumer education program
- Lack of standardization of structures (not rates) for currently existing DSM and DR programs in Virginia
- Resistance (perceived or real) of utility companies toward a statewide consumer education program
- Absence of a current crisis situation in Virginia to serve as a catalyst for statewide consumer education efforts

The goal of the energy consumer education program would be to increase energy efficiency awareness and generate behavioral change. The sub-group suggested that this new effort should have a brand name similar to the SCC's restructuring education plan branded "Virginia Energy Choice." There should be rules and fees to use the brand name that would ultimately cover the cost of administering the trademark. This process could be outsourced with SCC contractual oversight and control. The sub-group went on to discuss various ways to reach each sector – residential, commercial and industrial, and institutional.

The sub-group recommended that Virginia take the approach that highly energy-efficient states have taken – a high-level consumer education program with a clear and concise message that is complemented and/or supplemented by corollary messages offered by other independent lower-level programs.

Sub-group 5 believed the Commonwealth should be actively engaged in the development, management and delivery of the consumer education campaign for several reasons. Government involvement would ensure that all end users would have access to the same information. Commonwealth involvement would also leverage already existing county- and federally-funded initiatives. Additionally, government involvement would ensure consistent tracking, measurement and evaluation of impacts of consumer education.

The sub-group recommended that the SCC consider the following alternatives for the management of the new education program:

- Outsource the new program to an already-existing, non-utility, independent third party.
- Identify individuals representing several agencies, groups, etc. to collaborate and assist in the management.
- The program could be managed by a newly-created state program office located within an independent agency or the executive branch.

The sub-group provided an analysis of the management of electric energy consumer education programs in states deemed to have the most energy-efficient economies and highlights the different ways such a program could be effectively managed.

The sub-group suggested that a third-party (state agency, non-profit organization or private company) administrative approach is preferable for Virginia.

A successful program will require an adequate budget. Costs will vary as the campaign develops. A budget for the program must be flexible to respond to actual program results and also be dedicated to provide enough funding to ensure success.

An illustrative budget was developed using the Virginia Energy Choice Customer Education Program developed in 1999 as a framework for a simple cost projection for a consumer education program in Virginia. The following are categories to be considered as potential and, at this point, flexible line items in a budget projection for a statewide education program in Virginia: market research and tracking, information materials, media kits/public relations, grants, website, hotline and advertising.

This illustrative budget projects a five-year program with an average spending per year of $6 million, for discussion purposes only. The budget detail provided indicates that the first year of the program should entail above-average spending: however, the reality is that a less than average amount may be used to jump-start the program. Based on Virginia's estimated population of 7.5 million, the annual per capita cost would average $.80 under this framework. The budget total was based on mostly 1999 figures so increasing the budget detail by 20% should be considered to allow for inflation.

General consensus within the sub-group was that identifying a dedicated, reliable funding source is absolutely necessary to ensure the long-term success of any consumer education program that is developed and implemented. States that operate successful consumer education and energy efficiency programs typically use a PBF, also known as a System Benefit Charge ("SBC"). To date, over twenty states have adopted a PBF to help fund a wide range of energy programs.

Recognizing that a PBF may be politically difficult because it is perceived as a new tax, the sub-group believed that it should be given full consideration as a funding option for a consumer education program as well as for conservation and energy efficiency initiatives.

Three general PBF options were discussed:

- A PBF that uses a mills charge per kWh. The charge shall be a non-bypassable element of the local distribution service and collected on the basis of usage.
- A PBF that uses a flat rate that every ratepayer is charged.
- A PBF that uses either a mills charge per kWh or a flat rate, and the amount generated is matched either equally or at a percentage by the utility companies.

Recognizing the potential legislative difficulty posed by a PBF and the urgent need for immediate funding, some other options were discussed. A potential solution is set forth in the following two options, both of which target the Virginia Electric Consumption Tax:

Option 1: If the maximum allowable portion of the Special Regulatory Tax is still not being collected, then the same formula could be used to fund the new education campaign.

Option 2: If the maximum allowable portion of the Special Regulatory Tax is being collected, then the legislature could authorize raising the statutory limit within one of the Virginia Electricity Consumption Tax components, and the additional money could be used to fund the education programs.

Finally, the sub-group discussed potential legislative proposals that could be recommended to the Virginia General Assembly. The following are proposals unanimously recommended by this sub-group:

- Legislation to establish a Commonwealth-wide electric energy consumer education program that will design and deliver informational materials related to

conservation, energy efficiency, demand-side management and demand response

- Legislation to fund a Commonwealth-wide electric energy consumer education program by
- Creating a Public Benefit Fund and directing that such funding will support all necessary expenses related to the development and implementation of the program
- Authorizing a change in the statutory limit of the Virginia Electric Consumption Tax and directing that such funding will support all necessary expenses related to the development and implementation of the program
- Legislation to establish a K-12 energy education curriculum, tied to SOLs, in all public schools in Virginia to consistently and comprehensively inform our students about conservation, energy efficiency and demand-side resources.

Section III – Staff Analysis and Observations

The Third Enactment Clause of SB 1416 states that "The Commonwealth shall have a stated goal of reducing the consumption of electric energy by retail customers through the implementation of such programs by the year 2022 by an amount equal to ten percent of the amount of electric energy consumed by retail customers in 2006." From a mathematical perspective this goal is straightforward. The Staff observes that electric energy delivered to retail customers in Virginia amounted to approximately 100 million MWh in 2006. Ten percent of this delivered amount conveniently works out to approximately 10 million MWh. Thus, the first and most basic determination that the Commission is directed to make is:

> Can the implementation of cost-effective conservation of energy through fair and effective demand side management, conservation, energy efficiency, and load management programs, including consumer education --- by electric utilities, public or private organizations, or both electric utilities and public or private organizations --- reduce annual 2022 retail electric energy consumption in Virginia by 10 million MWh from the level that would have prevailed in 2022 in the absence of programs potentially implemented as a result of this process?

A numerical example provides some insight as to the attainability of this 10% goal. For example, assuming a program start date of 2008, if the contemplated demand-side management, conservation, energy efficiency, load management and consumer education programs reduce the rate of growth in electrical consumption from 3.0% to 2.5%, the goal will have been met.[15]

[15] This table is tendered as an example. We note that most current forecasts do not expect electricity use growth in Virginia to be quite this high.

Without Energy Efficiency Programs Growth Rate = 3.0% per year		With Energy Efficiency Programs Growth Rate = 2.5% per year	
2006	100.000	2006	100.000
2008	103.000	2008	102.500
2009	106.090	2009	105.063
2010	109.273	2010	107.689
2011	112.551	2011	110.381
2012	115.927	2012	113.141
2013	119.405	2013	115.969
2014	122.987	2014	118.869
2015	126.677	2015	121.840
2016	130.477	2016	124.886
2017	134.392	2017	128.008
2018	138.423	2018	131.209
2019	142.576	2019	134.489
2020	146.853	2020	137.851
2021	151.259	2021	141.297
2022	155.797	2022	144.830
	Difference in 2022 =	10.967	(000,000) MWH
	or	10.97%	of 2006 MWH use

Moreover, there is a body of evidence indicating that the 10% goal is physically attainable. That evidence includes Virginia's recently published Virginia Energy Plan, a Summit Blue report produced by the Piedmont Environmental Council, a consultant's report prepared for the Vermont Department of Public Service, and input from the stakeholder work-group convened in this proceeding.[16]

This body of evidence considered along with the numerical example set forth above, Virginia's longstanding low electric rates[17] and the Commonwealth's historically low level of utility spending on energy efficiency measures, together all indicate that the 10% goal is

[16] Sub-group 1 was specifically tasked with determining the feasibility of obtaining the 10% goal. The sub-group reviewed energy savings goals set in other states and suggested that more detailed analysis is needed to develop a goal specific to Virginia. The sub-group reported substantial agreement that an economic potential study should be conducted to determine Virginia's ultimate energy savings goal. The 10% goal is included in the Virginia Energy Plan, and some members of the sub-group expressed that the goal is modest. Others raise the possibility that it could be too high and say more information is needed before concluding that the 10% goal is cost-effective for Virginia. One member presented information suggesting that a cost-effectiveness analysis could yield a considerably lower goal than 10%.

[17] Virginia's current electric rate levels are displayed in Attachment 1. The source of the data is the Edison Electric Institute's Typical Bills and Average Rates Report – Winter 2007.

attainable. While the Staff believes that the 10% goal is attainable, there is substantial debate about the best way to achieve the goal. The policy directive to implement cost-effective conservation of energy through fair and effective demand-side management, conservation, energy efficiency, and load management programs, including consumer education --- by electric utilities, public or private organizations, or both electric utilities and public or private organizations is a worthy directive, even if it set no particular goal.

One approach, generally agreed to by most of the sub-groups, is to review and redesign utility rates to better match the price paid by a customer for electricity use with the cost of producing that power. Such a price should reflect the total cost to produce and deliver electric power at any given point in time. Such cost-based price signals would presumably influence consumer behavior and encourage more efficient use of electricity.

Energy economists have long noted that the prices that consumers pay for electric service greatly impact consumer behavior, including consumer willingness to purchase energy efficiency on their own. If the goal is to cut electric consumption, the most certain way to achieve the goal is to raise electricity prices, especially the price for electricity consumed at the margin. We note that this strategy could be disruptive to the economy on a short-term basis, but in theory would stabilize demand and supply on the longer-term basis.

Electric pricing or “rate design” determines how the relative purchase of electricity versus conservation impacts utility shareholders and then other ratepayers through later rate level changes. The influence of prices on consumer behavior is especially evident over the long run. The question here is to what, if any, extent regulated retail electric prices in Virginia, coupled with effective demand-side management, conservation, energy efficiency,

and load management programs, could be used as a means to promote cost-effective conservation of energy?

In simplest terms, it appears that much of the renewed interest in energy efficiency in Virginia and around the United States stems from the perceived high costs associated with the continued growth of electrical consumption. These perceived high costs include, but may not be limited to, the costs of fuel used to produce electricity, the cost of labor and materials required to construct new generating stations, and the cost and aesthetic impacts of new high-voltage bulk transmission lines required to deliver ever increasing amounts of electricity to load centers. Also apparently driving new policy directions are the environmental costs associated with generating electricity however produced, including any impact of electric generation on global climate. The point here is that if electric consumption and its associated production and delivery are indeed costly to our economy and environment, one might want to consider charging consumers a price that reflects those costs --- at least for consumers' elective consumption at the margin. In other words, prices for the part of the bill that changes as usage level changes could reflect the true cost of the consumer's decision to use --- or not use --- that last kWh of electricity.[18] Thus, people's electric bills will better reflect the actual costs imposed on the electric system and environment as the amount of kWh consumed fluctuates. This is known as marginal cost pricing. Prices are set so that electric utility rate design becomes an efficiency tool because electricity prices so determined reflect the true value of conservation. Of course, this discussion assumes that the environmental damages associated with electricity consumption can be calculated in preparation for its inclusion in electricity prices.

[18] A crucial part of this pricing program changes inelastic (non-price sensitive) rate elements so that the electric utility is not expected to over or under-collect its allowed revenue requirement.

The marginal cost pricing regime set forth for consideration here is not directed at saving electricity just for the sake of saving electricity. Rather, the objective is to price electricity closer to its true cost so that customers may make rational, balanced decisions regarding how much electricity supply and electricity conservation to purchase to meet each customer's unique requirements. There are substantial barriers to implementing marginal cost pricing in Virginia. First, customers will be dissatisfied if such a regime causes their bill to increase. Second, the numerous adjustment clauses currently included and likely to be added to Virginia utilities' retail electric bills make it hard for customers to determine what it actually costs to consume an additional kWh of electric service and then compare that cost to a conservation alternative. Finally, there are substantial technical competencies required to actually determine a particular utility's marginal costs for its various customer classes and rates.

Despite these impediments, the great benefit of prices appropriately set is that it allows customers to compare the true cost of electric power to the cost of conservation measures as it applies to their specific home or business. This potentially leads to truly efficient and balanced outcomes. Decentralized decisions are made by customers based on prices produced by the free market (for conservation measures) and prices resulting from a regulatory process designed to produce electricity prices at the margin that are as close as possible to those that would be produced by a well functioning electricity market --- if that could be achieved. Prices are information that reaches every customer. Many customers can and would act on that information.

Again the question here is to what, if any, extent regulated retail electric prices in Virginia be used as a means to promote cost-effective conservation of energy through fair

and effective demand side management, conservation, energy efficiency, and load management programs? Should Virginia opt to move in this direction, first steps would be the determination of electric utility marginal costs followed by the development of either voluntary or mandatory retail rates for customers.

Another approach to reduce electricity consumption is to make available a menu of demand-side management, conservation, energy efficiency, and demand response programs as cost-effective alternatives to meet a customer's electrical requirements. Sub-groups 2 and 3 tendered numerous programs for the Commonwealth to consider offering to its electricity consumers. Many programs are currently available, while others are under development in response to technology advancements and customer interests and concerns.

For electric power customers facing barriers[19] that leave them unable or unwilling to purchase their own conservation measures, potentially cost-effective conservation can be implemented through programs designed to overcome such barriers.[20] Our discussion here will move to the heart of demand-side management economics, briefly touch on the decades old controversy surrounding which test is best at determining "cost-effectiveness" and demonstrate the interrelated nature of the key policy areas identified earlier. As per the Third Enactment Clause, our goal is to develop measures and programs that are cost-effective, fair and efficient.

First, we note that the Virginia Energy Plan recognizes, at least in its back-up materials and supporting empirical analysis, what may be termed "organic" conservation. This is the amount of conservation that customers will undertake on their own over the next

[19] It is important to remember that sometimes barriers represent real costs.

[20] Sub-group 2 discusses barriers to the implementation of energy efficiency programs in their report's Appendix B- Current Barriers to Program Implementation in Virginia.

decade or so without the institution of any additional demand-side programs. The Plan determined that 25% of the 2022 goal will be met by such organic conservation. To the extent that Virginia electric utility rates for usage sensitive rate elements are below marginal cost, movement towards a regime of marginal cost prices for electric service would increase the amount of organic conservation, especially if environmental externalities are included in the design of electric rates.

Staff believes that terms "cost-effective," "fair" and "efficient" require definition before Virginia can move forward on electric efficiency programs. Again, no consensus on these key definitions emerged from the work group process employed in this proceeding. These definitions have proved controversial in other jurisdictions for many years. Arriving at appropriate definitions and methods of evaluation can be both conceptually and computationally complex.

The simplest statement that one may make regarding DSM economics is that if the cost (to the utility) of new electric service supply (including generation, transmission, and distribution) is greater than the cost of DSM, then the provision of DSM is "cost-effective." Here, DSM has a positive net benefit and should be provided in place of electric supply.

The rate impact problem has been one of the major impediments to utility sponsored DSM programs because it raises important side issues. Programs that fail a rate impact test raise fairness issues. If, for example, a factory owner has already undertaken self-financed conservation, why should that customer's electric rates go up as a result of the utility providing DSM to other customers, some of whom may be direct competitors to that factory? Also, how might future electric consumer conservation project evaluation change due to the potential availability of future DSM subsidies. Instead of moving forward,

perhaps a prudent consumer should wait and have the utility provide the valuable DSM measure at a heavily subsidized price or perhaps completely free of charge. A final consideration is the service territory wide impact on commerce resulting from higher electricity prices that potentially result from the implementation of the DSM program. Staff believes more work is needed in this vital component of developing sound policies in the electrical end-use efficiency arena.

Another important question often asked regarding the deployment of cost effective conservation programs is what entity should administer the program. It is often alleged that electric utilities have an incentive to sell more electricity and, therefore, bias against EE/DSM program implementation. As such, this line of reasoning holds that electric utilities implementing EE/DSM programs will make a half-hearted effort at success. Given this, some believe that electric utilities should not be tasked with energy efficiency and conservation programs. On the other hand, electric utilities may offer economies of scope and scale that reduce the administrative costs of implementing EE/DSM programs and measures.

We note the distinction here between different types of EE/DSM programs. Conservation or energy efficiency (C&EE) programs are undertaken with the idea that less energy overall will be consumed due to the installation of the measure. Electricity will be used more efficiently whenever it is called upon to do work; less energy is consumed to perform that work or task without regard to the timing of that electricity use.

Demand response (DR) programs, on the other hand, are more concerned with managing electricity use according to other demands placed upon the electric system. Often, demand response programs can be as simple as a telephone, fax, pager or e-mail

communicated request for a customer to interrupt an electricity use and produce a reduction in electric system demand for a specific time period. The customer receives some type of payment or consideration for so acting. It is not uncommon for such programs to impose relatively low compliance costs on customers, although some means of interrupting load (i.e. by starting standby generation) can impose greater cost on customers. The cost of required incremental metering, communications and control equipment can be trivial when compared to the equipment savings realized by the power grid. Customer costs, however, do include the cost that the customer incurs when an electrical use is interrupted. It is also common that the interrupted process be "made-up" during a time period when the electrical grid is less heavily loaded. Interruptible programs can be relatively inexpensive for utilities to implement and administer. Close cousins of interruptible load DR type are real-time pricing (RTP), critical peak pricing (CPP), and load management programs (LM) which all attempt to send more accurate price signals to customers.

Well implemented DR, load management and real-time pricing programs can eliminate or shift electricity consumption from high cost, high demand periods to low cost, low demand periods. This is a low-cost way to save real electricity system resources, increase reliability and potentially reduce system average costs. To the extent that the DR "family" of operating tools are considered a "peaking resource" by the system operator, it seems reasonable that the system operator play a crucial role in the design, implementation and administration of DR-type programs. This is much the case today with DR programs administered in Virginia by PJM. Staff recommends no change to this basic approach to DR.

Returning to C&EE programs, we note that utilities' incentives regarding administration of such programs can be quite complex. These incentives flow from the regulatory regime faced by the utility in conjunction with the relationship between utility marginal costs and utility marginal revenues. Depending on regulatory rules, electricity prices and production costs, the implementation of C&EE programs and the associated reduction in kWh sales to native load customers gives rise to several cash flows. The coincidence of those flows determine the impact on the utility's bottom line and should be a good predictor of utility incentives and resulting behaviors. At this juncture, given the novelty of Virginia's "re-regulatory" regime, the apparent lack of utility marginal and avoided cost information and the pending nature of this very proceeding, an important policy choice will be required as to what entity or entities may administer Virginia's C&EE programs.

The issue of which entity or entities would be able to most efficiently deploy and administer C&EE programs in Virginia is dependant on the answers to the questions posed above. While electric utilities may have some advantages in and a corresponding desire to administer C&EE programs, the potential administrator's business incentives are formed in large part with how electricity and conservation are priced and how C&EE program costs are defined and thus recovered under Virginia's new re-regulation statute.

Section IV – Summary and Recommendations

The Staff believes that the 10% goal as set forth in the Third Enactment Clause of SB 1416 can be achieved even using a relatively conservative test for "cost-effectiveness." This conservative test requires that electric rates do not rise as a result of the deployment of cost-effective conservation of energy through fair and effective demand-side management, conservation, energy efficiency, and load management programs, including consumer education. This conclusion is supported by the observation that Virginia's electricity rates have been relatively low for decades and that, as a result, it is reasonable to assume that conservation opportunities developed in higher electric cost jurisdictions could be adopted in Virginia at a lower cost than that of new supply from the electric power system. For the same reasons, Staff agrees with the findings of the Virginia Energy Plan and other studies that generally conclude that there is much cost-effective conservation ready for harvest. The Virginia Energy Plan posits that the conservation resource in Virginia is relatively inexpensive. Given the time constraints placed on this process and the necessary scope of our resulting inquiry, Staff finds no reason to disagree with this crucial VEP finding.

The Staff further believes that while the 10% goal is attainable, only "cost-effective" conservation should be undertaken whether that turns out to provide 8%, 10%, 12% reduction in consumption. Staff defers to the Virginia Energy Plan and the work of the stakeholders in this proceeding for the specific identification of electric conservation programs potentially deployed in Virginia. Staff again notes and thanks the stakeholder work-group for their contribution in this area.

Staff's lone recommendation seeks to rectify the most significant deficiency associated with this important effort. That deficiency is the lack of important data and information that is missing from this discussion yet crucial in determining whether EE/DSM programs are cost-effective, fair and efficient. Sound program evaluation requires reasonably complete quantification of the expected supply costs of grid provided electric power potentially avoided through deployment of EE/DSM. During Virginia's ten-year experiment with industry restructuring, the development of such information was not a priority for either Virginia's electric utilities or the Staff because the competitive market was to have transparently provided such information. The market was also supposed to enable the deployment of cost-effective EE/DSM through individual and independent consumer action. Given today's changed circumstances, the Staff recommends that Virginia's major electric utilities be required to develop and file with the SCC rate element specific marginal cost of service studies and associated avoided electric supply cost forecasts. While Staff recognizes that such an undertaking is difficult to do correctly, such information is absolutely necessary, although not necessarily sufficient, in determining the cost-effectiveness of potential EE/DSM programs.

Attachment 1 – Rate Ranking

Attachment 1A – for Industrial Customers

	State/Company				State/Company		
1	Idaho	$	0.0335	24	Oklahoma	$	0.0541
2	West Virginia	$	0.0369	25	Arkansas	$	0.0542
3	Tennessee	$	0.0373	26	North Dakota	$	0.0549
	APCO	**$**	**0.0385**	27	Colorado	$	0.0576
4	Utah	$	0.0403	28	Washington	$	0.0590
5	Wyoming	$	0.0405	29	Wisconsin	$	0.0590
	Potomac Edison	**$**	**0.0409**		**US**	**$**	**0.0600**
6	Missouri	$	0.0414	30	Mississippi	$	0.0632
7	Virginia	$	0.0433	31	Michigan	$	0.0632
8	Kentucky	$	0.0442	32	Texas	$	0.0632
	Dom. VA Power	**$**	**0.0462**	33	Pennsylvania	$	0.0685
9	South Carolina	$	0.0466	34	Louisiana	$	0.0690
10	Kansas	$	0.0477	35	Arizona	$	0.0705
11	Iowa	$	0.0479	36	Vermont	$	0.0780
12	Delaware	$	0.0483	37	Florida	$	0.0795
13	Alabama	$	0.0492		**Delmarva**	**$**	**0.0803**
14	Oregon	$	0.0494	38	Nevada	$	0.0892
15	South Dakota	$	0.0498	39	New York	$	0.0912
16	Illinois	$	0.0502	40	Maryland	$	0.0930
17	Indiana	$	0.0505	41	New Jersey	$	0.0985
18	North Carolina	$	0.0510	42	California	$	0.0988
19	Minnesota	$	0.0515	43	Maine	$	0.1107
	Old Dominion Power	**$**	**0.0522**	44	Connecticut	$	0.1200
20	New Mexico	$	0.0522	45	New Hampshire	$	0.1289
21	Ohio	$	0.0526	46	Rhode Island	$	0.1311
22	Montana	$	0.0531	47	Massachusetts	$	0.1640
23	Georgia	$	0.0539	48	Hawaii	$	0.1738

Attachment 1B – for Commercial Customers

	State/Company				State/Company		
1	Idaho	$	0.0486	25	Ohio	$	0.0808
	APCO	**$**	**0.0509**	26	Alabama	$	0.0817
	Potomac Edison	**$**	**0.0548**	27	Montana	$	0.0820
2	Tennessee	$	0.0549		**Delmarva Power**	**$**	**0.0833**
3	West Virginia	$	0.0551	28	Wisconsin	$	0.0854
4	Missouri	$	0.0556	29	Michigan	$	0.0866
5	Utah	$	0.0592	30	Arizona	$	0.0877
6	Virginia	$	0.0598	31	Texas	$	0.0904
7	Kentucky	$	0.0604	32	Louisiana	$	0.0919
	Dom. Virginia Power	**$**	**0.0608**	33	Pennsylvania	$	0.0927
8	Kansas	$	0.0624		**US**	**$**	**0.0929**
	Old Dominion Power	**$**	**0.0626**	34	Mississippi	$	0.0943
9	North Dakota	$	0.0667	35	Delaware	$	0.0987
10	Oregon	$	0.0672	36	Florida	$	0.1010
11	North Carolina	$	0.0674	37	Nevada	$	0.1065
12	Arkansas	$	0.0678	38	Maryland	$	0.1111
13	Wyoming	$	0.0689	39	Vermont	$	0.1129
14	Minnesota	$	0.0694	40	New Jersey	$	0.1135
15	South Dakota	$	0.0714	41	District of Columbia	$	0.1174
16	Indiana	$	0.0728	42	New Hampshire	$	0.1337
17	South Carolina	$	0.0732	43	Rhode Island	$	0.1360
18	Oklahoma	$	0.0734	44	California	$	0.1386
19	New Mexico	$	0.0738	45	Connecticut	$	0.1417
20	Colorado	$	0.0743	46	Maine	$	0.1419
21	Iowa	$	0.0744	47	New York	$	0.1511
22	Washington	$	0.0746	48	Massachusetts	$	0.1718
23	Illinois	$	0.0747	49	Hawaii	$	0.2098
24	Georgia	$	0.0750				

Attachment 1C – for Residential Customers

	State/Company				State/Company		
1	Tennessee	$	0.0531	25	Ohio	$	0.0909
	APCO	**$**	**0.0595**	26	Colorado	$	0.0910
2	Idaho	$	0.0600	27	Arizona	$	0.0962
	Old Dominion Power	**$**	**0.0603**	28	District of Columbia	$	0.0974
3	Kentucky	$	0.0626	29	Louisiana	$	0.0978
4	West Virginia	$	0.0627	30	Iowa	$	0.0988
	Potomac Edison	**$**	**0.0658**	31	Michigan	$	0.0993
5	Missouri	$	0.0696	32	Texas	$	0.1031
6	Washington	$	0.0701	33	Mississippi	$	0.1043
7	North Dakota	$	0.0730		**US**	**$**	**0.1059**
8	Utah	$	0.0748	34	Pennsylvania	$	0.1069
9	Kansas	$	0.0751	35	Wisconsin	$	0.1079
10	Oregon	$	0.0762	36	Maryland	$	0.1087
11	Virginia	$	0.0791	37	Nevada	$	0.1106
12	Wyoming	$	0.0811		**Delmarva Power**	**$**	**0.1157**
13	Indiana	$	0.0814	38	Florida	$	0.1161
14	Oklahoma	$	0.0822	39	Delaware	$	0.1186
15	Illinois	$	0.0830	40	New Jersey	$	0.1278
16	North Carolina	$	0.0841	41	Vermont	$	0.1308
17	South Dakota	$	0.0841	42	New Hampshire	$	0.1480
	Dom. Virginia Power	**$**	**0.0843**	43	Rhode Island	$	0.1497
18	New Mexico	$	0.0857	44	California	$	0.1519
19	South Carolina	$	0.0880	45	Maine	$	0.1595
20	Montana	$	0.0883	46	Connecticut	$	0.1698
21	Georgia	$	0.0882	47	Massachusetts	$	0.1724
22	Arkansas	$	0.0884	48	New York	$	0.1731
23	Minnesota	$	0.0891	49	Hawaii	$	0.2285
24	Alabama	$	0.0893				

Attachment 1D – for Total Customers

	State/Company				State/Company		
1	Idaho	$	0.0467	25	Ohio	$	0.0733
2	Tennessee	$	0.0468	26	Colorado	$	0.0764
3	West Virginia	$	0.0499	27	Montana	$	0.0811
	APCO	**$**	**0.0504**	28	Wisconsin	$	0.0816
4	Wyoming	$	0.0526	29	Texas	$	0.0830
	Potomac Edison	**$**	**0.0546**	30	Michigan	$	0.0843
5	Kentucky	$	0.0555	31	Louisiana	$	0.0846
6	Utah	$	0.0568	32	Arizona	$	0.0869
7	Missouri	$	0.0574	33	Pennsylvania	$	0.0881
	Old Dominion Power	**$**	**0.0585**	34	Mississippi	$	0.0882
8	Kansas	$	0.0635		**US**	**$**	**0.0887**
9	Virginia	$	0.0646	35	Delaware	$	0.0958
10	Indiana	$	0.0647		**Delmarva Power**	**$**	**0.0966**
11	North Dakota	$	0.0663	36	Nevada	$	0.1026
12	Oregon	$	0.0669	37	Maryland	$	0.1065
13	Minnesota	$	0.0674	38	Florida	$	0.1072
14	South Carolina	$	0.0677	39	Vermont	$	0.1105
	Dom. Virginia Power	**$**	**0.0679**	40	District of Columbia	$	0.1117
15	Iowa	$	0.0689	41	New Jersey	$	0.1178
16	North Carolina	$	0.0692	42	California	$	0.1369
17	Arkansas	$	0.0696	43	New Hampshire	$	0.1380
18	Oklahoma	$	0.0698	44	Maine	$	0.1401
19	Washington	$	0.0708	45	Rhode Island	$	0.1417
20	Alabama	$	0.0709	46	New York	$	0.1499
21	South Dakota	$	0.0719	47	Connecticut	$	0.1508
22	Illinois	$	0.0720	48	Massachusetts	$	0.1696
23	New Mexico	$	0.0729	49	Hawaii	$	0.2021
24	Georgia	$	0.0729				

Attachment 2 – Review of Case No. PUE900070

Review of Case No. PUE900070

We do not believe that much of substance has changed since these documents were issued; however, the context has now changed. Given that a greater sense of urgency has developed regarding conservation, and particularly given that we are primarily concerned with the externalities of energy use (i.e., carbon dioxide), there may be a need to reconsider the application of cost/benefit measures. The old emphasis was on utility and ratepayer costs. Programs that "passed" the tests were accepted. Now, there may be some desire to maximize the environmental benefits of the programs instead of minimizing costs. Such a situation could lead to suggestions to consider external costs, i.e., the Societal Test, although as described below, the Commission has not believed that it had the statutory authority to consider that test.

Synopsis of Staff's Review of Commission Policy Towards Conservation and Load Management Programs - April 26, 1991

Staff recommended revising rules relating to promotional allowances to permit such allowances for cost effective CLM. It recommended, as a prerequisite to rate recovery of related costs, that all programs be evaluated and approved on a case by case basis to assure that a program is both cost effective and primarily directed at CLM. Staff suggested that the issue of measuring cost effectiveness of CLM programs required more detailed work and recommended a series of technical conferences or a task force should be organized.

The report also recommended that the Commission should determine whether environmental and/or other societal externalities should be considered. This was the most

controversial issue in this case as the Commission did not believe that it had the statutory authority to do so.

The staff addressed two aspects related to the recovery of costs: direct CLM program costs and "lost revenues." Staff believed that specific cost treatment should be addressed in individual rates cases and that automatic adjustment clauses should not be used for such recovery.

As for "lost revenue," Staff noted that under current ratemaking principles, by promoting conservation a utility may forgo some profits due to lower sales. Staff did not make a recommendation.

Staff did not suggest utilities be required to use bidding. It did believe that the potential benefits warranted examination and recommended that Virginia Power be directed to use a demand-side bidding program on an experimental basis. Staff also suggested that utility demand-side programs should be subject to a formal approval by the Commission.

Synopsis of Final Order in the SCC's <u>Investigation of Conservation and Load Management Programs</u> -March 27, 1992

The Commission recognized that a more detailed investigation was needed regarding the appropriate tests to employ in measuring the success of CLM programs. The Commission stated that conservation at any cost is not appropriate, and utility companies' demand-side programs must be closely evaluated to assure that each company is carefully following a cost effective strategy.

The first critical question to address was which test or tests should be applied to judge whether a program is cost effective. Uniform measures must be adopted against which to evaluate programs designed to conserve energy or better balance a utility's load.

The Commission directed the Staff to establish the necessary meeting schedules to collect the requisite data. This effort was not to involve the question of how to quantify environmental externalities. The Commission believed it would be contrary to its legal authority to include adjustments to rates for external environmental factors.

The Commission accepted the revisions proposed by the Staff to the rules relating to promotional allowances. Promotional allowances for CLM programs are appropriate and rate recovery for such promotions would be allowed only for cost-effective CLM programs. Regarding the ratemaking treatment of CLM programs costs, recovery of direct CLM program costs is currently addressed in each company's rate case.

The Commission encouraged utilities to pursue innovative rate design and continue to improve costing methodologies. The Commission ordered Virginia Power to develop an experimental demand-side bidding program. Also, utilities were ordered to submit formal applications for review of CLM programs.

Synopsis of Staff's Report <u>Cost Benefit Analysis of Demand-Side Management Programs - Review of Commission Policy Towards Conservation and Load Management Programs</u> - February 9, 1993

The report identified the tests to be used to determine the economic costs and benefits of DSM programs. Staff identified five tests:[21]

- Participants Test – measures benefits/costs to a participating customer.
- Utility Cost Test – measures benefit/costs incurred by a utility, excluding costs incurred by a participant.
- Ratepayer Impact Measure Test – measures the difference between the total revenues and total costs of a utility resulting from a program.
- Total Resource Cost Test – measures the cost of a program to the utility and its ratepayers as a whole.

Societal Cost Test – attempts to measure the total resource cost to society as a whole. This involved estimating external effects of programs on health, safety, local economy, and the environment. The Commission had previously ruled that that it did not have the statutory authority to consider these effects.

Staff did not believe that any one cost/benefit test provided all of the requisite information necessary for proper evaluation of proposed programs. Thus, Staff believed that a multi-perspective approach was necessary to balance the interests of all parties. Staff recommended that utilities not screen potential programs on the basis of whether or not they passed any one particular cost/benefit test. Staff supports the practice of developing experimental of pilot DSM programs before full scale implementation.

Synopsis of Final Order Issuing Rules on Cost/Benefit Measures - June 28, 1993

This Order adopted the "Rules Governing Cost/Benefit Measures Required for DSM Programs" described in Attachment A of the Order.

[21] These tests were taken from the California Standard Practice Manual.

- DSM programs are to be analyzed from a multi-perspective approach using the Participants Test, the Utility Cost Test, the Ratepayer Impact Test, and the Total Resource Cost Test.
- These tests are to be supplied individually for each proposed program.
- The rules established minimum guidelines for data input and modeling assumptions - rather basic, common sense rules that typically apply.
- Commission approval is necessary for pilot or experimental programs involving rates or promotional allowances. Other limited pilot or experimental programs may be conducted without approval.
- Reports identifying programs must be filed 30 days before implementation.[22]
- At least semi-annual reports shall be filed identifying all DSM pilot or experimental programs and their status.

This Order contained the following policy statements in the Findings Paragraph:

- A multi-perspective approach to evaluating programs is in the public interest.
- Each of the four tests has weaknesses as well as strengths.
- The Societal Test can provide valuable information, but need not be conducted at this time. (This test measures externalities.)
- No single test was established as a threshold test for a give program.
- The usefulness of the analysis is dependent on the quality of the assumptions and input data.
- The Commission should consider the effects of any DSM program on alternative fuel suppliers in deciding whether a proposed program is in the public interest.
- Where promotional allowances are involved, the applicant should consider the effect of the proposed program on alternative energy suppliers and to demonstrate that the program is in the public interest. They do not have to consider the impact on alternative systems or their customers.

[22] Presumably, this applies to the programs not needing Commission approval.

Attachment 3 – Summaries of other studies

Summit Blue Report

Following an introduction, the report[23] contains sections that:

- Present an overview of economics associated with DSM.
- "Conservatively" estimate DSM benefits that Virginia can expect to gain from implementing the five programs listed below.
- Present a DSM action agenda

The report begins with an introduction pointing out that according to the non-profit groups known as the American Council for an Energy-Efficient Economy (ACEEE) and the Alliance to Save Energy (ASE), the Commonwealth of Virginia currently ranks near the bottom of all states in expenditures on demand-side management. The Summit Blue authors state that this situation creates a unique opportunity for the Commonwealth to take advantage of lessons learned and best practices from other jurisdictions to develop and implement a cost-effective portfolio of DSM programs.

A focus on DSM strategies that are most applicable to the Commonwealth and have proven successful in other jurisdictions reveals five (5) DSM programs with the greatest potential to generate energy savings and peak demand reductions along with cost savings over a short time frame.

- Residential and Commercial High-Efficiency Lighting Programs
- Residential HVAC Retrofit and Quality Installation Programs.
- Residential and Commercial New Construction Programs

[23] Conservation and Demand Response Opportunities in Virginia, prepared for the Piedmont Environmental Council, May 2007. http://www.pecva.org/_downloads/longterm/Summit_Blue_Report.pdf

- Residential and Commercial High-Efficiency Appliance/Office Equipment Programs
- Commercial Data Center Efficiency Programs

All of these programs include financial incentives in their design.

The report goes on to note that over the past twenty years these types of programs have achieved substantial energy saving and peak demand reductions within planning horizons of less than five years. The authors further state that these programs can be enhanced when combined with innovative rates that shift energy use (i.e., time-of-use, real-time rates, etc.).

In the main body of the report, beginning with Section 2, the authors state that:

- DSM should be viewed as a "fuel source" alongside convention generating fuels.
- "There is vast, untapped potential for far greater DSM, which could defer the need for dozens of new power plants in the next decade." DSM can deliver at a lower cost than new power plants and can be deployed faster.
- DSM should be viewed as a building block in reducing the electric industry's emissions profile.
- The regulatory paradigm can be changed to put saving energy on a level playing field with generating energy.

The authors state that in most instances, the costs associated with designing and implementing DSM programs are less that the costs associated with developing and constructing traditional supply-side resources. They also claim that nationwide sizable amounts of DSM have been delivered at a cost of $.03/kwh while targeting a minimum of a 1% decrease per year in energy use and peak demand.

Section 3 discusses the DSM potential for the Commonwealth. The authors provide a very general description of their methodology, which used baseline market profiles and spreadsheet models.

The study finds that a well-designed portfolio of DSM program offerings including both energy efficiency and demand response strategies could cost-effectively reduce the Commonwealth's peak demand by approximately 5,000 MW and its energy consumption by 7,800 GWh over a 10-year planning horizon through 2017. The authors claim that these estimates are likely conservative, representing nearly 17% of the Commonwealth's projected 2007 peak demand and nearly 10% of the Commonwealth's projected 2007 energy use.

The report refers to a FERC estimate cited in a Maryland PSC document (this is poor form for a serious report) that an immediate reduction of between 3% and 7% in peak demand can be achieved in most regions through demand response.

The report also cites a Brattle Group study that quantified the dollar benefits of demand response in PJM. That study found that a 3% reduction in peak demand would have generated a 5% - 8% reduction in wholesale electricity prices during the time periods studied.

Section 4 contains the report's action agenda. The report states that the Commonwealth needs to use the powers of the State Corporation Commission or the General Assembly to:

- Set DSM targets and provide incentives for demand response programs, innovative rates, and advanced metering technology.

- Set targets for 1% reductions per year in forecast energy consumption and peak demand growth. These goals are well within reach of Dominion Virginia Power, the Commonwealth's largest utility.
- Address financial disincentives for utility investment in DSM and allow the utility to earn a profit on DSM investments.

GDS Report

Compared to the Summit Blue report, the GDS Report[24] is a more technical and data packed report. This study estimates the achievable cost effective potential for electric energy and peak demand saving from energy-efficiency and fuel conversion measures in Vermont and uses the Vermont Societal Test as a screening measure. The achievable cost-effective potential is derived from the calculated technical potential and achievable potential saving estimates.

The study finds that achievable cost effective potential savings for Vermont would reduce energy use in that state by 1,287 GWh, or 19%, of forecast 2015 electric energy consumption. Load reductions from load management and demand response were not analyzed in this study.

The report also presents the achievable cost-effective potential based upon screening using the Total Resource Cost Test, the Utility Test, and the Participant Test.

Implementation costs in order to achieve the cost-effective reductions include financial incentives to customers, marketing, administration, planning, and program

[24] Vermont Electric Energy Efficiency Potential Study prepared for the Vermont Department of Public Service by GDS Associates, Inc., January 2007.

evaluation activities. The study assumes that financial incentives to customers would be equivalent to 50% of the incremental costs of a given measure.

To achieve the potential cost-effective savings would cost an additional $34.8 million a year in 2006 dollars or $348 million total. A significant portion of the average annual budget of $34.8 million would be for conversion of residential electric space heating and water heating systems and electric dryers to alternative fuels.

Using the Vermont Societal Test as the benefit/cost screening measure yielded net present value savings to Vermont of $964 million. The societal test includes environmental benefits.

The average rate impact of the base case scenario for energy efficiency spending would be 2.0% annually (levelized).

Among customer classes, the study found that residential customers could cost-effectively save 567.5 GWh of electric energy, or 21.3% of 2015 total residential sector electricity sales. Of this 567.5 GWh of savings, approximately 160 GWh are estimated to come from the installation of compact fluorescent lights, and approximately 190 GWh are estimated to come by switching from electric water heaters to water heaters utilizing other fuels. These two categories of savings comprise over 61% of the projected savings.

Within the commercial sector, the GDS study found that achievable cost-effective potential savings could reach 450.4 GWh. As with the residential sector, this level of savings amounts to 21.3% of forecasted 2015 total commercial sector sales. Among existing buildings, the vast majority of the potential savings were under the categories of lighting, 182.9 GWh, and refrigeration, 159.1 GWh. The largest portion of potential cost-

effective savings for new commercial construction is found in refrigeration, 2.7 GWh, and HVAC and cooling 1.1 GWh.

Finally the study found that 268.9 GWh of achievable cost-effective potential savings could be found in the industrial sector. The level of savings amounts to 14.5% of the 2015 consumption forecast for the industrial sector. The largest potential savings are expected to found within the categories of efficient industrial lamps and fixtures, 102.2 GWh, and motor system optimization, 59.5 GWh.

Appendix I – Case No. PUE-2007-00049

Sub-group reports and related comments and input provided by individuals or other entities, are posted to:

http://www.scc.virginia.gov/division/eaf/conserve.htm

SCC Order

AT RICHMOND, JUNE 8, 2007

COMMONWEALTH OF VIRGINIA

At the relation of the

STATE CORPORATION COMMISSION

CASE NO. PUE-2007-00049

Ex Parte: In the matter of determining a recommended mix of programs, including demand side management (DSM), conservation, energy efficiency, load management, real-time pricing, and consumer education, to be implemented in the Commonwealth to cost-effectively achieve the energy policy goals set in § 67-102 of the Code of Virginia to reduce electric energy consumption

ORDER ESTABLISHING PROCEEDING

The General Assembly of Virginia enacted on April 4, 2007, Chapter 933 of the 2007 Acts of Assembly ("Chapter 933")[25] that, among other provisions, established:[26]

> 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. These programs may include activities by electric utilities, public or private organizations, or both electric utilities and public or private organizations. The Commonwealth shall have a stated goal of reducing the consumption of electric energy by retail customers through the implementation of such programs by the year 2022 by an amount equal to ten percent of the amount of electric energy consumed by retail customers in 2006.

