COMMONWEALTH of VIRGINIA

GOVERNOR TERENCE R. MCAULIFFE'S CLIMATE CHANGE AND RESILIENCY UPDATE COMMISSION

The Honorable Molly Joseph Ward, Co-Chair
The Honorable Brian Moran, Co-Chair

REPORT AND FINAL RECOMMENDATIONS TO THE GOVERNOR

December 21, 2015

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I. INTRODUCTION

Governor Terry McAuliffe issued Executive Order 19 on July 1, 2014 convening the Governor's Climate Change and Resiliency Update Commission. The Commission, co-chaired by Secretary of Natural Resources Molly Ward and Secretary of Public Safety and Homeland Security Brian Moran, was directed to develop up to five actionable recommendations and submit those recommendations in a report to the Governor. On July 1, 2015, Governor McAuliffe signed Executive Order 45 extending the Commission's work for one year and requiring the Commission to submit its report by September 30, 2015.

This collaborative and bipartisan effort consisted of individuals from around the state including local elected officials, members of the General Assembly, business leaders, environmental advocates, faith leaders, and industry representatives. A list of the Commission membership is included as Appendix A.

The Commission met quarterly over the course of the year to review and prioritize the recommendations. The meetings consisted of the following: (1) a kickoff meeting on September 10, 2014 in Senate Room 3 of the Virginia State Capital Building; (2) a second meeting on December 5, 2014 in conjunction with the annual conference of the Virginia Coastal Policy Clinic at William & Mary Law School; (3) a third meeting on April 21, 2015 at the University of Richmond; and (4) a final meeting on August 31, 2015 in the West Reading Room of the Patrick Henry Building.

The Commission was directed to utilize Governor Kaine's Commission on Climate Change and the resulting 2008 Climate Change Action Plan as a starting point for the discussion. The 2008 Climate Change Action Plan outlined the impact changing weather conditions have on Virginia's built environment, natural systems, and the health of its citizens. Among the findings were the decline or disappearance of key species of the Chesapeake Bay, increased damage from more frequent and severe storms, and the spread of vector-borne diseases like West Nile virus. The report also made 113 recommendations to help Virginia adapt to the consequences of climate change, as well as reduce Virginia's contributions to the problem.

In addition to building off this prior work, the Commission received information regarding work underway since the 2008 Climate Change Action Plan was developed. These efforts include the work of the Secure Commonwealth Panel's Recurrent Flooding Subpanel, the Center for Coastal Resources Management at the Virginia Institute of Marine Science (VIMS), the Coastal Policy Clinic at William & Mary Law School, the Inter-Governmental Pilot Program, Virginia's Coastal Zone Management Program and Floodplain Management Program, and many other efforts throughout the Commonwealth. The Commission was directed to reflect upon all of this prior and ongoing work as it developed its recommendations.

To facilitate the development of the Commission's top five recommendations, the Commission divided into five workgroups: (1) Public Education, (2) Information, (3) Energy, (4) Funding, and (5) Land Use and Transportation. A description of each of the workgroups and a list of their members is found in Appendix B.

Between April and August, these workgroups met individually to formulate the recommendations and draft the workgroup reports. A broader list of recommendations discussed during these deliberations is provided in Appendix C. The workgroups narrowed the recommendations down to a total of thirteen that were presented to the full Commission and subsequently voted on by the membership. The top five recommendations resulting from the voting are as follows:

1. Establish a Climate Change and Resilience Resource Center and/or Clearinghouse;
2. Create a New Virginia Bank for Energy and Resilience;
3. Set a Renewable Energy Procurement Target for Commonwealth Agencies;
4. Adopt a Zero Emission Vehicle Program; and
5. Leverage Federal Funding to Make Coastal Communities, Southside, and Southwest Models of Resilience.

It is important to note this report does not represent a consensus document, but rather is a document summarizing the efforts of the Commission. While the voting on the top five recommendations was performed democratically, not all of the members of the Commission support each of the five recommendations. Further, not all of the members of the Commission support the recommendations found in the workgroup reports. The Commission's intent was to provide recommendations for Governor McAuliffe's consideration, while recognizing that the Governor will use his discretion to determine which recommendations he will move forward with implementing and how.

Finally, in addition to developing a set of five recommendations for the Governor's review, the Commission also provided two additional recommendations Governor McAuliffe has already acted on.

First, the Commission recommended that Governor McAuliffe appoint a Chief Resilience Officer to serve as the single, initial point of contact for issues related to resiliency. Governor McAuliffe appointed Secretary Moran to serve in that role. Since that time, Secretary Moran's office has initiated serious updates to emergency planning and disaster relief in eastern Virginia to address the deficiencies Governor McAuliffe identified in his earliest days on the job. The Virginia Department of Emergency Management (VDEM) released a strong report and continues to improve emergency planning to take into account the long-term challenges posed by higher

tides, stronger storms, and poorly placed infrastructure. Secretary Moran and his team are working with individuals and stakeholders to create a more resilient Virginia and to bring much-needed funding for resiliency projects in Hampton Roads and throughout the Commonwealth.

Second, the Commission recommended that VIMS develop a statewide protocol for sea level rise projections. The intent of this recommendation was to address one of the major problems planners face when trying to address long-term sea level rise, which is the lack of a coherent and comprehensive process for arriving at a projection. The Governor's office asked VIMS to develop such a protocol, and the result of that work is set forth in Section III below.

II. COMMISSION'S RECOMMENDATIONS

Ultimately, the Commission voted on its top five recommendations for presentation to the Governor. These recommendations are set forth in Section A below. The top five recommendations are derived from the recommendations each of the workgroups developed and presented during the August 31, 2015 meeting of the full Commission. Each workgroup was tasked with developing a workgroup report focusing on no more than three substantive action items. The action items were intended to be achievable or significantly underway by the end of Governor McAuliffe's term. However, the Commission recognizes that the Governor will use his discretion to determine which of these recommendations he will work to implement. The workgroup reports, as well as summaries of the discussion amongst the Commission members surrounding the reports, are set forth in Section B below.

A. TOP FIVE RECOMMENDATIONS

The Commission voted on the top five recommendations, from thirteen presented in the workgroup reports, through a democratic process. Each Commission member was given three votes. Those votes were tabulated such that the five recommendations with the most votes were deemed the top five. As noted above, the recommendations were not reached by consensus and not all of the Commission members support all of the recommendations. Where there was dissenting discussion, it is noted below. The top five recommendations are as follows.

1. Establish a Climate Change and Resilience Resource Center

Goal: This recommendation, provided by the Information Workgroup, is to create a resource center to identify and pursue needed information for decision-makers, operate with transparency, establish quality and format standards, and provide technical assistance as needed. The Commission voted to merge this recommendation with the recommendation of the Public Education workgroup, which is to provide a central location for an information clearinghouse, focusing on information of use to citizens and businesses.

Overview: The point of differentiation between the recommendation of the Information Workgroup and the recommendation of the Public Education workgroup is that the Information Workgroup viewed the resource center's audience to be lawmakers, legislatures, state governments, and other decision-makers as opposed to the public at large. Therefore, their findings and information would be more technical and wide-ranging. In voting to merge these two recommendations, the Commission discussed creating a central repository of information with a few different portals to separately target state and local governments and the general public. The portal for state and local governments would include actions that state agencies and federal and local partners are engaged in as well as information developed by academic institutions and research entities. The portal for the general public would include practical information regarding how to reduce carbon emissions and impacts associated with climate change.

Implementation: The Commission discussed questions with regard to logistics and where the resource center would be housed. Ultimately, the Commission determined that such decisions would be made by Governor McAuliffe and his administration. Questions regarding implementation that the Commission identified for the Governor's office include: (i) Should the resource center be organized as a consortium? (ii) Should it be located in a state agency, in the Governor's office, or in an academic institution? (iii) What content should the resource center maintain and how should that content be disseminated?

Cost Assumptions: Based on the wide-ranging nature and potential duties of the resource center, the Commission did not formulate cost assumptions associated with this recommendation.

Dissent: There was general agreement amongst the Commission membership around this recommendation. The only concern reflected during the discussion was that if the resource center's scope is too broad, it might be difficult to create or administer.

2. Create a New Virginia Bank for Energy and Resilience

Goal: This recommendation, provided by the Funding Workgroup, is to create a bank for energy and resilience projects. The goal is to use finite public dollars to fill gaps in private investments, thereby enabling additional support for energy and resilience projects.

Overview: The Funding workgroup identified the overarching premise that Virginia does not have the capital required to pay for all the measures necessary to combat climate change and build more resilient communities on its own. With potential federal funding shortfalls undercutting Virginia's ability to respond, the Funding Workgroup noted that strategies like the

bank could help to alleviate these obstacles. The bank would function as a public-private partnership institution providing low-cost financing for clean energy or resiliency projects in a manner that both leverages public funds and attracts private investment. The bank could provide such financing through subordinated loans or warehousing and securitization, or through other instruments, guarantees, loan loss reserves or credit enhancement structures.

Implementation: The Energy Workgroup noted that the bank could be developed in two ways. The first is to use currently available funds for specific energy and resilience projects in ways that stretch the public dollar and bring in private investment. These existing funding sources include the Commonwealth's Qualified Energy Conservation Bonds (QECBs) and other sources of public funding that could be leveraged to gain private investment. The second way is to develop a fully functioning state financing institution that would be capitalized through a bond or other state funding mechanism.

Cost Assumptions: The cost assumptions vary depending on which approach is utilized. If the bank takes the form of a fully capitalized financial institution, then it would require significant capitalization through a bond or the state budget process.

Dissent: Some members of the Commission recommended the Commission consider changing this to a trust fund or using a more limited and restricted method while recognizing that banks are complex institutions. Other members recommended that the bank be called "the New Virginia Investment Fund" or the "New Virginia Capital Fund." In addition, some Commission members questioned why public investments were needed, why the private industry did not invest unilaterally, and what obstacles prevent private groups from investing in these measures. There were also questions about opportunity costs in diverting funds to this bank rather than their original purpose. Finally, it was noted the bank may not actually address a financial need per se but instead may be addressing market-based obstacles, such as regulatory barriers or natural supply and demand.

3. Establish a Renewable Energy Procurement Target for Commonwealth Agencies

Goal: This recommendation, provided by the Energy Workgroup, is to develop a renewable energy procurement target for the Commonwealth of Virginia. The procurement target would require agencies with state-owned buildings to purchase a percentage of their energy generation from resources deemed renewable.