[25] Chapter 933 (SB 1416) amends and reenacts §§ 56-233.1, 56-234.2, 56-235.2, 56-235.6, 56-249.6, 56-576 through 56-581, 56-582, 56-584, 56-585, 56-587, 56-589, 56-590, and 56-594 of the Code of Virginia; amends the Code of Virginia by adding sections numbered 56-585.1, 56-585.2, and 56-585.3; and repeals §§ 56-581.1 and 56-583 of the Code of Virginia, relating to the regulation of electric utility service.
[26] Third Enactment Clause of SB 1416.

The State Corporation Commission ("Commission") is now directed to establish a proceeding[27] to:

> (i) determine whether the ten percent electric energy consumption reduction goal can be achieved cost-effectively through the operation of such programs, and if not, determine the appropriate goal for the year 2022 relative to base year of 2006, (ii) identify the mix of programs that should be implemented in the Commonwealth to cost-effectively achieve the defined electric energy consumption reduction goal by 2022, including but not limited to demand side management, conservation, energy efficiency, load management, real-time pricing, and consumer education, (iii) develop a plan for the development and implementation of recommended programs, with incentives and alternative means of compliance to achieve such goals, (iv) determine the entity or entities that could most efficiently deploy and administer various elements of the plan, and (v) estimate the cost of attaining the energy consumption reduction goal.

Upon the conclusion of the above-described proceeding, the Commission is directed to submit its findings and recommendations to the Governor and General Assembly, on or before December 15, 2007 ("Commission's Report"). The Commission's Report shall include:

> recommendations for any additional legislation necessary to implement the plan to meet the energy consumption reduction goal. In developing a plan to meet the goal, the Commission may consider providing for a public benefit fund and shall consider the fair and reasonable allocation by customer class of the incremental costs of meeting the goal that are recovered in accordance with subdivision A 5 b of § 56-585.1 of the Code of Virginia.[28]

The Commission is of the opinion that the proceeding we are directed to establish should receive the input of the broadest range of persons and organizations having an

[27] Id.
[28] Id.

interest in energy conservation within the Commonwealth. Accordingly, the Staff of the Commission ("Staff") should invite representatives of incumbent electric and gas utilities, competitive service providers ("CSPs"), retail customers, the Virginia Department of Mines, Minerals, and Energy ("DMME"), the Governor's Energy Council ("Council"), cooperative and municipal providers of electric and gas service in the Commonwealth, PJM Interconnection, environmental and consumer organizations, and any other interested persons to participate in a work-group that will assist Staff in making the determinations called for in the Third Enactment Clause of Senate Bill 1416 and to develop recommendations to the Commission regarding the Commission's Report due on December 15, 2007.

We will not enlist specific members of the work-group in this Order, other than to appoint the Director of the Division of Economics and Finance ("Director"), or his designee to call the work-group into meeting and receive any written information, statements, or recommendations by interested persons to the work-group. Based on our experience in related proceedings, the Commission is confident that a variety of interested persons having an interest in energy conservation will participate in the work-group. The Commission will not limit the size of the work-group. In order to promote maximum participation in the work-group, we direct the Staff to provide copies of this Order by electronic transmission or, when electronic transmission is not possible, by mail, to individuals, organizations, and companies, identified by Staff as potentially having an interest in this proceeding.

In order for the work-group to organize in a timely fashion to assist the Staff, we find that all persons with an interest in this proceeding and desiring to participate in the work-group should file with the Clerk of the Commission a letter expressing their intention

to participate in the work-group. The letter should include a complete mailing address, voice telephone number, facsimile telephone number (if available), and electronic mailing address (if available). If several interested persons are members of the same organization or employees of the same entity, they should designate in the letters one contact person. Interested persons are encouraged to transmit a copy of the letter filed with the Clerk, or other requested information, to econfin@scc.virginia.gov.[29]

In addition to the notice that Staff is directed to give of this proceeding, the Director or his designee should send a letter no later than June 15, 2007, to all interested persons outlining the scope of content and Staff's plan and process to complete its review. The letter should invite comments to the work-group. Comments should be in written form and transmitted to the Director in the manner and by the date set forth in the Director's letter.

The Commission directs the Staff to review all written information received by the Director and prepare a report to the Commission to assist the Commission in fulfilling its reporting obligations to the Governor and General Assembly under the Third Enactment Clause of Senate Bill 1416. The Staff should file its report on or before November 9, 2007.

IT IS THEREFORE ORDERED THAT:

(1) This matter shall be docketed and assigned Case No. PUE-2007-00049.

(2) Within five (5) business days of the filing of this Order with the Clerk of the Commission, Staff shall transmit electronically or mail copies of this Order to interested persons and organizations as discussed in this Order.

(3) The Director shall send a letter on or before June 15, 2007, consistent with the findings above, inviting representatives of incumbent electric and gas utilities, CSPs, retail

[29] To allow broad and efficient dissemination of information received by the Director from the work group, we will request that all information be submitted, to the extent possible, in electronic form. This information

customers, DMME, the Council, electric cooperatives, and municipal providers of gas and electric service in the Commonwealth, PJM Interconnection, environmental and consumer organizations, and any other interested persons to participate in a work-group to assist Staff.

(4) On or before June 15, 2007, the Commission Staff shall file with the Clerk a certificate of transmission or mailing, as required by Ordering Paragraph (2) of this Order, and shall include a list of names and addresses of persons to whom the Order was transmitted or mailed.

(5) On or before June 25, 2007, all persons who desire to participate in the work-group shall file with the Clerk of the Commission, c/o Document Control Center, P.O. Box 2118, Richmond, Virginia 23218-2118, a letter expressing their intention to participate in the work-group. The letter shall include a complete mailing address, voice telephone number, facsimile telephone number (if available), and electronic mailing address (if available). If several interested persons are members of the same organization or employees of the same entity, they shall designate in the letters one contact person. Interested persons should also transmit a copy of the letter filed with the Clerk, or the requested information, to econfin@scc.virginia.gov.

(6) The Commission Staff shall post promptly upon receipt all written comments received by electronic transmission at econfin@scc.virginia.gov to the Division of Economics and Finance website: http://www.scc.virginia.gov/division/eaf/index.htm. The Commission Staff shall not be responsible for editing any posted document to remove information that may be deemed confidential.

(7) On or before November 9, 2007, the Commission Staff shall conduct an investigation, with input from a work-group and other participants, and file with the Clerk

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will be posted on the Commission's Division of Economics and Finance website.

of the Commission a Report presenting its findings and recommendations in response to the directives to the Commission contained in the Third Enactment Clause of SB 1416.

(8) This case is hereby continued generally.

AN ATTESTED COPY hereof shall be sent by the Clerk of the Commission to: C. Meade Browder, Jr., Senior Assistant Attorney General, Office of the Attorney General, Division of Consumer Counsel, 900 East Main Street, Second Floor, Richmond, Virginia 23219; and the Commission's Office of General Counsel and Divisions of Economics and Finance, Public Utility Accounting, and Energy Regulation.

Work-group Participants

ACES
Advanced Printing & Graphics
Affinity Energy Group
Allegheny Energy
Alliance to Save Energy
American Council for an Energy-Efficient Economy
American Electric Power
Ameresco
Appalachian Power Co.
Arlington County
Assoc of Energy Conservation Professionals
Brayden Automation Corp.
Brickfield, Burchette, Ritts & Stone, PC
Calvert Jones Co.
Carrier
Center for Innovative Technology (CIT)
Chesterfield County Utilities
Christian & Barton, LLP (VEPGA)
CIT/IDHS
CLEAResult Consulting
Columbia Gas of Virginia
Comverge
Consumer Powerline
Cooper Power Systems
CURRENT Group, LC
D&R International
Danville Utilities
Delmarva Power
DJ Consulting, LLC
Div. of Legislative Services/General Assembly
Dominion Retail
Dominion Virginia Power
Elster Integrated Solutions
eMeter Strategic Consulting
Energy Connect Inc.
Energy Curtailment Specialists, Inc.
EnerNoc, Inc.
Fairfax County / VML&VACO
GH Herbert, PC
Gates Corp.
GridPoint, Inc.
GreenVisions Consulting
Hanover Technical Sales
Hunton & Williams, LLP
Henrico County
Honeywell International Inc
Itron
Landis & Gyr
Macaulay & Burtch, PC
Mayor of Purcellville
MeadWestvaco Corp.

Montgomery & Simpson, LLP
Natural resources Defense Council
New Era Energy, Inc
Nicholson Law PLC
Northern VA Electric Cooperative
Northern VA Regional Commission
Northern Virginia Sierra Club
Northrop Grumman Newport News Shipbuilding
Office of Attorney General
Office of Consumer Affairs
Office of Governor
Old Dominion Electric Cooperative
Old Dominion University
Old Mill Power Co
Original Ink
PJM Interconnection, LLC
Piedmont Environmental Council
Prince William County Public Works
Rappahannock Electric Cooperative
RGC Resources, Inc.
Shenandoah Valley Electric Cooperative
Sierra Club
Southside Electric Cooperative
Strategy Integration, LLC
Smigel, Anderson & Sacks, LLP
Southeast Energy Efficiency Alliance
The Brattle Group
Town & Country Mechanical
Trane
Washington Gas
Washington Gas Energy Services
WattShifters, LLC
VA Citizens Consumer Council
VCU
VA Department of Environmental Quality
VA DMME
VA Manufacturers Assoc
VA-MD-DE Association Electric Cooperatives
VC Controls
Virginia Tech
Vision & Results
Westridge Energy, LLC
Winn Energy Controls, Inc
World Bank

Plus 16 individuals as private citizens and/or customers

Sub-group Reports

Subgroup 1 Report

Virginia State Corporation Commission Energy Efficiency Working Group
Subgroup 1
Final Report

This report to the Virginia SCC staff is from Subgroup 1, charged with developing recommendations on issues concerning the statutory goal to achieve savings of 10% of Virginia's 2006 electricity sales by the year 2022. The issues the Subgroup was asked to address are:

- Determination of the appropriateness of the statutorily-defined goal, or a different goal, based upon cost effectiveness test(s)
- Selection of cost-effectiveness test(s) and criteria to be applied
- Measurement and verification standards to be applied
- Level playing field applicability (e.g., for supply and demand side alternatives)
- The customers for which a goal should be applied (e.g., investor-owned, municipal-owned, cooperative utilities)
- Interaction between PJM and Virginia programs
- Determination of whether goal is to be achieved by utility-sponsored programs only or a combination of utility-sponsored and non-utility-sponsored programs.

Energy Efficiency Goal

Electric utility legislation enacted in April 2007 [cite] set a statutory goal for the state to save 10% of Virginia's total 2006 electricity sales by 2022. The legislative language is as follows:

> The Commonwealth shall have a stated goal of reducing the consumption of electric energy by retail customers through the implementation of such programs by the year 2022 by an amount equal to ten percent of the amount of electric energy consumed by retail customers in 2006.
>
> The State Corporation Commission shall conduct a proceeding to (i) determine whether the ten percent electric energy consumption reduction goal can be achieved cost-effectively through the operation of such programs, and if not, determine the appropriate goal for the year 2022 relative to base year of 2006, …

> In developing a plan to meet the goal, the Commission may consider providing for a public benefit fund and shall consider the fair and reasonable allocation by customer class of the incremental costs of meeting the goal.

This goal is estimated to total about 11 billion kWh, based on federal Energy Information Administration data for the 2006 base year.

Of particular importance to Subgroup 1, the legislation requires that the SCC "determine whether the ten percent electric energy consumption reduction goal can be achieved cost-effectively through the operation of (fair and effective demand side management, conservation, energy efficiency, and load management programs, including consumer education) programs, and if not, determine the appropriate goal for the year 2022 relative to the base year of 2006".

The subgroup acknowledged that while the legislation focuses on an energy consumption goal, reducing peak demand is also an important consideration, and Subgroup 3 is focusing on these programs. There was no consensus on whether to set goals in both capacity and energy terms. Some stakeholders pointed out that capacity is the most important resource metric to apply, as powerplant build decisions are based on capacity needs more than energy demand. Others countered that the legislation does not call for a capacity savings target. It was generally agreed that to support the attainment of an energy savings goal, measurement and verification methods will be needed to measure the energy impacts of all programs. Demand and capacity impacts can also be estimated in such methods.

The subgroup reviewed Virginia's statutory energy savings goal in the context of goals set in other states. ACEEE tracks state energy efficiency resource goals, known generically

as Energy Efficiency Resource Standards (EERS).[30] Since its 2006 report, which documents EERS developments in Hawaii, California, Washington, Nevada, Colorado, Texas, Illinois, Pennsylvania, New Jersey, Connecticut, and Vermont, on state EERS, the following additional states have established or expanded policies that incorporate quantitative, aggregate, long-term goals:

- New York—In May 2007, Governor Spitzer announced a goal of saving 15% of total state electricity usage by 2015, compared to current forecasts. The Department of Public Service is in the process of developing a plan and regulations to attain this goal
- Maryland—In July 2007, Governor O'Malley announced a goal of reducing per-capita electricity usage 15% by 2015. This is estimated to approximate a 10% reduction in total electricity usage from current forecasts, once population growth is netted out. State agencies and stakeholders are engaged in a process to implement this target.
- Texas—In 2007, the legislature doubled the current savings target of 10% of forecast load growth (measured as summer peak demand) to 20% of peak load growth. Given current trends, the new EERS requirement is estimated to save about 0.4-0.5% of load annually.
- Illinois—In July 2007, the legislature passed a bill that would require utilities to save up to 2% of total sales annually by 2020. These annual requirements cumulate, such that by 2020 total savings could be well over 10%
- Minnesota—In 2007 the legislature passed a bill that requires utilities to achieve energy savings of 1.5% annually. As in Illinois, these savings would cumulate over time.
- North Carolina—In August 2007, the legislature passed Senate Bill 3, which establishes a renewable electricity portfolio standard reaching 12.5% of electricity sales by 2021. The bill allows energy efficiency to qualify for up to 25%-40% of requirements.

Members of the subgroup suggested that while these state goals suggest a range of targets to frame the discussion, to develop a goal specific to Virginia, more detailed analysis will be needed. The 10% goal is included in the state energy plan, and some members of the subgroup expressed the goal that it is modest. Others raised the possibility that it could be too high and asked that more information be developed before concluding

[30] Nadel. 2006. *Energy Efficiency Resource Standards: Experience and Recommendations.* ACEEE report no.

that the 10% goal is cost-effective for Virginia. One member of the subgroup presented information suggesting that a cost-effectiveness analysis could yield a considerably lower goal than 10%. While consensus was not reached, there was substantial agreement that an economic potential study should be conducted to determine the state's ultimate energy savings goal.

As another point of reference, Steve Walz of the Governor's Office summarized the development of goals in the Virginia Energy Plan (VEP)'s:

> Analysis completed for the Virginia Energy Plan looked at studies of achievable, cost-effective electrical efficiency in other states to estimate the potential in Virginia. Based on this analysis, the Plan concludes that the goal of reducing electric use by 10% of 2006 consumption by 2022 can be cost-effectively achieved. The Plan also recognizes that actions are needed for both energy efficiency and demand management. Some measures will provide for both results, while other measures only result in efficiency or demand management savings.
>
> The Virginia Energy Plan estimated that, based on all retail sales in Virginia, utilities would have to invest from $100 to $120 million per year on average for energy efficiency and demand management programs. This would have to be matched by consumer investments of between $180 and $200 million per year. These investments would result in a net savings (after utility and consumer costs) of between $15 and $50 million per year on average between 2008 and 2022.[31]

Subgroup 1 did not explicitly discuss this material, which are incorporated in Subgroup 4's report, and so are included here for consistency and convenience because they address the core issue our Subgroup was asked to consider.

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[31] Analysis for the Virginia Energy Plan assumed that the cost of energy efficiency measures equals 3 cents per lifetime kilowatt hour saved, based on cost estimates from the National Action Plan for Energy Efficiency and American Council for an Energy Efficient Economy. Energy efficiency measures were assumed to have a 4-year payback and a 12-year life on average. The analysis for the Plan assumed that 25% of the savings would accrue without public incentives, and that the remaining savings would require a 50% incentive level. This incentive level is based upon experience of electric efficiency programs in other states. Savings are projected using Virginia 2005 electric costs adjusted based on the Energy Information Administration's projection of future electric costs. Savings total to an average of $50 million per year if it is assumed that the full retail cost of electricity is saved. If the amount of savings is reduced to account for continued recovery of distribution system costs, then savings are reduced to an average of $15 million per year.

The savings targets established in the aforementioned state EERS policies are in many cases based on energy efficiency potential studies. Such studies typically entail detailed analysis of current market and technology conditions, identification of efficiency measures applicable to specific end-uses, estimation of energy savings performance and installation costs for measures, economic screening of measures using avoided cost parameters, bundling of measures into typical sets likely to be used in efficiency programs, and estimates of market penetration of such measures in targeted end-use markets. Because of the differences in avoided costs, markets, and other factors among these states, which have not been fully understood and assessed by the Subgroup, there was some discussion of setting a range of efficiency targets, nominally in the 5-15% range. Given the group's wide-ranging discussions and diversity of views, a Virginia-specific potential study would be helpful in determining whether the legislated 10% goal is appropriate.

Administration/Implementation

Because the legislation is unspecific on how Virginia's savings goal is to be achieved, the working group is exploring various policy and program channels for attaining this goal. Two key choices in this realm are (1) whether to rely solely on utility-sector programs or include broader policy avenues such as building codes, standards, and tax incentives, and (2) in the utility sector, whether to rely solely on direct utility administration or use other parties for program administration and delivery. For statewide market transformation and consumer education programs, there was a preponderance of support in the subgroup for a non-utility, third-party administration approach. This would be contingent on a public-benefit fund collected through utility bills and administered through

third parties. Utility representatives expressed interest in directly administering demand-reponse/load management programs.

On the first question, 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. California has a uniquely aggressive set of policies in these areas, however, and it is unlikely that Virginia could realize a similar proportion of savings. Nonetheless, we recommend that 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 are advocated by the Virginia Energy Plan.

To the extent that utilities do administer efficiency programs, the state should consider new business/regulatory models that provide the cost recovery, revenue stability, and shareholder returns that are necessary to make demand-side investments attractive to utility shareholders. Subgroup 4 is addressing these issues, but we want to endorse the importance of this area. Utilities and others believe it is extremely important from a policy perspective that utility expenditures on DSM options and expenditures on supply side resources be on equal footing with respect to investment return.

We include part of Subgroup 4's report language on the issue of regulatory incentives for utilities, again for consistency and convenience. Below is a summary of the statutory basis in current Virginia law:

> Incentives are provided to utilities for energy efficiency and demand-management programs through two mechanism, one direct and one indirect.
>
> Incentives are directly provided for as follows:
>
> Section 56-56-585.1.A.5.b of the *Code of Virginia* provides for timely and current recovery of projected and actual costs of providing incentives for the design and operation of fair and equitable demand-management, conservation, energy efficiency, and load-management programs. Utilities may, no more than once in any 12-month period, petition the State Corporation Commission for a rate adjustment clause to recover these costs. The Commission is to approve the rate adjustment clause if it finds such recovery is in the public interest and the need is demonstrated with reasonable certainty. The Commission is to allow the recovery of all such costs it finds are reasonable.
>
> Incentives are provided for indirectly as follows:
>
> Section 56-585.1.A of the *Code of Virginia* provides that the Commission may increase or decrease the formula-based combined rate of return by plus or minus 100 basis points based on the generating plant performance, customer service, and operating efficiency of a utility, as compared to nationally recognized standards. The operating efficiency of a utility's energy efficiency and demand-management programs may be one factor when considering the operational efficiency adjustment.

Subgroup 4's recommendations on incentives issues, while considerably more detailed, appear to be generally consistent with the views expressed in Subgroup 1.

On the second question—whether to rely on utility direct administration or use other parties—we recommend the SCC consider several alternative arrangements. For program approaches, especially market transformation, defined as broader, longer-term efforts to change markets without primarily targeting individual customer transactions. One of the programs briefly discussed by the Subgroup for <u>possible</u> third-party, state-wide

administration was low income housing/weatherization. Customer education can also be more successful and more cost-effective when pursued on a statewide basis, and the group suggests that a third-party administration approach is preferable. Third parties in this context could include state agencies, non-profit organizations, or private contractors.

For programs that are better suited to specific geographic areas and customer segments, we suggest that utilities are best suited to administer these programs. Demand response/load management programs are especially appropriate in this respect. Other examples include customized efficiency initiatives with larger customers that entail more complex projects. It is recognized, however, that residential, commercial, and industrial energy-efficiency initiatives may also be led by utilities. Utilities can select third party contractors to implement and, for the most part, administer programs to ensure a low cost approach. This methodology allows program oversight by the utilities to ensure maximum customer satisfaction and to quickly address customer concerns with process-related issues, including contractor performance and installation quality.

Third parties can participate in program administration and delivery in several ways.

- They can administer whole programs or program portfolios under contract with a statewide administrator.
- They can deliver services under contract with individual utilities.
- They can contract privately with customers, helping them to participate in various state/utility programs.

We also want to highlight the need for a strong state planning and coordination role, in whatever constellation of programs the state ultimately deploys. Given the 15-year time horizon for achievement of the goal, one or more state agencies must be tasked, and funded, sufficiently to play an effective role in sustaining the various efforts needed to reach the

overall goal. This is especially true with statewide consumer education and market transformation initiatives.

Interaction between PJM and Virginia programs

The subgroup did not have time to discuss this set of issues in any depth. We attempt here to summarize what is known, and defer to other subgroups on detailed recommendations.

In brief, the PJM wholesale power market, in which Virginia utilities and some large customers participate, has its own set of planning, demand response, and regulatory activities that would likely affect several aspects of Virginia's demand-side resource programs and policies. PJM's demand response programs, and its forward capacity market, are likely to be the most important and visible initiatives for the purposes of the SCC's working group. These programs allow larger customers and Curtailment Service Providers to participate in PJM's emergency and price-based demand response programs. The PJM forward capacity market, or Reliability Pricing Model (RPM), allows demand-side resources to participate in capacity planning for the region. While at present, RPM is limited to demand-response options on the demand side, PJM is under FERC order to include energy efficiency as a specific eligible resource category for future RPM resource acquisition.

While Subgroup 1 voiced no consensus recommendations on PJM market issues, it is safe to say that they will be an important part of utilities' and the SCC's considerations in planning demand response programs, and possibly energy efficiency programs. Other

subgroups are focusing more explicitly on demand response, load management, and related issues, and we defer to them on the details of this set of concerns.

Cost-Effectiveness

The state needs to establish a cost-effectiveness framework and specific tests for determining which efficiency programs and policies are cost-effective for purposes of establishing an appropriate efficiency goal. While the 10%/2022 goal appears to be generally well within the range of cost-effectiveness potential found in other states, it will be imperative that the goal that is ultimately set involve efficiency measures that in the aggregate evolve from the prudent expenditure of public/ratepayer funds.

This is what the VEP says about cost-effectiveness:

> The State Corporation Commission has historically given different weights to financial tests when considering the cost effectiveness of energy-efficiency programs. It historically has used the Rate Impact Measure Test as the primary test of cost effectiveness. The Total Resource Cost Test indicates whether an energy-efficiency measure or program has a cost per lifetime-kilowatt-hour-saved less than the avoided cost of electric generation, transmission, and distribution. The Societal Test assesses costs not directly attributed to utility services. A 2004 study found that twenty-eight states used either the Total Resource Cost or Societal Test as the main determinate of the cost effectiveness of energy-efficiency programs or measures. Virginia should use a mix of the Total Resource Cost Test, Societal Test, Utility/Program Administrator Test, Participant Test, and Rate Impact Measure Test. No one tool should be used solely as a go–no go decision point.

One helpful step in this area would be to conduct a statewide energy efficiency potential study. Many states have taken this step as a basis for guiding program design and targeting. The National Action Plan for Energy Efficiency is developing a guidebook for states in this area.

The principal tests used by state utility commissions include the Total Resource Cost, Utility Cost, Rate Impact Measure, Participant, and Societal tests. The Total Resource Cost (TRC) test, which was discussed rather extensively by the Subgroup and is used rather widely as a cost effectiveness measure, compares the total costs and benefits of a program, including costs and benefits to the utility and the participant and the avoided costs of energy supply. A key element of this test ~~all these tests~~ is a determination of avoided costs, because they determine the economic benefits side of the benefit-cost calculation in these tests. The state should consider avoided costs in at least three ways:

- For individual utilities—Each regulated utility will have a set of generation, transmission, and distribution costs to use as the basis for avoided costs within its service area.
- Statewide—To the extent that the state sets policies that are not focused on jurisdictional utilities, such as building codes or appliance standards, it has more flexibility to determine avoided costs.
- PJM market considerations—Because significant developments in energy efficiency and demand response can affect PJM market prices, both short-term under demand-response activation periods, and longer-term as demand and energy use moderates, the state should consider wholesale price benefits of demand-side resources.

These issues bear further clarification and discussion.

The subgroup discussed whether or not the state should assess cost-effectiveness on a portfolio basis rather than access individual technologies, measures or programs. The basis for such an approach is that it may reduce administrative costs and delays, and provide~~s~~ more flexibility in designing suites of programs. Although preliminary evaluation on a portfolio basis may be reasonable -- such an approach may be advocated by some members of the Subgroup -- it’s imperative that each energy efficiency measure and/or program pass the appropriate economic test. Even though the entire portfolio may be deemed cost effective, implementing demand side management and/or energy efficiency

initiatives that are not cost effective is not in the best interest of the Commonwealth. Programs should be provided on a priority basis with those deemed to have the most significant potential energy impacts implemented first. Furthermore, recognizing that each technology, program or measure must stand on its own merit should ultimately lead to lower costs for consumers and ensure, to the extent possible, a lowest cost approach to a comprehensive energy plan for Virginia.

It was also suggested that the state consider including risk assessment and uncertainty analysis in its cost-effectiveness approach. For example, the "hedge" value of demand side resources can be estimated in some conditions.

Resource Planning: Leveling the Playing Field

The subgroup spent a limited amount of time on this issue, primarily for schedule reasons. One issue that emerged in the discussion was reconciling the timeframe of demand side and supply side resource commitments. A preference for costing supply <u>and</u> demand side options on a life-cycle basis was suggested. The subgroup also reiterated its support for treating supply and demand investments on an equal footing.

It was suggested that the state needs some flexibility in planning for resource acquisition and cost recovery over a 10-15 year planning horizon. Making all resources commitments at the beginning of the period and leaving them unchanged may result in unintended economic consequences. The subgroup thus discussed the need for milestones and adjustment mechanisms, so that resource decisions can be made soundly at the appropriate time.

Measurement & Verification

The subgroup discussed M&V issues on two levels:

- Macro level—This entails measuring progress toward the ~~statutory 10%~~ goal. Such an approach can use simple forecast/review methods based on periodic assessment of resource impacts, forecast changes, etc.
- Micro level—This involves more detailed M&V of programs and measures, and requires more technical specificity. We touched on four major types of M&V techniques
  - Project M&V—This involves customized plans for major projects, typically at larger customer sites, or multiple sites
  - Market transformation—This approach typically uses market share benchmarking methods. For example, one can track the market share of Energy Star clothes washers versus baseline assumptions to estimate program impacts
  - Measure deemed savings—This applies to simple, common measures like typical lighting fixtures. It sets per-measure deemed savings values, verifies installations, and uses a portfolio statistics approach to account for measure failure and other "erosion" factors.
  - Simulation—Software simulation is the typical approach used for new buildings energy savings calculations. A reference building is specified in detail so that designers can measure energy performance of advanced designs against the reference building.

The subgroup discussed metering issues briefly in the context of M&~~C~~V. Digital metering, if it were widely deployed, would help with M&V by providing consistent, accurate, and hourly impact data. This would be especially helpful for verifying the capacity/coincident peak impacts of energy efficiency and demand response techniques that are not easily monitored through conventional metering technology. The group suggested that metering policies and practices in Virginia will need clear and consistent policies on technical specs, so that needs match capabilities over the mid and long term.

Finally, it was recommended that the state draw on national best practice resources in developing its M&V procedures. NAESB (North American Energy Standards Board) and NAPEE (National Action Plan for Energy Efficiency) were mentioned as good sources.

Subgroup 2 Report

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,[32] while helping to reduce the costs associated with future climate change policies.

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[32] 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)[33], 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 (NAPPEE)[34], the American Council for an Energy efficient Economy (ACEEE)[35], and a recent report on Virginia's demand-side management potential by Summit Blue Consulting LLC[36].

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

[35] www.aceee.org

[36] 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

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 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

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General Assembly's goal) though a portfolio of energy efficiency measures. Summit Blue was commissioned by the Piedmont Environmental Council to prepare this report.

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.[37] 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 educate consumers on the mercury content of CFL's and provide information about proper recycling and disposal options.[38]

2. High-Efficiency Lighting Program: This program would offer pre-determined rebates based on specified energy efficient lighting installations. For standard fixtures,

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[37] 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.

[38] Information available on CFL recycling at http://www.epa.gov/bulbrecycling/

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.[39] 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)[40] 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.[41] 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 IECC[42] and the ASHRAE 90.1-2004[43](the 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

[39] 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.
[40] http://www.standardsasap.org/
[41] http://www.standardsasap.org/documents/a062_va.pdf
[42] DOE's International Energy Conservation Code. More information available on DOE's website at http://www.energycodes.gov/training/onlinetraining/residential_2006IECC.stm
[43] Although ASHRAE standards continue to be upgraded, the 90.1-2004 standard is available at http://www.ashrae.org/technology/page/548

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.[44] 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.[45]

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."[46] 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.[47]

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 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

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[44] 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.

[45] DOE's "Building Energy Codes Program" available at http://www.energycodes.gov/

[46] 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

[47] www.bluelineinnovations.com/powercostmonitor.php

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 website[48]) 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.

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 AIRE[49] program and Fairfax's Cool Counties Initiative.[50] Energy audits for existing residential properties are inspections that identify where energy

[48] APCo Energy Calculator: https://www.appalachianpower.com/CustomerService/HelpfulInformation/SavingEnergy/Default.aspx#calcs
[49] Arlington: https://www.arlingtonva.us/portals/topics/Climate.aspx
[50] Fairfax: http://www.fairfaxcounty.gov/living/environment/coolcounties/energy_efficiency_template.pdf

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.[51]

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 installation[52] (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 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

[51] http://www.epa.gov/ozone/snap/emissions/radp.html

[52] 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.

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.[53]

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.[54] This yearly average represents just over 0.0005 percent of the estimated 3,174,708 housing units in Virginia as of 2005.[55]

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 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.[56] According to EPA, which has instituted the ENERGY STAR Roof Product Program, cool roof systems with

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[53] Leadership in Energy and Environmental Design Program for Neighborhood Design (http://www.usgbc.org/DisplayPage.aspx?CMSPageID=148

[54] http://www.eere.energy.gov/weatherization/cfm/index.cfm/state_abbr=va

[55] http://quickfacts.census.gov/qfd/states/51000.html

[56] 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.

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 appliances[57]: 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 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.

[57] www.paysamerica.org

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.[58] 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)[59] 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.[60] 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 of utility incentives for builders.[61] According to the Alliance to Save Energy,[62] 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

[58] Clean Energy Guide to Action http://www.epa.gov/solar/pdf/gta/executivesummary.pdf
[59] http://www.standardsasap.org/
[60] www.standardsasap.org/documents/a062_va.pdf
[61] Green Building Petition for Dutchess County" (NY) http://www.petitiononline.com/greenbld/petition.html
[62] www.ase.org/

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 installation[63] (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 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 Plan[64] 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.

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[63] 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.

[64] http://www.governor.virginia.gov/TempContent/2007_VA_Energy_Plan-Full_Document.pdf

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 standard[65]. 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.[66] States 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.[67] 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.

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[65] http://www.ashrae.org/
[66] EPA's Clean Energy Guide to Action http://www.epa.gov/solar/pdf/gta/executivesummary.pdf
[67] Information Week, Sept 3, 2007 www.informationweek.com/story/showarticle.jhtml?articleID=201803326

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 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. [68] A Compressed Air Program that coordinates its efforts with the Department of Energy's Compressed Air Challenge[69] 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)

[68] http://www.energystar.gov/ia/business/industry/compressed_air3.pdf
[69] http://www.compressedairchallenge.org/content/library/docs/CACEval_article113004.doc

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.[70] 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.[71]

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.

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.[72] 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.

[70] http://www.vpmep.org/what-we-do.html
[71] More info on VPMEP: http://www.vpmep.org/what-we-do.html
[72] http://www.vpmep.org/what-we-do.html

4. Waste Heat Reclamation[73]: 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 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)

[73] //orf.od.nih.gov/PoliciesAndGuidelines/DesignPolicy/HTMLVer/Voume4/SustainableDesign.htm#b3

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 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 LoanSTAR[74] 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.

[74] 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

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 Energy[75] 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. 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 percent[76]

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 charettes (between architects, owners, and developers); design competitions, incentives for equipment that far exceed code. Benefits include positive

[75] http://www.ase.org/section/program/greenschl/
[76] http://www.ase.org/content/article/detail/2977

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.

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.[77]

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.[78] And because the sun is free consumers are protected from fuel shortages and price hikes.

[77] Article reference available at http://www.environmentalleader.com/2007/09/14/safeway-to-install-solar-power-panels-on-23-stores/
[78] EERE Consumer Guide www.eere.energy.gov

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.[79] 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 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

[79] http://www.eere.energy.gov/consumer/your_home/water_heating/index.cfm

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 Plan[80].

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://cvecoop.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).
- 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

[80] http://www.governor.virginia.gov/TempContent/2007_VA_Energy_Plan-Full_Document.pdf

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/energindependent/lib/energindependent/documents/fs-coolappliances wap.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 ENEGY 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)

- o 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:
- o 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.cl-p.com/clmres/energy/air/indexair.asp)
- o 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:
- o 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.)
- o 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:
- o 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 NYSERDA's program. (http://www.getenergysmart.org/ContractorsPartners/builders/supportIncentives.asp)

- Utility-sponsored programs:

o 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.

o 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)
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:

o 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 fro 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.[81] 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

[81] 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).

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.

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 Virginia[82] – 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 kWh[83] while targeting a minimum of a 1% decrease per year in energy use and peak demand.[84] In contrast, the costs associated with developing and constructing traditional supply-side resources typically range from $0.04/kWh to

[82] http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_b.html
[83] NAPEE Chapter 6, page 6-5
[84] State of Delaware, Sustainable Energy Utility Task Force Briefing Book, available at http://www.seu-de.org/documents.html

$0.10/kWh depending on fuel source and region.[85] 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.[86] 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.[87] Studies by the 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."[88] 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.

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[85] Summit Blue Report, page 5 http://www.pecva.org/_downloads/longterm/Summit_Blue_Report.pdf

[86] 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.

[87] 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

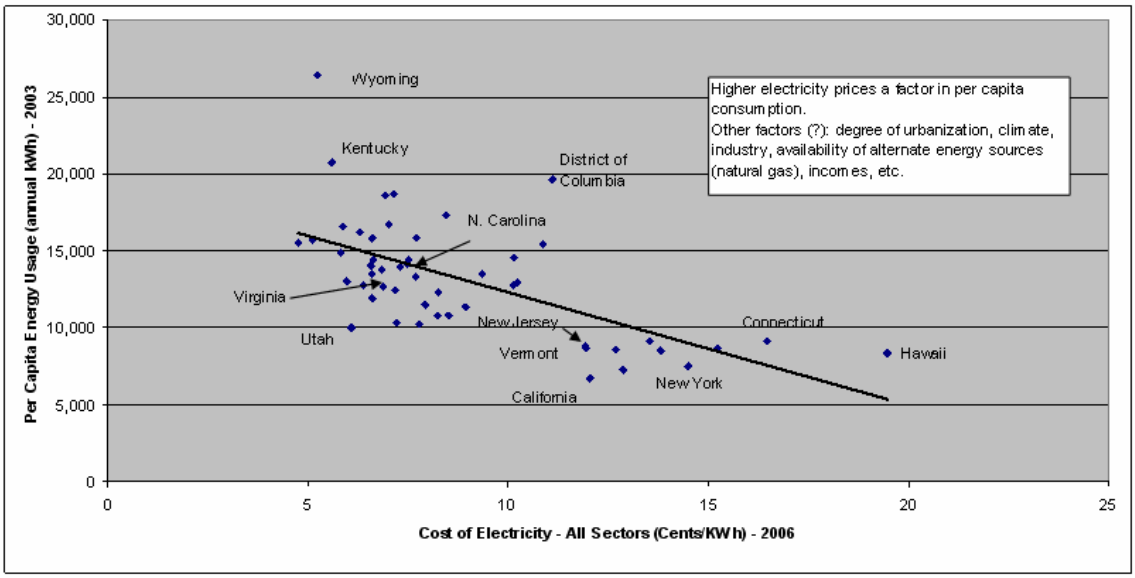
[88] Testimony of John "Skip" Laitner , Senior Economist for Technology Policy, ACEEE, before the Subcommittee on Research and Science Education House Committee on Science and Technology, page 5. Testimony available at http://www.aceee.org/tstimony/0709HouseScience_Laitner.pdf

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 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 states[89]. 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.



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

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.

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. <u>Building Codes and Standards – Retrofit and New Construction</u>

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/3rd 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; CO_2 = Carbon Dioxide; $MM = Million Dollars; N/A = Not Applicable; NR = Not Reported; NO_X = Nitrogen Oxides; SO_2 = 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 (cummulative 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.

Customer Segment	Key Stakeholders	Key Program Barriers	Key Program Strategies
Large Commercial & Industrial Retrofit	• Contractors • Building owners and operators • Distributors: lighting, HVAC, motors, other • Product manufacturers • Engineers • Energy services companies	• Access to capital • Competing priorities • Lack of information • Short-term payback (<2 yr) mentality	• 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	• Distributors: lighting, HVAC, other • Building owners • Business owners	• Access to capital • Competing priorities • Lack of information	• Financial incentives (rebates) • Information from unbiased sources • Direct installation

Acknowledgements

Workgroup #2 would like to thank the Commonwealth of Virginia, the Virginia General Assembly, and the State Corporation Commission for the opportunity to participate in this important advisory process. We hope that the contents of this report will help inform and guide the Commonwealth as it charts the future of energy conservation and efficiency in the years to come.

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Subgroup 3 Report:

DEMAND/PEAK REDUCTION

October 1, 2007

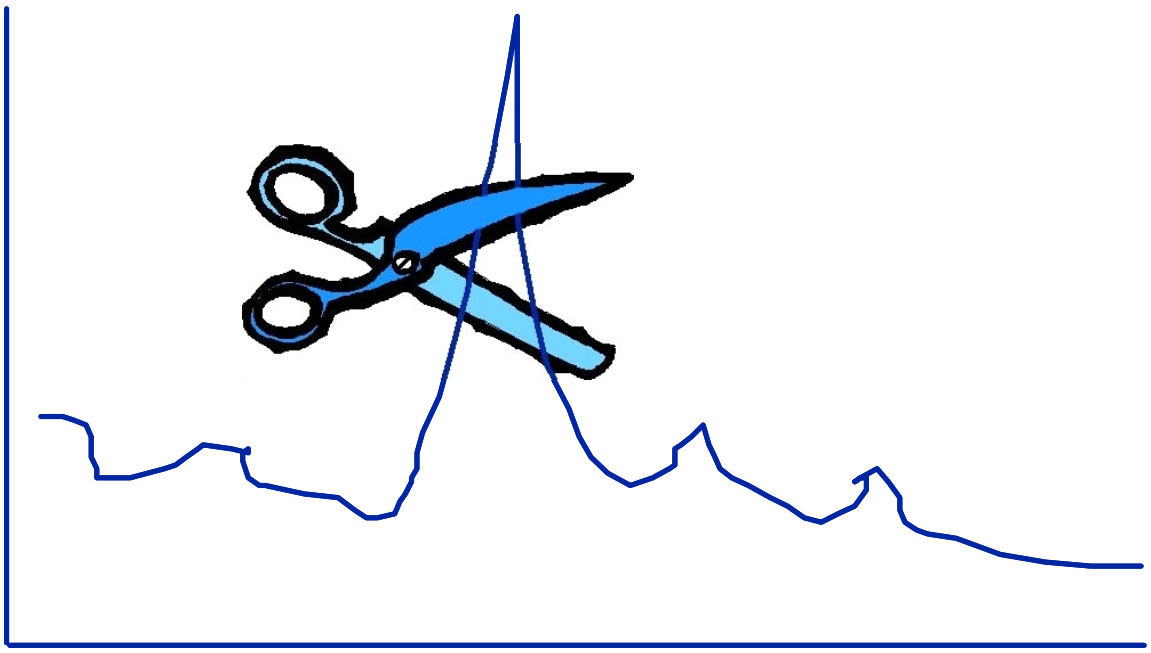

TABLE OF CONTENTS

Preface *3*

Executive Summary *4*

Summary of Findings and Conclusions *6*

A. ..... Background 6

B. ..... About Demand Response (DR) 6

C. ..... Virginia's Situation 9

D. ..... Impediments 10

E. ..... Programs/Action Recommendations 10

F. ..... Impacts of Peak Demand Management 12

1. ..... Background 14

A. ..... Introduction 14

B. ..... 1976 Report and Legislation 14

C. ..... 1991 SCC Staff Report 15

D. ..... 2006 SCC Proceeding on Time-of-Use Rates and Smart Metering 15

E. ..... 2007 Legislation – A Window of Opportunity 16

F. ..... Conclusion 17

2. ..... Demand Response (DR): What, Why, and How 17

A. ..... What is Demand Response 17

B. ..... Why Consider Demand Response 18

C. ..... Pricing and Rate Design for Demand Response 19

- Pros & Cons: Pricing vs. Incentives (bill credits) 19
- Time of Use Rates (TOU) 19
- Dynamic Pricing (dispatchable rates) 20

D. ..... DR Implementation: The Role of Utilities and Third-Party Providers 20

E. ..... DR Technology 21

- Equipment and System Architecture 22
- Elements of DR cost 22

F. ..... Advanced Metering Technology and Advanced Metering Infrastructure (AMI) 24

- Introduction 24
- Advanced Metering Functionality 24
- Interoperability and Open Architecture 25

G. ..... Distributed Generation for DR 25

H. ..... DR Programs and Expenditures in the US 26

3. ..... *Virginia Situation* *27*

A. ..... **Current and Projected Electricity Usage, Demand and Costs in Virginia** **27**

B. ..... **Existing Demand Reduction Programs in Virginia** **29**

C. ..... **Overall Assessment of Virginia Demand Reduction Situation** **29**

4. ..... *Impediments to Success: Stakeholder Perceptions* *31*

A. ..... **Lack of Perceived Need for Demand Response:** **31**

B. ..... **Issues Involving Incentives and Cost Recovery:** **32**

C. ..... **Institutional and Infrastructure Barriers:** **32**

D. ..... **Consumer Education and Usage Issues:** **33**

E. ..... **Rate Design Issues:** **35**

F. ..... **Barriers to Providing Demand Response by Third Parties:** **35**

G. ..... **Measurement and Verification Issues:** **35**

H. ..... **Establishment of Cost-Effectiveness Tests:** **36**

5. ..... *Programs/Action Recommendations* *36*

A. ..... **General Recommendations:** **37**

B. ..... **Recommendations to Address the Lack of Perceived Need for Demand Response:** **37**

C. ..... **Recommendations to Address Incentives and Cost Recovery** **38**

D. ..... **Recommendations to Address Institutional and Infrastructure Barriers** **38**

E.Recommendations to Address Fragmentation in the Industry and Government Regulatory Oversight

F. ..... **Recommendations to Address Lack of Standards** **40**

G. ..... **Recommendations to Address Lack of Consideration of Societal Benefits** **41**

H.Recommendations to Address Concern About the Potential Economic and Operational Impact of Dema

I. ..... **Recommendations to Address Consumer Education and Usage Issues** **41**

J. ..... **Recommendations to Address Rate Design** **41**

6. ..... *Impacts of Peak Demand Management* *42*

A. ..... **Introduction** **42**

B. ..... **Published Estimates of Peak Demand Reduction Potential in Virginia** **43**

C. ..... **DR Reduction of End-Use Loads** **43**

D. ..... **DR capacity across the US** **47**

E. ..... **DR Benefits** **49**

- Estimate of Gross Benefits 49
- The Difference between PJM and State/Utility Program Benefits 50

F. ..... **Estimating Program Cost-Effectiveness** **52**

7. ..... *Selected Reference Materials* *55*

Preface

This report was prepared by Subgroup 3 of the SCC Workgroup. As seen below, the Subgroup had a good representation from all categories of stakeholders in the demand management area. The membership included the following individuals:

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Our objective was to develop recommendations for peak demand management actions that would benefit Virginia's electricity users. We have assessed the situation in Virginia and uncovered both short- and long-run opportunities for demand response and peak demand reduction.