Overview: The recommendation builds upon Governor McAuliffe's Executive Order 31, which established a requirement that the Commonwealth reduce electricity consumption in state facilities by 15% by 2017, using 2009-2010 energy consumption levels as a baseline. In addition,

the Energy Workgroup noted that such policies are in place in the federal government and are helping to drive investments in renewable energy resources. Finally, the Energy Workgroup noted that the declining prices for renewables, including solar and wind, means these investments are becoming more cost-competitive over time.

Implementation: The workgroup did not recommend a specific target, though it did discuss targets ranging from 25% to 30% renewable energy procurement by 2025. Members also discussed establishing an interim target of, for example, 5% renewable energy procurement by the end of 2016. The workgroup ultimately noted such decisions should be left to Governor McAuliffe. The workgroup recommended that this target be carried out through Executive Order.

Cost Assumptions: The workgroup did not provide cost assumptions regarding this recommendation. Such cost assumptions would be based on the ultimate target as well as the price of procuring renewable resources, either through self-build, power-purchase agreements, or the purchases of renewable energy certificates (RECs).

Dissent: The Commission members asked how such procurement would occur and what requirements would this impose on state agencies. There were questions regarding cost and a discussion on varying views regarding the cost of renewables. Some members noted that renewables are more expensive than current energy prices. Others noted that long-term energy prices for fossil-fuel resources are volatile and renewables potentially provide a hedge on that volatility. There were also questions regarding why this would be limited to renewables and whether this recommendation should consider nuclear generation as well. Finally, there was a discussion regarding why a full renewable portfolio standard (RPS) was not considered and a discussion regarding the fact that such a standard would require legislative authorization.

4. Adopt a Zero Emission Vehicle Program

Goal: This recommendation, provided by the Land Use and Transportation Workgroup, is to adopt a zero emission vehicle (ZEV) program. The overall goal is that by 2025, fifteen percent of all new cars sold would be battery electric, plug-in hybrid, or fuel cell.

Overview: The Land Use and Transportation Workgroup noted that under the Clean Air Act, California can establish more stringent motor vehicle emission standards than federal standards, and other states can opt-in. The ZEV program is one such standard California enacted. It requires manufacturers to sell a percentage of ZEVs, which include battery electric, plug-in hybrid, and fuel cell vehicles. According to the workgroup, California, Connecticut, Maine, Maryland, Massachusetts, New Jersey, New York, Oregon, Rhode Island, and Vermont have all adopted ZEV programs.

Implementation: The workgroup concluded that Virginia would need to promulgate a regulation to opt into the ZEV program. The workgroup noted that the Stare Air Pollution Control Board and the Virginia Department of Environmental Quality would play a role in developing and approving this regulation. The Commission members discussed whether this program may need complimentary policies and/or funding in order to increase the infrastructure necessary to support acquisition of these types of vehicles.

Cost Assumptions: The workgroup indicated there would be minimal public cost associated with the administrative action. Some members of the Commission questioned that assessment and noted these types of vehicles tend to be more expensive than traditional vehicles. Further, there was discussion that the Commonwealth may need additional investments in infrastructure, such as electric charging stations that would facilitate the use of these vehicles.

Dissent: A few Commission members expressed concerns with this recommendation and did not support its adoption. One Commission member noted that California regulators should not dictate fuel economy rules in Virginia. Commission members also raised concerns that this recommendation could increase the average price of a vehicle and may lock customers into older and less efficient vehicles rather than purchasing a newer car. There was also the concern regarding enforcement and where that would fall: on dealers, manufacturers, or customers. Another concern related to the manufacturing sector and the fact that Virginia has two automotive plants but neither manufactures ZEVs. The Virginia Automobile Dealers Association provided a statement opposing this recommendation, included as Appendix D.

5. Leverage Federal Funding to Make Coastal Communities More Resilient

Goal: This recommendation, provided by the Funding Workgroup, is to leverage federal funding to develop programs to make coastal communities, as well as communities in Southside and Southwest Virginia, models of resilience.

Overview: The Funding Workgroup specifically focused on one area of potential federal funding: the U.S. Department of Housing and Urban Development (HUD) National Disaster Resilience Competition (NDRC). The workgroup noted that this Competition will provide approximately $1 billion in funding for disaster recovery and long-term community resilience. Finalists can compete for this funding, and submit proposals of up to $500 million. The workgroup recommended that Governor McAuliffe fully leverage this funding source and use it as a model that can be built upon to create resilient and adaptive communities in Hampton Roads and beyond.

Implementation: Virginia was selected to continue into Phase II of the competition along with 4 other states and localities. The Phase II application is due on October 27, 2015. The

Commission recommended fully developing this application with innovative projects demonstrating models for both coastal resilience and improving community resilience for at-risk populations in locations in Hampton Roads. The workgroup noted that these models should also be leveraged in Southside and Southwest Virginia.

Cost Assumptions: The Funding Workgroup recommended the Governor seek additional funds in the budget and through any G.O. bond request to utilize as leverage for the NDRC competition and for resilience projects beyond the competition. The Commission did not vote on a dollar amount associated with this recommendation.

Dissent: There were no dissenting comments regarding this recommendation.