We appreciate the opportunity to contribute to this important endeavor.

Executive Summary

- **The time has come to overcome missed opportunities.**

The importance of reducing peak demand has long been recognized by the Virginia General Assembly and the State Corporation Commission (SCC). However, State policymakers have failed to initiate comprehensive policies to address this challenge even though they recognized the important benefits to ratepayers more than 30 years ago. Now, construction of significant additional generation and transmission capacity is planned for the near future so a new opportunity exist to properly recognize demand reduction as an alternative to new facilities.

- **Virginia should proceed on an urgent basis to set a demand reduction goal (in MW) in addition to the electricity use reduction goal within a framework that addresses incentives for utilities to regard investment in demand response resources on par with investment in supply-side resources.**

The 2007 legislation established a goal of reducing total energy use (MWh) by 10% of 2006 levels over the next 15 years. The Subgroup strongly recommends the establishment of a goal for demand reduction (in MW) by a specified time separate from the MWh goal set forth in the legislation. The SCC should periodically review utility performance in meeting the goal and the continued appropriateness of the specified goal. Utilities should have flexibility in cost-effectively achieving the goal, with incentives awarded based on real results.

- **Peak demand reduction programs (demand response) will provide numerous benefits to Virginia electric customers.**

These benefits will include substantial customer financial benefits and electric reliability benefits. Individual customers can receive substantial savings on their energy bills and incentive payments by adjusting their electric demand in response to time-of-use electric rates and incentive-based programs. In addition, demand response programs serve to reduce wholesale market prices because such programs avert the need to use the most costly-to-run power plants during periods of otherwise high demand – driving generation costs and prices down for all wholesale electricity purchasers. Over the longer term, sustained and targeted demand response lowers the need to build new generating, transmission, and distribution system capacity. In addition, reliability benefits accrue because demand response lowers the likelihood and consequences of forced outages on the electric grid.

- **There is an urgent need to achieve the maximum practical demand reduction potential in Virginia.**

Virginia's electricity customers have enjoyed lower than average electricity prices over the last several years. This has contributed to the limited interest in energy efficiency and demand reduction in the state. However, the state's power companies are now facing a period of rising electricity costs from a combination of rising consumption of electricity requiring new investment in supply infrastructure, projected increases in equipment and fuel costs and the potential for additional environmental restrictions on power production. The elimination of price caps and renegotiation of fuel price adjustments will translate these rising costs into higher electricity prices to customers in the years ahead.

Further, the use of electricity in the Commonwealth is not uniform all year long, but varies during the year. In Virginia, peaks in electricity usage and the highest electricity costs occur during the coldest days of the winter and the hottest days of the summer. Summer peak demand, for example, can be two to two and a half times average demand levels. The capacity of the electric system must be designed to reliably meet those peak needs during those times. The summer peak is especially significant since the carrying capacity of the transmission and distribution system is lowest during hot weather. Thus the system must be designed with significant added capacity that is actually needed only during about 100 hours in the summer and winter.

During periods of peak demand, the wholesale price of electricity purchased by Virginia in the regional PJM electricity market has at times reached the price cap of $1,000/MWh (August 2007) – more than 17 times the average price of $57/MWh. Even though these extreme costs occur during a limited number of hours, they are a significant part of annual power costs to customers.

- **Virginia lags most states in implementing effective demand response programs.**

Current peak reduction programs in Virginia include some time based rates, some participation by very large customers in PJM peak reduction programs, a critical peak pricing program for very large commercial and industrial customers and some residential control systems for demand response. In addition to relatively low average electricity prices, Virginia's rate structure spreads the high peak costs over many hours. Thus few customers have been exposed to the very high peak costs.

As a result of low average rates, current rate design and low levels of promotion for these programs, current program investment and customer participation in Virginia significantly lags the leaders among states.

Reducing electricity use during periods of very high demand levels may be less costly and more reliable than adding to expensive infrastructure and relying on high-cost fuels. As Virginia faces rising demand for electricity and rising costs to produce and deliver at those peak times, demand reduction programs make sense and should be encouraged.

- **Regional, State, and utility demand response programs are all needed to achieve effective demand response.**

Programs at all three levels are needed to derive maximum current and future benefits. The SCC, utilities, PJM and Curtailment Service Providers should make a priority of working to resolve outstanding concerns regarding existing PJM DR programs.

- **Commence an aggressive effort to implement programs that reduce predictable peaks and defer the need for additional capacity.**

PJM programs do not provide appropriate incentives to reduce future growth of the peak demand. Aggressive State and/or utility programs are needed to take advantage of all opportunities to reduce future costs of supply. Illustrative examples of the magnitude of potential benefits are provided in the Subgroup's report. Absent any demand-side programs, Virginia expects to have to add over 5,000 MW of generation capacity over the next ten years. Time is of the essence.

- **Continuing efforts are needed**

We recommend continuation of the Workgroup as a Virginia Energy Collaborative to develop a Virginia Energy Action Plan, to continue to identify and mitigate impediments, and to update the Action Plan as needed. The Subgroup believes that the level of effort that it will take to implement this Action Plan will require additional resources within the SCC.

Summary of Findings and Conclusions

Background

The importance of reducing peak demand has long been recognized by the Virginia General Assembly and the State Corporation Commission (SCC). However, State policymakers have failed to initiate comprehensive policies to address this challenge even though they recognized the important benefits to ratepayers more than 30 years ago. The time has come to address this problem.

In a 1976 report required by the General Assembly, the authors emphasized that "the reduction of peak demand [is] a major goal." The report further stressed that "[i]n the long run, the reduction of peak demand is the one area where savings to the ratepayer can be accomplished and it must be followed up." More recently, this issue was addressed in a 1991 staff report to the SCC, in a 2006 SCC proceeding on time-of-use rates and advanced metering, and in legislation enacted by the General Assembly in 2007.

However, the picture of demand response (DR) in Virginia during the past three decades is one of missed opportunities. Although numerous states initiated aggressive and effective demand response programs in the 1970s, 1980s, and 1990s, Virginia continues to lag far behind.

However, the need for action is more pressing now than ever. The multiple challenges of rapidly escalating fuel and electricity prices, global climate change, deteriorating electric reliability in the mid-Atlantic region, and energy security risks provide a clarion call for prompt action.

Moreover, new opportunities are now available to harness the potential for reductions in peak demand. These new opportunities are the result of: (1) development of new policies in the PJM[90] market requiring the treatment of demand response on a par with supply-side options; (2) advances in telecommunications that allow for real-time communication among wholesale electric suppliers, retail suppliers, and customers; and (3) improvements in the affordability and functionality of demand response technology.

It is essential for the SCC to take advantage of new legislative authority granted in 2007 (as well as preexisting legislation enacted in 1976 requiring conservation of capital and energy resources) to meet these pressing needs and harness the new opportunities. The time is now to implement critical regulatory reforms that will spur reductions in peak load demand. The 2007 legislation provides another window of opportunity for action in the Commonwealth of Virginia to promote demand side management. Virginia ratepayers and the State's economy and environment will suffer if this opportunity is squandered.

About Demand Response (DR)

Programs designed to reduce customer demand (MW) have recently been termed "demand response." In the past they were often referred to as "load management." The definition and benefits of demand response (DR) were summarized well in a report issued by the Department of Energy in February 2006[91]. This report emphasized that:

> Most electricity customers see electricity rates that are based on average electricity costs and bear little relation to the true production costs of electricity as they vary over time. Demand response is a tariff or program established to motivate changes in electric use by end-use customers in response to changes in the price of electricity over time, or to give incentive

[90] PJM is the grid operator for the wholesale market in the mid-Atlantic Region (the PJM Interconnection)

[91] U.S. DOE, *Benefits of Demand Response in Electricity Markets and Recommendations for Achieving Them*, February 2006 http://www.oe.energy.gov/DocumentsandMedia/congress_1252d.pdf

payments designed to induce lower electricity use at times of high market prices or when grid reliability is jeopardized.

• *Price-based demand response* such as real-time pricing (RTP), critical-peak pricing (CPP) and time-of-use (TOU) tariffs, give customers time-varying rates that reflect the value and cost of electricity in different time periods. Armed with this information, customers tend to use less electricity at times when electricity prices are high.

• *Incentive-based demand response programs* pay participating customers to reduce their loads at times requested by the program sponsor, triggered either by a grid reliability problem or high electricity prices.

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States should consider aggressive implementation of price-based demand response for retail customers as a high priority, as suggested by EPACT. Flat, average-cost retail rates that do not reflect the actual costs to supply power lead to inefficient capital investment in new generation, transmission and distribution infrastructure and higher electric bills for customers. Price-based demand response cannot be achieved immediately for all customers. Conventional metering and billing systems for most customers are not adequate for charging time-varying rates and most customers are not used to making electricity decisions on a daily or hourly basis. The transformation to time-varying retail rates will not happen quickly. Consequently, fostering demand response through incentive-based programs will help improve efficiency and reliability while price-based demand response grows.

The Benefits of Demand Response

The most important benefit of demand response is improved resource-efficiency of electricity production due to closer alignment between customers' electricity prices and the value they place on electricity. This increased efficiency creates a variety of benefits, which fall into four groups:

• *Participant financial benefits* are the bill savings and incentive payments earned by customers that adjust their electricity demand in response to time-varying electricity rates or incentive-based programs.

• *Market-wide financial benefits* are the lower wholesale market prices that result because demand response averts the need to use the most costly-to-run power plants during periods of otherwise high demand, driving production costs and prices down for all wholesale electricity purchasers. Over the longer term, sustained demand response lowers aggregate system capacity requirements, allowing load-serving entities (utilities and other retail suppliers) to purchase or build less new capacity. Eventually these savings may be passed onto most retail customers as bill savings.

• *Reliability benefits* are the operational security and adequacy savings that result because demand response lowers the likelihood and consequences of forced outages that impose financial costs and inconvenience on customers.

• *Market performance benefits* refer to demand response's value in mitigating suppliers' ability to exercise market power by raising power prices significantly above production costs.

The financial benefits to the participants, particularly the larger ones, cannot be overemphasized. They create new opportunities for energy efficiency or other investments. Examples include facility enhancements, such as continuous commissioning, building control system upgrades, purchases of renewable energy certificates or carbon credits, as well as productivity improvements for industrial customers.

Demand response is generally focused on reducing peak demands of the utility,

not necessarily the individual end-use customer's peak demands.

A broad range of demand response technologies is available and continues to evolve with a number of new and enhanced technologies appearing on the market or in development. Included among the options are switches for control of specific devices, remotely controllable thermostats, energy management systems with automatic demand control, computer-controlled load management systems, improved communications technologies (both customer premise and wide-area networks), improved metering technologies with built-in demand-response functionality, Internet-controlled systems and integration of other subsystems with on-site generation and/or renewable energy sources. When developing a demand response program, it should be flexible enough to accommodate a number of approaches and technologies appropriate for a variety of customers and needs and electrical configurations. An effective program should take advantage of developing technologies and should be as broadly compatible across devices and systems as possible to maximize the useful life of equipment and to maintain options for expanding the scale of existing programs.

One of the emerging capabilities for enabling demand management is the advent of advanced meters and the concept of an Advanced Metering Infrastructure (AMI).
AMI is not a specific technology; rather it is an infrastructure which has at its core a bi-directional network with advanced meters. The actual capabilities depend on the selection of specific equipment from technology suppliers. In general, the primary benefit of creating an AMI is the ability to quickly process large amounts of pricing and usage data and make such data available to both the customers and the service providers. AMI not only offers opportunities for sophisticated load management measures behind the meter, but it also provides a platform for potential benefits for utility operations in areas such as remote service connects/disconnects, outage management, theft detection and remote load control.

AMI is not a prerequisite for demand response. Rather, it should be viewed as a significant option to enhance opportunities for communicating prices to customers in real- or near-real time, accelerating measurement and verification of demand changes, and facilitating faster data processing and settlement. Eventually, AMI may become a part of a "smart grid"[92] -- a network tying together and coordinating supply-side resources with customer processes.

Meanwhile, demand response program design should include a thorough evaluation of AMI capabilities relative to other alternatives and should take advantage of the range of technologies available to the extent that they can be integrated into an overall coordinated program and are designed to be cost-effective. Interoperability among devices should be one of the focal points of such an evaluation; this is important to ensure that the utility retains the flexibility to use multiple technology vendors.

A number of pricing approaches exist to encourage reduction in electrical load during times of peak demand which are generally designed to either approximately or very precisely reflect variations in the cost of producing electricity over time. Dynamic pricing methodologies or rebates and incentive payments are effective tools for encouraging customers to voluntarily reduce load during times of peak demand or to shift load to off-peak periods. Rates can be designed so that long- or short-term variations in pricing can be accommodated. Each of these approaches (or a combination) can be used to support a demand response program.

Utilities are well positioned to develop, implement, and administer demand side management programs that involve demand response because of their substantial expertise in the technical aspects of load management, specific knowledge of their electrical grid systems, relationships with their customers, and existing administrative mechanisms. In addition, the growing number of private sector firms that provide specific load curtailment and related services constitute a very important resource for enhancing the effectiveness of and expanding the reach of demand response programs.

Energy efficiency and conservation programs that involve initiatives such as consumer education, rebates and incentives to encourage the adoption of higher efficiency equip-ment and market support functions are best

[92] Referenced in national energy legislation currently under consideration by the U.S. Congress.

administered through a non-utility third party, such as a state agency or private sector organization, in order to maximize the consistency and availability of program offerings. In comparison to demand response programs, energy conservation programs do not depend on system-specific events and knowledge.

Coordinating various programs available to customers avoids confusion and potential conflict among the various programs and also allows customers to select the options that make best sense for them. Good coordination among program offerings makes it possible to develop complementary (rather than conflicting) programs and to take advantage of opportunities for demand response that arise with new residential and non-residential development activities.

Virginia's Situation

Virginia's electricity customers have enjoyed lower than average electricity prices over the last several years. This has contributed to the limited interest in energy efficiency and demand reduction in the state. However, the state's power companies are now facing a period of rising electricity costs from a combination of rising consumption of electricity requiring new investment in supply and transmission infrastructure, projected increases in fuel costs and the potential for additional environmental restrictions on power production. The elimination of price caps and renegotiation of fuel price adjustments will translate these rising costs into higher electricity prices to customers in the years ahead.

Further, the use of electricity in the state is not uniform all year long, but varies during the year. In Virginia, peaks in electricity usage and the highest electricity costs occur during the hottest days of the summer and the coldest days of winter. Summer peak demand, for example, can be two to two and a half times average demand levels. The capacity of the electric system must be designed to reliably meet those peak needs during those times. The summer peak is especially significant since the carrying capacity of the transmission and distribution system is lowest during hot weather. Thus the system must be designed with significant added capacity that is actually needed only during about 100 hours in the summer and winter.

In addition, electricity is very expensive to produce during peak times. High-cost gas and less efficient plants are brought into service to fill the high demand. The cost to buy a kWh of electricity during peak hours can be almost 20 times the cost at other times, rising to $1.00 per kWh in a state where the average electric rate is only about $.07. Even though these extreme costs occur during a limited number of hours, they are a significant part of annual power costs to customers.

Finally, peak demand in Virginia is expected to grow at about 1.9% per year in the decade ahead, leading to a need for yet additional investment in electric supply and delivery capacity and more use of expensive peaking fuels, driving costs still higher in the years ahead.

Current peak reduction programs in Virginia include some time-based rates, some participation by very large customers in PJM peak reduction programs, a Critical Peak Pricing program for some very large commercial and industrial customers, and some residential demand control systems. However, in addition to relatively low average electricity prices, Virginia's rate structure spreads the high peak costs over many hours. Thus few customers have been exposed to the very high peak costs.
As a result of low average rates, current rate design and low levels of promotion for these programs, current program investment and customer participation in Virginia significantly lags the leaders among the states.

Reducing electricity use during periods of very high demand levels may be far less costly and more reliable than adding to expensive infrastructure and relying on high-cost fuels. As Virginia faces rising demand for electricity and rising costs to produce and deliver at those peak times, demand reduction programs make sense and should be encouraged.

Impediments

Historically, the focus on the utility industry in Virginia has been on supply-side solutions to address peak demand rather than on demand-side approaches. Even where legislation has encouraged demand-side management, there were no specific goals established nor was there follow-up action to track and report actual progress. As a result, expensive generating plants and transmission lines have been built and continue to be planned to meet peak loads during limited hours of the year, including critical peak capacity that is effectively needed for less than 100 hours annually.

A variety of factors have contributed to the focus on supply-side approaches in Virginia and other states. These factors include:

- **cost recovery approaches that have provided a disincentive for utilities to pursue demand response programs;**
- **institutional and infrastructure barriers;**
- **lack of consumer awareness;**
- **limited rate design options;**
- **barriers to providing demand response by third parties;**
- **measurement and verification challenges; and**
- **the lack of consensus procedures for the determination of cost-effective programs.**

Institutional and infrastructure barriers have posed a particular problem. Until this year, there had been no mechanism for valuing demand reduction on an equivalent basis
to supply to meet critical peak demand in the wholesale electricity market. PJM has initiated a demand response program intended to accomplish this, but there are concerns by utility stakeholders regarding this program.

Necessary metering and/or other enabling equipment supporting real-time DR has not been in place for the majority of customers. The absence of consensus standards for mass-market energy management equipment has created impediments to residential and small business customer deployment.

Except for interruptible programs for a small number of large commercial and industrial customers, most demand-side management in Virginia has used TOU rates (some with a demand charge) based on long periods (of more than 2000 hours per year) – severely limiting their value. For example, under Dominion's Schedule 1S for residential customers, the on-peak period is 11 hours daily all summer and 8 hours all winter (five days a week) whereas the critical congestion periods amount to less than a hundred hours a year. Thus, these rate designs do not provide demand response on a real-time or near real-time basis that could provide incentives for more targeted demand reductions during critical peak periods. Moreover, even where time-of-use (TOU) rates are available, such as for Virginia Power customers, they are largely unaware of them. Even when customers request information on them, they are frequently told by company phone center employees that the rates are either not available or that they are not eligible for them.

None of the impediments to demand response in Virginia are insurmountable. In fact, many other states have moved ahead rapidly to overcome these challenges and to deliver substantial levels of real-time demand response.

Programs/Action Recommendations

The Subgroup reviewed the status of load management and demand-side management programs in Virginia and developed recommendations to reduce the impediments to expansion of them. These included a lack of

perceived need, inadequate cost recovery and profitability, institutional and infrastructure barriers, fragmentation in the industry
and regulatory oversight, low valuation of demand response, and lack of customer awareness. New industry developments now allow demand response programs specifically during periods of high wholesale level prices, as distinct from historical programs involving time-of-use programs during full days, five day a week all year.

- **Establish quantified goals for DR and track them on annual basis**

The Subgroup recommends the establishment of a quantified goal for demand reduction (MW) by a specified time separate from the consumption (MWh) goal set forth in the 2007 legislation. The SCC should periodically review utility performance and the continued appropriateness of the specified goal. Utilities should have flexibility in cost-effectively achieving the goal, with incentives awarded based on real results. The SCC should be required to submit an annual report to the General Assembly for DR, consumption reduction and conservation. In addition, the utilities should be required to submit annual reports on demand response and demand management that are subject to SCC approval, including performance results for incentives tracking.

- **Establish policies for utility cost recovery and profit to result in DR having at least equivalent value as those of supply side resources**

Utilities should be allowed full cost recovery, including lost revenue recovery, plus appropriate incentives for successful deployment of cost-effective DR programs. DR valuation should be at least equivalent to supply-side resources. Consideration should be given to "decoupling" the direct correlation between utility revenues and total electricity consumption. The societal benefits of DR are currently explicitly excluded from the valuation of demand-side resources. We recommend that this policy be reevaluated. Cost recovery for planning and executing demand response programs should begin on January 1, 2008, rather than wait for the removal of capped rates.

- **Implement a consumer education program**

Virginia also should encourage participation in DR programs for all classes of customers, including providing education and incentives. Specifically, establishment and funding of the Customer Education Program recommended by the Information Subgroup should have a very high priority. This should include achieving broad consumer awareness of the Virginia State Energy Plan and the need for their individual actions to participate in it.

- **Establish policies for Virginia's participation in PJM wholesale markets and the role of Curtailment Service Providers**

PJM is implementing new programs for DR. Utilities and CSPs are deploying them in most states within the footprint of the PJM power market. The SCC should encourage and implement procedures and policies to foster these and other complementary programs throughout Virginia. The SCC, utilities, PJM and CSPs should make a priority of working to resolve outstanding concerns regarding existing PJM DR programs in order for those programs and new ones that may be created to realize their full potential. Consideration should be given to allowing utilities to include MWs delivered by the CSPs in their territory as counting toward their DR goals.

- **Begin evaluation of the potential and benefits of advanced metering infrastructure**

The SCC also should begin evaluation of deployment of advanced meters, advanced metering infrastructure (AMI), and the capabilities that would support the ultimate creation of a "smart grid".

- **Establish policies and procedures to improve the use of otherwise idle generation equipment during critical peak times**

Policies should be evaluated for implementation that would encourage the use of customer-owned generation capability during times of high wholesale prices. The quickest and least expensive source of substantial DR capacity is to allow the use of this otherwise idle resource during critical peak times. We recommend that the SCC work with the Virginia Department of Mines, Minerals and Energy (DMME) and the Virginia Department of Environmental Quality (DEQ) to develop rules that will allow customers, CSPs and utilities to minimize the administrative process involved in deploying this resource, consistent with the protection of air quality.

- **Consider the qualification of certain clean DR options as renewable**

Some DR methods, not involving fossil fueled distributed generation, should be considered as counting toward renewable performance standards.

- **Continue the Workgroup to develop a Virginia Energy Action Plan**

Finally, we recommend continuation of the current Workgroup as a Virginia Energy Collaborative to develop and maintain a Virginia Energy Action Plan, continuing to identify and mitigate impediments.

- **Evaluate the adequacy of SCC resources to accomplish the recommendations of this report**

We believe additional resources will be required within the SCC to accomplish the recommendations of this report.

Impacts of Peak Demand Management

During periods of peak demand, the wholesale price of electricity purchased by Virginia in the regional PJM electricity market has at times reached the price cap of $1,000/MWh (August 2007) – more than 17 times the average price of $57/MWh. Virginia customer participation in demand response (DR) programs could reduce these peak wholesale power costs. Moreover, with aggressive action to reduce peak electricity demand over the next decade, Virginia utilities may be able to save millions of dollars by deferring some of the expensive additions to generation, transmission and distribution resources.

In addition to capacity benefits, peak demand reduction also can improve distribution system efficiency. It is often assumed that most distribution benefits stem from deferral of capacity expansion. In fact, an immediate benefit from peak load reduction is a significant reduction in line losses. This result occurs because on-peak distribution system losses can be in the 12 to 15% range, compared to about 5% on the average.

Recently published estimates of cost-effective demand reduction potential achievable over the next decade in Virginia range from 7.5 to 17% of the 2006 or 2007 summer peak demand. Unfortunately, neither of these published reports provided any quantitative information on the assumptions that led to their estimates.

The team had neither the data nor the resources to estimate an achievable and cost-effective amount of peak demand reduction. To create an estimate with a high level of confidence, it is essential to start with a baseline reflecting the factors that drive the current energy use patterns in Virginia. At a minimum, this analysis would consider the number and type of customers, saturation of electric end-use equipment and systems, and the expected evolution of these in the future. Customer and end-use load shapes and peak demand patterns would make the task much easier. However, notwithstanding current data limitations, the qualitative information assembled as part of this Subgroup's effort, recent national studies conducted by the DOE and others, and successful programs implemented by leading states provide a strong argument for proceeding with peak demand reduction efforts on an expeditious basis in Virginia.

- **Regional, State, and utility programs are all necessary to contribute to the achievement of the maximum practical demand reduction potential in Virginia.**

Although PJM has DR programs in place for reliability purposes, the PJM program does not provide appropriate incentives to defer expensive expansion of future generating and transmission capacity. However, PJM demand response programs play an important role in: (1) ensuring reliability during capacity shortages (emergency response programs); and (2) moderating prices by permitting demand response to compete with available generation resources (economic programs). The benefits of the PJM programs include reduced wholesale power costs, reduced peak demands and capacity needs, and increased reliability of supply.

Because PJM cannot assure the availability of cost-effective future supply for Virginia, State and/or utility programs are needed to focus on the reduction of future peak demand growth and the attendant Virginia capacity needs. The 2007 Virginia Energy Plan estimates that absent any substantial effort to control the growth of the peak, an additional 5,100 MW of supply may be needed over the next decade if the 2005 level of imports is to be maintained. Currently, Virginia has only modest programs and related rate designs in place on the retail side.

- **Demand response programs can result in substantial savings to consumers.**

A 3% reduction in peak demand has been shown to correspond to a 5-8% reduction of wholesale power costs during the 100 to 150 peak price hours.[93] During the past year, the prices for the Dominion Virginia Power zone of PJM during the 100 peak price hours ranged from $200 to $1,000 per MWh.

The DOE report cited above[91] estimates that the benefits of peak demand reduction would range from 50¢ to $2 per peak kW per year. These figures translate into gross savings for Virginia ranging from $16 million to $65 million in 2006 alone![94] This figure compares to an estimated 2006 total of more than $7 billion in Virginia customers' bills.[95]

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[93] Brattle Group, *Quantifying Demand Response Benefits in PJM*, January 2007. http://www.energetics.com/madri/pdfs/BrattleGroupReport.pd

[94] Based on 2007 peak demand estimated in the 2007 Virginia Energy Plan

[95] Based on Energy Information Administration, *State Energy Profiles: Virginia*, Sept. 2007. http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=VA

1. Background

Introduction

The importance of reducing peak electric demand has long been recognized by the Virginia General Assembly and the State Corporation Commission (SCC). However, State policymakers have failed to initiate comprehensive policies to address this challenge even though they recognized the important benefits to ratepayers more than 30 years ago. The time has come to address this problem.

Concern about peak demand was addressed as early as 1976 in a report required by the General Assembly and resulting legislation. More recently, this issue was addressed in a 1991 staff report to the SCC, in a 2006 SCC proceeding on time-of-use rates and advanced metering, and in legislation enacted by the General Assembly in 2007.

However, the picture of demand response in Virginia during the past three decades is one of missed opportunities. Yet, the need for action is more pressing now than ever, and it is essential for the SCC to take advantage of its new legislative authority to advance critical regulatory reforms. The multiple challenges of rapidly escalating fuel and electricity prices, global climate change, and energy security risks provide a clarion call for prompt action.

1976 Report and Legislation

In a report to the Virginia General Assembly issued more than 30 years ago, the authors emphasized that "the reduction of peak demand [is] a major goal." The 1976 report further stressed that "[i]n the long run, the reduction of peak demand is the one area where savings to the ratepayer can be accomplished and it must be followed up."[96]

The 1976 report was prepared to respond to a legislative directive for the completion of a study on public utility regulatory reform. At that time, the Commonwealth of Virginia was faced with many problems which are apparent today. The price of fossil fuels was skyrocketing, and there were rapid increases in the cost of constructing new plants and infrastructure. In addition, energy security risks were a major concern.

It is noteworthy that the Senate report emphasized that the problems faced by Virginia in 1976 were not unique and that "every state legislature and every regulatory agency is confronted to some degree with the same questions concerning the actions that should be taken…." The report stated that "the controversies that are prevalent in Virginia abound in every state…."[97]

However, while several states initiated comprehensive policy reforms to encourage demand response as a result of the energy crises in the 1970s, the General Assembly and the SCC did not undertake similar action. In its 1976 legislative session, the Virginia General Assembly did follow up on the Senate report with some important new legislation expanding the authority of the SCC in several areas, including conservation of energy and capital resources and the licensing of new facilities for power generation, transmission or distribution. The legislation directed the SCC to study the acts, practices, rates, and charges of public utilities to determine whether these firms are maximizing the "effective conservation and use of energy and capital resources" and authorized the SCC to order any changes necessary to promote these goals.[98] In addition, the licensing provisions were designed to enable the "Commission to anticipate and prevent rate increases based

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[96] REPORT OF THE JOINT SUBCOMM. STUDY OF PUBLIC UTILITIES, VA S. Doc. No. 21 at 17 (1976). http://leg2.state.va.us/dls/h&sdocs.nsf/Published%20by%20Year?OpenForm

[97] Id., at 6.

[98] VA Acts of Assembly 1976, ch. 379, *codified at* VA CODE Ann. Sec. 56-235.1. *See also*, *Twenty-First Annual Survey of Developments in Virginia Law, 1975-1976,* 62 VA. L. REV. 1352, 1360-62 (1976).

on unnecessary capital investments."[99] These provisions were spurred by the 1976 report, which underscored the serious shortages of capital and energy facing the country and the key role of public utility regulation in providing "minimum cost energy consistent with a long-term energy supply and environmental cost-benefits."[100]

However, this new legislative authority was construed to focus on individual licensing and rate cases rather than sweeping reforms. As a result, it is not surprising that a 1991 SCC staff report concluded that:

> The Commission has not adopted broad policy statements concerning conservation and load management, preferring instead to address such issues on a case by case basis. The Commission's 'policy' regarding conservation and load management, therefore is not a comprehensive policy statement, but rather a collection of orders and administrative practices established in various cases and proceedings over the last twenty years.[101]

1991 SCC Staff Report

In April 1991, the SCC issued a staff report to review "what Commission policy was necessary to promote optimal investment in demand-side resources on the part of utilities in Virginia."[102] The staff identified numerous impediments to energy efficiency and demand response and recommended specific steps that should be undertaken by the SCC to overcome these barriers. The staff report urged that the policy reforms should "fully promot[e] cost effective conservation and load management programs on the part of electric and gas utilities operating in Virginia."[103]

The recommendations set forth by the SCC staff in 1991 were extensive and included the following:

- **Removing any disincentives associated with conservation and load management and providing necessary cost recovery practices that place demand-side options at least on a par with supply side options;**
- **Subjecting utility demand-side programs to formal approval by the Commission;**
- **Modifying the Commission's policies to allow various promotional allowances to customers, including incentives to encourage customers to purchase high-efficiency appliances or equipment;**
- **Reviewing the impact of rates on conservation and load management in future rate cases; and**
- **Developing an experimental demand-side bidding program.[104]**

2006 SCC Proceeding on Time-of-Use Rates and Smart Metering

In February 2006, the SCC established a proceeding to consider for implementation in the Commonwealth the new federal standard enacted in section 1252(a)(14) of the Energy Policy Act of 2005. This provision required each state public utility commission to investigate and issue a decision on the

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[99] *Twenty-First Annual Survey of Developments in Virginia Law, 1975-1976*, 62 VA. L. REV. 1352, 1361 (1976).
[100] REPORT OF THE JOINT SUBCOMM. STUDY OF PUBLIC UTILITIES, VA S. Doc. No. 21 at 5 (1976).
[101] Virginia State Corporation Commission Staff Report, *Review of Commission Policy Toward Conservation and Load Management Programs,* Case No. PUE-900070, at 11, April 26, 1991.
[102] Id. at 1.
[103] Id. at 18.
[104] Id., at 56-57.

appropriateness of issuing a standard offering all electric customers time-of-use rates and advanced metering and communications technology. The SCC received comments from a variety of interested parties, including several members of the Energy Efficiency Working Group, urging the adoption of the federal standard because of the benefits of time-of-use rates.

On the other hand, the investor-owned utilities opposed the adoption of the order for several reasons. First, they asserted that their tariff offerings already offered time-of-use metering and rates. Second, these utilities noted that those who purchase electricity from third parties are entitled to the same time-based metering and communications as third parties. Third, several of the utilities asserted that there is no real demand for time-based metering options and that participation in such options has been limited. Fourth, they expressed objection based on existing rate caps.

The SCC staff recommended against the immediate adoption of the Federal standard but also urged that the Federal standard should not be completely dismissed pending the outcome of electric restructuring in Virginia. The staff stressed that a program of time-of-use rates and advanced metering and communications "may provide customers with protection against more volatile rates and possible increases to consumer bills."

In July 2006, the SCC issued its final order in the TOU proceeding.[105] The Commission expressed general agreement with the staff recommendation. They rejected the immediate adoption of the Federal standard but left the door open to future action.

However, the rationale of the SCC is worth noting in conjunction with the findings of this Subgroup report. The Commission asserted as part of their rationale that:

> [t]here appears to be minimal customer demand for such [time-based] rate schedules, even for those that currently exist. Customers may not be capable of or willing to, among other things, vary demand and usage in response to changes in prices based on specific time periods, manage costs by shifting usage to lower cost or off-peak time periods, or reducing consumption…."

2007 Legislation – A Window of Opportunity

Although numerous states initiated aggressive and effective demand response programs in the 1970s, 1980s, and 1990s,[106] Virginia continues to lag far behind. However, legislation enacted in the 2007 session of the Virginia General Assembly provides another window of opportunity for action in the Commonwealth of Virginia.

In April 2007, the General Assembly of Virginia enacted legislation that, among other provisions, established:

> That it is in the public interest, and is consistent with the energy policy goals in section 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….The Commonwealth shall have a stated goal of reducing the consumption of electric energy by retail customers through the implementation of such programs by

[105] Final Order in Case No. PUE-2006-00003.

[106] Some states acted after the energy crisis in the mid-1970s. Others acted in the 1980s to require integrated resource planning -- with energy efficiency and demand response considered on a level playing field with new supply in determining future electricity resources. A third set of states, including Connecticut and New York, acted in the late 1990s to require the initiation of energy efficiency and demand response programs as a prerequisite to the enactment of electricity restructuring legislation. Other states (e.g, Vermont, Minnesota, Wisconsin) developed legislation to address the need for stable funding for efficiency and demand response programs without restructuring their state electricity markets. U.S. Environmental Protection Agency and U.S. Department of Energy, *National Action Plan for Energy Efficiency*, at 6-11, 2006.

> the year 2022 by an amount equal to ten percent of the amount of electric energy consumed by retail consumers in 2006.[107] (emphasis added)

The 2007 legislation should be read in conjunction with the provisions of the 1976 legislation, requiring conservation of capital and energy resources, since these provisions remain in effect.

Although the 2007 legislation did not include a specific percentage reduction goal for demand response, the legislation clearly supported the promotion of demand-side management and load management. Moreover, the Commission's 1976 directive
to achieve the strong ratepayer benefits of reducing peak loads remains as critical provision of the Virginia Code.

Moreover, new opportunities are now available to harness the potential for reductions
in peak demand, and these new opportunities provide a further impetus for accelerated action. These new opportunities are the result of: (1) development of new policies in
the PJM market requiring the treatment of demand response on a par with supply-side options; (2) advances in telecommunications that allow for real-time communication among wholesale electric suppliers, retail suppliers, and customers; and (3) improvements in the affordability and functionality of demand response technology.

Conclusion

It is essential for the SCC to take advantage of new legislative authority granted in 2007 (as well as preexisting legislation enacted in 1976 requiring conservation of capital and energy resources) to meet these pressing needs and harness the new opportunities. The time is now to implement critical regulatory reforms that will spur reductions in peak demand. The 2007 legislation provides another window of opportunity for action in the Commonwealth of Virginia to promote demand-side management. Virginia ratepayers and the State's economy and environment will suffer if this opportunity is squandered.

Demand Response (DR): What, Why, and How

What is Demand Response

Demand response (DR) is part of the arsenal available to reduce customers' electricity costs. It complements energy efficiency measures by offering a tool to reduce electricity use for a limited period (typically two to four hours, 10 to 15 times per year) at the "push-of-a-button." Somewhat similar to energy conservation, demand response generally implies a "do without" approach. This compares to energy efficiency measures, which create a lasting, "round-the-clock" reduction in use by reducing the amount of electricity required to provide a service, but may or may not result in a significant reduction of electricity use during peak hours.

One category of demand management measures shifts the load away from the peak hours. These measures reduce the peak demand (kW) by deferring electricity use required for a service or process to other times of the day, but may or may not reduce electricity use (kWh). Examples include deferral of an industrial process, water pumping, irrigation, or dish- and clothes-washing for residential customers. Energy storage, generally for heating, cooling, or water heating, can be employed to provide the service when desired, but move the corresponding electricity consumption away from peak hours. Because cooling represents one of the largest contributions to the summer peaks, this is a particularly effective approach for decoupling the time of the delivery of the service from the time when the electricity for this service is consumed. However, this
is also more expensive than other peak demand reduction techniques.

[107] VA Act of Assembly 2007, ch. 933.

As described above, there are many different approaches to DR; hence, some confusion arises due to varying definitions. For purposes of this document and to focus on those initiatives applicable to this Subgroup's scope, demand response is defined as the change in a customer's behavior and its electric load profile in response to a change in price, a direct-load control action/signal initiated by the utility (or under utility control), information, or receipt of a payment or incentive. Demand response may take the form of a decrease, or an increase, in the customer's electricity use. For example, a Critical Peak Pricing tariff may influence a customer to reduce loads during the critical peak periods, by shifting (and thus, increasing) loads to a non-critical peak period.

Retail customers may participate in demand response through initiatives at the retail level (e.g., utility-sponsored) and/or at the wholesale level (e.g., ISO/RTO-sponsored), and in a variety of ways. Such participation may include utility-sponsored demand response programs (e.g., air conditioner load control) or a utility's tariff-based demand side management initiative, such as Critical Peak Pricing. Retail customers' participation in wholesale demand response programs, such as those offered by PJM (e.g., Economic or Capacity Load Response Programs), would be as part of an aggregation of customers by a utility or a Curtailment Service Provider (CSP).

There are two basic types of demand response programs: dispatchable and non-dispatchable. Dispatchable programs provide a capability to trigger the program in real-time or at some time specified ahead. They may or may not include a dynamic pricing element. Non-dispatchable programs, such as time-of-use (TOU) rates, are designed
to lower predictable peaks.

Why Consider Demand Response

Electricity is a unique commodity in that it is absolutely essential to our health, safety, life style and business operations; yet it is currently difficult to store economically in anticipation of infrequent surges of demand for it, primarily weather related. These surges have traditionally been accommodated by the construction of substantial reserve generation and transmission capacity that is only required for approximately a hundred hours a year. The cost of this capacity has been averaged into the standard electricity rates. Part of the over 5,000 MW of new capacity needed over the next ten years is for maintaining this reserve. DR is generally focused on impacting (reducing) peak demands of the utility, not necessarily the individual end-use customer's peak demands. As a result, DR assists in deferring or eliminating the need for a supply side resource (e.g., generation capacity) for reserve purposes, and assists in alleviating congestion in the transmission system.

DR can be viewed as a risk management tool, providing utilities and end-use customers with viable alternatives to generation supply, transmission and/or distribution reliability concerns or issues. In addition, the application of DR will tend to dampen or reduce the applicable market clearing price (or lower the marginal generation cost/system lambda) through the process of economic dispatch, lowering costs for all customers, including non-participants.

A secondary benefit of DR is to reduce energy costs, either fuel or purchased power costs, typically targeting the (relatively) few hours adjacent to or containing the critical peak demand periods.

Other benefits of DR may include improved air quality and the environmental benefit of deferring the need for generation, transmission and distribution infrastructure.

The issues associated with deferring different types of capacity are different.

There is ample experience from the 1980's in deferring generation, primarily through residential and large commercial/industrial programs. While the technology and program designs needed to accomplish the impact have evolved, the detailed information avail- able for load response characteristics has remained pertinent and been confirmed in more recent studies.

On the other hand, experience with deferral of transmission and distribution (T&D) capacity is not as mature. A number of analyses of the potential and suggestions of program design have been carried out in the 1990's.[108] The controlled loads and measures have to be location-specific, and power flow simulations are required to ensure that the programs have the intended impact.