B. WORKGROUP REPORTS

Each of the recommendations discussed in Section A above, as well as all of the recommendations considered during the August 31, 2015 full Commission meeting, were set forth in the reports developed by the five workgroups. The workgroup reports do not include background information already presented to the Commission or contained in the 2008 Climate Change Action Plan, but rather contain policy suggestions related to the issue area of the workgroup. The reports were drafted based on conversations that took place during the workgroup meetings. As noted previously, not all of the members of the Commission agree with the recommendations set forth in the workgroup reports. These reports merely represent the output based on the efforts of each workgroup.

1. Public Education Workgroup Report

Introduction and Background

The Public Education Workgroup of the Climate Change and Resiliency Update Commission was established to "focus on the available and the needed state mechanisms for effective education of the public on the issue of climate change impacts and responses". The charge to the Workgroup included *"identifying key issues and messages, outreach opportunities and resources, and agency outreach responsibilities".* It was anticipated that the Workgroup would develop an evaluation process to determine the success of outreach efforts using measurable and verifiable metrics and, if possible, to provide cost estimates for outreach implementation.

The Workgroup met twice (March and July 2015) outside of the three meetings of the full Commission (September 2014, December 2014 and April 2015). In addition to the formal meetings, the Workgroup Chair had informal discussions about climate-change education with

faculty and staff at the Virginia Institute of Marine Science, faculty members in the Center for Climate Change Communication at George Mason University, the Director of the Office of Science and Health Education at the Virginia Department of Education, and leadership at Resilient Virginia, a not-for-profit organization that promotes resiliency education as one of its goals.

During the two Workgroup meetings, discussions were wide ranging but centered primarily on (1) the challenge of how to effectively engage the public in climate-change education, (2) identifying key messages that were deemed to be of highest priority, and (3) strategies for how best to convey those messages to diverse audiences. It was clear from the discussion that simply bringing up the topic of climate change can lead to polarization, misunderstanding, confusion, and even suspicion. It was noted that the public may be wary of actions that cost money, and that climate-change education should not take an alarmist approach. The Workgroup felt that, while sea-level rise in Hampton Roads was a compelling example of climate-change impact, public education should communicate impacts in a way that resonates with audiences throughout the entire state.

There was widespread agreement among Workgroup members that a tremendous amount of information is already available on climate change education, both in print form and on various websites. Examples at the international and national level include education resource sites at *UNESCO, NOAA,* and the *National Center for Science Education (NCSE),* and at the state level include *Virginia Naturally* and *Resilient Virginia.* Many more exist. Information from these resources covers strategies for raising awareness, resiliency planning, identification of health and economic impacts, and links to recent publications, sources of data, and public policy. On the single topic of adaptation to sea-level rise and flooding, there are at least 25 programs and initiatives in Virginia within academia, NGOs, Commonwealth agencies, and Federal agencies that address these issues. What became clear, however, is that, despite the high level of interest and number of ongoing activities, there currently is no single authoritative and comprehensive website that is devoted specifically to public education on climate change in Virginia.

Considerable discussion focused on this point. The Workgroup concluded that there would be benefit in establishing an online clearinghouse that could provide a wide range of information about climate change on one easy-to-use site pertinent to key issues in Virginia. This site could include, but not be limited to, technical advice, practical information for businesses and citizens, links to educational materials for all ages, information on current programs underway and new programs being proposed, high resolution maps, financial incentives, and tools and resources for sharing information. The Workgroup recognized and discussed the overarching issues of funding, staffing, information delivery, and marketing the information.

Recommendation #1: ***Establish a Climate Change Clearinghouse***

a. **Goal:** Provide a central location for dissemination of climate change and resiliency information for Virginia from government and academic sources.
b. **Action Items:** Determine how the site will be housed/hosted, the level of information to be included, the best way to ensure objectivity, and the critical links to other sites. Questions include: (i) Should the site be organized as a consortium? (ii) Will an academic institution(s) offer stability and insulation from politics? (iii) How will the clearinghouse be marketed to reach people who would not otherwise seek it out? (iv) How should the content and breadth of information be established and structured (e.g. for citizens, homeowners, business owners)? (v) Is there value in establishing an interactive section with a blog, discussion board, or listserv?
c. **Cost Assumptions:** Unable to quantify at present but will likely require a modest level of new funds. Funding from endowed private support should be explored, as well as long-term education and outreach grants. Academic institutions may already have some of the necessary infrastructure, and may be able to move more quickly to implementation.
d. **Implementation Period:** 1 year.
e. **End Result:** A comprehensive and trusted source of climate change information focused on Virginia that will help educate the public, increase their awareness and stewardship, and serve as the most authoritative and up-to-date site for the science of climate change with special emphasis on practical information for citizens and businesses.

Recommendation #2: ***Develop a Strategy for Enhancing Environmental Literacy***

a. **Goal:** Provide a strategy for dissemination of public information relative to Virginia climate change and resilience through strategic partnerships to promote environmental literacy.
b. **Action Items:** Establish stories that feature certain locales, businesses, and examples of specific impacts that will be readily understood and appreciated by the public; explore the possibility of information dissemination analogous to PBS's "A Moment in Time"; direct audiences to existing programs at, for example, Community Colleges or Master Naturalists functions; develop materials for specific high-volume delivery points such as state parks and through carefully-crafted messages delivered by TV weathercasters, as well as through community centers, local festivals, and other public gatherings; consider developing public service announcements that include, for example, tips on how to save money.
c. **Cost Assumptions:** Unable to quantify at present but will likely require a modest level of new funds. Funding from endowed private support should be explored, as well as long-term education and outreach grants.
d. **Implementation Period:** 1-2 years.

e. **End Result:** A more fully educated public that understands and appreciates the implications of climate change in their lives, who will in turn educate others.