Pricing and Rate Design for Demand Response

It is very rare that electricity cost savings alone will compensate a customer for the cost of participating in a demand response program, if valued by the kWh reduced at the standard billing rate at the time of the reduction. Further, electricity represents a small fraction of most industrial products (see list below); only very few electricity-intensive industries are still operating in the United States. Because of that, it is not always cash that is required; for example, some industrial customers participate in return for being in the last outage block. On the other hand, for customers with very low profit margins, such as supermarkets, energy costs may represent just about the only option to reduce operating costs. Still other customers may become participants by providing an added functionality to their control systems already designed to reduce the demand component of the bill.

Electricity dollar content of product value:

- **Electrolysis (electrical separation of materials, such as in production of hydrogen and chlorine) and air separation for the production of industrial gasses, such as nitrogen and oxygen (10% to 50%)**
- **General manufacturing (5% to 10%)**
- **White collar (1% to 5%)**
- **Computers and information (less than 1%)**

A number of pricing approaches exist that can be used to encourage reduction in electrical load during predictable or unpredictable times of peak demand. Such approaches are generally designed to either approximately or very precisely reflect variations in the cost of producing or purchasing electricity over time and to send signals to the customer reflecting that price. Dynamic pricing methodologies or rebates and incentive payments are effective tools in encouraging customers to voluntarily reduce load during times of peak demand or to shift load to off-peak periods. Programs are emerging that create a closer degree of correlation between the dramatically higher prices for electricity during critical peak times in the wholesale market and the compensation mechanism employed to reward customers that can reduce demand at that precise time. Rates can be designed such that long- or short-term variations in pricing can be accommodated. Each of these approaches or a combination thereof can be used to support a demand response program.

Pros & Cons: Pricing vs. Incentives (bill credits)

- **Utility pricing is typically based on annual average demand and energy cost where the utility assumes the risk and retains a greater portion of revenue generated from the market. PJM programs allow the end user to retain more of the revenue by assuming greater risk.**
- **Incentives to encourage energy efficiency improvements should be reimbursed based on avoided cost of generation and offered in addition to any pricing options.**

Time of Use Rates (TOU)

[108] See, for example, Yau, T.S., et al, Demand-Side Management Impact on the Transmission and Distribution System, IEEE Transactions on Power Systems, Vol. 5, Issue 2, May 1990. http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?arnumber=54560

- **Energy prices that are set for a specific time period on an advance or forward basis, typically not changing more often than twice a year (summer and winter season). Prices paid for energy consumed during these periods are pre-established and known to consumers in advance of such consumption, allowing them to vary their demand and usage in response to such prices and to manage their energy costs by shifting usage to a lower cost period, or reducing consumption overall. The time periods are pre-established, typically include from two to no more than four periods every day except weekends and holidays, and do not vary in start or stop times.**
- **Cost savings for shifting load to off-peak periods when base load generators are not fully loaded. Improves the utility's load factor and typically reduces the cost of kWhs and should continue to be part of conservation initiatives.**
- **Demand charges should be used to reward on-peak energy conservation efforts and penalize poor performance.**

Dynamic Pricing (dispatchable rates)

Retail prices for energy consumed that offer different prices during different time periods and reflect the fact that power generation costs and wholesale power purchase costs vary during different time periods. Types include dynamic versions of Time-of-Use Pricing, Critical Peak Pricing and Real-Time Pricing.

- **Real Time Pricing (RTP): Where energy prices are set for a specific time period on an advance or forward basis and may change according to price changes in the wholesale generation spot market. This may be very costly to administer but offers significant savings when load shifting.**
- **Critical Peak Pricing (CPP): A type of dynamic pricing whereby the majority of kWh usage is priced on a TOU basis, but where certain hours on certain days (typically 12-15 days per summer) when signaled by the utility or ISO are subject to higher hourly energy prices.**
- **Peak Time Rebate (PTR rate): For a fixed number of peak hours during the critical peak days when signaled by the a utility or the ISO (typically 12-15 days per summer) customers receive a rebate equal to the critical peak price minus the current flat rate during critical peak hours.**

DR Implementation: The Role of Utilities and Third-Party Providers

Virginia Senate Bill 1416/House Bill 3068 acknowledged that an entity other than utilities may be better positioned to administer some aspects of the Commonwealth's demand side management and conservation efforts. The legislation states that the programming activities by "electric utilities, public or private organizations, or both" may be used to promote the Commonwealth's energy policy goals.

Due to their substantial expertise in the technical aspects of load management, specific knowledge of their electrical grid systems, relationships with their customers and existing administrative mechanisms, utilities are best positioned to develop, implement, and administer demand side management programs that involve direct load control, active load management, advanced metering, communication protocols, distributed generation, time-of-use and critical peak pricing. A new industry of companies called Curtailment Service Providers (CSPs) is emerging and growing rapidly in the United States. These companies generally assist utilities in deploying outsourced DR and energy efficiency programs. For example, the DMME recently awarded such a contract for the Commonwealth's own facilities. In some jurisdictions, these CSPs also directly aggregate

retail customers to respond to PJM's wholesale DR programs. Utilities also often function as aggregators of their retail customers. They frequently use third parties to develop and maintain the programs, but they tend to retain the dispatch function.

Energy efficiency and conservation programs that involve initiatives such as consumer education, rebates and incentives to encourage the adoption of higher efficiency equipment and market support functions are best administered through a non-utility third party such as a state agency or private sector organization. Providing such information and programs on a consistent basis throughout the Commonwealth will ensure that all customers will receive an equal opportunity to take advantage of all programs, regard- less of whether the customer is served by an investor-owned utility or cooperative. Examples of states in which non-utility entities have been assigned responsibility to administer such programs are Vermont, New York and North Carolina.

DR Technology

Short-term reductions in electrical load during times of peak demand are generally facilitated by sending a signal of some type to the end user of the electricity. The signal can take the form of a pricing signal, an electronic control signal or an informational signal.

A broad range of demand response technologies is available for transmission of the pricing signal and to enable an appropriate response to that signal. The range of technologies continues to evolve with new and enhanced versions appearing on the market or in development. With appropriate incentives and pricing, the expertise and creativity in the market place will continue to develop new technologies aimed at reducing electrical loads and electricity bills at times of peak demand.

Included among the technical options are switches for control of specific devices, remotely controllable thermostats, energy management systems with automatic demand control, computer-controlled load management systems, improved communications technologies (both customer premise and wide-area networks), improved advanced metering technologies with built-in demand-response functionality, Internet-controlled systems and integration of other subsystems with on-site generation and/or renewable energy sources.

When developing a demand response program, it should be flexible enough to accommodate a number of approaches and technologies appropriate for a variety of customers as well as the operational requirements of the utilities. An effective program should take advantage of developing technologies and should be as broadly compatible across devices and systems as possible to maximize useful life of equipment and to maintain options for expanding the scale of existing programs.

The various types of systems generally respond to either a real-time signal transmitted by a local utility via some communications protocol or pre-programmed information.
In the case of the real-time signal transmitted by or on behalf of the local utility, the information transmitted can consist of a simple on/off signal used to trigger a remotely controlled switch which temporarily curtails operation of a specific device or circuit. Such devices can include heating and air conditioning equipment, water heaters, pool pumps, lighting circuits or other high-load electrical devices. The transmitted information can also contain more instructions that can be used to ramp operation of a device up or down or send temperature adjustment information to a thermostat. Price information can also be transmitted to allow a customer or automated device to choose to either respond to the signal or not.

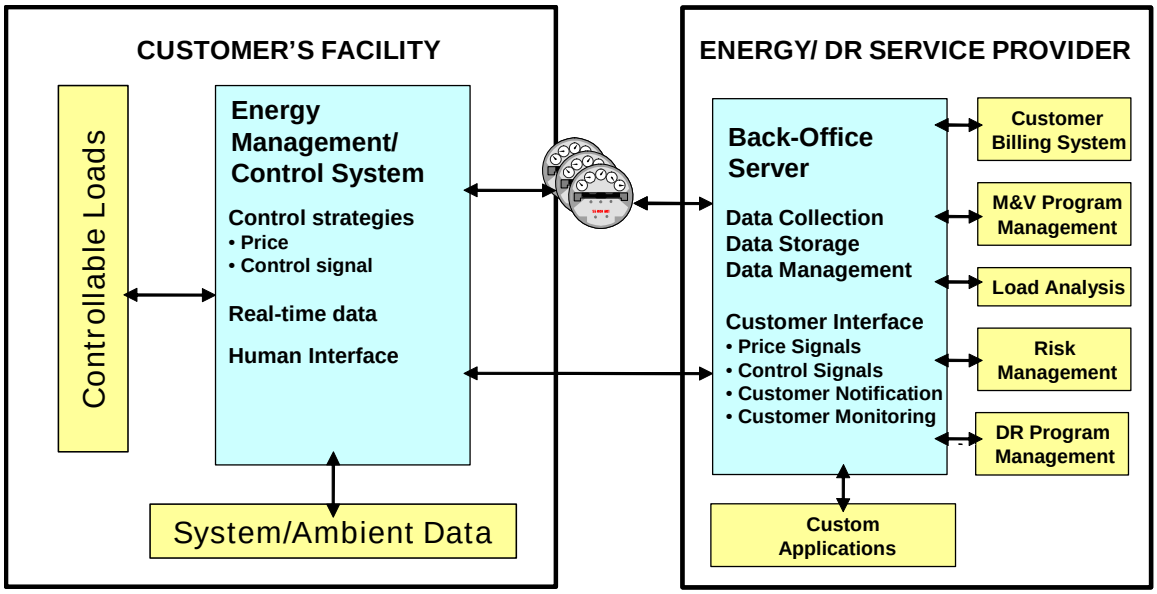
Communication technologies that can be used to send control signals or pricing information include radio frequency, power line carrier systems, cell-phone networks, wide area wireless networks, broadband over power line and Internet, to name a few. The simplest systems involve the use of one-way radio-paging signals. More complex systems can make use of two-way communication capabilities between metering systems and utility central computer control systems. One emerging technology uses computer control to

integrate delivery of power from a renewable energy source with backup battery supply and curtailment of load when needed or when favorable to do so based on real-time power pricing.

Equipment and System Architecture

A typical architecture of a DR system that accommodates the various system elements described above is shown in Figure 0 below.[109]

This figure illustrates the complexity (and simplicity) of technology required to implement a DR program, but perhaps more importantly, it shows the various elements that need to be considered in designing and costing the program.



- **Elements of system architecture**

It is often assumed that small business establishments (the "under-served" customer class) are poor targets for demand management. In fact, many of them are willing to pay for a demand management system just to control their demand charges and bill. Their system can then be interfaced with a DR program and dispatched if needed. A report prepared for Southern California Edison provides numerous examples of equipment and systems appropriate for small business customers.[110]

Elements of DR cost

There are a number of elements that should be considered in determining the implementation costs of DR programs. There are often many different alternatives that result in the same or similar outcome, so a proper costing approach is essential and can be used to consider trade-offs between costs and functionality.

Typical cost elements include:

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[109] Adapted from Rabl, V., "Evaluating and Measuring Demand Resources," Proceedings of CBI's 3rd Annual Demand Response Programs Conference," Alexandria, VA, March 2004. The acronym M&V on the right hand side of the figure stands for "measurement and verification."

[110] Lockheed Martin Aspen, Demand Response Enabling Technologies for Small-Medium Businesses, prepared for M. Martinez, Southern California Edison, April 2006. http://www.energy.ca.gov/demandresponse/documents/group3_april18_workshop/LMA_DR_ENABLING_TECHNOLOGIES_SMB.PDF

- **Equipment and installation costs. This is often the simplest cost element to establish either through RFPs or experience in other programs. Includes control equipment installed on customer premises, metering (if required by the rate schedule), as well as communications and dispatch infrastructure.**

- **Operation and maintenance costs. In addition to the equipment maintenance, this category also includes the maintenance of the DR capacity. Customers can drop out, move, change their systems, and new customers may need to be recruited to compensate for the decline in the demand resource.**

- **Measurement and Verification. Includes costs of metering, data acquisition, and data analysis.**

- **Data Processing. The large amounts of data collected in these programs would probably require new back office computer hardware and software, as well as interfaces of the software to other business and/or customer service systems.**

- **Marketing costs. This cost element is often not fully included or even ignored. However, even at relatively low market penetrations, it can easily overwhelm equipment and installation costs. After screening for suitability for the program (often requiring a site visit), cost-effectiveness, and willingness to participate, the final program participants may well represent only a small fraction of the initial target market. This category also includes the cost of marketing staff, educational and marketing materials, as well as advertising costs. The almost total lack of awareness of customers about DR and how to benefit from it is a huge factor. Some of these options have not previously existed for most classes of customers. The general perception is that there are only two ways to save money on electricity – use less or accept significant inconvenience. New technologies combined with new options from utilities can change that but an entire population needs to become educated that a paradigm shift has occurred.**

- **Intangible costs. While difficult to quantify, transaction costs may be very important to the customer. It is often impossible to recruit a customer, even if there are obvious financial benefits associated with program participation. For example, the cost/kW to recruit commercial and industrial customers may be lower than that for the mass market, yet most of US programs focus on the residential sector, because the customers are much easier to acquire. On the positive side, the utility or service provider could take advantage of the new data acquisition capabilities to create new product offerings. For example, the hourly load profile information allows analysis of operational practices by the customer, such as realizing that a company is turning on all A/C equipment at the same time of the morning, when prices are higher than a few hours earlier. Significant energy efficiency and demand control opportunities can often be discovered simply because of the increase in data availability.**

A recent paper presented at the AESP conference includes a good discussion of these typical cost elements.[111]

Advanced Metering Technology and Advanced Metering Infrastructure (AMI)

Introduction

Another emerging technology for enabling demand management is based on the use of advanced meters and the concept of an Advanced Metering Infrastructure (AMI). AMI is not a specific technology; rather, it is an infrastructure that has at its core a bi-directional network with advanced meters. FERC[112] defines AMI as:

> "The communication hardware & software and associated system and data management software that creates a network between advanced meters and utility business systems and which allows collection and distribution of information to customers, retail providers and the utility."

The actual meter capabilities depend on the selection of specific meters and communication capabilities from technology suppliers. In general, the primary benefit of creating an AMI is the ability to quickly process large amounts of pricing and usage data and make such data available to both the customers and the service providers. AMI not only offers opportunities for sophisticated load management measures behind the meter, but it also provides a platform for potential benefits for utility operations in areas such as remote service connects/disconnects, outage management, theft detection and remote load control.

AMI is not a prerequisite for demand response; rather, it should be viewed as a significant option to enhance opportunities for communicating prices to customers in real- or near-real time, accelerating measurement and verification of demand changes, and facilitating faster data processing and settlement. One day, AMI may become part of a "Smart Grid"[113] -- a network tying together and coordinating supply-side resources with customer processes.

Meanwhile, initial demand response programs should be made available to customers using existing metering capabilities (such as interval meters). The design for the next generation of demand response programs should include a thorough evaluation of AMI capabilities relative to other alternatives and should take advantage of the range of technologies available to the extent that they can be integrated into an overall coordinated program and are designed to be cost-effective. Interoperability among devices should be one of the focal points of such an evaluation; as this is important to ensure that the utility retains the flexibility to use multiple technology vendors.

Advanced Metering Functionality

Advanced meters can provide up-to-the-minute information on energy pricing and customer usage. In addition, they may incorporate a number of added functions.

For example, current technology leaders offer the following advanced meter functionality via Two Way Command and Control:

- **Time of Use (TOU)**
- **Remote connect and disconnect services**

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[111] McCarthy, P., et al., A Demand Response Solution for Underserved Mid-Size Commercial Customers, Proceedings of the17th National Energy Services Conference, Las Vegas, NV, 2007.

[112] FERC, Assessment of Demand Response and Advanced Metering, Staff Report, Aug. 2006. http://www.ferc.gov/legal/staff-reports/demand-response.pdf

[113] Referenced in the pending Energy Bill

- **Interval data (hourly and subhourly)**
- **Coincident and off cycle demand reads**
- **Move-in, move-out readings**
- **Multi-utility (e.g., water and gas) solutions**
- **Remote administration**
- **Outage/restoration management**
- **Plug-and-Play meter deployment**
- **Tamper and theft detection**
- **Reverse energy monitoring**
- **Load research**
- **Voltage reads**
- **Daylight savings**
- **Network management**
- **Asset tracking**

Interoperability and Open Architecture

- **Interoperability means that one technology company's technology/service has the ability to interface with other technologies or services.**
- **A key element in any advanced metering infrastructure (AMI) is the ability to leverage the infrastructure investment to the fullest extent possible.**
- **The distinction between "open" architecture and proprietary technology/services is very important.**
- **The meter technology company's network infrastructure, from back office software to the meters (and into the home), should be designed to leverage existing communications standards and open protocols.**
- **On the electricity side, all meter manufacturers, while employing ANSI standards, utilize manufacturer tables which result in a proprietary way to obtain meter data.**
- **While one may employ standards, there is not a single end-to-end solution in the industry that is not proprietary in some manner.**

Distributed Generation for DR

Many commercial and industrial facilities with stringent power reliability requirements use backup generators to supply replacement power. Typically, operation of these units is limited to a few hundred hours per year, during power outages, precautionary times when severe storms are approaching, and periodic testing.

While unlikely to completely eliminate the need for new generation or transmission facilities, use of backup generators on a very limited basis as part of a distributed generation fleet can potentially defer construction of new electrical infrastructure by reducing overall load on existing generation and transmission equipment. During times of peak demand, on-site generators can be used to produce electricity locally at commercial or industrial facilities, enabling those facilities to remove all or part of their load from the electrical system. Combined with other load curtailment measures, distributed generation can serve as a bridge to accommodate growing demand while electrical infrastructure assets are in the development stage.

For the most part, backup generation systems consist of reciprocating engines or in some cases combustion turbines, with a small portion of backup power now supplied by micro-turbines. Solar photovoltaic systems, coupled with battery systems, are being used to supply a small, but growing, segment of the backup power needs.

Since most combustion-based backup generator systems are used infrequently and since the total amount of generating capacity from these types of systems is limited, impact to air emissions is similarly limited. While dispatch of backup power systems, when used in a demand response mode, may require increased run time to supply power during times of peak demand, such increases are generally modest since periods of peak demand are typically very infrequent - totaling only a few percent of the hours in a given year, leaving the equipment idle for the vast majority of time. The environmental impact anticipated from such increases in run time, if required, would similarly be expected to be minimal with the possibility of reducing the amount of time required for generator testing. Although anticipated to be minimal, impacts from combustion-based distributed generation are required to be addressed under environmental regulations on a case-specific basis. Environmental controls must comply with state and federal standards. New or modified installations typically must install controls for air emissions of nitrogen oxide and use low- or ultra-low sulfur fuel. In many parts of the nation where the distributed generation resource is being used for DR, utilities, CSPs and customers, or some mix of them, are upgrading the environmental controls on the customer's equipment to further reduce the adverse environmental impact of this option.

Although there is no single approach to demand response that will completely fill the need for active load management measures, using the fleet of backup generation equipment as part of a distributed generation system can be an extremely effective component of a comprehensive demand response program and can provide a means
to significantly reduce load on utility electrical systems.

DR Programs and Expenditures in the US

According to the FERC report[112] the total potential demand response resource contribution from existing U.S. programs in 2006 is estimated to be about 37,500 MW. The vast majority of this resource potential is associated with incentive-based demand response, i.e., interruptible/curtailable programs and dispatchable remote appliance control programs.

Some of the history of demand response is described in an ACEEE report and reproduced below:

> "The DSM era of the 1980s and 1990s saw extensive investments in DSM programs-both load management and energy efficiency programs. Such spending peaked in 1993 at about $2.7 billion nationwide. Since that peak, utility DSM spending has declined significantly, largely due to industry restructuring-in 2003, this value had fallen by about half, to $1.3 billion (EIA 2004). Of this total, about $800 million was for direct costs of energy efficiency programs, about $350 million was for direct costs of load management programs, and the balance of about $140 million was for indirect costs associated with both kinds of programs. Impacts from these programs are significant. In 2003, the total actual peak-load reduction achieved from utility DSM programs was 22,904 MW; of this total, 13,581 MW is attributed to impacts from energy efficiency programs and 9,323 MW is attributed to impacts from load management programs." [114]

Many of the new utility-conducted DR programs focus on dynamic pricing for residential customers. The following are examples of programs approved or pending approval for full scale implementation:[115]

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[114] ACEEE. Exploring the Relationship between Demand Response and Energy Efficiency, report U052, March 2005, p.10
[115] Private communication, The Brattle Group

- **San Diego Gas and Electric: Peak time rebate (PTR) program (pending approval of CPUC)**
- **Southern California Edison: Peak time rebate (PTR) program.**
- **Pacific Gas and Electric Company: Critical peak pricing (CPP) program**

In addition, the following dynamic pricing pilots are currently underway or have been recently completed in North America:

- **Ameren, Missouri (CPP, TOU) – preliminary results**
- **Anaheim, California (PTR) – preliminary results**
- **BGE (CPP, possibly PTR) – pilot will occur in 2008**
- **Commonwealth Edison (RTP) – results available**
- **Hawaiian Electric, Hawaii (CPP, PTR) – planned for 2008**
- **Hydro Ottawa (CPP, PTR) – preliminary results recently released**
- **Idaho Power, Idaho – preliminary results**
- **Pepco, DC (CPP, PTR, RTP) – will begin late summer 2007**
- **PSEG, New Jersey –will begin in 2008**
- **SMUD, California –concluded, no results publicly available**

Virginia Situation

Current and Projected Electricity Usage, Demand and Costs in Virginia

Total annual electricity consumption in Virginia is approximately 110,000 million kWhs. This consumption is divided among residential users (40%), industrial users (20%) and commercial users (40%).

Annual electricity use per person in Virginia is approximately 14,400 kWhs/yr, which is higher that the US average usage of approximately 12,350 kWh.

Virginia's per capita use of electricity is also higher than that of several nearby states.

Annual Electricity Usage[116]

PA	11950	kWh/person
MD	12230	"
VA	14400	"
DE	14420	"
NC	14800	"
WV	16620	"

72% of residential energy usage (electricity, gas and other) in Virginia is for three uses: heating and cooling (49%), water heating (13%) and lighting (10%). Cooking, food storage, electronics and various other appliances account for the rest.

[116] "US Per-Capita Electricity Use by State" California Energy Commission, 2005. www.energy.ca.gov/electricity/us_per_capita_electricity_2005.html

Use in commercial establishments is primarily for cooling, heating, and lighting, though a rising use is for information processing. Data centers, which are an important growth area in Virginia's economy, use significant amounts of electricity per square foot of space for both the equipment itself and for cooling.

Industrial users also use electricity for cooling, heating and lighting, but their primary use is for motor drives.

However, use of electricity is not level, but varies during the year with usage highest on cold winter days from electric heat and even higher on hot summer days as a result of high air conditioning usage. This is significant because the level of highest demand for electricity determines the total amount of generation required by the electric system and determines the amount of transmission and distribution capacity the system must have for reliable operation and also requires the use of expensive fuels used only during times of high system electric demand. The summer peak in Virginia is especially significant because electric transmission and distribution systems are reduced in carrying capacity during hot weather. Thus, even more capacity must be added to meet high summer peak demand.

The Virginia electric system peak demand occurs normally in July or August. It totaled approximately 33,000 MW in the summer of 2007 according to the Virginia State Energy Plan. This peak is almost 2½ times higher than the average demand in the state of 13,000 MW and is predicted to grow at a rate of 1.9% per year for the next decade. These peak demands, which last for only about 100 hours per year, determine the required capacity of the utility infrastructure in Virginia

As the figures below indicate, the current retail price of electricity in Virginia is low compared to the US average, which has been an important factor in reducing interest
in electricity conservation and demand reduction.

US and Virginia Electricity Prices (Source EIA)[117]

Residential:	VA 8.30 cents/kWh	US 10.27 cents/kWh
Commercial:	VA 6.17 cents/kWh	US 9.32 cents/kWh
Industrial:	VA 4.88 cents/kWh	US 6.18 cents/kWh

These prices will increase in the future, potentially driven by significant planned additions to generation and transmission capacity, including two nuclear units, additional coal-fired plants and major high-voltage transmission lines. Further, a recent study by the Brattle Group for the Edison Foundation has pointed out that new power generation construction costs are rising much faster than inflation, which will put additional pressure on electricity costs. Additionally, new environmental restrictions, potential carbon taxes and continued increases in the cost of fuels, especially natural gas will drive up Virginia's power costs.

With the elimination of the price cap, and the renegotiation of fuel prices, these fundamental pressures on costs will cause rates for retail electricity to rise soon and throughout the next decade and beyond.

Costs of producing electricity are particularly high during peak times because the system is forced to dispatch its least efficient plants and use its most expensive fuels during that time. A good measure of the instantaneous cost of producing electricity is PJM's "Locational Marginal Price", or LMP,[118] the price at which it will buy or sell wholesale electricity during any one hour in one of its zones.

For example, in the most recent year, PJM's average LMP over the past year for Dominion Virginia Power (PJM's DOM zone) was $57.00/MWh or 5.7 cents/kWh. In August 2007, the average LMP in DOM was $94.00/MWh. During the highest 28 hours in the DOM zone in August 2007, the LMP exceeded $500/MWh and during the single highest hour in August, 2007 the price was $1000/MWh or $1.00/kWh[119]. And this is

[117] "Average Retail Price of Electricity to Ultimate Customers by End Use Sector by State", Energy Information Administration, DOE, Sept. 2007.
[118] LMP is a pricing mechanism to approximate optimal power flow in the system as currently configured.
[119] See PJM website, http://www.pjm.com/markets/jsp/lmp.jsp

just the price of wholesale electricity, not the retail price to most end use customers, which would be higher still.

However, under Virginia's current rate structures, for most customers these peak costs are averaged into standard rates so almost all customers do not see these high peak time costs and, thus, have little incentive to reduce demand at those times.

These peak demand electricity costs can be expected to continue to rise as peaking plants (run only during periods of very high demand) and transmission capacity are added to maintain the ability to serve customers during these periods of particularly high and rising electricity demand levels. Further, since natural gas is the fuel used to satisfy peak demand levels, expected increases in gas prices will add even more to increases in peak electricity costs.

Demand Response programs can reduce demand for electricity during these periods of high usage and high costs through either voluntary reductions in usage during these periods or through control systems that can turn off or turn down certain equipment and appliances during these peak periods. These programs are usually supported by prices that expose users to both the very high costs of electricity in peak times and the lower costs at other times and by direct payments to customers for their willingness to have their usage reduced during peak times.

The particularly high costs which can be avoided, and the relatively brief times during which reductions are required, make many programs of control and peak reduction cost-effective.

Existing Demand Reduction Programs in Virginia

A variety of programs currently exist in Virginia to aid in reducing demand during peak usage times, but participation levels are low in most cases.

These existing programs include:

- **CPP rates, available to some of Virginia's largest commercial and industrial customers;**
- **Some participation by larger electricity users in PJM's various demand response programs;**
- **Some existing time-of-use (TOU) rates; and**
- **Several programs for control of residential air conditioning and hot water heaters.**

In addition, Virginia has also installed some advanced metering systems that include both interval meters and communication systems to allow monitoring and control of short-term usage.

Overall Assessment of Virginia Demand Reduction Situation

Relatively low rates for electricity and poorly designed TOU rates in Virginia have reduced interest in electricity conservation and demand reduction programs. Current participation in demand reduction programs is small, and the programs which exist are not particularly targeted to the highest periods of power demand and cost.

However, as Virginia moves toward a rising electricity cost and price environment, it has significant opportunity to implement effective demand reduction programs. Further, it can move efficiently and swiftly, using the substantial experience gained elsewhere.

Programs in Virginia to reduce demand during peak times are modest, as the following illustrations indicate:

(1) TOU rates are designed to expose customers to high peak time costs and to lower off-peak costs as well, providing an incentive to reduce peak time usage. However, although peak time costs are actually highest during only about 100 hours per year, current rates in Virginia spread those costs over thousands of hours for most customers, significantly diluting their effects.

(2) Meters capable of measuring electricity use during short intervals of time and communicating that usage to a control center facilitate the more sophisticated demand reduction programs since they provide the basis for assessing individual usage patterns and triggering various control systems. However, in Virginia only about 4.2% of customers have such meters installed.

In comparison, according to a 2006 study by the Federal Energy Regulatory Commission (FERC)[120], U.S. leaders in advanced meter installation included:

- **PA 52.5% of all meters**
- **WI 40.2 "**
- **CT 21.4 "**
- **KS 20.0 "**
- **ID 16.2 "**

(3) According to the same FERC report, installed demand response programs in 2006 in the U.S. totaled about 37,000 MW or about 4% of total US peak demand. In comparison, Virginia utilities report only about 314 MW of load currently under control, or about 1½% of the system peak. Yet, the success of a Virginia cooperative utility, NOVEC, demonstrates that a far higher level of demand response programs is possible. In NOVEC, approximately 25% of its residential customers have peak limiting control systems installed.

(4) In a recent PJM day ahead auction for demand response in early August 2007,
a total PJM peak of over 133,000MW was anticipated. Dominion Virginia Power contribution to the expected PJM peak demand was about 19,000MW. Almost 2000 MW of reduction was offered by large electricity users in the 13 states that are part of PJM's system, potentially reducing the PJM peak by 1½ %. However, contribution to peak reduction from users in Virginia totaled only 60MW[121] or only about 0.3% of Virginia's peak.

(5) A 2006 study by the American Council for an Energy-Efficient Economy (ACEEE) compared utility expenditures for energy efficiency among the states. Virginia's utility expenditures were reported to be the lowest of all states.[122]

(6) The same 2006 ACEEE study ranked Virginia 38th among all states in its combined total scores in eight energy efficiency policy categories.[123]

The Virginia General Assembly, in 2007, recognizing the opportunity to reduce the need for future electric cost increases and to improve the utilization of energy in Virginia, enacted new legislation setting a goal for electricity usage reduction in the state, and encouraged efforts to explore the use of a variety of energy efficiency and demand management techniques.

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[120] FERC, Assessment of Demand Response and Advanced Metering, Staff Report, Aug. 2006. http://www.ferc.gov/legal/staff-reports/demand-response.pdf
[121] PJM presentation to Workgroup, Richmond, VA, August 23, 2007
[122] Eldridge, M., et al, *The State Energy Efficiency Scorecard for 2006*, ACEEE Report #U054, 2007. Table 1.2, pp. 8-9.
[123] Id., Table ES-1, pp. iv-v.

In our situation of rising prices, rising demand and modest current participation in demand reduction programs, we have a major opportunity to implement effective programs and significantly limit the extreme costs of meeting high peak demand levels.

Impediments to Success: Stakeholder Perceptions

The Subgroup has compiled and reviewed several sources of information to identify impediments to demand response. These sources include:

- **a 1991 SCC Staff Report entitled "Review of Commission Policy Toward Conservation and Load Management Programs;"**
- **a 2006 and a 2007 report on demand response, both prepared by the Federal Energy Regulatory Commission;[124]**
- **a July 2006 report entitled the National Action Plan for Energy Efficiency -- a plan developed by more than 50 leading agencies and organizations from the energy and environmental community and coordinated by the U.S. Environmental Protection Agency and the U.S. Department of Energy;**
- **a 2007 presentation on impediments developed by the PJM Demand Side Response Working Group; and**
- **a quick survey of impediments to demand response of concern to members of the Subgroup representing utilities and curtailment service providers.**

The impediments identified by all these sources paralleled each other in many respects. A compilation of these inputs is provided below:

Lack of Perceived Need for Demand Response:

- **The traditional focus of the utility industry in Virginia has been on supply-side solutions to address peak demand rather than on demand-side approaches. There has been no legislative or regulatory direction to achieve demand response specifically during critical peak times.**
- **Demand-side management in Virginia has generally utilized TOU and demand based rates, except for a small number of large commercial and industrial users on interruptible rates and a NOVEC program for air conditioner cycling. The TOU rates are based on *long TOU periods* (over two thousand hours per year). For example, under Dominion's Schedule 1S for residential customers, the on-peak period is eleven hours daily all summer and eight hours daily for the rest of the year (five days a week). The critical congestion periods amount to less than a hundred hours a year. The ISOs and/or regulatory authorities, not the local utilities, have driven the expansion of demand response on a real-time or near real-time basis.**
- **Lack of recent serious reliability failures masks the urgency of creating effective demand response programs for the future.**

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[124] U.S. Federal Energy Regulatory Commission, *Assessment of Demand Response and Advanced Metering*, August 2006, pp. xi-xii and 71-75. See http://www.ferc.gov/legal/staff-reports/demand-response.pdf

- **If the emerging demand response programs at the regional wholesale level achieve progress in reducing the large price surges now encountered at critical peak times, the interest of parties in rewarding demand response may diminish.**

Issues Involving Incentives and Cost Recovery:

- **Virginia law provides incentives for generation expansion that do not apply to demand response expansion.**
- **Traditional approaches for cost recovery provide for inadequate recovery of the direct costs of demand-side programs.**
- **Most utilities earn profits based on the volume of electricity sold, thereby discouraging utility involvement in demand-side management programs that result in lost revenues. Some states are moving toward decoupling of revenues from kWh sales to address this conflict.**
- **Delays encountered by utilities in obtaining timely adjustments to rates/prices (e.g., rate caps, inability to make rate revisions outside of rate cases) discourage demand-side program investments;**
- **Utilities are reluctant to undertake investments in enabling technologies, such as advanced metering, unless the business case and regulatory support for deployment is sufficiently positive to justify the outlay;**
- **In ISO/RTO markets, there is delayed processing and disbursement of payments for demand reductions to participating retail customers. ISOs typically wait 60 days or more to finalize settlements. This delay creates cash flow problems for customers and curtailment service providers.**
- **Some Virginia utilities are resistant to demand response because of concern that the structure of the PJM program can result in DR payments above their actual value, resulting in potential adverse cost impacts to the utility and non-participating customers.**

Institutional and Infrastructure Barriers:

- **Fragmentation in the industry and government regulatory oversight.**
- **The demand response issue is multi-layered, with the legislature, PJM, the SCC, other state agencies, the utilities, and the CSPs, all seeking to work out policies, programs, and procedures to benefit the electricity industry and ultimately the consumer. In the meantime, there is confusion and a reluctance of consumers to participate.**
- **Better coordination is needed between FERC and State agencies. While states have primary jurisdiction over retail demand response, the FERC has jurisdiction over demand response in wholesale markets. Greater clarity and coordination between the Federal and State programs is needed.**
- **CSPs are able to bid in the wholesale market to provide MWs of demand response when called for by PJM, but the ability of these companies to then market and deliver these MWs within Virginia is subject to State regulatory policy. This potentially decreases the motivation of CSPs to support DR deployment in Virginia. It creates confusion due to potential differences in**

operations between regions and jurisdictions in the Commonwealth. More importantly, it may result in lower response for DR in the PJM auction market for future energy supply for Virginia.

- **Lack of standards. For manufacturers to design demand control enabling equipment that is intended for mass-market customer use, there is a need for a degree of harmonization of requirements within the utility industry. The goal is to allow development of a mass market for these products, expanded competition and lower unit cost. These differences involve a variety of factors, including but not limited to equipment functionality requirements, rate structures designed for demand response users, procedures for using distributed generation for demand response, signaling technology for emergency response and its relationship to metering and billing infrastructure. This would require utility, ISO and manufacturers' representatives to develop industry standards, such as the standards that have been established for electricity metering.**
- **Lack of consideration of societal benefits, including environmental benefits of most forms of demand response.**
- **DEQ requirements are viewed by users as difficult to navigate, making it hard for users to utilize customer owned, otherwise idle, generation capability during critical peak time.**
- **Concern about the potential economic and operational impact of demand response on industrial customers.**
  - Industrial customers have expressed concern that mandatory programs from individual utilities could result in negative impacts in the short-term.
  - PJM demand response programs at the wholesale level are designed to be voluntary and should improve reliability and reduce cost to industrial consumers in the long run.
- **The concentration of work required in the near-term recommended for the SCC by this report may require additional staffing resources.**

Consumer Education and Usage Issues:

- **Lack of customer awareness that programs do exist or how to use them effectively.**
- **Very few residential customers in Virginia have gained access to time-variant rates in Virginia. Although such rates have been offered by utilities in Virginia for decades, the vast majority of customers do not know they are available. Many residential customers who have sought such rate schedules have encountered obstacles, such as Virginia Power telephone support employees telling them that no such rates exist or that the customer is not eligible for them. Commercial and industrial customers are more familiar with TOU rates, but most do not under- stand their own rate or how to manage their usage under that rate. Very few are aware of dispatchable programs.**
- **Customers are suspicious of vendors and technology that are unfamiliar. Demand response enabling equipment and CSPs are generally unknown to Virginia consumers. There is no brand awareness. This information gap can**

substantially increase marketing cost for CSPs and utilities attempting to deploy new programs.

- **Customer belief that insufficient incentives exist. Because of their different needs and knowledge levels of *how* to respond, as well as their varying *abilities* to respond, customers need targeted and ongoing training and education to help them understand how to increase their response to demand response programs. Customer price-responsiveness varies significantly by market segment among commercial and industrial users. The differences in customers' ability to respond at peak times and the degree to which they are able or willing to respond implies that policy-makers need to create a portfolio of dynamic pricing products from which customers can choose and offer different incentives to different types of customers.**
- **Customer inertia/desire for simplicity. Most customers (particularly residential and small business ones) will be resistant to programs if they require non-automated effort and if the basic design of the program is complicated. Focusing these educational efforts first on the largest customers will allow these customers to adequately assess the rewards and costs associated with participation in demand response programs. Experience in other states such as New York and California (which use some system benefit funds for consumer education) has shown that targeted customer education and training increases participation and response rates.**
- **Simplicity enhances success. Customers notified by various means about real-time prices and price spikes achieve better responses and are more satisfied with the programs than with long TOU programs. For example, a recent Southern California Edison test of Ambient Orbs, a device that glows green when the grid is underused and red during peak hours, resulted in customers reducing their peak-period energy use by 40%.**
- **Customer responses to well-designed, simple programs they perceive as fair are high: they want to stay in the programs, and felt they achieved savings and control. Experience suggests that customers especially like dynamic pricing programs that pair automated customer technologies. Customers with access to smarter appliances and energy management systems thought they became more aware of their energy use and costs as well as how their routines at home and at work impact their energy use.**
- **Requirements for customer investments:**
  - Customers may need a commitment for a utility to offer a rate or program for a period of time to receive their payback. Failure to perceive this commitment causes the investment to fail the return-on-investment test. However, utilities seek to balance this requirement with their interest in "timely rate revisions." There are over 7,000 Virginia Power customers on Schedule 1S, a demand based TOU rate, and most have purchased an energy management system to automate their response based on the pre-programmed times for on peak. The uncertainty of how Schedule 1S will evolve after rate caps are removed is adversely impacting the promotion of this technology to customers.
  - Current cost for enabling technology tends to be high because of the lack of "critical mass" for product development, bulk manufacturing and marketing costs.
  - Customers and load-serving entities often need new automation or control equipment or retrofits to existing equipment and appliances that will allow them

to easily adjust consumption. Recent advances in controls, electronics, and communications have dramatically decreased the cost and increased the functionality of these energy management technologies. Greater saturation of advanced meters will support additional demand response, where economic and effective, but they are not a prerequisite to meaningful demand response. Existing interval meters can be effective.

Rate Design Issues:

- **Existing time-of-use rate designs in Virginia are primarily based on long periods of TOU (thousand of hours per year). Options that provide adequate compensation for responding during emergency peaks are missing.**
- **New technologies are emerging that allow customers to respond to near-real time signals. Programs that exploit that new customer capability have generally not been deployed.**
- **New rate designs are perceived as being detrimental to non-participants and may create perceived free riders.**
- **The utility rate structure is based on average (embedded) costs whereas DSM payments and pricing options are primarily based on marginal costs. Unless cost allocation is worked through carefully, adversely impacted parties will oppose the outcome. PJM and the member utilities are currently working on these issues, and SCC oversight also must assure fair and reasonable rates. Research has demonstrated that as long as customers are convinced that utility-posted rates are fair and reflect actual system circumstances, and are based on competitive markets, they will accept them as the basis for time-varying rates.**

Barriers to Providing Demand Response by Third Parties:

- **The potential sunset of various demand response programs are a disincentive to demand response providers.**
- **Because third parties or customers often bear the risks of programs dependent upon enabling technologies, they need long-term regulatory assurance or long-term contracts in order to raise the capital needed to invest in enabling technology.**
- **Lack of third-party and customer access to data has been identified as a barrier to demand response.**

Measurement and Verification Issues:

- **The measurement of demand reductions associated with incentive-based demand response programs has proven to be a difficult and controversial problem, particularly for demand-bidding, emergency demand response, and capacity programs. The key measurement issue is how to calculate the level**

of consumption that would have occurred if the participant had not curtailed consumption, i.e., the customer baseline level. Once the customer baseline is determined, the level of reduction is calculated by subtracting the actual demand from the estimated baseline normal demand. Although there are a variety of means to estimate the baseline that are used by utilities and ISOs (typically involving an average of usage over several recent days), at least one Virginia utility has not yet been convinced that PJM has successfully addressed the potential for "gaming" of the system by customers with unpredictable loads. For example, a participant may bid into the market or state that they will curtail when they would already be shut down for the day.

- **For the vast majority of users, current metering systems are not capable of accommodating real-time rate schedules and other DSM initiatives. Without the ability to measure consumption by varying times of day, it will be difficult to offer and conduct many incentive-based demand response programs and to measure any reductions. Many states are addressing this by the mass deployment of advanced meters, but expanded use of interval meters can also be useful.**
- **Lack of customer access to their own metered data;**
- **Lack of real-time communication system to interface with metering systems;**
- **Current billing systems for the vast majority of customers will require modification to accommodate DR billing.**

Establishment of Cost-Effectiveness Tests:

- **One of the key challenges for regulatory approval and review of demand response is the lack of an adopted method or consensus procedure for the evaluation and definition of cost-effectiveness. The cost-effectiveness tests that were developed to assess demand-side management in the 1980s and 1990s focus on avoided generation costs and are inadequate to capture the additional market and reliability benefits that demand response can bring to retail and wholesale markets at critical peak times. Several ISO/RTOs have attempted to evaluate the cost-effectiveness of demand response in their yearly evaluations, but there is no consistency among them.**
- **Utilities and non-participating customers are likely to oppose cost-effectiveness tests that result in rates to non-participants exceeding the rates resulting from a supply-side resource.**

Programs/Action Recommendations

While the Bill directs the SCC to conduct a much needed investigation into demand-side measures, it does not provide enough specific direction or mandate specific actions that would overcome the major impediments to the development and implementation of cost-effective programs. In this section, we recommend actions that will spur immediate and short-term opportunities and lay the foundation for longer-term investment in demand-side resources by the utilities, third-party Curtailment Service Providers (CSPs) and electricity-consuming customers. We are not making judgments as to whether existing legislation or SCC rules and policies "allow" the utilities, the SCC or others to implement programs. Rather, we simply note that the existing collection of legislation, policies, practices and rules do not currently promote demand-side resources, and it is imperative that this change.