Recommendation #3: ***Promote Hands-on K-12 Learning Experiences***

a. **Goal:** Engage young people through hands-on experiences to become more climate literate.
b. **Action Items:** Utilize Executive Order 42 ("Establishing the Virginia Environmental Literacy Challenge) as a framework for action; engage church and scout groups, the Department of Forestry, *Virginia Naturally* partners, and Department of Conservation and Recreation fourth grade state park experience opportunities; coordinate with the Secretary of Education and the Virginia Science Teachers Association to determine what is currently being done; develop a menu of options for teachers and other educators, mapping information to Virginia science Standards of Learning when they are next updated.
c. **Cost Assumptions:** Unable to quantify at present but will likely require a modest level of new funds. Funding from endowed private support should be explored.
d. **Implementation Period:** 1-2 years.
e. **End Result:** Every K-12 student statewide receives a hands-on experience through their school that has a basis in the science of climate change.

Concluding Remarks

The Public Education Workgroup concludes that the above recommendations will advance the public's understanding of climate change and are worthy of consideration by the full Commission. If implemented, they will lead to better access of information that is accurate and unbiased, and that is targeted for a public as opposed to scientific audience. Citizens and businesses will be better able to make informed decisions; students will have a more robust learning environment; adaptation and resiliency will be enhanced; and natural resources will be used more effectively. Evaluation of success should incorporate SMART objectives (Specific, Measurable, Achievable, Results-focused, Time-bound) as described in http://www.cdc.gov/phcommunities/resourcekit/evaluate/smart_objectives.html.

2. Information Workgroup Report

Introduction and Background

The Information Workgroup of the Climate Change and Resiliency Update Commission was established to "focus on identifying and pulling together the essential information necessary to support effective and coordinated management and planning across state and local governments." The charge to the Workgroup included examining and recommending "the

vehicle or program for the state to establish in order to successfully generate, present, and distribute the information."

The Workgroup met four times (two meetings in April 2015, one meeting in June 2015, and one meeting in July 2015) outside of the three meetings of the full Commission. While the workgroup investigated the types of data that will be needed to effectively adapt to climate change, a comprehensive and detailed list proved to be well beyond our limited time, resources, and technical expertise. Despite these hurdles, we were able to identify several systemic challenges with the collection and aggregation of climate-related data in the Commonwealth. Our discussion highlighted the effective efforts already at play in Virginia and generated a solution that maximizes return on investment and impact.

There are already significant data collection projects being performed throughout the Commonwealth. Vast, useful data sets have already been collected, but there is limited coordination between research partners and no comprehensive list of available data. As a result, parties with shared aims sometimes unknowingly re-collect already gathered information. This is an inefficient and ineffective use of research dollars and resources. It is our belief that the value of information increases exponentially when shared.

Summary of Recommendation

The workgroup recommends that Governor McAuliffe establish a Climate Change Resource Center (CCRC). The mission of the CCRC would be to identify the information needed by decision makers to make communities more resilient to climate change. The CCRC would both make the information available and train decision makers and their staff to utilize the information. The CCRC could be created as a new state agency of state government, as a division within an existing agency, or be housed at one or more universities. It is important that an advisory committee of climate change experts and local or regional decision makers be formed to assist the CCRC in the implementation of its mission.

a. Goal

The simple collection and aggregation of data is not enough to mitigate and adapt to the challenges presented by climate change. First and foremost, data must be stored and displayed in a useful and usable manner. Considering this, the information workgroup has come up with four guiding principles for data collection, aggregation, and use. They are as follows:

- Information should be in a consistent format so that it can be shared across jurisdictional lines.

- Information needs to be presented in a way that is understandable and useful to decision makers. Where applicable, data should be summarized for specific management use rather than being presented in its raw form.
- While the coastal zone is understandably an area of initial focus given that the impacts of climate change may become more obvious there sooner than in other parts of the state, the workgroup recognizes that climate change will affect the entire Commonwealth. Therefore, when the state invests in data collection, it should as much as possible ensure the data is collected statewide.
- Data collection efforts for the Commonwealth should consider collaboration across federal, state, local government entities, university, and private industry by leveraging the "Whole of Government and Community" approach employed by the Hampton Roads Sea Level Rise Pilot Project.

b. Action Items

Much of the necessary data has already been collected or is already in the process of being collected. Over the course of our discussion, we identified several data sets that provide a strong foundation for future research, including information from federal, state, and local governments as well as universities and private entities. The workgroup envisions that the recommendations would be structured as follows.

1) <u>CCRC Responsibilities</u>

Recognizing the limitations of our work group, we have conceptualized a process by which the CCRC, once formed, should go about aggregating, interpreting, and augmenting already gathered data. The CCRC should be tasked with the following responsibilities:

- Make a priority of information needs listed below, as well as determine additional information needs that the workgroup did not have the resources to identify.
- Track and regularly provide updates on when information was collected or is being collected, and when updated information is expected to be available.
- Identify information that is needed but is not currently being collected, and resources that may be available for collection efforts.
- Identify information that requires summarization to be useful for planning and management efforts; emphasis should be placed on data summarization which helps eligibility for State and Federal programs (e.g. National Flood Insurance Program's CRS program).
- Establish quality and format standards. Ideally these standards would conform to those already in use at the federal level or should be designed in consultation with neighboring states so we can share information across state borders.
- Provide technical assistance and training for local elected officials, local staff, Planning District Commission staff and state agency staff.
- Analyze information to create useable products for decision makers.