We believe that some of these recommendations may require either authorization or funding by the General Assembly. For the items in the following list of actions that are identified as **Immediate**, we urge the SCC to address in its report to the General Assembly whether it supports these actions and, if so, to request legislation in the next session that will include any necessary authorization and funding for these actions beginning in June 2008.

The recommendations have been identified to overcome the impediments identified in this report. Every specific impediment is not tied to a specific recommendation. Most recommendations serve to reduce many individual impediments. For that reason, some of the broad categories listed in the impediments section may not be included below, but they have been considered within the recommendations provided.

General Recommendations:

- **Establish a quantified goal for DR (MW) separate from the goal for consumption reduction (MWh) and to be achieved by a specified time. Utility performance and the continued appropriateness of the specific level of the goal should be subject to periodic evaluation by the SCC. Utilities should have flexibility in determining how best to cost-effectively achieve the goal in their service territory. The SCC should be able to award incentives based on real results in utility performance. If a determination is made to allow CSPs to market PJM DR Programs directly to retail customers, allow the utilities to include MWs of DR delivered by CSPs in their service territory to be counted toward achievement of their DR goals. Consideration should be given to counting specific methods of achieving demand response toward renewable energy goals, when these methods can be demonstrated to be cleaner and less expensive than those currently defined as renewable. (*Immediate*)**
- **Continue collecting information from electricity service providers offering load management programs, special metering programs, special rate programs, etc. Collect specific information related to costs, customer incentives, penetration levels, measurement and verification methods or standards, impacts on peak demand, other benefits, and plans to continue or enhance such programs. Use information to prepare a DR Programs Report and periodically update it as a source document for programs to be considered. (*Immediate*)**
- **Provide education to members of the General Assembly and state agencies, including conducting legislative workshops, regarding the changes taking place in the electricity industry and the need for enabling legislation and policy. Require an annual report by the SCC to the General Assembly on DR, Consumption Reduction and Conservation. *(Immediate)***
- **Continue the Workgroup process, renamed the Virginia Energy Collaborative, to develop a Virginia Energy Action Plan. Continue to identify impediment to DR and to recommend actions to reduce them. *(Immediate)***

Recommendations to Address the Lack of Perceived Need for Demand Response:

- **Establish a statewide education effort on the Virginia Energy Plan, with the objective of creating broad consumer awareness of the importance of consumers actively participating by taking positive actions to be part of the**

solution. The Virginia Energy Plan explains that there are short-term costs associated with developing and deploying effective energy efficiency and demand response programs but that the long-term costs for all are lower. As PJM and local utilities achieve the needed levels of supply commitments in the years looking forward, coming from both generation and DR, the marginal cost for additional supply will decrease. We need to reach the point where supply exceeds demand to attain price reductions. *(Immediate)*

- **Require all utilities in Virginia to prepare demand response and demand management reports for review and approval by the SCC and to update them annually. *(Immediate)***

Recommendations to Address Incentives and Cost Recovery

- **Under current Virginia statute, the SCC is authorized to approve "pilot" programs. While a properly designed "pilot" can be useful and effective, it can also be wasteful if it is merely a substitute for a full-scale program when the enabling technology and market transformation issues have already been proven/resolved elsewhere. Authorization for immediate cost recovery should allow conversion of "pilots" to full-scale programs and should encourage other new DR programs, with full cost recovery of investment and ongoing expenses.**
- **The standards/rules for full cost recovery and return on investment should mirror those for utility investments in conventional power plants, including the recently enacted profit incentives for new generation. Consideration should be given to allowing the utilities to earn an even higher profit on certain demand-side resources to recognize the difficult-to-quantify environmental attributes of those sources relative to conventional generation. Full cost recovery of prudently incurred costs is not sufficient to spur investment in demand response programs. To properly balance utility decisions to consider demand response as an alternative to peaking generation, they must have at least the same financial incentives for each.** (Immediate)
- **Authorize cost recovery effective 1 January 2008, prior to removal of rate caps, for utility costs associated with planning and executing demand response programs.** (Immediate)
- **Evaluate "decoupling" or variations of the same as are being implemented in other states.**
- **Evaluate implementation of a Technical Assistance Program (TAP) and Technical Incentive Program (TIP), similar to that being used successfully elsewhere. The TAP provides compensation for consumers for the costs of engineering analysis to identify potential demand response actions, and the TIP subsidizes the cost for purchase and installation of enabling technology.**

Recommendations to Address Institutional and Infrastructure Barriers

- **Evaluate the appropriate role for the SCC in the emerging PJM system, working with regulatory bodies of other states within the PJM footprint, to achieve regulatory consistency similar to the consistency being developed**

within the industry for states with regulated retail markets. The intent of this effort should be to support and encourage the demand response programs of PJM and the local utilities, ancillary service, TOU and peak load interruption programs, including increased use of interval meters and of automated energy management systems. Within the PJM Demand Side Response Working Group process, the issues of cost effectiveness and the appropriate price for wholesale DR, the necessary metering and validation requirement, and many other similar issues addressed in the impediments section are being negotiated within the industry.

- **We recommend that the SCC review the activities of CSPs in other states and develop consistent policies for their role in Virginia that would be applicable to all Virginia utilities. The objective should be to set policies that best achieve an aggressive program for deploying cost-effective DR throughout the state.** (Immediate)
- **Establish the policy that measurement and verification of load shedding by residential and small commercial customers can be established via statistically rigorous sampling and that comprehensive AMI deployment need not precede DR programs for this class of customers.** (Immediate)
- **Evaluate deployment of an AMI throughout all or part of the state. It should be viewed as an option to enhance opportunities for communicating prices to customers in real or near real time, accelerating measurement and verification of demand changes, and facilitating faster data processing and settlement. Additional opportunities would be available with a "smart grid", which encompasses not only AMI but provides additional capabilities and functionality.**
- **Evaluate alternatives for and deploy communications to customers on congestion in their area. Customers notified by various means about daily prices and price spikes achieve better responses and are more satisfied with the programs. Both in re-regulated electricity markets and traditional utility territories, multiple notification channels (such as toll-free numbers, pagers, cell phones, and the Internet) increase success rates of RTP programs. Customers' use of programmable communicating thermostats and other automated energy management devices is important for easier response to these rates. We envision that these capabilities and signals would be provided by utilities or CSPs, based on the deployment of rate options that allowed customers to benefit from their response actions taken.**
- **Implement strengthened building codes for all new and retrofitted building, requiring installation of load management/demand response equipment and controls as well as energy efficiency design features.**
- **Evaluate and act on the need for additional SCC staffing to implement the recommendation of this report.**

Recommendations to Address Fragmentation in the Industry and Government Regulatory Oversight

- **Include CSPs' participation in appropriate stakeholder processes of the SCC that impact on demand response within the state. Demand response programs are being designed and deployed by a combination of PJM and**

local utilities. A new aspect of this environment is the emergence of the CSP as agents to deploy these wholesale programs. The CSPs may be deploying a utility retail program or a PJM wholesale program and may become a point of contact with certain consumers. (Immediate)

- **Establish a process within the SCC for ruling on conflicts involving utilities, CSPs or end use customers that believe the rules or policies of PJM and the utilities are adversely and unfairly impacting their ability to participate in these programs.**
- **Establish policies, supported by legislation where appropriate, that provide consistency and reasonable long-term certainty for programs to allow customers to make effective return on investment decisions. Allow the utilities to contract with CSPs under agreements with sufficient term lengths (10 years or more) to eradicate biases that exist for conventional generation.**

Recommendations to Address Lack of Standards

- **Establish a workgroup of stakeholders to develop, through a collaborative effort, standard rate designs (not the actual amount but the structure) that all utilities would be encouraged to offer as optional rate designs. We envision as few different structures as possible, recognizing that there are clear differences between customer classes. At least one rate within each class should be designed to accommodate customers willing to participate in dispatchable real-time or near-real time programs. A set of standard rates allows statewide education to consumers. It provides consistency to which enabling technology manufacturers can design. It also lowers marketing cost of utilities and CSPs in promoting specific programs because of the increased knowledge of consumers of the underlying principles and the dispelling of commonly held misconceptions.**
- **Establish policies that would encourage utilization of customer-owned generation, consistent with air quality goals, and simplify the process of using that source for critical peak demand response. There are significant levels of MWs available from this resource. As CSPs and utilities begin to market emergency and capacity programs to customers having such generation resources, it is important to be able to evaluate on the spot whether a specific prospect's resource fits whatever rules will apply. CSPs and utilities will be performing an engineering analysis of every prospect's facilities and should not have to go through a DEQ permitting process for every single analysis. Customers may be intimidated from pursuing this resource just to avoid such a process. The FERC has already established interconnection and net metering procedures for distributed generation. Virginia State agencies, including the Department of Environmental Quality, can decide what types of distributed generation it wishes to include under "demand response" for the purpose of meeting targets for peak reduction (MW), For instance, it may want to include or exclude based on size, operating hours limits, fuel type, or size relative to load "behind-the-fence". It is expected that the involved agencies would consider the Ozone Transport Com- mission's Memorandum of Understanding on the High Electric Demand Day Initiative, which is designed to reduce the use of backup generation with high emissions during peak demand periods. The agencies also may want to establish some other**

pre-defined limitations. The end result should be the ability to pre-approve situations that meet the rules established for this purpose.

- **Provide sufficient flexibility to avoid the difficulties of implementing a "one-size-fits-all" approach to DR, such as treating a small apartment with one window A/C as being in the same class as a 5,000 square foot home with five A/C zones.**
- **The new market for DR products and services is likely to attract individuals and companies that fail to meet appropriate standards for ethics and performance. If a determination is made that CSPs can directly market certain PJM DR programs to retail customers, the SCC should consider licensing those CSPs similar to the process used for Competitive Service Providers in the Rules Governing Retail Access to Competitive Energy Services. As was the case for the initial licensing rules, the purpose is not to obstruct participation but to provide a means for the SCC to assess qualifications and to track complaints back to the offending company.**

Recommendations to Address Lack of Consideration of Societal Benefits

- **The Virginia Energy Plan recommends that societal benefits be considered in the valuation of DR. Existing legislation is inconsistent with this view. We recommend a proceeding, with participation by all stakeholders, to reevaluate this policy. (**Immediate**)**

Recommendations to Address Concern About the Potential Economic and Operational Impact of Demand Response on Industrial Customers

- **Allocations of cost for consumer education programs and other DR incentives should consider that electricity is a major business expense in Virginia and an important factor in location, expansion, and relocation decisions, while also recognizing that larger facilities are actually likely to be the primary initial benefactor of DR programs.**

Recommendations to Address Consumer Education and Usage Issues

- **Implement the Consumer Education Program recommended by the Information Subgroup. (**Immediate**)**
- **Promote participation in DR by all state-owned government buildings and facilities, encouraging use of the recently awarded contract for these and other energy efficiency services.**
- **When developing the Consumer Education Program, focus initial efforts on those areas that should have the largest and quickest payback, including the rapidly growing commercial sector.**

Recommendations to Address Rate Design

- **Evaluate the design of existing time-of-use rates to consider changes that would increase their effectiveness in reducing demand and their acceptance by consumers.**
- **The SCC should consider the potential cost impact of new rate designs on non-participants to determine if additional measures of protection for these customers are appropriate.**
- **Because of the immediate opportunity and urgency, most of the discussion focuses on the summer peak demand. However, all forecasts indicate that Virginia's winter peak is growing faster than the summer peak. High winter peaks can be as difficult to deal with as high summer peaks. Generation and delivery equipment ratings are typically slightly higher in the winter, but the public health and safety issues associated with supply scarcity or outages can be more serious than during the summer. To avoid capacity problems in the winter, programs would need to be designed to control space heating and water heating -- the primary drivers of winter peaks.**

Impacts of Peak Demand Management

Introduction

The objective of this section is to discuss potential peak demand impacts resulting from DR programs. With the revival of DR programs over the past several years, there is quite a bit of research available from the Federal government, states with successful program and others, which could be used to prepare such an estimate. However, to create an estimate with a high level of confidence, it is essential to start with a baseline reflecting the factors that drive the current energy use patterns in Virginia. At a minimum, this would include the number and type of customers, saturation of electric end-use equipment and systems, and the expected evolution of these in the future. Customer and end-use load shapes and peak demand patterns would make the task much easier.

The legislation also asked that the recommended programs be cost-effective. The team had neither the data nor the resources to reach a conclusion on this matter. Unfortunately, there is no generally accepted methodology that can monetize ALL benefits and costs of DR. In the sections below, we provide illustrative examples of benefits and costs and discuss the issues involved in monetizing them.

However, notwithstanding current data limitations, the qualitative information assembled as part of this Subgroup's effort, recent national studies conducted by the DOE and others, and successful programs implemented by leading states provide a strong argument for proceeding with peak demand reduction efforts on an expeditious basis in Virginia.

Given this body of work, a decision on a DR portfolio can be made. For example, methods like Integrated Resource Planning can help quantify the cost of DR compared to generation, transmission or distribution investment. In addition, impact on wholesale costs, which represent about one-half of the retail rates, can be estimated fairly readily by the regional transmission organization.

Published Estimates of Peak Demand Reduction Potential in Virginia

The team found two published estimates of Virginia's demand reduction potential: one prepared by Summit Blue Consulting, the other in the 2007 Virginia Energy Plan.

- **In a May 2007 report, Summit Blue Consulting states that:**

  "a well-designed portfolio of DSM program offerings including both energy efficiency and demand response strategies could cost effectively reduce the Commonwealth's peak demand by approximately 5,000 MW and its energy consumption forecasts by 7,800 GWh over a ten-year planning horizon. These estimates represent nearly 17% of the Commonwealth's projected 2007 peak demand and nearly 10% of the Commonwealth's projected 2007 energy use. The estimates are well within the ranges presented in evaluations of DSM potential in other jurisdictions, and are likely conservative in that only basic DSM strategies were considered." [125]

Of the 17% demand reduction, Summit Blue attributes about 7.5% to cost-effective demand response programs.

- **The 2007 Virginia Energy Plan estimates that conservation and efficiency programs could reduce the projected 2016 peak demand by about 14%,[126] which would be equivalent to almost 17% of the 2006 peak demand.**

Unfortunately, neither report provides any quantitative information on the assumptions that led to their estimates.

The team did not have access to sufficient data or resources to develop a credible estimate of a feasible peak demand reduction or even whether such a reduction could be implemented within the time frame of the estimate. As recommended in Section 5 above, the Commonwealth should undertake and complete a study on an urgent basis to develop defensible demand reduction targets.

However, a lot of experience with DR programs has been accumulated over several decades that should be relied on by the SCC to expeditiously accomplish this objective. Some of the readily available data is presented below.

DR Reduction of End-Use Loads

In order to obtain an estimate of a system-level demand impact, it is necessary to understand the composition of the baseline demand. In simplified terms, the process then involves the following steps:

- **Obtain/model end-use load shapes by customer segment**
- **Identify controllable end-use loads by segment**
- **Select technology for control and M&V**
- **Establish control strategy**
- **Estimate individual end-use load reductions**
- **Estimate total reductions and adjust for technology constraints**

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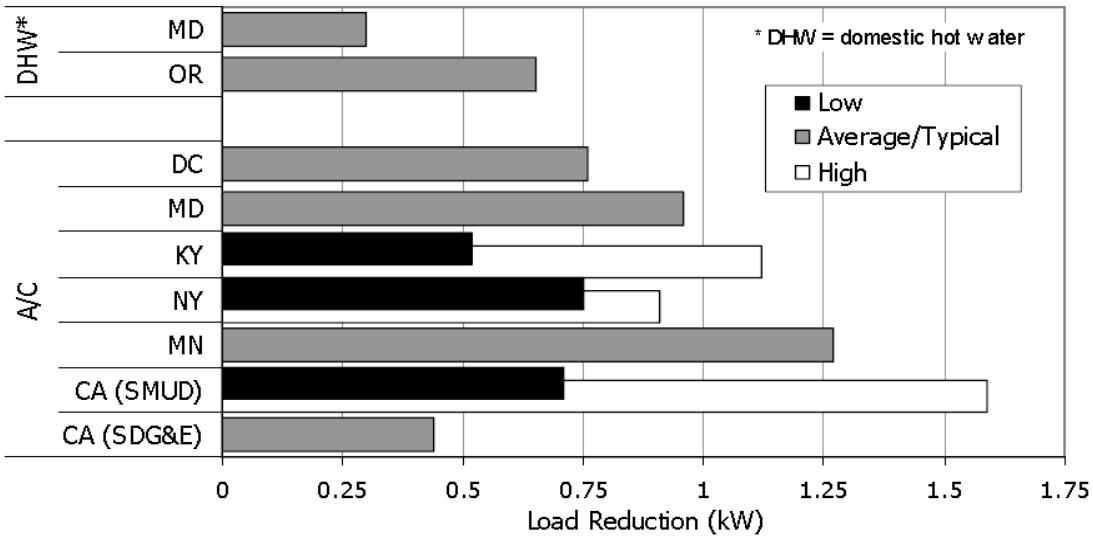
[125] Summit Blue, *Conservation and Demand Response Opportunities in Virginia*, prepared for the Piedmont Environmental Council, May 2007. http://www.pecva.org/_downloads/longterm/Summit_Blue_Report.pdf

[126] State of Virginia. *The Virginia Energy Plan 2007*, Sept. 2007. See Table 2-4, page 40. http://www.governor.virginia.gov/TempContent/2007_VA_Energy_Plan-Full_Document.pdf

This section presents illustrative examples of data that is available to conduct the analysis of demand impacts.

Data from a number of residential programs was summarized in a recent DOE report[127] (see Figure 0 below, along with the explanation reproduced from the report).

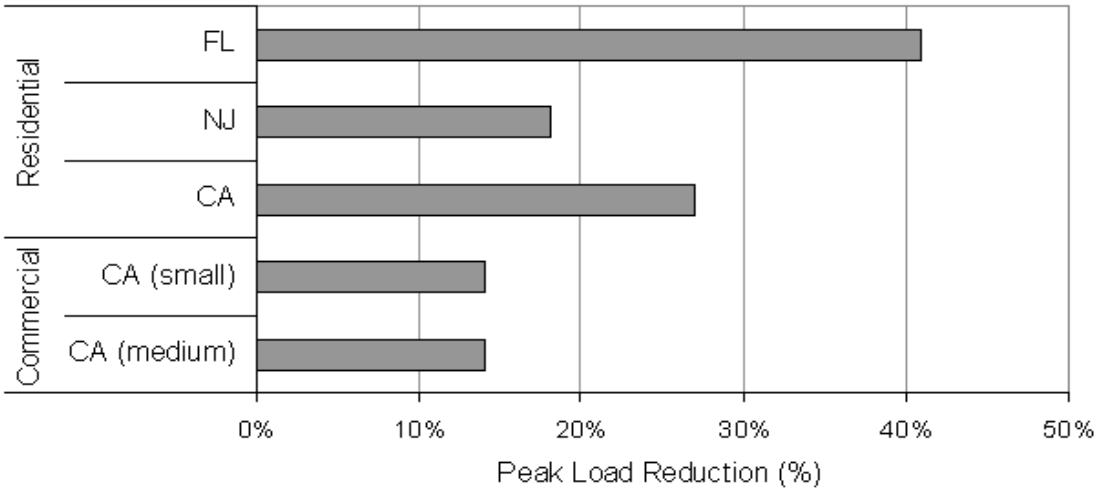


- **Estimated load impacts from residential DLC programs**

> "Figure [0] summarizes reported load reduction estimates for large groups of customers with water heating load controls and various types of control strategies for air conditioning equipment (e.g., cycling the device on and off at a specified time interval, shutting the device off for a period of time, or resetting a thermostat set point. Residential water heating control programs have typically yielded load reductions in the range of 0.3 to 0.6 kW per house; the magnitude and timing of the load impact depends on household and equipment size, ground water temperature and household usage patterns. DLC programs targeting residential air conditioning (A/C) have reported load reductions ranging from approximately 0.4 to 1.5 kW per customer over the course of an event. The magnitude of the load reduction per customer can strongly depend on climate, the control strategy deployed (e.g. 100% shed, duty cycling, thermostat reset) and the customer's air conditioning usage levels absent load control. This is illustrated in Figure [0] by several studies that reported low and high load reduction values based on testing different cycling strategies at various temperature levels".

The same report also provides California data on commercial sector impacts, see Figure 0 below.[128]

[127] U.S. DOE, Benefits of Demand Response in Electricity Markets and Recommendations for Achieving Them, February 2006. Fig. 4-2, p. 34. http://www.oe.energy.gov/DocumentsandMedia/congress_1252d.pdf
[128] Ibid, Figure 4-3, p. 35

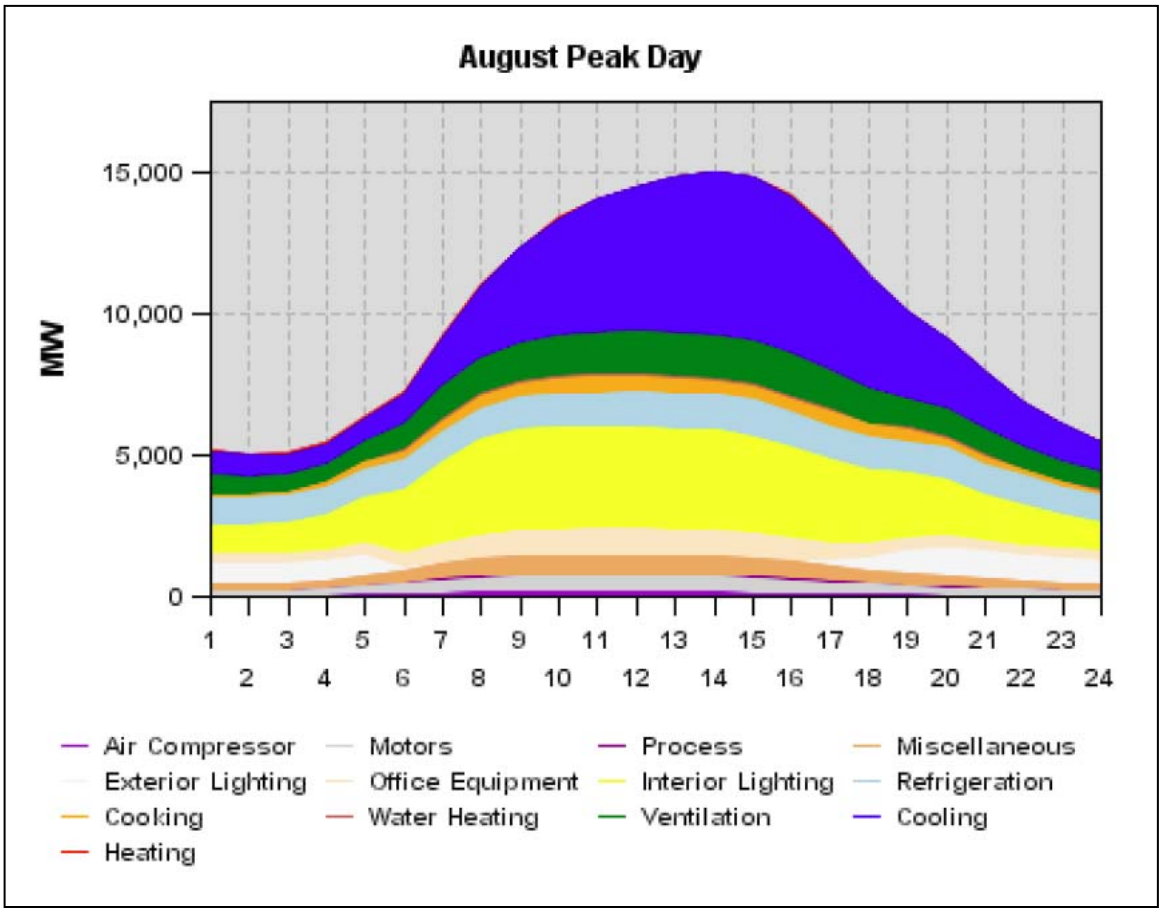


- **Response to Critical Peak Pricing and DR enabling technologies**

Note, however, that the above data does not include potential DR contributions from other major loads, such as large commercial and industrial, agricultural and municipal pumping – all amenable to reliability dispatch. In fact, as shown in Figures 0 and 0 below, about one-half of the demand resources in place are attributable to these types of loads.

To understand and estimate demand response opportunities, one must understand the composition of the loads that contribute to the peak demand. For example, Figure 0 below shows the composition of the commercial demand during a peak day. The commercial load shape in Virginia would be very similar, except the cooling and refrigeration loads would be higher due to higher humidity (increased latent load) in this region.

As in all regions with high saturation of residential air conditioning, the Virginia summer peak is rather broad. From the load shape, we infer that it is driven primarily by commercial air conditioning and lighting during mid-afternoon (2-4 PM) and residential air conditioning during the early evening hours (5-7 PM). The residential and commercial air conditioning peaks are not coincident; therefore, both need to be addressed to achieve an impact that lasts for the duration of the system peak.



- **End-use load shape for a California commercial building**[129]

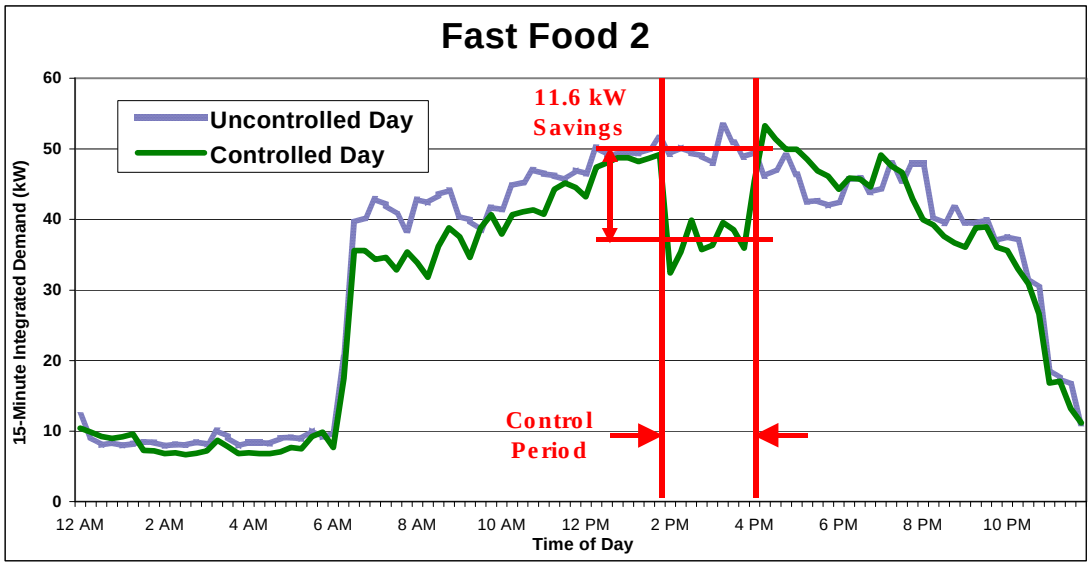
An example of the impact of a load curtailment on an individual establishment is shown in Figure 0 below.[111] It is one of the small commercial establishments monitored in the Southern California Edison territory as part of the CPP pilot.

Equipment controlled in this pilot included:

- **Lighting**
- **Walk-in coolers**
- **Walk-in freezers**
- **Reach-in coolers**
- **Commercial packaged air conditioners**
- **Ice makers**
- **Water heaters**

The control system monitored temperatures for sensitive equipment, releasing the equipment from control if temperatures exceeded designated thresholds.

[129] Reproduced from http://capabilities.itron.com/CeusWeb/Chart.aspx



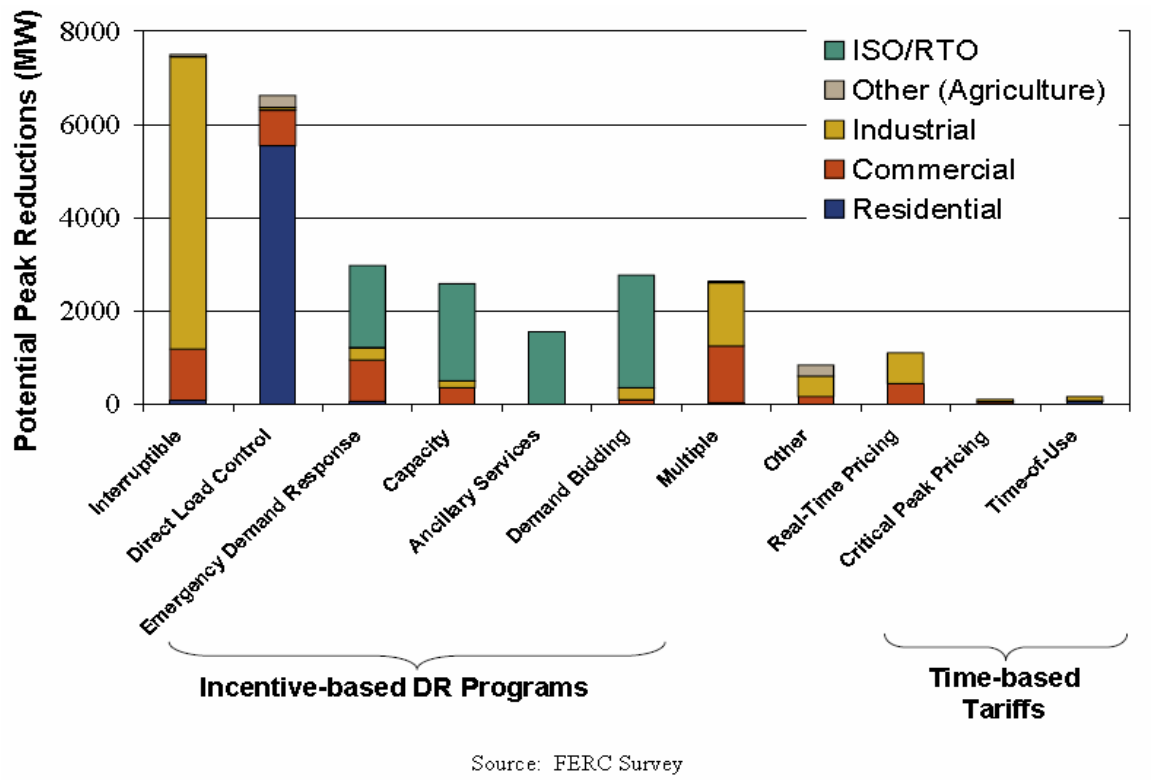
- **DR in a fast food establishment**

This result is particularly interesting, because it is generally assumed that small businesses are very difficult to include in demand response programs. Note also that the "payback" (increase in demand that sometimes occurs after releasing control) is very small.

DR capacity across the US

In 2006, FERC published the results of a demand response and advanced metering survey.[130] One of the results of the survey was an estimate of 37,552 MW in US demand resources available for the 2006 summer peak. Figure 0, reproduced from the report,[131] shows the US peak demand reduction capacity by program type and customer class. The largest contribution comes from industrial interruptible/curtailable programs and residential direct load control programs. On the other hand, time-of-use rates, while available from most utilities, provide the smallest contribution. This is because few residential customers are aware of these rates, and many commercial customers (even though they are on the rate) don't (know how to) respond to the signals the rate provides – a situation similar to that in Virginia.

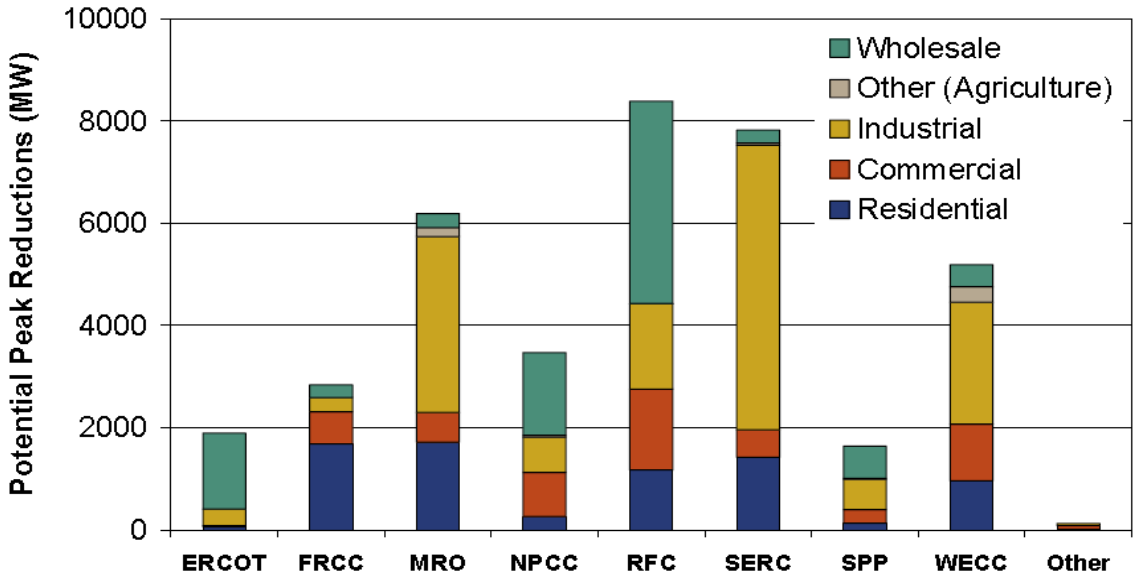
[130] FERC, *Assessment of Demand Response and Advanced Metering*, Aug. 2006. See also http://www.ferc.gov/industries/electric/indus-act/demand-response/charts-graphs.asp
[131] Ibid, Figure V-4, p. 83



- **Resource potential of various types of demand response programs and time-based tariffs**

Figure 0 below, also reproduced from the report,[132] shows the composition of demand resources as well as their impact on the summer peak for each reliability region. (Virginia is included under SERC.) Although the DR capacity is about 4-5% in most cases, MRO reports 20%. As FERC staff explains, the reason for this result is that several states (Minnesota and Iowa) in the MRO region currently have or previously had laws that required utilities to invest a certain percentage of revenues in demand-side management programs (1.5 to 2 percent), which contributed to demand response resource development. Utilities in this region have made significant investments in residential DLC programs, including both air conditioning and water heating programs. Second, utilities in the upper Midwest have historically had favorable rules that allowed load management resources to be counted towards meeting reserve requirements. Third, the characteristics of the customer base in the region, particularly among industrial customers, may be relatively more favorable to demand response resource development (e.g. steel plants and processes that can be interrupted). Utilities in the MRO region report that interruptible/curtailable tariffs are particularly popular among their large industrial customers.

[132] Ibid, Figure V-6, p. 87



	ERCOT	FRCC	MRO	NPCC	RFC	SERC	SPP	WECC	Other
As Percent of Projected Summer 2006 Peak Demand	3%	7%	20%	6%	4%	5%	4%	4%	N/A

Source: FERC Survey
Notes: Other reliability region includes Alaska and Hawaii

- **FERC staff estimate of existing demand response resource contribution**

We have not discussed demand reduction achievable from energy efficiency programs. A good summary of such data can be found in Table 2 of a recent ACEEE report.[133]

DR Benefits

During periods of peak demand, the wholesale price of electricity purchased by Virginia in the regional PJM electricity market has at times reached the price cap of $1,000/MWh (August 2007) – more than 17 times the average price of $57/MWh. Virginia customer participation in demand response (DR) programs could reduce this peak wholesale power cost. Moreover, with aggressive action to reduce peak electricity demand over the next decade, Virginia utilities may be able to save millions of dollars by deferring some of the expensive additions to generation, transmission and distribution resources.

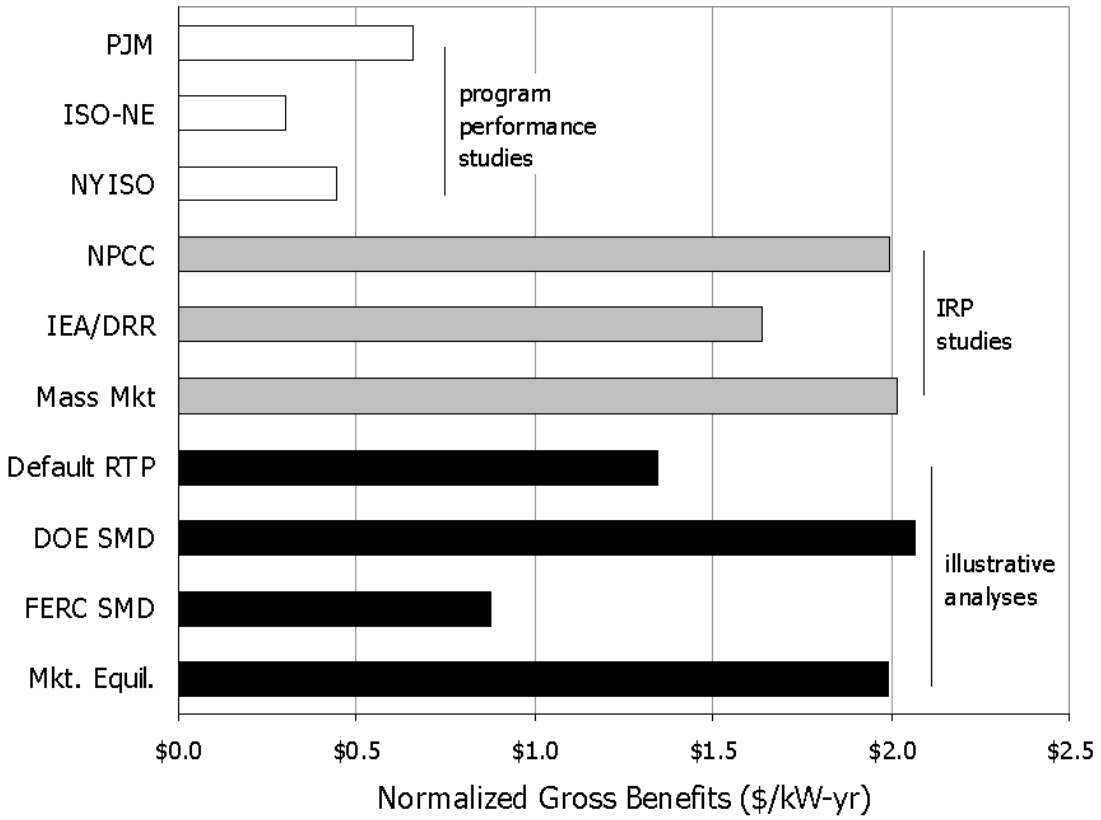
In addition to capacity benefits, peak demand reduction also can improve distribution system efficiency. It is often assumed that most distribution benefits stem from deferral of capacity expansion. In fact, an immediate benefit from peak load reduction is a significant reduction in line losses. This result occurs because on-peak distribution system losses can be in the 12 to 15% range, compared to about 5% on the average.

Estimate of Gross Benefits

There are many different ways to estimate the benefits from a demand response program. Most often, the approach taken includes only the specific types of benefits

[133] ACEEE. Examining the Peak Reduction Impacts of Energy Efficiency, Feb. 2007

the program was designed to achieve. Unintended benefits may not be included in the valuation. The DOE report cited above[127] presents the results (see Fig. 4-4 of the report) of an effort to compare reported benefits on a uniform basis. A gross benefit metric was devised to normalize the study results, incorporating and adjusting for several factors: market size, time horizon, and the assumed level of customer participation in a demand response program or pricing initiative. The result is shown in Figure 0 below. (Note that $/kW shown in the figure are NOT avoided capacity costs, but $/kW of the total system peak.)



- **Normalized Gross Demand Response Benefits: Estimates of Ten Selected Studies**

Benefits estimated from actual program performance appear to be much lower than those estimated in various studies. Apparently this is not due to poor program performance. Rather, much of the discrepancy is due to different valuation methods and different time horizons employed by the analyses.

The benefits range from 50¢ to $2 per peak kW per year. These figures would translate into gross savings to Virginia customers ranging from $16 million to $65 million in 2006 alone![134] This compares to an estimated total 2006 customer cost of electricity in Virginia of over $7 billion.

The Difference between PJM and State/Utility Program Benefits

PJM has incorporated demand response both in reliability and in economic markets.
The programs play an important role in: (1) ensuring reliability during capacity shortages (emergency response programs); and (2) moderating prices by permitting demand response to compete with available

[134] Based on 2007 peak demand estimated in the 2007 Virginia Energy Plan

generation resources (economic programs). The benefits of the PJM programs include reduced wholesale power costs, reduced peak demands and capacity needs, and increased reliability of supply.

A specific example is provided in a recent report, which shows that a 3% reduction in peak demand can result in a 5-8% reduction of wholesale power costs during the 100 to 150 peak price hours[135]. (During the past year, the peak price period prices for Dominion Virginia Power (DOM zone of PJM) ranged from $200 to $1,000 per MWh.) The detailed breakdown of the savings to various stakeholders is shown in Table (ii).

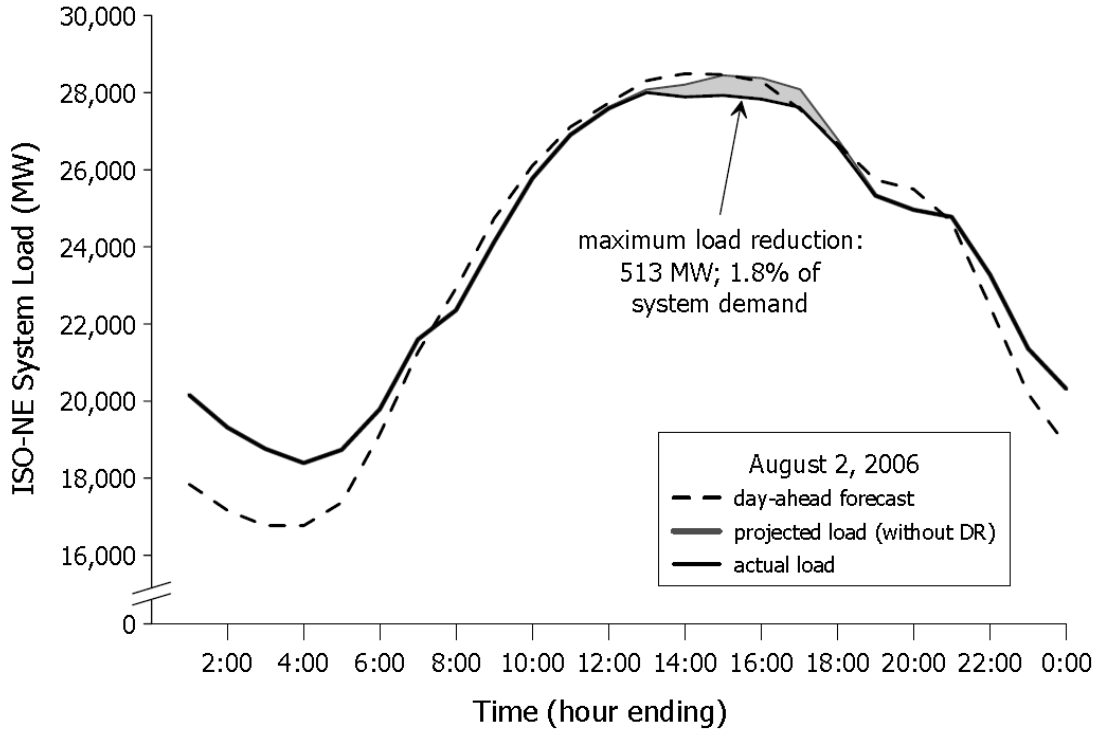
(ii) Annual Benefits from 3% Load Reduction in the top 100 Hours in 5 MADRI[136] Zones

	Quantified Benefits in MADRI States	Quantified Benefits in Other PJM States	Unquantified Benefits	Caveats
Benefits to Non-Curtailed Load	$57-182 Million (energy only) (5-8% price reduction in curtailed hours)	$7-20 Million (energy only) (1-2% price reduction in curtailed hours)	• Capacity price decrease due to reduced demand; • Enhanced competitiveness in energy and capacity markets; • Real-time vs. day-ahead; • Value of reduced volatility; • Insurance against extreme events; • Avoided T&D costs.	• Probably significantly offset in long-run equilibrium as capacity and capacity prices adjust; "long-run" might not be so long. • Load shifting and demand elasticity offest some benefit in short-term.
Energy Benefits to Curtailed Load	$9-26 Million ($85-234/MWh price reduction in curtailed hours)	n/a	n/a	• Based on simplifying assumptions regarding the value of load that is curtailed.
Capacity Benefits to Curtailed Load	$73 Million (assuming $58/kW-Yr)	n/a	n/a	• Based on generic long-run cost of avoided capacity; • Ignores costs of equipment and DR program administration.
Total Annual Benefits	$138-281 Million	$7-20 Million	• Additional benefits to non-curtailed load could be large.	• Includes both the solid economic efficiency gains to curtailed load and the less robust benefits to non-curtailed loads.

Figure 0 below provides an example of how demand response can be dispatched to reduce the system peak. The figure shows the impact on ISO-NE load shape due to a reliability DR program.

[135] Brattle Group, *Quantifying Demand Response Benefits in PJM*, January 2007. http://www.energetics.com/madri/pdfs/BrattleGroupReport.pd

[136] Mid-Atlantic Distributed Resources Initiative (MADRI) was established in 2004 by the public utility commissions of Delaware, the District of Columbia, Maryland, New Jersey and Pennsylvania, along with the U.S. DOE, U.S. EPA, FERC, and PJM.



Source: www.iso-ne.com, Yoshimura and Corcoran (2007)

- **Impact of Reliability DR Programs on ISO-NE System Load[137]**

Although PJM has DR programs in place to ensure reliable grid operations, the PJM program does not provide an appropriate incentive to defer expensive additions of future generating, transmission, and distribution capacity. Because PJM cannot assure the availability of cost-effective future supply for Virginia, State and/or utility programs are needed to focus on the reduction of future peak demand growth and the attendant Virginia capacity needs. The 2007 Virginia Energy Plan estimates that absent any substantial effort to control the growth of the peak, an additional 5,100 MW of supply may be needed over the next decade. Currently, Virginia has only modest programs and related rate designs in place on the retail side.

Estimating Program Cost-Effectiveness

The cost/benefit measures used by the regulators in the past have been developed for energy efficiency programs and they do not account for the time-varying benefits of peak demand reduction programs. In addition, the current valuation framework does not capture the full range of DR costs and benefits and many other factors associated with implementation of DR in a deregulated environment. These include the inherent flexibility of DR, which manifests itself in a broad range of DR strategies and program options, the additional benefits that result from DR, the advent of new DR enabling technologies, and the presence of multiple stakeholders. While there are significant efforts aimed at its development, there is no acceptable methodology available today that can fully value DR.

Such a methodology has to be capable of taking into account the many different stakeholders and the value from their perspectives. For example:

[137] Reproduced from LBL, The Summer of 2006: A Milestone in the Ongoing Maturation of Demand Response, LBNL-62754, May 2007, Fig. 1. http://eetd.lbl.gov/ea/EMS/EMS_pubs.htm

- Participating customer value factors: e.g., financial (direct and indirect), comfort and convenience, transaction cost, service quality, product quality, and derived services [depending on the approach, these may include consumption data from energy management systems (EMS), equipment performance monitoring and diagnostics, web access, etc.]
- Non-participating customer value factors: financial (through rates), avoidance of blackouts or brownouts)
- Utility (distribution company) value factors, e.g., implementation costs,[138] revenue impacts; reserve requirements; timing, location, and persistence of impacts (including long-term resource impacts and/or forward curve); wholesale cost/ risk management; and distribution system costs, data, and controllability
- Power System/Transmission Grid value factors, e.g.,, as emergency control, flexibility in shaping the response, risk management, impact on merchant power suppliers, price stability, resource "equivalency"
- Environmental factors, e.g., impact on criteria pollutants and GHGs.

These factors are summarized in Table (iii) below.

Many of these factors require development of a brand new metric. Past practice has placed emphasis on cost of service methodologies. Today, markets and reliability are the focus of the new thinking, and tomorrow an approach based on measuring consumer surplus and producer surplus may be desired. Examples of more difficult tangible and intangible valuation issues include customer flow-down benefits derived from any technology installed in conjunction with DR; value of information generated as part of the DR process; avoided costs of brownouts or blackouts; and value of flexibility and risk management. The eventual framework will have to be able to accommodate all of these factors and include a capability to reflect the current and future range of technology portfolios, capabilities, and associated impacts.

(iii) How DR Values and Costs Might be Allocated

Perspectives	Customer	Utility	Power System	Environment
Derived Value	• Financial incentives • Reduced energy bills • Higher product quality • Better control • Better information • Improved comfort and productivity	• Avoided capacity costs • Avoided energy costs • Load information • Enhanced customer service • Reduced billing costs	• System reliability • Price stabilization • Avoided system expansion • Risk management • Market power mitigation	• Avoided criteria pollutants • Avoided GHGs

[138] Program marketing costs are often neglected or underestimated; in fact, even at a 10% penetration they can far exceed any equipment, installation, or incentive costs.

Perspectives	Customer	Utility	Power System	Environment
Potential Cost	• System automation • Labor • Loss of comfort • Loss of productivity	• Incentive payments • Lost revenues • Infrastructure development • Administration • Increased billing costs	• Incentive payments • Infrastructure development • Administration	• Increased emissions

Selected Reference Materials

- **ACEEE. Examining the Peak Reduction Impacts of Energy Efficiency, ACEEE report U072. Feb. 2007**
- **ACEEE. Exploring the Relationship between Demand Response and Energy Efficiency, ACEEE report U052, March 2005.**
- **Brattle Group and UtiliPoint, Rethinking Rate Design: A survey of leading issues in California, prepared for DRRC, Draft, May 2007**
- **Brattle Group, California's Next Generation Of Load Management Standards, prepared for CEC, Draft, May 2007**
- **Brattle Group. Quantifying Demand Response Benefits in PJM. Prepared for PJM Interconnection, LLC and the Mid-Atlantic Distributed Resources Initiative, January 29, 2007. http://www.energetics.com/madri/pdfs/BrattleGroupReport.pdf**
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Please note that comments of Brickfield, Burchette, Ritts and Stone, PC, were submitted after the completion of the above report and appear as an Appendix to the report of Subgroup 3, found at:
http://www.scc.virginia.gov/division/eaf/conserve/sub/repts.htm .

Subgroup 4 Final Report:

FINANCIAL CONSIDERATIONS

Table of Contents

1. ***Preamble***

2. ***Review of SCC authority***

3. **Rate Structure and Rate Design Issues**

4. **Incentives for Customers**

5. **Incentives for Utilities**

6. **Public Benefits Fund**

Attachment 1

1. Preamble

The focus topics for Subgroup #4 - Financial considerations outlined in SCC Staff's August 3, 2007 communication included the following: regulatory/market incentives for utilities and market providers, customer incentives and rebates, utility revenue decoupling, public benefits funds and carve out for existing participants. Staff also requested that each of the subgroups develop a list of actions or programs categorized by those that may occur immediately, in the short term, mid-term, and long-term as well as those having zero or minimal costs to those reflecting higher costs to implement.

This report is designed to be a fairly accurate portrayal of the Subgroup's discussions and joint findings on the topics outlined above, but should not be considered to be a consensus document. A concerted effort was made to prepare a report which will be helpful to Staff as they draft their report for the General Assembly. Staff is advised that individual organization positions are better reflected in their official comments filed in Case No. PUE-2007-00049.

2. Review of SCC authority with respect to cost recovery and implementation of energy efficiency programs

Attachment 1 to this report includes the relevant sections of the Virginia Code and SCC regulations which bear upon the SCC's existing authority with respect to Cost Recovery and financial impacts of EE/DSM programs implemented in Virginia. Following study and discussion among Working Group 4 participants, and without attempting a legal analysis, we offer the following observations and suggestions.

1. The SCC should provide guidance on its authority under existing law over conservation, efficiency and demand side/load management (EE/DSM) programs which could be implemented by electric utilities pursuant to SCC approval or direction. The SCC should also state its position with respect to programs which should be implemented by it, by other state or local governing bodies, or by other entities which are generally associated with providing products in open and competitive markets. Most importantly, the Commission should provide direction and guidance on how it expects to carry out its authority and responsibilities with respect to full cost recovery and other regulatory treatment of EE/DSM programs consistent with current statutes. Such guidance will provide important information to utilities, consumers and stakeholders, as well as to the legislature and other policy making bodies.

2. The SCC's basic authority over rates of public utilities including the "power to fix and order substituted therefore such rate or rates, tolls, charges or schedules as shall be just and reasonable" was established by the Virginia Legislature in 1919 and codified at 56-235. In 1976 the legislature enacted an amendment to such section providing as follows:

> "56-235.1 Conservation of energy and capital resources
> It shall be the duty of the Commission to investigate from time to time the acts, practices, rates or charges of public utilities so as to determine whether such acts, practices, rates or charges are reasonably calculated to promote the maximum effective conservation and use of energy and capital resources used by public utilities in rendering utility service. Where the Commission finds that the public interest would be served, it may order any public utility to eliminate, alter or adopt a substitute or any act, practice, rate or charge which is not reasonably calculated to promote the maximum effective conservation and use of energy and capital resources used by public utilities in providing utility service and it may further provide for the dissemination of information to the public, either through the Commission staff or through a public utility, in order to promote public understanding and cooperation in achieving effective conservation of such resources; provided, however, that nothing in this section shall be construed to

authorize the adoption of any rate or charge which is clearly not cost-based or which is in the nature of a penalty for otherwise permissible use of utility services."

While the language of this section is very broad in terms of the Commission's ability to act with respect to conservation measures of electric utilities, it does not appear that the SCC has construed its authority pursuant to such section nor has any reviewing court. The statutory language appears to confirm that the Commission may have authority to act on its own initiative to require adoption by utilities of measures to promote maximum effective conservation. It would be constructive and useful for the Commission to provide utilities and the public guidance with respect to this question.

In 1977, the Legislature enacted an amendment now codified as 56-235.2. This section concerns just and reasonable rates generally. However, subsection A thereof specifically allows recovery of costs incurred by a utility for "advertisements either required by law or rule or regulation or for advertisements which solely promote the public interest, conservation or more efficient use of energy".

Section 56-235 was further amended in 1996 by a provision now codified as section 56-235-6. This section authorizes utilities to seek and the Commission to approve, or approve with modifications, such measures as the Commission may find to be in the public interest, "a performance-based rate-making methodology for any public utility engaged in the business of furnishing *** electricity service (for the purpose of this section an "electric utility") ***." Such rate-making methodology "shall mean a method of establishing rates and charges that are in the public interest, and that departs in whole or in part from the cost-of-service methodology set forth in 56-235.2."

While the language of this section would appear broad enough to cover performance-based conservation or load management measures, no specific mention is made of such measures in the statutory text, nor is there any apparent intention expressed to depart from the provisions of section 56-235-1 with respect to conservation measures. The SCC's authority under 235.6 appears to be triggered by an application of the utility in question which elects to submit proposals which would depart from traditional cost-of-service methodology. It would be useful for the SCC to provide guidance with respect to the significance of this provision to EE/DSM programs.

3. The SCC has general authority to receive, review and approve, modify or reject particular proposals by individual utilities, including those involving new rate schedules and new services.

4. Utilities may present their own proposals, consistent with state statutes and any applicable SCC direction or guidance, for such programs, whether on a customer class-wide or pilot basis.

5. Discussion of other current statutory provisions or SCC rules appear below in connection with particular subjects.

Comment on Basic Concepts

1. There is wide agreement that a utility should be able to fully recover its costs, including return of and on capital costs and operating costs consistent with current law, through properly designed rate schedules.

2. With respect to cost recovery, costs associated with SCC approved or legislatively mandated EE/DSM programs should be considered on an equal footing with the costs of building, operating and maintaining new supply side options. This may include incentive rates.

3. Under current law, after the termination of rate caps at the end of 2008, a utility will have the right to file for and seek approval for full and contemporaneous recovery of all costs related to SCC approved or legislatively mandated EE/DSM programs based on the test year 2007 levels of those costs. In addition, utilities may seek and the SCC may award lost revenues and/or any other incentives deemed appropriate.

4. The Commission should review its existing general authority, to determine and report on whether and under what terms the Commission, as part of its review and approval of a proposed EE/DSM program, will provide for full contemporaneous cost recovery or whether any periodic under-recovery of costs may be deferred and amortized, along with allowance of appropriate carrying costs on such deferrals, for subsequent recovery in rates.

5. Since the costs associated with general rate case filings are large, there is agreement that it would be useful for the SCC to issue rules or guidance as to the nature of EE/DSM programs which, if any, are considered to be pre-approved in general, and which types of programs are encouraged and the cost recovery policies it intends to follow consistent with current law.

3. Rate Structure and Rate Design Issues

Definitions

For the purpose of these comments, a utility's rate structure is defined as the totality of how customers are billed for utility services and includes rate schedules, charges, fees, rebates and other incentives, allowances, or penalties as contained in the utility's tariff. Rate design refers to the specific fixed and variables charges used to determine customer bills for each rate schedule.

Virginia Base Rate Procedures

There is general consensus that good rate structures and proper rate design are crucial to providing utility customers clear and appropriate price signals. Indeed, in its March 27, 1992 Order in Case No. PUE900070, the SCC stated:

> Rate design is also a powerful tool which can be used to achieve optimal CLM [conservation and load management] objectives. As Staff indicated, it is important to establish appropriate price signal to promote energy efficiency.
>
> A large number of rate design objectives must be balanced in setting rates, and the Virginia Supreme Court has sustained the Commission's determination that "non-cost factors may be considered by the Commission in setting rates for various classes of service…to accomplish legitimate regulatory objectives." Secretary of Defense v. C & P Telephone, 217 Va. 149, 152 (1976).
>
> Clearly then, we have the discretion to consider the impact of rate design on CLM. Rates can reflect costs or drive costs. Example of the latter would include mandatory time of use rates and summer/winter differentials. In designing rates, utilities should consider costs and cost allocation in terms of the market signals sent by the rates. We thus encourage utilities to pursue innovative rate design and continue to improve costing methodologies.[139]

While the SCC recognizes the importance of rate design, the Commission's current rate procedures present a strong disincentive to making changes in existing utility base rate structures and designs. Although utilities may introduce new experimental, voluntary rates outside of a rate case, changes to existing rates must be made in the context of an expedited or general rate case. Thus, utilities typically wait until additional revenue is sought in a rate case before proposing rate structure or design modifications. Until recently, rate design changes were actually prohibited in expedited rate cases.

In addition to formal rules limiting rate structure changes, other practical factors restrain changes in rate design. Even within general or expedited rates cases it is simply easier, and less controversial, to implement

[139] *Ex Parte: In re, Investigation of Conservation and Load Management Programs*., Case No. PUE900070, 1992 S.C.C. Ann. Rept. at 264-265.

across the board rate increases to existing rate structures rather than change those rate structures. Since rate design changes can have different effects upon customers within the same rate class, there is an ongoing concern about customer impact and potential opposition to rate design changes on that basis. Consequently, as long as the existing rate structure recovers revenue requirements adequately, there is little immediate incentive to revise rate design to provide better price signals.

It should be noted that the SCC has generally not imposed rate design mandates on utilities. For example, in its Final Order dated July 18, 2006, in Case No. PUE-2006-00003, Ex Parte: In the matter of considering § 1252 of the Energy Policy Act of 2005, the SCC rejected implementation of a new federal standard that would have required utilities to offer time-of-use rates.

Position for Consideration by SCC Staff

Customers receive most of the information they use to make decisions about energy use through rates and monthly bills. Many consumers will respond to the information contained in rates. However, if the price for energy consumption remains unchanged in spite of changing costs, customers do not have the information, or the incentive, to reduce usage or change their usage pattern. The SCC should review its policies and procedures related to changes in utilities' rate structures and rate design and consider establishing a limited, expedited, and revenue neutral regulatory procedure under which changes can be made to rate structures or rate designs outside of a full general rate case. Such a limited rate proceeding should be available so that rates and rate structures can be reviewed and modified more frequently and more efficiently to assure that customers receive appropriate price signals.

Pros

- A separate, limited rate procedure would provide a framework to focus on rate design as it relates to energy conservation and load management.
- Better price signals would aid efforts to encourage purchases of energy efficient products and appliances and would reinforce any other market incentives.
- Unless underlying prices to consumers are accurate, layering other incentives into the rate structure could be wasteful or counterproductive.
- Changes in rate design may be a more efficient and effective way to mitigate certain issues related to energy conservation, such as revenue erosion, than other options.
- A limited rate proceeding would encourage utilities to propose beneficial rate modifications sooner than they would if they have to wait for a full rate case proceeding. This pro could be mitigated when utilities begin making their biennial filings, during which they could propose rate design changes, under procedures subject to Commission interpretation.
- Major rate design changes could be implemented gradually through a series of limited rate proceedings rather than through one large shift during a full rate case, thus mitigating customer impact.
- A limited rate proceeding would be less costly than a full rate case.
- Interested parties could fully participate in such proceedings.

Cons

- Even if the rate design changes proposed in a limited rate procedure are revenue neutral, certain customers could experience large rate increases.
- A rate proposal that is revenue neutral on a class basis may have broader revenue effects that would not be fully captured in a limited rate design proceeding.
- Rate design changes may have a negative impact on customers, such as low-income families and renters, with limited ability to respond to price signals.
- Some customers may have limited ability to participate in such proceedings.

Virginia Fuel Recovery

The recovery of fuel expenses by utilities in Virginia is set forth in Section 56-249.6 of the Code of Virginia. Typically, the recovery of fuel expenses through a rate charged to customers is addressed in annual fuel proceedings conducted by the Commission for each utility. In such proceedings, a fuel factor is determined on a projected basis and is charged to customers over a twelve month period. Fuel factor revenue is then compared to actual fuel expenses to identify if there has been an over-recovery or under-recovery of fuel expenses actually incurred. The over-recovery or under-recovery, if any, is deferred for future recovery or credit to ratepayers through a prior period portion of the fuel factor. Both the current period portion of the fuel factor and the prior period portion of the fuel factor are priced at an average amount per kWh consumed for all customers. Under this approach, utilities recover the actual fuel costs incurred but do not make any profit or return on fuel.

The electric cooperatives in Virginia adjust their fuel charges monthly and are considering moving to semi-annual adjustments covering winter and summer periods.

Position for Consideration by SCC Staff

As stated earlier in the section on base rate recovery, customers receive most of the information they use to make decisions about energy use through rates and monthly bills. Consumers will respond to the information contained in rates, including the portion of rates that provides utilities with recovery of fuel expenses. Currently, such recovery is through an average charge per kWh which is the same for all classes of customers. There are no differences in recovery based on differences in service characteristics, such as service voltage differences or line losses and the energy generated to account for such line losses. Also, as load changes over time and as generation responds to meet that load, a utility's fuel cost is changing such that the average fuel rate does not represent the appropriate price signal or charge at a given point in time even though it represents the appropriate charge over the course of the entire year. If the price for energy consumption remains unchanged in spite of changing costs, customers do not have the information, or the incentive, to reduce usage or change their usage pattern. The Commission should consider revising the fuel cost recovery mechanism and the allocation of such costs to the customer classes while continuing the policy of providing the utility with recovery of its actual fuel costs. Examples of how this can be accomplished include the development of voltage differentiated fuel factor rates or by time of use rates which include a differentiated fuel component.

Pros

- Better price signals would aid efforts to encourage purchases of energy efficient products and appliances and would reinforce any other market incentives.
- Unless underlying prices to consumers are accurate, layering other incentives into the rate structure could be wasteful or counterproductive.
- Changes in rate design for fuel recovery may be a more efficient and effective way to mitigate certain issues related to energy conservation, such as revenue erosion, than other options.

Cons

- Certain customers could experience large rate increases.
- There may be a negative impact on customers, such as low-income families and renters, with limited ability to respond to price signals.

Revenue Decoupling

Revenue decoupling was viewed by the working group as another form of rate design that could be considered. Revenue decoupling is defined as a ratemaking methodology that separates utility revenues from volume of sales. Revenue decoupling may be enacted to address a variety of issues such as lost sales due to utility energy efficiency programs. Lost revenue recovery may be needed to pay for infrastructure in times of decreasing sales.

Virginia recognized the problems addressed by revenue decoupling in 2007 when amending its regulatory standards for electric utilities. For example, the law provides, as part of the State Corporation Commission's 2009 reviews of investor-owned utility rates, terms, and conditions, that the Commission shall authorize to

increase a utility's rates if it finds that the utility's combined rate of return on common equity is more than 50 basis points below the authorized combined rate of return. Conversely, if the Commission finds that the combined rate of return on common equity is more than 50 basis points.

Additionally, the law provides that eligible investor-owned utilities may, after termination of capped rates, petition the Commission for approval of a rate adjustment to recover the projected and actual costs of providing incentives for effective demand-management, conservation, energy efficiency, and load management programs. These adjustments would, through subsequent biennial reviews, be incorporated into rates.

Virginia law provides that the utility may retain 25% of the margins from the off-system sales and return 75% of such margins to customers through the fuel clause. The Commission, after application, notice and opportunity for hearing may require that a smaller percentage of margins be returned to customers if clear and convincing evidence is provided that it is in the public interest to do so. The portion of margins retained by the Company is an incentive for the Company to maximize such sales in today's complex energy markets, is not to be considered in the biennial review of utility earnings, and would not be returned to customers or counted against any under-earnings in future rate adjustments.[140] Therefore, the portion of this revenue retained by the utility this revenue would not be considered when the Commission determines whether a utility has over or under-earned by more than 50 basis points. Under this arrangement, if energy efficiency and demand-management actions permit additional off system sales to be made, then both customers and the Company would benefit. Given the projected increased demand for power in Virginia and the anticipated continued power deficit situation despite the proposed plans to build additional generation, it is not expected that the Virginia utilities will be able to make significant levels of off system sales anytime soon.

These provisions were enacted in 2007 and therefore have not been implemented or evaluated. Any new efforts on electric rate decoupling may need to be deferred until Virginia has the opportunity to evaluate the effect of these new measures. At this point, a minimum policy requirement would be to remove any disincentives associated with a utility implementing conservation and DSM programs including but not limited to the recognition of the possibility that lost revenue associated with the reduction in sales due to such programs may detrimentally impact the recovery of the utility's fixed costs.

4. Incentives for Customers

Promotional Allowances

In an Order dated March 27, 1992, in Case No. PUE900070, the Virginia State Corporation Commission adopted the current Rules Governing Utility Promotional Allowances. The review and revision of promotional allowance rules was part of a broader investigation related to energy conservation and load management programs. The current promotional allowance rules supersede and were derived from an earlier set of rules, which were aimed at restricting utility activities designed to build load through programs such as appliances sales and special rate discounts. (See Case No. 18796, Final Order dated April 15, 1970.) Changes to the earlier 1970 rules were made specifically to permit promotional allowances for cost effective conservation and load management programs while maintaining restrictions on most other promotional allowances. Left essentially unchanged from the 1970 rules were a series of very strict standards related to promotional allowances.

Position for Consideration by SCC Staff

In the fifteen years since the Commission last reviewed and revised its promotional allowance rules, there has been an increase in the variety and range of energy conservation and load management programs that could be

[140] Section 56-249.6.D.1 of the *Code of Virginia* provides that 100% of fuel factor costs incurred in producing the off-system sales are returned to customers through an adjustment to fuel factor expenses. The total annual margins after fuel factor is split 25% to the utility and 75% to the customer. Net losses from off-system sales cannot be charged to customers. This provides an incentive to the utility to maximize cost-effective off-system sales.

developed and offered by utilities. Potential programs include rebates, special rates or other incentives offered to all customers or to selected customer groups. Consequently, the current promotional allowance program standards may be too restrictive, or otherwise function as a perceived regulatory barrier to viable programs offerings. Of particular concern are certain promotional allowance program standards, listed under 20VAC5-303-40, including:

1. Any utility offering a promotional allowance program shall adhere to the following standards:

> a. The promotional allowance program shall not vary the rates, charges and schedules of the tariff under which service is rendered to the customer.
>
> b. A utility may not, directly or indirectly, offer or grant to a customer any form of promotional allowance except as is uniformly and contemporaneously extended to all customers in the same reasonably defined class.

Further, the current rules provide little guidance as to types of programs that may be acceptable within the rules without requiring prior regulatory approval. Given these circumstances, the Commission should consider reviewing and updating the current promotional allowance rules to reflect changes occurring since 1992.

Pros

- Revisions would clarify what energy conservation and efficiency promotional allowances are permitted.
- Revised rules would reduce costs for proposing promotional allowances programs.

Cons

- Revisions are not needed because the promotional allowance rules provide for a waiver of the rules under 20VAC5-303-50.
- Strict program standards should be maintained to prevent discriminatory programs.

5. Incentives for Utilities

Definition

- A policy requirement, subject to a just and reasonable standard, to provide for the timely recovery of all prudently incurred costs and an appropriate return, related to or caused by the implementation of conservation, DSM, load management and energy efficiency programs ("conservation and DSM") such that utilities will have the incentive to undertake these activities while removing any disincentives associated with a utility implementing such programs.

Prevalence

- Since 1995, the Indiana URC has been allowed to approve incentives "for earnings from prudent investments in both supply-side and demand-side resources." The incentive mechanism may take one of three forms: a share of the net benefit attributable to a demand-side management program, a greater than normal ROE for DSM expenditures or adjustments to the utility's ROE based upon DSM program performance.
- A Kansas statute authorizes electric utilities to earn a premium on investments of up to 200 basis points over otherwise allowed ROE. This is for renewable generation, conservation, or energy efficiency.

- A Montana statute authorizes the PUC to approve ROE premiums of up to 200 basis points for capitalized DR program expenditures.
- On April 28, 2004, the Nevada PUC adopted revised integrated resource planning rules to allow for a 5 percent ROE premium for energy efficiency investments that are deemed "critical."
- Wisconsin allows utilities to earn the same ROR on capitalized DR expenditures as it would earn on generating assets in rate base.
- In North Carolina, the 2007 session of the General Assembly added §62-133.8 to the North Carolina General Statutes titled "Cost recovery for demand side management and energy efficiency measures". §62-133.8(d) allows the Commission to approve an annual rider to recover all reasonable and prudent costs incurred for adoption and implementation of new demand-side management and new energy efficiency measures. Recoverable costs include all capital costs, including cost of capital and depreciation expenses, administrative costs, implementation costs, incentive payments to program participants, and operating costs. The new law goes on to allow electric public utilities to capitalize all or a portion of those costs to the extent that those costs are intended to produce future benefits. Other incentives may also be approved for electric utilities to adopt and implement new demand-side management and energy efficiency measures including rewards based on the sharing of savings achieved by the demand-side management and energy efficiency measures, rewards based on capitalization of a percentage of avoided costs achieved by demand-side management and energy efficiency measures and any other incentives that the Commission determines to be appropriate.
- In Maryland, the Public Service Commission ("Commission") authorized Pepco and Delmarva to implement and recover the costs of their CFL Programs and those portions of the Residential Awareness Campaign necessary to support the programs over a five-year period, with interest expense on unrecovered amounts set at each utility's rate of return. A surcharge is to be set annually based upon the budgeted and actual expenditures through annual filings, subject to Commission approval. Also, in February 2007, the Commission approved BGE's request to create a regulatory asset for costs associated with the Demand Response Pilot Program, estimated by the Company to be $1 million.
- In New Jersey, there are financial incentives to utilities to encourage and promote cost-effective investment in DSM initiatives. Included in these incentives are mechanisms which permit utilities to earn financial returns equivalent to or, in recognition of the potential positive impact on society, greater than, the returns provided on utility owned supply side projects. A deferred accounting mechanism can be used to provide for recovery of actual program costs plus incentives and it also addresses disincentives. The deferred accounting treatment recognizes that fixed cost revenue erosion associated with implementing programs can be detrimental to a utility and provides for its recovery.

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  The basis for the opportunity to earn an incentive is to be through one of the following formats either a shared savings approach or a standard price offer. Under the standard price offer approach. A utility makes an offer in lieu of Shared Savings Programs with the offer determined under the following formula:
    - Avoided Energy Costs plus Avoided Capacity Costs, minus Fixed Cost Revenue Erosion, times 0.5 (which can be adjusted by the Board from time to time)
    - An appropriate discount below the formula that may be applied to reflect the anticipated benefits which would result from a competitive bid.
- In 2001, the Hawaii PUC promulgated guidelines that permitted Hawaiian Electric Company, Hawaiian Electric Light Company, and Maui Electric Company to retain 10 percent of after-tax DR savings. (Note that HECO subsequently entered into an agreement that eliminated such incentives if they would cause the company to exceed its allowed ROE.)

Virginia Statutory Framework

The following incentives are provided to utilities for energy efficiency and demand-management programs. Capital investments are included and accounted for in rate base and then depreciated. The cost, including a rate of return on rate base, is recovered through rates. Prudent expenses are recovered through rates with no incentive.

Revisions to the law in 2007 provide new incentives for energy efficiency and demand-management through three mechanisms, two direct and one indirect. The primary incentive is full cost recovery and removal of barriers to cost recovery treatment which equal to that of supply side options.

Incentives are directly provided for as follows:

Section 56-585.1.A.5.b of the *Code of Virginia* provides for timely and current recovery of projected and actual costs of providing incentives for the design and operation of fair and equitable demand-management, conservation, energy efficiency, and load-management programs. After the expiration or termination of capped rates, utilities may, no more than once in any 12-month period, petition the State Corporation Commission for a rate adjustment clause to recover these costs. The Commission is to approve the rate adjustment clause if it finds such recovery is in the public interest and the need is demonstrated with reasonable certainty. The Commission is to allow the recovery of all such costs it finds are reasonable.

Section 56-585.1.A.4 of the Code of Virginia provides that costs charged to utilities that are associated with FERC-approved demand response programs administered by the regional transmission entity shall be deemed reasonable and prudent and recoverable on a timely and current basis. After the expiration or termination of capped rates, utilities may, no more than once in any 12-month period, petition the State Corporation Commission and the Commission shall approve a rate adjustment clause to recover these costs.

Incentives are provided for indirectly as follows:

Section 56-585.1.A of the *Code of Virginia* provides that the Commission may increase or decrease the formula-based combined rate of return by plus or minus 100 basis points based on the generating plant performance, customer service, and operating efficiency of a utility, as compared to nationally recognized standards. The operating efficiency of a utility's energy efficiency and demand-management programs may be one factor when considering the operational efficiency adjustment.

During the 2007 Legislative session, the House and Senate agreed on HJR686 directing the Commission on Electric Utility Restructuring (CEUR) to review and evaluate a voluntary program to encourage the production of electricity from renewable resources, based primarily on the program currently in place in North Carolina entitled NC GreenPower. The CEUR, at its Sept. 19, 2007 meeting established a sub-committee of the full Commission, to be chaired by Delegate Plum to hold meetings and develop a report on the matter. That sub-committee will hold its first meeting on October 3, 2007 to hear from representatives of NC GreenPower and other stakeholders. This activity is clearly germane to issues related to recovery, most specifically, the issue of voluntary contributions as a form of implementing a public benefits fund concept, and the effectiveness of administration of various programs through an independent third party administrator.

Methodology

- **Capitalization Business Model** - Utilities are paid for undertaking energy efficiency activities by capitalizing and earning a return on energy efficiency costs. The shareholder incentive is based on a capitalization policy (i.e., deferral accounting treatment).

- **Shared savings** - Utilities are paid a share of the net benefits for undertaking energy efficiency efforts. The shareholder incentive is based on a defined share of net benefits measured by an agreed cost-benefit measure. A cost recovery mechanism and way to address the throughput issue may also be used.

- **Performance-Based Ratemaking** - Through a long-lived Performance-Based Regulation (PBR) plan, the utility shares savings arising from implementation of energy efficiency. PBR mechanisms—

tailored to energy efficiency issues—could include multi-year versions of the conventional regulatory incentives.

- **Energy Services** – Energy Efficiency services sold directly to retail customers on a fee-for-service basis, either through the Public Utility or an affiliate.

- **Tariff Rider** – A tariff rider for energy efficiency allows for a periodic rate adjustment to account for the differences between planned costs (included in rates) and actual costs.

- **System Benefits Charge** – A separate charge added to customer bills to collect funds for energy efficiency programs providing a stable stream of funds

- **Bonus Return** - To encourage energy efficiency investments over supply investments, regulators can authorize a return on investment that is slightly higher for energy efficiency investments or offer a bonus return on equity investment for superior performance.

- **Capitalization of a Percentage of Avoided Costs** - Energy efficiency is treated as a resource. The resource is valued at some percentage of the cost of avoided capacity and energy. The portion of avoided cost is deferred, amortized over time and recovered through rates or a rider with a return.

- **Capitalization Business Model – Participant Fund (analogous to SCC Staff's Idea)**
  In contrast to the Capitalization Business Model, there may be programs related to conservation that are not undertaken by utilities but are undertaken directly by utility customers. To provide access to capital for customers desiring to undertake activities that will conserve energy, a Participant Fund could be established. Funding for these customers could be provided from utilities, collections from a public benefit fund ("PBF"), or some combination of both. Initially, the sources from a PBF may be very limited and utility sources may be relied upon. Customers decide to "participate" in EE/DSM after they have conducted their own decision analysis based on resource costs and a marginal cost-based rate design from the utility. Following their individual evaluation of these costs and benefits, customers then choosing to access the Participant Fund will use those funds to finance the installation of material and equipment to achieve a reduction in their consumption.

  - If utilities provide a portion of the funding for the Participant Fund, those contributions could be treated as a regulatory asset in that such contributions would be deferred and guaranteed recovery in the future with a return on the unamortized balance (comparable to rate base treatment for assets). The direct recovery of the funds, including the return, would be through charges on the electric bills to those specific customers accessing (borrowing from) the Participant Fund. Those same participating customers while seeing a charge on their bill as a "participant" to recover the amortized cost of repaying the Participant Fund would also receive the direct bill savings resulting from participation in EE/DSM and the reduction in energy consumption that results.

  - The Participant Fund would replenish itself as participating customers repay the fund on their monthly bills providing an on-going source of funds for other customers to participate in EE/DSM.

  - Finally, there would be no rate impact upon non-participants resulting from some allocation of the recovery of utility's contributions to the Participant Fund. However, such customers would experience the benefit that reductions in demand have on the need for future generation capacity and its associated cost.

Pros

- Makes investments in EE and DSM as financially attractive as traditional supply-side investments

- Promotes investment in all cost-effective EE and DSM programs.

- Utilities are financially motivated to design efficient cost effective programs.

- Both Utilities and Commissions agree that there is a need for incentives to provide a bonus to stimulate DSM, to get utility management to focus on DSM, and to overcome the lost revenue problem.

- In some areas of the country capitalizing energy efficiency is the only way to deal with transitional rate effects and can provide a match over time between the costs and benefits of the efficiency investments.

Cons

- A utility may be rewarded for spending money on a program that has not proven to produce the desired result.

- Many programs have failed to achieve the significant electricity savings and high degree of participation needed to make DSM the true equal of new generating units and other supply-side options in meeting customer energy needs.

- Incentives could distort rates unnecessarily as utilities are already under some obligation to invest in cost-effective efficiency measures as a means of minimizing rates whether or not they are as profitable for shareholders as new generating plants.

- There are features in the legislation which can provide incentives thereby negating the need for additional incentives.

- Some efficiency programs can meet short term rate-oriented cost-effectiveness tests if costs are capitalized. However, if the choice is made to capitalize, the regulator still has to decide the appropriate amortization period for program costs.

- Some argue that capitalizing energy efficiency is too costly and that rate effects from expensing are modest.

Position for Consideration by SCC Staff

- There should be full and timely cost recovery of, and an appropriate return on, capital investment in rate base along with full and timely recovery of expenses to implement and operate conservation and DSM programs.

- Expenses allowable for recovery should include but not be limited to operations and maintenance expenses, general and administrative expenses and advertising, promotional and education expenses. In addition, if funding of a non-utility third party administrator or public benefit fund is determined by policy and regulation to be collected as part of a utility's cost of service, then such expense should be granted full recovery based on actual payments to the administrator or fund.

- Incentive treatment for the recovery of expenses (excluding non-utility third party administration or public benefit funds) is an appropriate policy to implement for utilities seeking to undertake conservation and DSM programs. An incentive based policy would establish the up front understanding that cost associated with programs approved by the Commission for implementation

would be fully recovered. Among such incentive treatment options may be an approach that provides for deferred accounting treatment of prudent and reasonable expenses for Commission-approved programs. As an incentive, such expenses that have been incurred could have an appropriate carrying charge applied to the unamortized balance of the deferred account.

- Investments in conservation and DSM and investments in generation supply should be treated on a comparable basis in terms of the opportunity to earn a fair return consistent with current statutory provisions for establishing general rate of return on a utility's rate base. Section 56-585.1.A.6 of the Code of Virginia provides for basis points to be added to the utility's general rate of return to provide for an enhanced rate of return on common equity for specific types of generation facilities. A similar incentive for investment in rate base for conservation and DSM programs should be applied and would provide comparable treatment for recovery from supply side and demand side options

Virginia Energy Plan Assessment

A preliminary analysis completed for the Virginia Energy Plan looked at studies of achievable, cost-effective electrical efficiency in other states to estimate the potential in Virginia. Based on this analysis, the Plan concludes that the goal of reducing electric use by 10% of 2006 consumption by 2022 can be cost-effectively achieved. The Plan also recognizes that actions are needed for both energy efficiency and demand management. Some measures will provide for both results, while other measures only result in efficiency or demand management savings.

The Virginia Energy Plan estimated that, based on all retail sales in Virginia, utilities would have to invest from $100 to $120 million per year on average for energy efficiency and demand management programs. This would have to be matched by consumer investments of between $180 and $200 million per year. These investments would result in a net savings (after utility and consumer costs) of between $15 and $50 million per year on average between 2008 and 2022.[141]

6. Public Benefits Fund

This issue proved to be the most controversial for Subgroup 4 and therefore may need targeted study by SCC Staff. Individual organization filed comments should be referenced to gain an appreciation for member's views on this topic as this text does not represent a consensus opinion.

Definition

- Public Benefit Funds (PBF) are referred to by many names, including system benefit funds, system benefit charges and public goods funds.
- A PBF is a collection of money by utilities from customers to foster energy efficiency and conservation goals established in the state.
- Most commonly, utilities are used as conduits to collect the money from their customers and then pass it on to the state or their specified agency to fund Energy Efficiency (EE) programs. However, a PBF may also be used to collect funds for utility operated programs.

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[3] Analysis for the Virginia Energy Plan assumed that the cost of energy efficiency measures equals 3 cents per lifetime kilowatt hour saved, based on cost estimates from the National Action Plan for Energy Efficiency and American Council for an Energy Efficient Economy. Energy efficiency measures were assumed to have a 4-year payback and a 12-year life on average. The analysis for the Plan assumed that 25% of the savings would accrue without public incentives, and that the remaining savings would require a 50% incentive level. This incentive level is based upon experience of electric efficiency programs in other states. Savings are projected using Virginia 2005 electric costs adjusted based on the Energy Information Administration's projection of future electric costs. Savings total to an average of $50 million per year if it is assumed that the full retail cost of electricity is saved. If the amount of savings is reduced to account for continued recovery of distribution system costs, then savings are reduced to an average of $15 million per year.

Prevalence

- In an April 2004 American Council for an Energy-Efficient Economy (ACEEE) conducted a study entitled *"Five Years In: An examination of the First Half-Decade of Public Benefits Energy Efficiency Policies"* (by Martin Kushler, Dan York, and Patti White; Report Number U041). The report identified approximately 20 states that either required or encouraged PBF EE programs in their legislation or regulatory orders. Eighteen of those states currently have such programs in operation. The 18 states consisted of Arizona, California, Connecticut, Illinois, Maine, Massachusetts, Michigan, Montana, Nevada, New Hampshire, New Jersey, New York, Ohio, Oregon, Rhode Island, Texas, Vermont, and Wisconsin.
- Most of these states with EE PBF are currently under some form of a restructured regulatory environment. Another common thread is that these are mostly relatively high-utility price states (with noted exceptions being Michigan and Ohio) with tight supply-demand situations.
- The study also identified other states where PBF were also used for renewables, low income customer weatherization (a specific type of EE), and uncollectible accounts receivable.