2) Types of Information Needed

While the workgroup lacked capacity to compile a comprehensive list of information needs, we did begin to compile lists of data that we know will be needed.

Projections and derived/summarized data already exist for localized sea level rise, but will need periodic updating. Indeed, the Commission requested at its December meeting that a protocol be developed by VIMS and the Hampton Roads Planning District Commission. One workgroup member shared a report that had been commissioned by the Sierra Club to analyze and update the most recent VIMS information on this subject and to recommend the levels that local governments should use for planning purposes. Another member recommended that the Commonwealth endorse the use of scenario planning instead of planning only to a single number.

VIMS is proposing to provide information on sea level rise at two time scales, relevant to management. The first is a 30 year projection based on historic tide gauge records. This is most useful for individuals and short term local planning efforts. The second carries projections out to the end of the century and offers high, low and mid-case scenarios for climate change effects. This is most useful for long term local planning and construction of major infrastructure (new roads, bridges, tunnels, storm barriers). The Sierra Club report adds 50-year and 100-year projections and recommends margins of safety that can be added depending on risk tolerance.

Projections would be improved by:

- More detailed subsidence data
    - NASA is trying to get Synthetic Aperture Radar (SAR) flights to measure land elevation; this will take several years to get useful data but will provide highly resolved subsidence data
    - ODU/NOAA/USGS/NASA are equipping tide gauges with the capacity to measure subsidence at the tide gauge; this will take several years to get useful data but will provide subsidence data specific to tide gauges (the primary source of local sea level change information)
- Sea level rise viewer
    - VIMS has a sea level rise viewer for certain localities which has been approved for CRS credit; other coastal localities are under development
    - These would be improved by better sea level rise projections and land elevation data (collected either using SAR or LiDAR)
- Floodplain mapping
    - New floodplain maps have been generated by FEMA HAZUS and systems analysis for flooding in the coastal plain currently and under sea level rise scenarios
    - Data to generate these derived/summarized data currently exist
    - Analyses would be improved by:

    - Elevation of first floors in floodplains.
    - Locations of septic systems and wells vulnerable to saltwater intrusion.
    - Information that identifies the infrastructure that is most vulnerable to rising water levels and more frequent, intense storms. Pollution control, energy and transportation infrastructure were all noted as important types of infrastructure that may need to be managed differently in the future as the climate changes.
    - Comprehensive, integrated, statewide tax parcel data with assessed values is also needed to assess socio-economic vulnerability.
- Changing precipitation patterns that are expected as a result of climate change.
    - Should be summarized to address changes in water supply and crop requirements
- Projected changes in air and water temperatures expected as a result of climate change
    - These would be most usefully summarized as days above a particular temperature (affects aquatic plants that shelter and feed fishery species) and growing degree days (affects agricultural opportunities)
    - Also should be summarized as heating and cooling degree days (affects energy usage and human health)

In addition, baseline information as well as ongoing monitoring to detect changes is needed for:

- High-resolution elevation data seamlessly integrated across the state.
    - Efforts in Hampton Roads and most of the coastal plain are currently underway, but the interior of the state currently has poor coverage
    - Coverages will need to be updated periodically as technology improves
- High-resolution land cover data. There is an effort by the Chesapeake Bay Program to acquire 3-meter resolution data for the Bay Watershed.
- Trends in socioeconomic data that can be used to estimate risks from climate change to facilities and populations. Two sources of this data are the "Surging Seas" project from an organization called Climate Central and HAZUS, a FEMA database.
- Information to assess the economic impact of climate change on critical infrastructure and industries. The economic impact assessment should focus on scenarios and help localities decide when to adopt an adaptation/mitigation measure.
- Sequestration capacity of Virginia's forests, wetlands, seagrass beds, and other natural carbon sinks. The 2008 Climate Action plan included a recommendation that Virginia should establish a no net loss standard for natural carbon sequestration areas.
- The location and extent of coastal natural infrastructure, particularly wetlands and bathymetric resources such as SAV and oyster reefs. VIMS has conducted wetlands inventories for some coastal counties, but these resources are among the most vulnerable to sea-level rise, so more continuously updated information is needed.
- More tide gauges and subsidence monitoring throughout the coastal zone.

3. Funding Workgroup Report

Recommendation 1: The New Virginia Bank for Energy and Resilience

a. Introduction

There is a significant and untapped opportunity to help grow a New Virginia Economy: modest public investment in adapting to climate change and in technologies that reduce greenhouse gas emissions could unlock vast private capital investment across the Commonwealth. Indeed, the Governor articulated four essential priorities in the Virginia Energy Plan: (i) diversify Virginia's economy by strategically growing the energy sector; (ii) innovate to reduce greenhouse gas emissions and lower energy consumption; (iii) strengthen Virginia's business climate by investing in reliable and resilient energy infrastructure; and (iv) prepare Virginia's workforce to drive the energy economy into the future.[1]

The New Virginia Bank would accomplish these priorities of accelerating the growth of clean energy and resiliency markets and businesses by increasing the availability of private capital, so that Virginia can finally catch up to—and surpass—other states in maturing these 21st century market sectors. Just like cars and homes, upfront financing is essential. Clean and resilient energy technologies like solar, CHP, and energy efficiency are increasingly cost-competitive and are proven to pay for themselves through reduced energy cost and risk. However, their initial deployment is still hampered by market barriers and upfront costs. Though these markets may be mature elsewhere, they are still nascent in the Commonwealth due to these financing gaps.