Methodology

- The most common PBF approach is for the utility to charge customers a non-bypassable per KWH charge on the electric distribution rates. Twelve of the eighteen states used this method of collection. The remaining six states used some other approach, such as embedding the charge in base rates, or charging some type of flat monthly fee.
- The PBF is generally collected from all customer classes. In some instances, certain customer classes seek to be exempted from the fee. Industrial customers are often capable of achieving this exemption. Industrial customers often use the rationale that they should be able to opt-out of the PBF on the basis that they have individually implemented sufficient EE measures regarding their own operations such that they should not be required to fund other competitors or other customer classes.
- Issues related to competitive impact may be mitigated through placing caps on the monthly kWh used by any single customer that would be subject to the PBF fee.
- Another consideration in Virginia is that rates for certain customers (the Commonwealth, local governments, the federal government) are not subject to the jurisdiction of the SCC but instead are set based on contracts between utilities and these non-jurisdictional customers.

Funding Levels

- The magnitude of the funding levels for the 18 states identified in the ACEEE study ranged from .03 to 3 mills per kWh. The median value was just over 1.1 mills per kWh.
- Total funding in Virginia would be subject to the amount of the fee and whether the fee covered all jurisdictional and non-jurisdictional consumers. If it is assumed that 10 percent of total electric consumption is from non-jurisdictional customers, then a PBF fee of 1 mill per kWh would result in collections of approximately $100 million based on 2006 jurisdictional customer consumption.

Pros

- Limits conflicts of interest of utilities (impact of reduced sales on earnings)
- Lower administrative costs (avoids duplication of utility administrative efforts)
- Consistency in branding among state residents
- Economies of scale (for statewide efforts)
- Utilities do not have to increase their work force to support utility-sponsored programs
- Ease of administration
- Flexible programs can be designed to target specific goals.
- Can facilitate wide involvement in establishing and operating programs.

Cons

- If used alone, eliminates the ability for utilities to receive supply-side treatment for demand-side programs (i.e., earning a return on and of investments)
- Utilities collect and pass on the fee to agencies to fund EE programs
- Depending upon the agency selected, may require a refocus of existing agencies mission and activities since energy efficiency may not necessarily be a part of these agencies core mission
- Agency regulations may limit flexibility of programs.
- Risk of funding programs that are not cost effective.
- Fund raids - funds being diverted from the public benefit fund to other governmental programs. This can be a serious concern that should be safeguarded through the careful legislation.
- Does not take advantage of utility relationship with their customers
- Can separate the responsibility for performance and operational control (Utilities could be held responsible for the goals with no control over the administration)
- 'One-size-fits-all' programs may not be best for customers across entire state.

Potential PBF Funding Process

If Virginia adopts policy to have utilities collect money to finance a Public Benefits Fund, a mechanism similar to the Electric Utility Consumption Tax (Code of Virginia §58.1-2900) should be given strong consideration by the Commission. The structure of the consumption tax assigns the tax revenues proportionately to the State consumption tax (similar to a gross receipts or sales tax), Special regulatory tax (to fund the operation of the State Corporation Commission), and Local consumption tax (similar to a Business, Professional, and Occupational License tax). The tax rates are divided into usage blocks so that the rates decline as usage increases. The current tax rates and monthly usage blocks are: $0.00155 per kWh for usage of 2,500 kWh or less; $0.00099 per kWh for consumption between 2,501 to not more than 50,000 kWh; and $0.00075 per kWh for all consumption in excess of 50,000 kWh. This mechanism has several benefits and relatively few negatives.

Pros

- The process has been used since 2000 and would require little if any additional computer programming by utilities.
- The consumption tax already appears on electric statements and would therefore not require additional space or redesign of billing statements.
- The Department of Taxation already receives and redistributes consumption tax revenues based on the Code requirements. Adding a fourth distribution category, or directing more money to the special regulatory fund which can then be used for public benefits, should require only minimal administrative changes.
- Consumers who wish to avoid the tax can minimize its impact by reducing their consumption, thus helping to achieve the stated goal of reducing consumption by 10%.
- Due to the tax's block design, tax rates can be created that, if desired, limit the amount paid by larger commercial and industrial customers.

Cons

- The PBF dollars would essentially be "hidden" within the overall consumption tax.
- As conservation and efficiency efforts are implemented electricity consumption should decrease, resulting in reduced tax revenues and fewer dollars with which to fund programs supported by the PBF.
- The Electric Utility Consumption Tax does not apply to sales of electricity to non-jurisdictional customers.

Position for Consideration by SCC Staff

- The Commission and the stakeholders should consider whether energy conservation goals are best achieved through the public benefits fund or the utility sponsored EE program mechanisms or a combination of both.
- If the utilities are going to be held accountable for the energy consumption goals then they are best served by programs that are under their control. If the public benefit fund is used then the utilities should not be held accountable for the energy consumption reductions, since they will only have limited control over the implementation of the programs.
- PBF's can be utilized effectively for efforts that are universal to all the utilities and are not utility-specific, such as general EE education for consumers. This is a good example of a program that lends itself to the public benefits fund, as impacts cannot be as easily measured as other energy efficiency programs.
- Utility-specific sponsored programs are preferable for EE efforts that are tailored to each state utility's service territory, and unique circumstances of the utility such as demand control programs.
- PBF's require oversight for program funding and spending. Regardless of which approach is taken or if it is a combination of the two – PBF and utility sponsored programs - such programs need to be cost-effective and provide for lasting reduction impacts. The programs should be subject to measurement and verification and be periodically monitored for cost effectiveness.
- Utilities, by hiring outside contractors to implement their EE programs, can limit their workforce investment.
- The financial disincentive to promote reduced consumption by customers can be addressed by providing appropriate cost recovery to place EE investments on equal footing with supply side investments in the form of cost recovery of program costs, net lost revenues (i.e., fixed costs) between rate cases and a financial return.
- Using third-party administration (which often accompanies PBF's) is an option to consider. Such an arrangement should come with proper measurement, verification and oversight.
- It may be appropriate to have the PBF be subject to a "sunset provision" and a blocked tier structure or other capping mechanism to address the competitive issues raised by industrial customers.

Attachment 1

Scope of Existing SCC Authority To Implement Conservation, Energy Efficiency and Demand Side/Load Management and Allow Cost Recovery

The following represents Dominion Virginia Power regulatory staff's attempt to respond to a request by Work Group #4 to provide a summary-level review of the scope of the State Corporation Commission's ("Commission") authority to implement conservation, energy efficiency and load management programs and to provide for the recovery of the costs associated with such programs. The following information has been obtained from two sources: 1) the Virginia Administrative Code, Agency 5 – State Corporation Commission, Chapters 303 and 304, and 2) the Code of Virginia.

1) Virginia Administrative Code, Agency 5 – State Corporation Commission Chapters 303 and 304

The following rules were derived from the Commission's Order in Case No. PUE900070. Statutory authority for Chapter 303 comes from §§ 56-235.1 and 56-235.2 of the Code of Virginia. Statutory authority for Chapter 304 comes from §§56-234, 56-235.1, 56-235.2, 56-247 and 56-249 of the Code of Virginia. Chapter 303 became effective on March 27, 1992. Chapter 304 became effective on June 28, 1993.

CHAPTER 303

RULES GOVERNING UTILITY PROMOTIONAL ALLOWANCES

20VAC5-303-10. Purpose.

The purpose of these rules is to establish the conditions under which electric and gas utilities operating in Virginia may propose to recover reasonable costs associated with promotional allowances to customers. Any utility proposing a promotional allowance program shall demonstrate that such program is reasonably calculated to promote the maximum effective conservation and use of energy and capital resources in providing energy services. Promotional allowance programs shall he cost justified using appropriate cost/benefit methodologies.

20VAC5-303-20. Promotional allowances prohibited for ratemaking.

Except as provided for under 20VAC5-303-30, no electric or gas utility shall give or offer to give any payment, subsidy or allowance, directly or indirectly, or through a third party, to influence the installation, sale, purchase, or use of any appliance or equipment.
No electric utility shall give or offer to give any monetary or other allowance or credits based on anticipated revenues for the installation of underground service. Schedules of charges for underground service based on revenue-cost ratios or cost differentials shall be filed with the Commission.

20VAC5-303-30. Permitted activities.

1. Unless otherwise specifically prohibited in writing by the Commission, the following activities are not prohibited by these rules:

a. Advertising by a utility in its own name, consistent with §56-235.2 of the Code of Virginia.

b. Joint advertising with others, if the utility is prominently identified as a sponsor of the advertisement consistent with §56-235.2 of the Code of Virginia.

c. Financing the purchase of appliances by utilities so long as the interest rate or carrying charge to the purchaser is not less than the interest rate paid by the utility for short term debt.

d. Merchandising of appliances or equipment by utilities.

e. Inspection and adjustment of appliances by utilities. Repairs and other maintenance to appliances and equipment if charges are at cost, or above.

f. Donation or lending of appliances by utilities to schools for instructional purposes.

g. Technical assistance offered to customers by employees of utilities.

h. Incentives to full time employees of utilities.

2. Promotional allowance programs designed to achieve energy conservation, load reduction, or improved energy efficiency are permitted under these rules, subject to the prior approval of the Commission. Any promotional allowance program proposed under this chapter shall comply with the standards contained in 20VAC5-303-40.

20VAC5-303-40. Promotional allowance program standards.

1. Any utility offering a promotional allowance program shall adhere to the following standards:

a. The promotional allowance program shall not vary the rates, charges and schedules of the tariff under which service is rendered to the customer.

b. A utility may not, directly or indirectly, offer or grant to a customer any form of promotional allowance except as is uniformly and contemporaneously extended to all customers in the same reasonably defined class.

c. Any utility promotional allowance program should be designed in such a manner so as to minimize the potential for placing private businesses at an undue competitive disadvantage.

d. To the extent applicable, any appliances or equipment promoted by a utility under a promotional allowance program shall have energy efficiency ratings which meet or exceed current federal standards as contained in the National Appliance Energy Conservation Act (Public Law 100-12), or any subsequent amendments thereof. The Commission may, at its discretion, impose other standards for appliances or equipment promoted under a utility promotional allowance program.

e. Any utility proposing a promotional allowance program that would have a significant effect on the sales levels of an alternative energy supplier shall consider the effect of the program on that supplier, and demonstrate that the program serves the overall public interest.

20VAC5-303-50. Waivers.

A utility may file for exemptions from any or all of these rules. In making its decision regarding exemptions, the Commission will consider the size of the utility's operations in Virginia, the requirements of other regulatory bodies having jurisdiction over the utility, and the specific Virginia statutory authority under which the utility operates.

20VAC5-303-60. Commission authority.

Notwithstanding any of the provisions of this chapter, the Commission may authorize an otherwise prohibited promotional allowance program if the Commission finds that it is in the public interest.
Nothing in the provisions of this chapter shall preclude the Commission from investigating, formally or informally, a utility promotional activity and, if it determines the activity to be adverse to the public interest, modifying or eliminating the activity.

Statutory Authority: §§56-235.1 and 56-235.2 of the Code of Virginia.
Historical Notes: Derived from Case No. PUE900070 §VI, eff. March 27, 1992.

CHAPTER 304

RULES GOVERNING COST/BENEFIT MEASURES REQUIRED FOR DEMAND-SIDE MANAGEMENT PROGRAMS

20VAC5-304-10. Purpose.

The purpose of these rules is to establish the cost/benefit measures which utilities operating in Virginia must conduct to determine whether a proposed demand-side management ("DSM") program is cost effective and in the public interest.

20VAC5-304-20. Cost/benefit measures.

Utility applicants shall analyze a proposed program from a multi-perspective approach using, at a minimum, the Participants Test, the Utility Cost Test, the Ratepayer Impact Measure Test, and the Total Resource Cost Test. Utilities may file for approval of programs individually or as a package. However, any application which includes a package of DSM programs shall also provide an analysis of the cost/benefit of each program individually.

20VAC5-304-30. Minimum guidelines for data input and modeling assumptions.

Minimum guidelines to provide direction to electric and natural gas utilities in developing applications for approval of DSM programs are as follows:

1. That the assumptions used in developing projected input data and the models used in the integrated resource planning process should be identified and well-documented. Utility-specific data should be used whenever possible (e.g., unit performance data, end-use load research data, market research data, etc.). In cases where utility-specific data are not available, the assumptions must be clearly defined;

2. That historic data, if available, should be assessed in developing projected data. Significant departures from historic trends should be explained;

3. That each projected data series should represent the Company's most current forecast;

4. That computer modeling techniques should be used in the development of an integrated resource plan;

5. That estimates of the capital and O&M (operation and maintenance) costs of supply-side options should include realistic projections of the costs of compliance with all promulgated environmental regulations or enacted legislation from which environmental regulations will be promulgated;

6. That each assumption and/or projected data series should be consistent with all other assumptions and/or projections. Consistency of data should be maintained between all models used within the integrated resource planning process; and
7. That alternative projections to determine sensitivity to input assumptions should be developed. These alternative projections should be used to perform cost/benefit analysis.
Waiver of strict adherence to these guidelines for small utilities or those in unusual circumstances may be granted by order of the Commission.

20VAC5-304-40. Pilot or experimental programs.

Utilities must seek Commission approval of pilot or experimental programs that involve rates or promotional allowances, but other limited pilot or experimental programs may be conducted without prior Commission approval. Utilities shall file reports with the Commission's Division of Economics and Finance that identify any pilot or experimental program at least 30 days prior to its implementation. Periodic reports shall also be filed at least semi-annually with the Commission's Division of Economics and Finance identifying all DSM pilot or experimental programs and the status of such programs.

Statutory Authority: §§56-234, 56-235.1, 56-235.2, 56-247 and 56-249 of the Code of Virginia.
Historical Notes: Derived from Case No. PUE900070 §1, eff. June 28, 1993.

2a) Enactment Clause from House Bill 3068 approved on April 4, 2007

Be it enacted by the General Assembly of Virginia:

3. 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. These programs may include activities by electric utilities, public or private organizations, or both electric utilities and public or private organizations. The Commonwealth shall have a stated goal of reducing the consumption of electric energy by retail customers through the implementation of such programs by the year 2022 by an amount equal to ten percent of the amount of electric energy consumed by retail customers in 2006. The State Corporation Commission shall conduct a proceeding to (i) determine whether the ten percent electric energy consumption reduction goal can be achieved cost-effectively through the operation of such programs, and if not, determine the appropriate goal for the year 2022 relative to base year of 2006, (ii) identify the mix of programs that should be implemented in the Commonwealth to cost-effectively achieve the defined electric energy consumption reduction goal by 2022, including but not limited to demand side management, conservation, energy efficiency, load management, real-time pricing, and consumer education, (iii) develop a plan for the development and implementation of recommended programs, with incentives and alternative means of compliance to achieve such goals, (iv) determine the entity or entities that could most efficiently deploy and administer various elements of the plan, and (v) estimate the cost of attaining the energy consumption reduction goal. The Commission shall, on or before December 15, 2007, submit its findings and recommendations to the Governor and General Assembly, which shall include recommendations for any additional legislation necessary to implement the plan to meet the energy consumption reduction goal. In developing a plan to meet the goal, the Commission may consider providing for a public benefit fund and shall consider the fair and reasonable allocation by customer class of the

incremental costs of meeting the goal that are recovered in accordance with subdivision A 5 b of § 56-585.1 of the Code of Virginia.

2b) The following sections from the Code of Virginia may be relevant to the implementation of conservation, energy efficiency and demand side/load management and programs and the allowance of cost recovery

§ 56-232. Public utility and schedules defined.

A. The term "public utility" as used in §§ 56-233 to 56-240 and 56-246 to 56-250:

1. Shall mean and embrace every corporation (other than a municipality), company, individual, or association of individuals or cooperative, their lessees, trustees, or receivers, appointed by any court whatsoever, that now or hereafter may own, manage or control any plant or equipment or any part of a plant or equipment within the Commonwealth for the conveyance of telephone messages or for the production, transmission, delivery, or furnishing of heat, chilled air, chilled water, light, power, or water, or sewerage facilities, either directly or indirectly, to or for the public.

2. Notwithstanding any provision of subdivision 1 of this subsection or subsection G of § 13.1-620, shall also include any governmental entity established pursuant to the laws of any other state, corporation (other than a municipality established under the laws of this Commonwealth), company, individual, or association of individuals or cooperative, their lessees, trustees, or receivers, appointed by any court whatsoever, that at any time owns, manages or controls any plant or equipment, or any part thereof, located within the Commonwealth, which plant or equipment is used in the provision of sewage treatment services to or for an authority as defined in § 15.2-5101; however, the Commission shall have no jurisdiction to regulate the rates, terms and conditions of sewage treatment services that are provided by any such public utility directly to persons pursuant to the terms of a franchise agreement between the public utility and a municipality established under the laws of this Commonwealth.

§ 56-233. Service defined.

The term "service" is used in this chapter in its broadest and most inclusive sense and includes not only the use and quality of accommodations afforded consumers or patrons, but also any product or commodity furnished by any public utility and equipment, apparatus, appliances and facilities devoted to the purposes in which such public utility is engaged and to the use and accommodation of the public.

§ 56-233.1. Public utilities purchasing practices.

Every public utility subject to the biennial review provisions of Title 56 shall use competitive bidding to the extent practicable in its purchasing and construction practices. In addition, all such public utilities shall file with the Commission and keep current a description of its purchasing and construction practices.

§ 56-234. Duty to furnish adequate service at reasonable and uniform rates.

It shall be the duty of every public utility to furnish reasonably adequate service and facilities at reasonable and just rates to any person, firm or corporation along its lines desiring same. It shall be their duty to charge uniformly therefor all persons, corporations or municipal corporations using such service under like conditions. However, no provision of law shall be deemed to preclude voluntary rate or rate design tests or experiments, or other experiments involving the use of special rates, where such experiments have been approved by order of the Commission after notice and hearing and a finding that such experiments are necessary in order to acquire information which is or may be in furtherance of the public interest. The charge for such service shall be at the lowest rate applicable for such service in accordance with schedules filed with the Commission pursuant to § 56-236. But, subject to the provisions of § 56-232.1, nothing contained herein or in § 56-481.1 shall apply to (i) schedules of rates for any telecommunications service provided to the public by virtue of any contract with, (ii) for any service provided under or relating to a contract for telecommunications services with, or (iii) contracts for service rendered by any telephone company to, the state government or any agency thereof, or by any other public utility to any municipal corporation or to the state or federal government. The provisions hereof shall not apply to or in any way affect any proceeding pending in the State Corporation Commission on or before July 1, 1950, and shall not confer on the Commission any jurisdiction not now vested in it with respect to any such proceeding.

§ 56-235.1. Conservation of energy and capital resources.

It shall be the duty of the Commission to investigate from time to time the acts, practices, rates or charges of public utilities so as to determine whether such acts, practices, rates or charges are reasonably calculated to promote the maximum effective conservation and use of energy and capital resources used by public utilities in rendering utility service. Where the Commission finds that the public interest would be served, it may order any public utility to eliminate, alter or adopt a substitute for any act, practice, rate or charge which is not reasonably calculated to promote the maximum effective conservation and use of energy and capital resources used by public utilities in providing utility service and it may further provide for the dissemination of information to the public, either through the Commission staff or through a public utility, in order to promote public understanding and cooperation in achieving effective conservation of such resources; provided, however, that nothing in this section shall be construed to authorize the adoption of any rate or charge which is clearly not cost-based or which is in the nature of a penalty for otherwise permissible use of utility services.

§ 56-235.2. All rates, tolls, etc., to be just and reasonable to jurisdictional customers; findings and conclusions to be set forth; alternative forms of regulation for electric companies.

A. Any rate, toll, charge or schedule of any public utility operating in this Commonwealth shall be considered to be just and reasonable only if: (1) the public utility has demonstrated that such rates, tolls, charges or schedules in the aggregate provide revenues not in excess of the aggregate actual costs incurred by the public utility in serving customers within the jurisdiction of the Commission, including such normalization for nonrecurring costs and annualized adjustments for future costs as the Commission finds reasonably can be predicted to occur during the rate year, and a fair return on the public utility's rate base used

to serve those jurisdictional customers, which return shall be calculated in accordance with § 56-585.1 for utilities subject to such section; (1a) the investor-owned public electric utility has demonstrated that no part of such rates, tolls, charges or schedules includes costs for advertisement, except for advertisements either required by law or rule or regulation, or for advertisements which solely promote the public interest, conservation or more efficient use of energy; and (2) the public utility has demonstrated that such rates, tolls, charges or schedules contain reasonable classifications of customers. Notwithstanding § 56-234, the Commission may approve, either in the context of or apart from a rate proceeding after notice to all affected parties and hearing, special rates, contracts or incentives to individual customers or classes of customers where it finds such measures are in the public interest. Such special charges shall not be limited by the provisions of § 56-235.4. In determining costs of service, the Commission may use the test year method of estimating revenue needs. In any Commission order establishing a fair and reasonable rate of return for an investor-owned gas, telephone or electric public utility, the Commission shall set forth the findings of fact and conclusions of law upon which such order is based.

For ratemaking purposes, the Commission shall determine the federal and state income tax costs for investor-owned water, gas, or electric utility that is part of a publicly-traded, consolidated group as follows: (i) such utility's apportioned state income tax costs shall be calculated according to the applicable statutory rate, as if the utility had not filed a consolidated return with its affiliates, and (ii) such utility's federal income tax costs shall be calculated according to the applicable federal income tax rate and shall exclude any consolidated tax liability or benefit adjustments originating from any taxable income or loss of its affiliates.

B. The Commission shall, before approving special rates, contracts, incentives or other alternative regulatory plans under subsection A, ensure that such action (i) protects the public interest, (ii) will not unreasonably prejudice or disadvantage any customer or class of customers, and (iii) will not jeopardize the continuation of reliable electric service.

C. After notice and public hearing, the Commission shall issue guidelines for special rates adopted pursuant to subsection A that will ensure that other customers are not caused to bear increased rates as a result of such special rates.

§ 56-235.4. Prohibition of multiple rate increases within any twelve-month period; exception.

A. The regulated operating revenues of a public utility shall not be increased pursuant to Chapter 9.1 (§ 56-231.15 et seq.), 10 (§ 56-232 et seq.) or 19 (§ 56-531 et seq.) of this title more than once within any twelve-month period. This limitation shall not apply to increases in regulated operating revenues resulting from (i) increases in rates pursuant to § 56-245 or § 56-249.6, (ii) any automatic rate adjustment clause approved by the Commission, (iii) new rate schedules for service not offered under existing rate schedules or for expansion, reduction, or termination of existing services, (iv) initiation, modification or termination of experimental rates under § 56-234, or (v) the making permanent of an experimental program. Notwithstanding any other provisions of this section, a telephone company may apply to the Commission to pass on to its customers as a part of its rates any changes approved by the Commission in the carrier access charges.

B. The Commission may adopt such rules and regulations as may be necessary to carry out the provisions of this section. The Commission may specify, by rule, the time during the calendar year when application may be filed by electric utility and cooperatives, gas utilities, telephone utilities and cooperatives, and other utilities.

The Commission may by rule provide standards and procedures for expedited handling of rate increase applications, and such rules may provide that an expedited rate increase may take effect in less than twelve months after the preceding increase so long as regulated operating revenues are not increased pursuant to the provisions of subsection A of this section more than once in any calendar year.

§ 56-35. Regulation of public service companies.

The Commission shall have the power, and be charged with the duty, of supervising, regulating and controlling all public service companies doing business in this Commonwealth, in all matters relating to the performance of their public duties and their charges therefor, and of correcting abuses therein by such companies.

§ 56-36. Inspection of books and documents; special reports; rules and regulations to prevent unjust discrimination.

The Commission shall also have the right at all times to inspect the books, papers and documents of all public service companies doing business in this Commonwealth, and to require from such companies, from time to time, special reports and statements, under oath, concerning their business. It shall keep itself fully informed of the physical condition of all railroads of the Commonwealth, as to the manner in which they are operated, with reference to the security and accommodation of the public, and shall, from time to time, make and enforce such requirements, rules and regulations as may be necessary to prevent unjust or unreasonable discrimination by any public service company in favor of, or against, any person, locality, community, connecting line, or kind of traffic in the matter of car service, train or boat schedule, efficiency of transportation or otherwise, in connection with the public duties of such company.

§ 67-102. Commonwealth Energy Policy.

C. All agencies and political subdivisions of the Commonwealth, in taking discretionary action with regard to energy issues, shall recognize the elements of the Commonwealth Energy Policy and where appropriate, shall act in a manner consistent therewith.

D. The Commonwealth Energy Policy is intended to provide guidance to the agencies and political subdivisions of the Commonwealth in taking discretionary action with regard to energy issues, and shall not be construed to amend, repeal, or override any contrary provision of applicable law. The failure or refusal of any person to recognize the elements of the Commonwealth Energy Policy, to act in a manner consistent with the Commonwealth Energy Policy, or to take any other action whatsoever, shall not create any right, action, or cause of action or provide standing for any person to challenge the action of the Commonwealth or any of its agencies or political subdivisions.

During the 2007 General Assembly Session, new legislation was enacted through Senate Bill 1416 and House Bill 3068. § 56-585.1 sets forth new provisions for the regulation of generation, distribution, and transmission rates after capped rates terminate or expire. Capped rates are set to expire on December 31, 2008 unless terminated sooner by the Commission.

The following are specific provisions within § 56-585.1 that could possibly impact the implementation and the provision for cost recovery of conservation, energy efficiency and demand side/load management programs.

2009 Rate Case

§ 56-585.1 A. During the first six months of 2009, the Commission shall, after notice and opportunity for hearing, initiate proceedings to review the rates, terms and conditions for the provision of generation, distribution and transmission services of each investor-owned incumbent electric utility. Such proceedings shall be governed by the provisions of Chapter 10 (§ 56-232 et seq.) of this title, except as modified herein. In such proceedings the Commission shall determine fair rates of return on common equity applicable to the generation and distribution services of the utility…

Biennial Reviews Commencing in 2011

§ 56-585.1 A. … Commencing in 2011, the Commission, after notice and opportunity for hearing, shall conduct biennial reviews of the rates, terms and conditions for the provision of generation, distribution and transmission services by each investor-owned incumbent electric utility, subject to the following provisions:

1. Rates, terms and conditions for each service shall be reviewed separately on an unbundled basis, and such reviews shall be conducted in a single, combined proceeding. The first such review shall utilize the two successive 12-month test periods ending December 31, 2010. However, the Commission may, in its discretion, elect to stagger its biennial reviews of utilities by utilizing the two successive 12-month test periods ending December 31, 2010, for a Phase I Utility, and utilizing the two successive 12-month test periods ending December 31, 2011, for a Phase II Utility, with subsequent proceedings utilizing the two successive 12-month test periods ending December 31 immediately preceding the year in which such proceeding is conducted. For purposes of this section, a Phase I Utility is an investor-owned incumbent electric utility that was, as of July 1, 1999, not bound by a rate case settlement adopted by the Commission that extended in its application beyond January 1, 2002, and a Phase II Utility is an investor-owned incumbent electric utility that was bound by such a settlement.

Additional specific provisions that provide details on how the biennial reviews will be conducted have not been included in this document.

Rate Adjustment Clauses

§ 56-585.1 A.4. The following costs incurred by the utility shall be deemed reasonable and prudent: (i) costs for transmission services provided to the utility by the regional transmission entity of which the utility is a member, as determined under applicable rates,

terms and conditions approved by the Federal Energy Regulatory Commission and (ii) costs charged to the utility that are associated with demand response programs approved by the Federal Energy Regulatory Commission and administered by the regional transmission entity of which the utility is a member. Upon petition of a utility at any time after the expiration or termination of capped rates, but not more than once in any 12-month period, the Commission shall approve a rate adjustment clause under which such costs, including, without limitation, costs for transmission service, charges for new and existing transmission facilities, administrative charges, and ancillary service charges designed to recover transmission costs, shall be recovered on a timely and current basis from customers. Retail rates to recover these costs shall be designed using the appropriate billing determinants in the retail rate schedules.

§ 56-585.1 A.5. A utility may at any time, after the expiration or termination of capped rates, but not more than once in any 12-month period, petition the Commission for approval of one or more rate adjustment clauses for the timely and current recovery from customers of the following costs: …

b. Projected and actual costs of providing incentives for the utility to design and operate fair and effective demand-management, conservation, energy efficiency, and load management programs. The Commission shall approve such a petition if it finds that the program is in the public interest and that the need for the incentives is demonstrated with reasonable certainty; provided that the Commission shall allow the recovery of such costs as it finds are reasonable;

Clarification of Commission Authority

§ 56-585.1.D. Nothing in this section shall preclude the Commission from determining, during any proceeding authorized or required by this section, the reasonableness or prudence of any cost incurred or projected to be incurred, by a utility in connection with the subject of the proceeding. A determination of the Commission regarding the reasonableness or prudence of any such cost shall be consistent with the Commission's authority to determine the reasonableness or prudence of costs in proceedings pursuant to the provisions of Chapter 10 (§ 56-232 et seq.) of this title.

Subgroup 5 Report

INFORMATION/CONSUMER EDUCATION

Recommendations for the Commonwealth of Virginia
Submitted to the Virginia State Corporation Commission

Case Number PUE-2007-00049

October 1, 2007

Table of Contents

Executive Summary……...1

I. Introduction…….3

II. Justification…….4

III. Impediments……6

IV. Market Research…….7

V. Consumer Education Campaign…….8
A. Web-based Approach……9
B. Residential Sector ……...……10
C. Commercial & Industrial Sector …….11
D. Institutional Sector……..…….12
E. Specific Aspects……..13

VI. Management…….14

VII. Cost……...16

VIII. Funding…….18

IX. Legislative Proposals……20

X. Summary……...21

Selected Reference Materials……..22

Attachments

Attachment 1. Summary of State Scoring on Energy Efficiency……. 23

Attachment 2. Consumer Education Campaign Timetable.……...….. 25

Subgroup 5 Report: Information/Consumer Education

Recommendations for the Commonwealth of Virginia
Submitted to the Virginia State Corporation Commission

Case Number PUE-2007-00049

October 1, 2007

Executive Summary

The Virginia General Assembly has directed the State Corporation Commission (SCC) to determine whether an established goal of reducing electricity consumption by retail customers by 10% by the year 2022 is achievable. The SCC has established a Workgroup comprised of a wide variety of stakeholders, including state and local government agencies, utilities, consumers, environmental groups, and others, tasked to provide input and ideas to the SCC. The Workgroup has divided into five subgroups to address the feasibility of the goal of a statewide reduction in electricity use from different assigned perspectives.

Subgroup 5 has been specifically tasked to consider how information and consumer education fit within the overall goal of reducing consumption. Our focus has been deemed to include the following aspects: What justification exists for a new consumer education program? What are the impediments to implementation? What market research is needed? What are some of the immediate, short-term, mid-term, and long-term consumer education components? What are some effective ways to design and deliver information in a consumer education campaign?
Who should oversee and implement the program? How much could it cost and how could it be funded? What legislative action is necessary to facilitate these efforts?

Our subgroup acknowledges that many consumer education programs currently offered in the Commonwealth provide important conservation and energy efficiency messages but believes that a new core program is urgently needed. Significantly, we note that all of the states that have achieved highly energy-efficient economies have already launched statewide consumer education campaigns. The subgroup has reached consensus that Virginia needs a centralized, innovative, comprehensive electric energy consumer education program to transform the overall energy efficiency awareness that existing programs already have generated into widespread consumer action that can be tracked, measured, and evaluated.

We have identified several impediments to the development of a new Commonwealth-wide energy education program, and we discuss ways to overcome these market barriers throughout this report.
We recognize the compelling need for market research to assist with the design and delivery of the program and to enable tracking, measurement, and evaluation of results.

To implement a successful electric energy consumer education campaign for the Commonwealth, our subgroup envisions a clear and concise message that will resonate with all Virginia consumers.
For education to create change three things must occur: (i) Education must <u>inspire</u>; (ii) Education must <u>inform</u>; and (iii) Education – most importantly – must <u>enable</u>. The consumer education campaign should focus on simple behavioral changes in the home and at the office, which could also be tiered based on no-cost, low-cost, and high-cost efforts.

The subgroup recognizes that most people do want to do something to save money and energy but do not know where to start. The campaign should focus on helping homeowners identify what they can do, the efficiency savings available, and where they can start. Toward that end, we have identified immediate, short-term, mid-term, and long-term components of a consumer education campaign that we believe would help ensure its success. We have addressed the information needs of residential, commercial/industrial, and institutional sectors in this report, but we do not include a specific messaging package.

There are many different ways the Commonwealth-wide consumer education campaign could be effectively managed. Initially, the SCC could manage the electric utility re-regulation portion of the program. Third-party marketing organizations should be engaged to design and/or deliver the consumer education campaign. Ultimately, the program would be most efficiently managed either within the SCC or within the Department of Mines, Minerals and Energy (DMME); or by an independent, third-party entity with SCC or DMME oversight. The SCC should establish a Citizen Advisory Panel.

We provide an illustrative budget to emphasize critical cost considerations for a new consumer education program. We also recognize the compelling need for a dedicated, reliable funding source to ensure long-term success of the program, and we feel strongly that a Public Benefit Fund (PBF) should be given full consideration as a funding option.

Our subgroup has discussed several potential legislative proposals that could be recommended to the Virginia General Assembly. New legislation would probably be required both to establish the Commonwealth-wide consumer education program and also to fund the program. New legislation would also be needed to create a K-12 energy education curriculum for all public schools in the Commonwealth. Our recommendations supporting these legislative proposals reflect consensus reached within the subgroup.

There is also consensus within our subgroup not only that a 10% reduction in electricity consumption by the year 2022 is highly achievable but also that a reduction in consumption through conservation, energy efficiency, demand-side management, and demand response programs is absolutely imperative. The availability and reliability of affordable electric energy, reducing the negative impact of energy use on the environment, and the challenges of meeting peak demand are issues that should concern all consumers in the Commonwealth. Conservation, energy efficiency, and related programs should be promoted now, within the parameters of our current framework, as we move forward.

We are hopeful that the general ideas and specific input reflected in this report will help SCC staff make recommendations to the General Assembly that will inspire, inform, and enable all citizens of the Commonwealth to embrace better energy solutions.

Barbara Kessinger, Co-Chair (Citizen)
Billy Weitzenfeld, Co-Chair (AECP)

Subgroup 5 Report: Information/Consumer Education

I. Introduction

In April of 2007, the Virginia General Assembly directed the State Corporation Commission (SCC) to determine whether reducing electricity consumption by retail customers by 10% by the year 2022 is achievable. The SCC formed a working group comprised of a wide variety of stakeholders, including state and local government agencies, utilities, consumers, environmental groups, and others, with the assigned task of providing input and ideas to the SCC on the feasibility of statewide reduction in electricity use. The group met on July 19 in Richmond, and at that time it was suggested that the only way substantive information could be obtained so that recommendations could be formulated was to break into smaller groups/ committees.

Five subgroups were then formed with co-chairs assigned to each group. Subgroup 1 evaluated general considerations; Subgroup 2 identified conservation and energy efficiency programs; Subgroup 3 considered demand-side management (DSM) and demand response (DR) programs; Subgroup 4 evaluated financial considerations; and Subgroup 5 focused on information and consumer education. Subgroup 5 co-chairs Barbara Kessinger and Billy Weitzenfeld agreed on a process to gather input and developed a framework of categories and questions based on SCC-suggested focus topics for the subgroup.

SCC-suggested focus topics for subgroup 5 were as follows: (i) how information and consumer education fit within the overall goal of reducing consumption; (ii) what justification exists for a new program; (iii) what are the impediments to implementation; (iv) what market research is needed; (v) what are effective ways to design and deliver information in a consumer education campaign; (vi) how we can enable consumers to make changes in behavior and decision-making; (vii) what are some immediate, short-term, mid-term, and long-term consumer education components; (viii) what entity or entities should oversee and implement the program; (ix) how much it might cost and how it could be funded; (x) what legislative action is necessary; and (xi) what further consumer education recommendations, if any, could be made, given the conservation, energy efficiency, demand-side management, and demand response programs recommended by subgroups 2 and 3.

On August 8, the co-chairs emailed a framework to the full subgroup with a request for response within a week. About half of the subgroup members submitted input, which the co-chairs then compiled into an outline format that constituted a summary of ideas presented and a working document that could be used moving forward. The co-chairs emailed the summary outline to the full subgroup in time for review before our first face-to-face meeting on August 23. We discussed and modified the outline, incorporating additional ideas into its content, resulting in a more stream- lined outline that could lead to a written report. Several subgroup members then provided written drafts of sections, which the co-chairs converted into a draft report dated September 10. The co-chairs emailed this draft report to the full subgroup in time for review before our next meeting on September 14. We discussed the entire draft during morning and afternoon breakout sessions. After this discussion, several subgroup members provided additional verbiage, which the co-chairs incorporated into a revised document dated September 24, which again was reviewed by the entire subgroup. The co-chairs then finalized this report for submission to the SCC on October 1.

This report is divided into eight main sections: Justification, Impediments, Market Research, Consumer Education Campaign, Management, Cost, Funding, and Legislation. Our Consumer Education Campaign does address the needs of residential, commercial/industrial, and institutional sectors but does not include a specific messaging package. We do agree that messaging is a critical component of a consumer education campaign and that great care and oversight is necessary to produce educational content that is accurate and balanced. However, there was insufficient time to develop a consumer education messaging package, and our subgroup also feels that this is not our task at this point in the proceeding. In the event the SCC decides to continue this Workgroup, recommendations for more specific messaging could be provided at a later time.

Our subgroup reached consensus that Virginia needs a centralized, innovative, and comprehensive electric energy consumer education program to transform the overall energy efficiency awareness that existing programs already have generated into wide- spread changes in consumer behavior that can be tracked, measured, and evaluated.

II. Justification

Many consumer education programs currently offered in the Commonwealth provide important conservation and energy efficiency messages, but a new Commonwealth-wide program is urgently needed. Multiple low-level programs (one-time offerings, utility bill inserts/website information, initiatives that cost as little as several thousand dollars, etc.) have helped to raise overall awareness of energy efficiency activity in Virginia, but a high-level program (multiple-year offerings costing $6 million or more annually) is imperative for widespread changes in the ways we use electricity.

Several years ago, the Commonwealth of Virginia Department of Mines, Minerals and Energy (DMME) submitted a study entitled *Consumer Education for Energy Efficiency*.[142] The Department had contracted with Primen to research then-existing conservation and energy efficiency programs, survey Virginian consumers to establish baselines for acceptance of and attitudes toward energy efficiency, and evaluate the effectiveness of then-existing programs. The DMME submitted its study to the Virginia Consumer Advisory Board, a subcommittee of the Legislative Transition Task Force studying electric utility restructuring in Virginia.

Primen researched over 30 consumer education programs offered in Virginia by government agencies, utility companies and electric cooperatives, colleges and universities, and non-profits. It found that most of the offerings in the Commonwealth were low-level programs, budgets were small, media components were limited, and most of the efforts achieved minimal consumer action.

As part of the same study, Primen conducted a survey that established some useful baseline data for 2001. Sixty-one percent of Virginians surveyed were aware of energy efficiency advertising, and only 25% of the total number of respondents admitted that they were not well informed about energy efficiency. However, only 18% of Virginians surveyed had purchased a compact

[142] Consumer Education for Energy Efficiency. The Commonwealth of Virginia Department of Mines, Minerals and Energy (DMME), December 4, 2001.

fluorescent light (CFL) in the prior two years, and less than 10% of the respondents who had purchased a new appliance within the same time frame had done so with the specific purpose of selecting a more energy-efficient model. In other words, survey results suggested that the important link between consumer awareness and actual behavior modification had not been achieved in Virginia on a widespread basis.

Primen concluded that the effectiveness of programs offered in the Commonwealth was rarely tracked and that many regional and national efforts did not seem to reach Virginia consumers. It suggested that low-level programs were more likely to promote awareness only, whereas high-level programs were more likely to spur actual consumer action.

Given that six years have elapsed since the publication of the DMME study, SCC Staff should consider whether another survey of consumers is warranted to establish current baseline information for energy efficiency activity. It should be noted that during the Workgroup's second meeting, a brief, informal "survey" of participants was conducted toward the end of this sub- group's presentation. When asked, "Do you currently participate in a time-of-use/other metering program or a load management program?" only 12% (eight of sixty-seven) of the individuals then-present raised their hands to indicate, "Yes." The Workgroup's "survey" response certainly suggests that even its own participants are not receiving an appropriate demand-side resources message and/or are non-responsive. If Staff determines that updated baseline information would help provide further justification for a new consumer electric energy education program, a non-costly survey, conducted on-line by the SCC over the next few months, would be warranted.

Although existing studies do not conclusively establish a causal relationship between statewide consumer education programs and highly energy-efficient economies, there is undoubtedly a strong correlative link between the implementation of these programs and high levels of energy efficiency. Most notably, all of the states that have earned the highest scores in the ACEEE's most recent comprehensive nationwide energy efficiency ranking[143], have launched statewide consumer education campaigns, e.g., *Efficiency Vermont* www.efficiencyvermont.com/pages/ and California's *Flex Your Power* www.fypower.org/. The Flex Alerts provided by the latter are credited with reducing peak demand at critical times and avoiding electrical emergencies, another economic benefit linked to consumer education.

The Virginia Energy Plan recognizes the importance of education in overcoming a *consumer knowledge market barrier* to conservation and energy efficiency efforts. It states that "recent market research has shown that lack of information about energy-efficient equipment and building practices is a major barrier that prevents consumers from practicing energy efficiency."[144] The Virginia Energy Plan also recommends the development of an expanded energy education program to overcome this *consumer knowledge market barrier*; however, as the next section of this subgroup report indicates, there are also market barriers to a statewide consumer education program.

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[143] M. Eldridge, B. Prindle, D. York, and S. Nadel, The State Energy Efficiency Scorecard for 2006, Report#U054 [Washington, D.C.: American Council for an Energy-Efficient Economy (ACEEE), 2007], iv-v. (Reference Attachment 1.)

[144] *The Virginia Energy Plan*. The Commonwealth of Virginia Department of Mines, Minerals and Energy (DMME), 2007, 74.

III. Impediments

Our subgroup identified several impediments to the development and implementation of a successful Commonwealth-wide electric energy consumer education program, as follows:

- Very limited availability of market research that tracks and measures results from statewide programs. As noted in the previous section, there is little if any empirical data that conclusively proves that information provided via statewide consumer education programs (as opposed to other sources) causes consumers to take energy-efficient actions.

- Apathy (perceived or real) of consumers toward consumer education in general. Many consumers might feel they are already experiencing information overload. Some might not want to take the time to get educated. Several members of our subgroup felt that it is more a case of consumers wanting to do the right thing but not knowing where to start.

- Lack of immediate positive feedback from their energy-efficient actions, making it difficult for consumers to connect their actions with cost savings, much less energy savings or assisting the electric grid. Everyone agreed that this is a disconnect that must be resolved.

- Cost of a consumer education program. This impediment is specifically addressed in section 7 of this report.

- No funding for a consumer education program. This impediment is specifically addressed in section 8 of this report.

- Lack of standardization of structures (not rates) for currently-existing DSM and DR programs in Virginia, making it more difficult to educate consumers about them.
  (The resolution of this market barrier falls outside the scope of this subgroup's tasking.)

- Resistance (perceived or real) of utility companies toward a statewide consumer education program. Electric service provider representatives within our subgroup felt strongly that this is an inaccurate perception and that, to the contrary, they will support such a program as long as it does not preclude, control, or supersede their own consumer education efforts.

- Absence of a current crisis situation in Virginia to serve as a catalyst for statewide consumer education efforts, much as the rolling blackouts did in California. Regardless, our subgroup recognizes the need to educate consumers now to help avoid any such crisis situation in the future.

We address these impediments throughout this report, beginning with the need for market research discussed in the next section.

IV. Market Research

Market research is a systematic, objective collection and analysis of data about a target market, in this case, the residents of the Commonwealth. The initial goal would be to obtain an increased understanding of residents and their behavior, which could assist in the design of a comprehensive consumer education program. Professional market researchers can merge existing ***demographic data*** (age, education/income levels, family size/no. of children, age of home, etc.) with a wide array of collected ***attitudinal information*** (energy, home repairs/upgrades, environmental, etc.). Subsequent goals would be to track, measure, evaluate, and adjust the consumer education pro- gram. Market research is not an activity that should be conducted only once; rather, it should be an ongoing activity that accounts for shifts and trends within the target market. See, for example, the impact evaluations for the EPA ENERGY STAR appliance program.[145]

Market research can help create benchmarks. What do residents already know? What channels of information are most useful? What types of messages are likely to prompt actions? What are residents already doing?

Market research will minimize risk. For example, the energy marketplace already might be saturated with certain information, thereby frustrating residents. This sort of market information would be useful in designing a program that takes all learning, negative and positive, into account.

Market research will identify opportunities in the marketplace. With demographic data merged with attitudinal information, program managers would be able to identify clusters or patterns within the Commonwealth and tailor information as well as increase touch points. For example, Tidewater area residents might be less inclined to adopt certain energy-efficient behaviors than residents who live in the Piedmont area.

Market research will guide communication with residents. With data merged with information, program managers also would be able to formulate more effective and targeted educational programs that speak directly to the residents they are trying to reach in ways that interest and motivate them to take action. In addition, they would be better able to understand the needs of categories of future consumers, i.e., those recently joining new age or income brackets, new homeowners or renters, and those recently domiciled in Virginia.

Market research will prevent potential problems. For example, most residential customers might be willing to spend only a certain amount on energy efficiency in any given calendar year. This sort of market information would influence the delivery of messaging.

Market research must involve an effective quantitative tracking protocol to measure outcomes. This is necessary to see if the program is really working and to guide the design of adjustments to the program as needed. Are residents receiving the message? Are residents taking action? Tracking results to measure outcomes not only enables program modification and improvement; it also hopefully provides data that supports the ongoing merit of the program.

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[145] *National Awareness of Energy Star® for 2006*: Analysis of 2006 CEE Household Survey. United States Environmental Protection Agency (EPA), 2007.

In addition to providing valuable insight about residents and their behavior, comprehensive market research and effective quantitative tracking can generate positive feelings about the consumer education program itself. The act of participating in a customer satisfaction survey or study can actually increase loyalty to the program, particularly if energy-efficiency activities already have resulted in cost savings to the customer. Also, when qualitative research is con- ducted and shared, a common side effect is positive word-of-mouth advertising. Finally, participating in activities that are proven to reduce overall consumption and/or peak demand can also give customers the satisfaction of having assisted the electric grid. Tracking, measuring, evaluating, and adjusting the consumer education program over a period of time will promote a more successful, long-term outcome.

V. Consumer Education Campaign

To implement a successful electric energy consumer education campaign in the Commonwealth, our subgroup recognizes the need to develop a clear and concise message that will resonate with Virginia consumers in residential, commercial/industrial, and institutional sectors.

The goal of the campaign would be to increase energy efficiency awareness and generate behavioral change. For education to create change three things must occur: (i) Education must inspire; people need to feel excitement about the benefit that will result from a change in behavior; (ii) Education must inform; simple, accurate, user-friendly information and messaging that is easily understood by all consumers is necessary; and (iii) Education – most importantly – must enable; people must be given the tools, the capability, and the instruction they need to allow them to change behavior and to make better decisions in the home and in the marketplace.

Just as the SCC's Consumer Education Plan for restructuring was branded "Virginia Energy Choice," this new effort should be branded. There should be trademark control over the use of the brand name for the new effort to ensure that reliable vendors are using it and for uses consistent with the program's plan. There should also be rules and a fee to use the brand name, which would ultimately cover the cost of administering the trademark. The entire process could be outsourced, with SCC contractual oversight and control.

Branding is a critically important feature that allows consistent advertising in in-store display, printed materials, and on-air media to create the repetition that is necessary to get consumers to take notice.

The Virginia Energy Plan recommends that Virginia support a national program to extend the ENERGY STAR brand name label beyond appliances, office equipment, and buildings. If this cannot be accomplished, the Commonwealth should help establish and support an independently administered, multi-state branding effort that verifies efficiency and should participate in an extensive advertising campaign to build brand name recognition.

The overall message needs to have some life/longevity so it will still resonate with consumers in five to ten years. Possible messaging could include: "*Working Toward an Energy-Efficient Virginia*" or "*Leading the Way to a More Energy-Efficient Virginia.*" A simple message can draw curiosity and spur a call-to-action movement for consumers to work actively together to change their behavior as energy users. The sub-message is just as important as a key motivator. A sub-message could be "*Save Money, Save Energy, Preserve Virginia's Environment*."

Web-based Approach. While there will always be a need to have print and other media distribution of the message, web-based communication is paramount to getting the message out and should include:

- Text "how-to" content on multiple topics, with self-paced material with different levels of detail
- Links:
  - incentives and rebates
  - institutional energy education websites for federal and state agencies, universities, etc.
  - utility company and electric coop websites, DR and DSM programs
  - non-profit environmental and community action group websites
  - Virginia Weatherization assistance programs
  - small wind and solar websites
  - third-party provider websites, including Curtailment Service Provider (CSP) websites
  - electric energy-related web pages for county public works departments/school districts
  - advertising (products and services) that would make the website largely self-funded
- Video "how-to" segments on multiple topics, from energy savings tips to the implementation of new technologies

Messaging should be focused on driving people to the website, as it was in the previous Virginia Energy Choice campaign. One way to help bring people back to the website regularly would be to allow users to register for periodic news on energy issues that affect them. Registrants could be given the option of allowing their email addresses to be provided to vendors on topics of interest to them. Messages containing links back to information that has changed or been added to the website would be sent monthly to those who register.

The website may be able to offer paid advertising by third-party providers. This could provide easy access for consumers to vendors that would bypass the step of making them look elsewhere, which they frequently will not do. This could also subsidize the cost of the website itself. It is unclear, however, whether current state procurement rules allow paid advertising on a state-funded website.

The following are links to some statewide consumer education websites:

- Efficiency Vermont (EVT) – www.efficiencyvermont.com/pages/
- Connecticut's "Saving without Sacrifices" campaign – www.ctsavesenergy.org
- Connecticut's other "Watts New" website – www.wattsnewct.com
- California's "Flex Your Power" campaign – www.fypower.org/ (includes demand response info with answers to frequently asked questions and also includes an overview of "Flex Alerts," which are urgent calls for consumption reduction via email notifications typically sent 24 hours in advance)

Although the website would be a critical component of Virginia's new consumer education campaign, information would flow from a number of other sources, including utility companies and electric coops; traditional media (newspapers, TV); interactive venues (energy fairs, etc.); and private companies (contractors/builders, energy supply/service companies, energy auditors/home energy raters, retail sales people). The new campaign should be designed to leverage other efforts and to promote those programs in the Commonwealth and elsewhere that provide effective electric energy information.

Residential Sector

The residential sector accounts for about 40% of the electric energy consumed in Virginia. The consumer education campaign should focus on helping homeowners identify what they can do, the efficiency savings available, and where they can start. The subgroup recognizes that most people do want to do something to save money and energy but do not know where to start. This campaign should focus on simple behavioral changes in the home and at the office, such as a "top 10 things you can do" list, which could also be tiered based on no-cost, low-cost, and high-cost efforts. To be successful, a consumer education campaign must address individuals at home, in schools, and at work.

Recognizing various income levels and segments within the residential sector, messaging should be consistent yet fair when addressing opportunities to save money and energy. For example, middle and upper income individuals have the resources to buy more efficient equipment if they perceive an attractive rate of return; however, for lower income individuals there is a constrained capital issue. The design of a comprehensive program should be assigned to marketing professionals who have experience in reaching the different market segments within Virginia.

What will motivate the homeowner? This is definitely an area where market research could serve as a useful tool. What will it take for the homeowner to reach into his or her wallet and spend $150 to $300 to change standard light bulbs to CFLs? What will it take for the home- owner to go to the next level and spend $500 to $1,000 on ENERGY STAR appliances or windows? How long is the homeowner willing to wait to see a return? 30 days? 180 days? 2 years? Having this sort of knowledge would allow a determination of how much would need to go back into the homeowner's wallet for a program to work on a mass level and would also assist in the design and delivery of the messaging.

There are many groups that have experience with the delivery of programs (e.g., ENERGY STAR, the Alliance to Save Energy, NEED), and these groups should be asked to assist in delivering the message to residential consumers. "ENERGY STAR is a joint program of the U.S. Environ- mental Protection Agency and the U.S. Department of Energy helping (citizens) save money and protect the environment through energy efficient products and practices."[146] The Alliance to Save Energy has partnered with others in its Energy Hog Campaign.[147] The National Energy Education Development (NEED) Project's mission "is to promote an energy conscious and educated society by creating effective networks of students, educators, business, government and community leaders to design and deliver objective, multi-sided energy education programs."[148]

Virginia residents should understand that their most immediate and cost-effective action is to reduce electric energy consumption in the home. This is the one place in residents' lives where they have the most control and the arena where simple activities and applications can have the greatest impact.

[146] www.energystar.gov
[147] www.energyhog.org
[148] www.need.org

Commercial and Industrial (C&I) Sector

The commercial and industrial consumer segments account for about 30% and 20% respectively of the electric energy consumed in the Commonwealth or about half of the state's consumption of electric energy. Information about conservation measures and energy efficiency and other programs that leads to consumer action within this sector could result in substantial electric energy savings for the Commonwealth.

Commercial operations may be as small as a barber shop or as large as an office complex or a metropolitan area shopping mall. What they typically have in common is that they do not have the staff or the time to wade through general information to determine how it may apply to their business. However, much like the larger industrial user, they need to know the payback period before making investments in energy conservation or load curtailment. Therefore, information for this segment should outline specific simple steps that can be taken or programs that can be used to save energy, as well as the expected return or payback time.

Industrial operations include some of the largest single users of energy in Virginia. The industrial segment uses a wide range of energy sources to run their operations. The issues in this segment go beyond the standard heating and lighting issues, but unlike the commercial segment, many industrial operations have staff available to address energy issues and who are familiar with process improvements. However, they could benefit from specific information related
to compressed air, heating applications in chemical processes, and electric motor efficiency information. Such information could be maintained through a central information agency.
Also, many utility companies have assigned account managers to work closely with these larger customers to help address energy concerns; newsletters provide the latest news on energy issues and energy calculators for specific application comparisons.

A coordinated central office could help leverage existing communication avenues by:

- Maintaining a library of information and best practices specific to categories of commercial and industrial customers.

- Linking to existing utility company communication programs to deliver energy conservation information.

- Developing and maintaining a list of certified providers of energy audits and other services.

Institutional Sector

The institutional consumer sector accounts for about 10% of the electric energy consumed in the Commonwealth. Institutional facilities include educational facilities (schools, colleges, and universities), correctional institutions, health care facilities (medical offices, hospitals, and nursing homes), and buildings used for religious worship. Historically, government facilities are also included in this particular sector. These types of facilities, especially state government facilities, include some of the largest single users of electric energy in Virginia.

Information for the institutional sector should be specific and should include programs that can be used to save energy, such as an effective energy management (EEM) program. Many utility companies have assigned account managers to work closely with this particular customer sector to help address energy concerns. There are many other well-known programs, such as ENERGY STAR, that lend support to implementing best management practices.

A number of Virginia's agencies and institutions have aggressively pursued energy best practices. However, because facility operation and maintenance (O&M) functions are handled by individual agencies, there is little coordination between agencies. Also, since there are no established state- wide guidelines for O&M of state facilities (e.g., training, budget development, standard maintenance schedules, etc.), each agency develops and implements guidelines for its own facilities, with limited opportunity to share lessons learned among agencies.

A coordinated central office could help leverage existing communication avenues by:

- Maintaining a library of information and best practices specific to categories of institutional customers.

- Providing support, outreach, and training to agency facility staff, including energy managers, facility operators, O&M personnel, procurement managers, and other administrators.

- Leveraging tools and resources from the ENERGY STAR's *Guidelines for Energy Management* program.

- Providing specialized technical expertise to agencies to improve their knowledge of O&M procedures, energy conservation fundamentals, new technologies, and other skills to improve building performance.

- Developing and maintaining a list of certified providers of energy audits and other services.

Local Governments and Schools. Virginia's local governments and schools should play a significant role in changing electric energy consumers' behavior. **Energy education that targets young adults and school-aged children represents the best long-term opportunity for successful consumer education.** NEED has established an excellent K-12 energy education curriculum that is used as a resource in many states and that could serve as a model for the development and implementation of an energy education curriculum in Virginia. The following are links to some other impressive state energy education curriculum websites:

- California's energy curriculum resource – www.energyquest.ca.gov/about.html
- Colorado's Energy Science Center Program – www.energyscience.org/education/index.html
- Connecticut's curriculum for high school educators – www.ctenergyeducation.com
- Maine Energy Education Program (MEEP) – www.home.psouth.net/~meep/
- Texas' energy education curriculum – www.seco.cpa.state.tx.us/energy-ed_curriculum.htm
- Wisconsin's K-12 Energy Education Program (KEEP)–www.uwsp.edu/cnr/wcee/keep/index.htm

Special Aspects

Electricity Education. Education should explain conceptually why electricity costs more to all consumers at certain times, even if the effect of that is masked by the average rates most customers pay. Summaries of and links to the following should be provided on the website: SB1416, Governor Kaine's Executive Order 48, the Virginia Energy Plan. Education should also include a glossary of terms that the average consumer does not understand (e.g., decoupling, demand response, demand-side management, etc.).

Demand-Side Management(DSM) and Demand Response (DR). A combination of utility-administered programs and programs offered by Curtailment Service Providers (CSPs) provide a wide potential for reducing load during peak periods. Overall, there has never been much information disseminated about these programs in Virginia; hence, consumers must be educated about the various demand-side resources that are currently available, including time-based pricing structures/rate programs and load curtailment programs and technologies. In addition, there are opportunities emerging this year for large end users of electricity to become part of an aggregation group to participate in demand response; thus, consumers should be educated about this also. CSPs are only now entering the marketplace in Virginia, and many consumers in all classes still have no idea who they are and what they do; this is a related aspect of this area of education.

Renewables. Education should include information about the use and availability of both small wind and solar/photovoltaics. Efficiency is inherent in materials, equipment, and systems, including technologies that lower electric bills, avoid loss of power during an outage, and, for some consumers, help them become energy independent. The use of new equipment such as small wind (rural and suburban) and solar (all areas) is both a short-term and long-term energy efficiency strategy because once efficient equipment and systems are in place, they continue to pay back year after year. Educated consumers can choose these technologies if they are suitable solutions for their circumstances.

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Because no formal statewide conservation, energy efficiency, and demand-side resource programs have been implemented to date in Virginia, significant transition will be needed for the consumer education campaign to be fully understood by residents. Effecting change in consumer behavior will require a considerable shift in attitudes, awareness, and appreciation for the future welfare of the Commonwealth. Developing and implementing an effective consumer education campaign that educates residents about conservation, energy efficiency, and other related topics will make good business sense for Virginia, as it has in other states.

Our subgroup recommends for Virginia the approach that highly energy-efficient states have already taken – a high-level consumer education program with a clear and concise message that is complemented and/or supplemented by corollary messages offered by other independent lower-level programs. We recommend the sequenced timeframe for design and delivery of the Consumer Education Campaign set forth in Attachment 2 to ensure a successful program in Virginia.

VI. Management

Our subgroup recognizes that the Commonwealth must be actively engaged in the management[149] of a new electric energy consumer education program for several reasons. First, governmental involvement would ensure that all end users would have access to the same information, regard- less of customer class, geographic location, or service provider. Commonwealth participation in management would also leverage already-existing county efforts as well as federally-funded initiatives. Finally, governmental involvement would ensure consistent tracking, measurement, and evaluation of impacts of consumer education. Some of the subgroup participants also raised concerns that some stakeholders have agendas that could conflict with the goals of consumer education.

The subgroup recommends that the SCC consider several alternatives for the management of the new consumer education program:

1. The new program could be outsourced to an already-existing, non-utility, independent third party.

2. Another approach would be to identify individuals representing several agencies, groups, etc. to collaborate and assist in the management.

3. The program could be managed by a newly-created state program office (for example, the Virginia Energy Education Office) located within an independent agency or the executive branch.

An analysis of the management of electric energy consumer education programs in states deemed to have the most energy-efficient economies (reference Attachment 1) highlights the different ways such a program could be effectively managed.

Efficiency Vermont (EVT) manages Vermont's statewide consumer education program. Created by the state legislature in 2000, EVT is the nation's first statewide provider of such a program. An independent, non-profit organization under contract with the Vermont Public Service Board (PSB) operates EVT. It should be noted that Vermont's electric energy efficiency services replaced the services previously provided by the utility companies (except in the case of Burlington Electric, which continues to provide those services).

Connecticut's statewide consumer education program is managed by the utilities, with oversight (advice and assistance) provided by the Energy Conservation Management Board (ECMB).
The ECMB is an all-volunteer board that is comprised of representatives of the regulated electric utilities; various state offices/departments; an environmental group; statewide business, manufacturing, and retail associations; a chamber of commerce, and consumers. The Department of
Public Utility Commission (DPUC) appoints members to the ECMB, which (aided by consultants) reviews a utility-generated plan and then presents that plan (and budget) to the DPUC for approval.
It should be noted that Connecticut's electric market, unlike Virginia's, gives most state customers the ability to choose their electric service provider.

[149] Management, as used here, refers to development, management, and delivery of the consumer education campaign.

California's statewide consumer education program is managed by the California Energy Commission, which develops and maintains the Consumer Energy Center (CEC), a comprehensive resource for energy efficiency information, including incentives and rebates, equipment and technology, etc. The California Energy Commission also has a Media and Public Communications Office that provides program information to the media and the general public.

Our sister states, Maryland and North Carolina, have initiated consumer electric energy education programs. The Maryland Public Service Commission developed a three-year Consumer Education Program (CEP) on electric choice (www.psc.state.md.us/psc/electric/ConsumerEdPlanYr3), and the Maryland Energy Administration continues to partner with the Alliance to Save Energy, ENERGY STAR, NEED, and Green Schools Focus to disseminate information to consumers. North Carolina operates a statewide consumer education program through its Cooperative Extension offices, and North Carolina State University provides oversight in its role as administrator. The program provides seminars/workshops for the general public as well as a variety of other conservation and energy efficiency activities (www.energync.net/efficiency/residential.html).

In some states management and oversight of an electric energy consumer education program are handled by the same entity, while in other states management and oversight are performed by two distinct entities. Based on the successful implementation of statewide programs in other states, the SCC should evaluate these initiatives closely to determine which program(s) it wants to emulate or which components from various programs it wants to apply. The state programs referenced above illustrate a broad array of effective management options.

Our subgroup suggests that a third-party[150] administrative approach is preferable in Virginia. Initially, the SCC could manage the consumer education program regarding electric utility re-regulation just as it managed consumer education regarding restructuring. A third-party private marketing consultant could be engaged to raise consumer awareness of other segments of the program that follow. Other third-party organizations could design and/or deliver the consumer education campaign. Ultimately, the program would be most efficiently managed either within the SCC or within the DMME Division of Energy; or by an independent, third-party entity with SCC or DMME oversight. The SCC should establish a Citizen Advisory Panel.

Regardless of the management approach that is assumed, multiple entities would have important, ongoing roles in the consumer education process. These would include other state departments (Housing and Community Development, Education, and Environmental Quality); utility companies, electric cooperatives, and municipal power companies; the Virginia Association of Counties (VACO); the Virginia Energy Purchasing Governmental Association (VEPGA); non-profit environmental organizations and various citizens groups; and local governmental energy departments and school district energy departments. All of these entities should continue developing and disseminating consumer education messages to complement and/or supplement the primary Commonwealth-wide message.

[150] Third-party, in this context, could refer to state agencies, non-profit organizations, or private companies.

VII. Cost

It is very important to discuss projected costs of a new Commonwealth-wide consumer education program and to acknowledge that effective efforts will require a reliable, dedicated funding source to ensure the long-term success of the campaign. A successful program will require an adequate budget. An underfunded program will result in a significantly greater cost to all Virginians. Education is the foundation from which all efforts to reduce consumption will emanate; we must adequately fund these efforts.

Costs will vary as the consumer education campaign develops. These costs may change from year to year, transitioning from initial start-up expenses to mid- and long-term expenditures as the program changes and expands due to modifications and improved approach. A budget for the consumer education program must have the flexibility to respond to actual program results but also the dedication to provide enough funding to ensure success.

Unfortunately, clear data representing what other states are spending on consumer education programs is not readily available, so we rely on budget information presented in the Consumer Education Plan that was developed for the Virginia Energy Choice Customer Education Program in 1999 as a framework for a simple cost projection for a consumer education campaign in Virginia.[151] Although this report is eight years old it still represents a valid and illustrative resource by which a comparative budget/cost projection can be based. The total estimated cost of the five-year Virginia Energy Choice education plan for Virginia was $30.1 million. The average estimated annual cost for a five-year plan was approximately $6 million. This amount compares favorably with energy choice education programs being implemented in other states. Listed below are categories to be considered as potential and, at this point, flexible line items in a budget projection for a statewide consumer education program in Virginia:

Marketing Research and Tracking. Marketing research will be the first step in the process in order to establish baseline consumer information and may involve statewide consumer focus groups, a consumer survey, and other marketing tools useful in obtaining information that will help develop effective educational messaging and effective delivery systems. Tracking involves measuring results and outcomes in the areas of market penetration, information awareness, and consumer action. Research and tracking will be ongoing during the education campaign. It is probable a professional marketing firm will conduct these efforts. This information is critical for continuation of the consumer education program and is necessary to maintain support among funding sources, legislators, utilities, oversight agencies, and consumers.

Information Materials. There is a wealth of good information already available in the form of brochures, pamphlets, and handbooks, but brochures, bill stuffers and other handout material will be necessary for a new statewide program. Costs may include design, printing, and distribution of informational materials.

[151] *Consumer Education Plan*: Report to the General Assembly in Response to §56-592 of the Code of Virginia. Commonwealth of Virginia State Corporation Commission, December 1, 1999.

Media Kits/Public Relations. Cost for creating and distributing packaged materials containing press releases, consumer information, etc. and for costs related to participation and information delivery at events (energy fairs, community events, state fairs).

Grants. Grants ranging in size from $1000 to $15,000 to help grassroots organizations, local governments, schools, and Cooperative Extension offices to develop and implement community- based workshops and seminars.

Website. Cost for developing and managing a centralized website.

Hotline. Cost for developing, maintaining, and staffing a statewide consumer hotline. This is a difficult area in which to provide a cost estimate due to a variety of variables including long distance calls, duration of calls, etc.

Advertising. In the Virginia Energy Choice program, advertising represented the largest percentage of total budget (about 70%). TV, radio, and newspaper advertising is very expensive but also necessary in an effective consumer education campaign.

Budget Detail – Consumer Education Campaign

(Proposed Spending in Thousands of Dollars)

Category	2008	2009	2010	2011	2012	Total
Research	200	100	100	100	50	550
Information	300	300	200	200	150	1150
Media Kits	350	200	200	150	100	1000
Grants	200	150	150	100	100	700
Website	350	200	200	200	150	1100
Hotline	1500	1000	1000	500	500	4500
Advertising	6000	4000	4000	4000	3000	21000
Total	**8900**	**5950**	**5850**	**5250**	**4050**	**30000**

This illustrative budget projects a five-year program, with an average spending per year of $6 million, for discussion purposes only. Ideally, as the budget detail indicates, the first year
of the program should entail above-average spending; however, the reality is that a less than average amount may have to be utilized to jumpstart the program. Based on Virginia's estimated population of 7.5 million, the annual per capita cost would average $.80 under this framework.
Since the budget total is based on mostly 1999 figures, increasing the budget detail by 20% should be considered to allow for inflation. Also, since the consumer education program will continue through 2022, budgeting projected cost for a significantly longer duration would be necessary.

This budget is purely illustrative and as stated is somewhat based on figures and information reflected in the Consumer Education Plan developed for Virginia Energy Choice in 1999. An attempt has been made to tailor this information to reflect the ideas and recommendations made in the Consumer Education Campaign section of this subgroup report. The above budget detail should provide a useful framework for discussion by SCC staff.

The 2007 Virginia Energy Plan states: "**Virginia should implement an expanded energy education program.** This program should be developed by July 2008 based on input from energy and education stakeholders."[152] There is a sense of urgency in this statement, and if the Commonwealth is to move forward in an expeditious manner then the cost of a successful program must be at the forefront of the discussion. Otherwise, a real and greater cost will come in the form of an under-educated general population that continues to expend our energy resources in a wasteful and inefficient manner.

VIII. Funding

There was general consensus within our subgroup that identifying a dedicated, reliable funding source is absolutely necessary to ensure the long-term success of any consumer education program that is developed and implemented. A reliable, long-term funding source allows for effective planning and the flexibility to create new programming as demands and needs may change. States that operate successful consumer education and energy efficiency programs typically use a Public Benefit Fund (PBF), also known as a Systems Benefit Charge (SBC).
To date over twenty states have adopted a PBF to help fund a wide range of energy programs.

Normally a PBF is funded either through a mills charge per kWh or a flat rate charged per electric ratepayer. It is understood that a PBF may be politically difficult, particularly in tax-averse states, because it is perceived as a new tax. Framing the PBF as a user fee for energy may help in terms of perception, but the reality is that it is a tax. Virginia has a history of unsuccessful efforts to introduce PBF proposals for legislation.[153] At least four different proposals were introduced during the Virginia utility restructuring process. Only one of the PBF proposals actually entered the legislative arena; the others never made it that far. This was most likely due to a legislative concern about new tax increases and opposition from the C&I sector related to a mills per kWh charge that would raise their electric rates significantly. Nevertheless, a PBF, which has been successfully legislated and administered in many other states, remains a very reliable and effective funding mechanism. Our subgroup feels that it should be given full consideration as a funding option for a consumer education program as well as for conservation and energy efficiency initiatives.

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[152] *The Virginia Energy Plan*. The Commonwealth of Virginia Department of Mines, Minerals and Energy (DMME), 2007, 10.

[153] This summary was provided by Billy Weitzenfeld:

1998 – Virginia Council Against Poverty (now the Virginia Community Action Partnership) presented a legislative proposal to the legislation drafting committee of the SJR91 subcommittee studying electric utility restructuring. This proposal used a mills charge per kWh as the funding mechanism.

1999 – The Southern Environmental Law Center offered a legislative proposal to the Consumer Advisory Board, a subcommittee of the Legislative Transition Task Force studying electric utility restructuring. This proposal used a mills charge per kWh as the funding mechanism.

2000 – AECP offered the Low-Income Usage Reduction Program as a legislative proposal to the Consumer Advisory Board. This proposal used a flat rate per ratepayer as the funding mechanism.

2003 – House Bill 2317 was introduced in the General Assembly but was defeated in Committee. A flat rate per ratepayer was the funding mechanism.

Listed below are the three general PBF options we discussed:

1. A public benefit fund that uses a mills charge per kWh. The charge shall be a non-bypassable element of the local distribution service and collected on the basis of usage. Currently these charges range in other states from $0.00003/kWh to $0.003/kWh. Some PBFs using the mills charge per kWh model allow non-payment from low income consumers and cap the kWh at a certain level in fairness to large C&I users.

2. A public benefit fund that uses a flat rate that every residential ratepayer is charged. For example if every ratepayer were charged $0.15 per month the yield would be approximately $5,000,000 annually.

3. A public benefit fund that uses either a mills charge per kWh or a flat rate, and the amount generated is matched either equally or at a percentage by the utility companies. The rationale is that electric customers may be less resistant to paying a higher monthly bill for consumer education programs if they understand that their local utility is also contributing.

In recognition of the potential legislative difficulty posed by a PBF and the urgent need for immediate funds to jumpstart a consumer education program, some other options were also discussed. A question asked and considered by our subgroup was: Are there existing sources of revenue that could be used to fund the program in lieu of the creation of new funds? A potential solution is set forth in the two options below, both of which target the Virginia Electric Consumption Tax:

Background: The Virginia Energy Choice Customer Education Plan created by legislative action within the Restructuring Act and administered by the SCC was funded via the Special Regulatory Tax, a component of the VA Electric Consumption Tax. This did not involve a new tax increase but rather utilized uncollected tax revenue under the Special Regulatory Tax. The full amount allowed under the Code of Virginia had not been fully collected prior to 2000, and additional revenue was generated for the Virginia Energy Choice program through the subsequent collection of the maximum amount. When the Virginia Energy Choice program was phased out, the Special Regulatory Tax rate reverted to its previous level.

Option 1: If the maximum allowable portion of the Special Regulatory Tax is still not being collected, then the same formula could be used to fund a new statewide electric energy consumer education campaign.

Option 2: If the maximum allowable portion of the Special Regulatory Tax is being collected, then the legislature could authorize raising the statutory limit within one of the VA Electricity Consumption Tax components, and this additional money could be used to fund consumer education programs.

Note: Creating a PBF would require an additional line item on customers' bills, and there most likely would be resistance to this from customers and local utilities. Even though it would represent an increase, using an existing line item may provide a more palatable approach.

Other potential sources of revenue that could help fund the consumer education program might include: (i) cooperative advertising on the website; or (ii) allowing taxpayers to donate a portion of their state tax refunds by checking a box on their tax returns.

The following links provide useful information on Public Benefit Funds.

- ACEEE fact sheet on Public Benefits Funds
  www.aceee.org/energy/pbf.htm

- ACEEE review of 25 state Public Benefit Funds (an abstract)
  www.aceee.org/pubs/u042.htm

- Alliance to Save Energy's index of states with Public Benefit Funds
  www.ase.org/content/article/detail/2604

- Pew Center's map of states currently utilizing Public Benefit Funds
  www.pewclimate.org/what_s_being_done/in_the_states/public_benefit_funds.cfm

IX. Legislative Proposals

Based on a suggestion by SCC staff, our subgroup discussed potential legislative proposals that could be recommended to the Virginia General Assembly. Listed below in very brief and general content are the proposals unanimously recommended by our subgroup:

Legislation to establish a Commonwealth-wide electric energy consumer education program that will design and deliver informational materials related to conservation, energy efficiency, demand-side management, and demand response.

Legislation to fund a Commonwealth-wide electric energy consumer education program, either by:

– Creating a Public Benefit Fund and directing that such funding will support all necessary expenses related to the development and implementation of the program.

  or

– Authorizing a change in the statutory limit of the VA Electric Consumption Tax and directing that such funding will support all necessary expenses related to the development and implementation of the program.

Legislation to establish a K-12 energy education curriculum, tied to SOLs, in all public schools in Virginia to consistently and comprehensively inform our students about conservation, energy efficiency, and demand-side resources.

X. Summary

Consumer education will be a critical component of any plan that is implemented to achieve the General Assembly's established goal of reducing electricity consumption by 10% by the year 2022.

Subgroup 5 believes that a sufficiently funded, carefully designed, well-managed, properly marketed, and legislatively bolstered consumer education program would prompt Virginians to move from general awareness to specific action. The campaign could build upon the foundation that has already been laid by environmental and other organizations. Oversight by the SCC, the DMME, or another governmental agency would ensure that every citizen in the Commonwealth has the same access to accurate electric energy information and would allow consistent tracking, measurement, and evaluation of program impacts. This could in turn encourage the networking and partnering of different groups striving collectively to make a difference as a result of the campaign. Ideally, a centralized, comprehensive consumer education program could serve as
the cornerstone for separate but related conservation, energy efficiency, and possibly other programs.

The 10% consumption reduction goal can be achieved by 2022, and educated consumers will ensure that this initiative is successful.

This report reflects the ideas, recommendations, and input from 23 members of Subgroup 5:

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Billy Weitzenfeld, Co-Chair (AECP)

John Broughton (DMME)
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Bruce Edgerton (Citizen)
Scott DeBroff (Elster/Trilliant)
Jack Greenhalgh (Consumer Powerline; New Era Energy)
Ron Hartzheim (Town & Country Mechanical)
Richard Hirsh (Virginia Tech)
Ron Jefferson (APCO)
Tom Jewell (DVP)
Salud Layton (Assoc. of Electric Coops)
Robert Lazaro (Purcellville)
Irene Leech (Virginia Tech)
Joe Lenzi (Chesterfield/VEPGA)
Doug Pickford (NoVA Region)
Charles Price (Sierra Club)
Victoria Racine (Original Ink)
Mark Repsher (Dominion Retail)
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John Sheppelwich (APCO)
Mike Town (Sierra Club)

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ACEEE's fact sheet on Public Benefits Funds – www.aceee.org/energy/pbf.htm

ACEEE's review of 25 Public Benefit Funds (an abstract) – www.aceee.org/pubs/u042.htm

Alliance to Save Energy's index of states with PBFs – www.ase.org/content/article/detail/2604

California's energy education curriculum resource – www.energyquest.ca.gov/about.html

California's *Flex Your Power* – www.fypower.org/

Colorado's Energy Science Center Program – www.energyscience.org/education/index.html

Connecticut's energy education curriculum for high school educators – www.ctenergyeducation.com

Connecticut's *Saving without Sacrifices* – www.ctsavesenergy.org

Connecticut's *Watts New* – www.wattsnewct.com

Efficiency Vermont (EVT) – www.efficiencyvermont.com/pages/

Energy Hog Campaign – www.energyhog.org

ENERGY STAR program – www.energystar.gov

Maine Energy Education Program (MEEP) – www.home.psouth.net/~meep/

Maryland PSC three-year Consumer Education Program (CEP) on electric choice www.psc.state.md.us/psc/electric/ConsumerEdPlanYr3

National Energy Education Development (NEED) Project – www.need.org

North Carolina's statewide energy progam – www.energync.net/efficiency/residential.html

Pew Center's map of states currently utilizing Public Benefit Funds www.pewclimate.org/what_s_being_done/in_the_states/public_benefit_funds.cfm

Texas' energy education curriculum – www.seco.cpa.state.tx.us/energy-ed_curriculum.htm

Wisconsin's K-12 Energy Education Program (KEEP)–www.uwsp.edu/cnr/wcee/keep/index.htm

Attachment 1:

Summary of State Scoring on Energy Efficiency

Rank	State	Utility Spending on EE	EERS	Combined Heat & Power	Building Codes	Transportation Policies	Appliance Standards	Tax Incentives	State Lead by Example	TOTAL SCORE
	Maximum Points:	*15*	*5*	*5*	*5*	*5*	*3*	*3*	*3*	*44*
1	Vermont	15	5	3	3	4	2	0	1	33
1	Connecticut	11	5	5	4	4	1	2	1	33
1	California	7	5	5	5	3	3	2	3	33
4	Massachusetts	13.5	0	4	2.5	4	2	1	2	29
5	Oregon	11.5	0	4	4	3	2	3	0.5	28
6	Washington	9.5	3	3	4	4	2	1	0.5	27
7	New York	5	0	5	3	5	2	2	3	25
8	New Jersey	7	1	5	2.5	4	1	0	1.5	22
9	Rhode Island	8.5	0	1	4	4	2	0	0.5	20
9	Minnesota	7	3	3	4	2	0	0	1	20
11	Texas	2	5	4	4	1	0	0	1.5	17.5
12	Wisconsin	6.5	0	3	3	2	0	0	2.5	17
13	Iowa	6.5	0	2	4	1	0	0	3	16.5
14	Pennsylvania	0	3	4	4	4	0	0	1	16
15	Colorado	1.5	5	3	3	0	0	1	2	15.5
15	Maine	6.5	0	2	2	4	0	0	1	15.5
15	Hawaii	4.5	3	3	2	1	0	0	2	15.5
18	New Hampshire	7.5	0	1	3	1	0	0	2	14.5
18	Nevada	2	5	2	4	0	0	1	0.5	14.5
20	Maryland	0	0	2	4	4	1	1	2	14
21	Montana	5.5	0	0	4	0	0	3	0.5	13
22	District of Columbia	2.5	0	0	4	1	0	3	2	12.5
23	Arizona	0.5	0	2	3	1	2	1	2	11.5
24	New Mexico	0.5	0	3	4	1	0	1	1.5	11
25	Idaho	3	0	2	4	0	0	1	0.5	10.5
26	Illinois	0	3	2	3	1	0	0	1	10
27	Utah	4.5	0	0	4	0	0	0	1	9.5
27	Ohio	0.5	0	3	4	1	0	0	1	9.5
29	Florida	2.5	0	0	4	1	0	0	1.5	9
30	Delaware	NA	0	3	3	2	0	0	0.5	8.5
30	North Carolina	0	0	2	3.5	1	0	0	2	8.5
30	South Carolina	0.5	0	2	4	0	0	1	1	8.5
33	Michigan	0.5	0	3	1	1	0	0	2	7.5
34	Kansas	0	0	2	4	0	0	0	1	7
35	Nebraska	1.5	0	1	4	0	0	0	0	6.5
35	West Virginia	0.5	0	2	4	0	0	0	0	6.5
35	Kentucky	0.5	0	0	3.5	1	0	0	1.5	6.5
38	Virginia	0	0	2	4	0	0	0	0	6
38	Georgia	0	0	0	4	2	0	0	0	6
40	Louisiana	0	0	0	3.5	0	0	2	0	5.5
41	Indiana	0	0	3	2	0	0	0	0	5

Rank	State	Utility Spending on EE	EERS	Combined Heat & Power	Building Codes	Transportation Policies	Appliance Standards	Tax Incentives	State Lead by Example	TOTAL SCORE
41	Alaska	0	0	2	2	1	0	0	0	5
43	Tennessee	1.0	0	1	1	1	0	0	0	4
44	Oklahoma	0	0	0	2.5	0	0	1	0	3.5
45	Arkansas	0	0	0	3	0	0	0	0	3
46	Missouri	0	0	0	1.5	0	0	0	0.5	2
46	Alabama	0	0	1	0	0	0	0	1	2
48	South Dakota	0.5	0	1	0	0	0	0	0	1.5
49	Mississippi	0	0	1	0	0	0	0	0	1
49	Wyoming	0	0	1	0	0	0	0	0	1
51	North Dakota	0.5	0	0	0	0	0	0	0	0.5

Source: Eldridge, M., B. Prindle, D. York and S. Nadel. *The State Energy Efficiency Scorecard for 2006.* www.aceee.org/pubs/e075.htm. Washington, DC: The American Council for an Energy-Efficient Economy.

Attachment 2:
Consumer Education Campaign Timetable

Immediate

Announce the Consumer Education Campaign (possible launch: Earth Day 2008)

1. Issue press release to newspapers and radio stations (articles and radio PSAs).
2. Coordinate with utilities to develop bill inserts.
3. Post press release on various websites (state/utility/county) already in existence.
   Other existing websites: DEQ, DMME, VACO, VEPGA, etc.

Short-term (within one year)

1. Publicize the Consumer Education Campaign
   a. Television PSAs (local talk shows, FOX News'"Energy Team," NBC-12's "Go Green,"etc.).
   b. Continue to include inserts with utility/coop bills.
   c. Develop a Commonwealth-wide EE brochure.
   d. Promote central website on other already existing web sites.
2. Central Website (consumer-friendly, well-designed, consumer sector-oriented)
3. Consumer Energy Stewardship Hotline for Q&A
4. Expand Consumer Education Campaign Efforts – Take message to:
   a. County Board of Supervisors and County School Boards
   b. HOA communities and developers
   c. Civic groups, religious institutions, sports leagues
   d. Schools, community colleges, and universities

*Ongoing: Track, Measure, and Evaluate Results * Modify Message Design and Delivery as Needed*

Mid-term (one to five years)

1. Publicize the Consumer Education Campaign
   a. Continue multimedia approach (add billboards, mass transit ads).
   b. Continue to include inserts with utility/coop bills, to include Commonwealth-wide EE brochure.
   c. Continue promoting central website.
2. Central Website (w/ interactive pages)
3. Utility-sponsored energy fairs and Other-sponsored local/regional energy workshops.
4. Consumer Energy Stewardship Hotline for Q&A
5. Expand Consumer Education Campaign Efforts – Integrate message with:
   a. All county websites
   b. Public School K-12 energy education curriculum tied to SOLs (with handouts for kids to take home to parents)
   c. Colleges/Universities
   d. All chambers of commerce monthly business meetings
6. Target Specific Audiences with Specific Messages
   a. Those with high energy burdens – Weatherization program
   b. High energy users – ENERGY STAR appliances
   c. Small business users

Long-term (over five years)

Continue to expand the education efforts and to target specific audiences.