The key to unlocking a clean and resilient energy future in Virginia is simple: abundant and reasonably-priced capital to finance the deployment of these proven technologies, and the build-out of the businesses necessary to deploy them.

The New Virginia Bank, with modest public financing to leverage greater private financing, would drive that much-needed market growth. Through public-private financing structures, public dollars can leverage far greater private investment, while also preserving taxpayer dollars, as capital is recycled and reused until such capital markets are mature enough to grow solely with private investment.

The New Virginia Bank is a win-win-win: government wins by reducing emissions and increasing resiliency without the ongoing expense of grants; the private sector wins because new

[1] The Governor has also set out five priorities for resiliency[1] in the "thRIVe: Resilience in Virginia" framework described in the Commonwealth's proposal to the US Housing and Urban Development's (HUD) National Disaster Resiliency Competition (NDRC): (i) unite the region, (ii) create coastal resilience, (iii) build water management solutions, (iv) improve economic vitality, and (v) strengthen vulnerable neighborhoods.

investment opportunities are opened for investors and new businesses grow; and consumers win because they access cheaper and cleaner energy, while increasing resiliency with better financing and less upfront cost.

Here is how Governor McAuliffe can accomplish these three wins and grow the New Virginia Economy by funding a New Virginia Bank. We recommend a two-track strategy to achieve the objective of increasing investment in clean energy and resilient technologies in Virginia: (1) the executive approach is comprised of executive actions available today; and (2) the comprehensive approach proposes a New Virginia Bank to achieve broad market transformation, which would require significant capitalization through a G.O. bond.

b. The Executive Approach

This approach uses currently available funds for specific energy and resiliency projects in ways that stretch the public dollar and "crowd in" private investment.

i. **We recommend the Governor examine the Commonwealth's Energy Conservation Bonds ("QECBs") allocation to better leverage private investment.** Virginia has a remaining QECB allocation of about $75MM, of which $20MM has been earmarked for the Virginia Green Community Program. The remaining QECB allocation should be used to create a new loan fund to support smaller clean energy projects (residential and small commercial), because these projects lack upfront financing and are in greater need of accessible, low-cost capital.[2]

ii. **We recommend the Governor use ARRA loan fund repayments to create a loan-loss reserve for Virginia contractors for solar projects by Dominion and others.** Of the $10.5MM funding provided to DMME for a revolving loan fund (Energize Virginia), $1.5MM has been repaid and is available for redeployment. This $1.5MM and all future repayments should be used as a loan-loss reserve to facilitate bank lending for solar installation. The funds, as repaid, could provide a loan-loss reserve[3] credit enhancement for capital loans to the Virginia subcontractors who help build the 400 MW of solar for Dominion in the next 2 years or who build smaller, distributed systems.

iii. **We recommend the Governor develop a program to allow property owners to finance resiliency upgrades through their property tax bills ("PACE for Resilience" program).** Virginia should develop a PACE for Resiliency program to allow commercial and residential property owners to finance retrofits, such as elevating flood-prone buildings, installing

[2]This QECB loan fund approach has been used elsewhere in the country to great success, and is an effective means for drawing in private capital for underserved markets. *See, e.g.*, the St. Louis Energy Efficiency Loan Program using QECBs.

[3] A loan-loss reserve fund could help subcontractors without strong balance sheets access the working capital they need. Connecticut has a similar program, providing working capital to help installers cover the capital cost of solar panels and other costly equipment until installers receive payment from customers.

temporary flood shields or moving vulnerable equipment to higher ground. The costs would be abated by reductions in insurance premiums.[4]

iv. **We recommend the Governor use $4MM of DMMS Alternative Fuel Vehicle ("AFV") funds to help local and state agencies convert fleets to electric or natural gas vehicles.** The funds, part of Energize Virginia, should be used to cover the increased cost of purchasing (above the price of a conventional vehicle) AFVs and fueling infrastructure for state and local governments. The loans from DMMS to government agencies should be structured specifically to be paid for by the operating budget savings on fuel; payments would vary as the price of fuel varies, since the ARRA funds, unlike QECBs, are very flexible in repayment structure and timeline.[5]

v. **We recommend the Governor, in order to better generate an ongoing pipeline of public/private clean energy, energy efficiency, and resiliency projects, appoint from staff an Energy and Resiliency ("E&R") finance officer for the Commonwealth**. The officer would streamline the Commonwealth's ability to eliminate financing gaps, by overseeing E&R finance and marketing throughout the entire Commonwealth government, with a view to leveraging maximum private investment. The new E&R finance officer would: streamline disparate efforts among agencies; initiate E&R projects and programs; secure financing for these endeavors from Commonwealth sources, federal government, or the private sector; and keep the public informed.

vi. **We recommend utilizing Virginia Energy Sense funds to provide a web-based portal to provide consumers access to clean energy and energy efficiency finance materials and programs.** Ultimately, such a portal would inform Virginians about the available technologies and financing options and, in this way, strengthen demand for and access to these technologies.

c. Comprehensive Approach: Transform Markets through the New Virginia Bank.

We recommend the Governor create a New Virginia Bank for Energy & Resilience, a dedicated state financing institution that leverages private capital by working in partnership with investors.

[4]The San Francisco Seismic Retrofit program–which applies the PACE framework to finance seismic retrofits in addition to clean energy investments—is a similar program in place that has key components that would be useful guides for creating a program for coastal Virginia. *See* http://www.sfgsa.org/index.aspx?page=6570.

[5] Other ARRA grantees such as the City of New York have successfully used ARRA funds to capitalize institutions that are still making clean loans today. The NYC Energy Efficiency Corporation (NYCEEC) was initially capitalized with $37.5 million received by NYC through two federal ARRA grants earmarked for energy efficiency. NYCEEC has raised capital from other sources as well and has financed $50 million in clean energy projects. *See* http://nyceec.com.

The Bank, fully capitalized through a G.O. bond, is a solution based on highly-successful public-private partnership models deployed in other states. Rather than a piecemeal approach of using funds scattered about government agencies, the Bank is a purpose-built institution with its own source of capital to leverage private investment. The Bank would operate efficiently in coordinating market activity across clean energy and resiliency programs, designing holistic market solutions, and more directly engaging with private investors seeking to enter Virginia's untapped markets. And because the Bank would provide loans, rather than grants, all public capital invested in the Bank would be preserved and continually recirculated into the economy.

New Virginia Bank objectives: Due to space constraints, we do not discuss all the details of creating and executing the New Virginia Bank: there are a great many similar state banks already operating, and a host of institutions with capacity to facilitate the creation of a New Virginia Bank.

Overall, the Bank would have **three primary objectives**, which in unison would transform Virginia's markets for clean energy, energy efficiency, and resiliency:

i. *Provide a range of financing tools and structures that leverage private capital* and attract investment to underdeveloped energy and resiliency markets. As described above, many clean energy projects are low-risk and economically viable, yet unable to find upfront financing. Such projects include residential sector projects, like solar & efficiency; commercial sector projects, like solar & whole building upgrades; or larger institutional or infrastructure projects, like micro-grids, CHP, and facility hardening. Public-private financing solutions increase the availability of long-term and reasonably-priced capital;

ii. *Expand the availability of financing by partnering with local financiers* to accelerate development of appropriate underwriting criteria & financing structures, to take advantage of the opportunities presented by clean energy and resiliency-focused financial products;

iii. *Spark the technology demand necessary to achieve the economies of scale* that significantly reduce costs, and thus build out the supply-side of the market, offering financing tools to the contractors & installers that must grow in order to transform markets.

New Virginia Bank activities: In accordance with successful models in other states, the Bank's specific financing activities would likely focus on: co-lending, subordinated debt, credit enhancements, bundling small loans for private sale, and conventional financing tools often

applied to more traditional technologies.[6] Here is how each Bank activity functions to unlock private investment:

i. *Co-lending*: a public entity invests directly in a project in partnership with one or more private investors. The public lender can fill any financing gaps not covered by private investors and reduce the overall interest rate to the borrower.
ii. *Subordinated Debt*: a loan or security that is less senior than other forms of debt, therefore getting repaid only after the senior investors are repaid. If the New Virginia Bank held subordinated debt, this increases the likelihood of repayment for private senior investors.
iii. *Credit enhancements*: reduces the repayment risk for a private lender who has invested in a project. Credit enhancements provide collateral or other forms of assurance to a lender that it will be compensated if the project loan is not repaid. One example is a loan loss reserve.
iv. *Bundling*: gathering a pool of assets, usually a group of small and illiquid assets that are unprofitable when sold individually.
v. *Conventional financing*: loans and leases applied to energy efficiency and resiliency.

Through these mechanisms, the Bank would likely leverage 5 to 10 private dollars for every one public dollar of investment, as already seen elsewhere in more mature state banks. Through these techniques, Connecticut's bank has increased total clean energy investment in the state over ten-fold, in 4 years. Many other states have taken notice and created similar institutions, including in New York, the New Jersey Energy Resilience Bank, and the Rhode Island Infrastructure Bank. These banks are benefiting from the successful example of Connecticut and are on track to replicate its success. For example, New York's bank has a capital pipeline in excess of $350 million, and, based on this success, in July 2015 the New York Public Service Commission approved an additional $150 million of capital for the bank.

Bank capitalization: The Bank would be capitalized with public funds. These funds would ideally originate in a G.O. bond, or through the budgetary process or existing funds.

Just as importantly, significant federal resources are also available to be utilized, and the federal Administration has consistently voiced its intent to fund state banks as soon and as robustly as possible.[7] Such funding streams include: the DOE Loan Program Office; the USDA Rural Utility Program; HUD NRDC grant funds; FEMA Pre-Disaster Mitigation Grants; federally-backed Qualified Energy Conservation Bonds; federally-backed Clean Renewable Energy Bonds; and the federal EPA.

[6] For more details on these tools, *see* "State Banks for Clean Energy" and "The Role of Clean Energy Banks in Increasing Private Investment in Electric Vehicle Charging Infrastructure."
[7] *See, e.g.*, a recent White House announcement that provided clarity that funds may be used by state entities like the New Virginia Bank.

Recommendation 2: Make commonsense adjustments to existing state programs.

a. **We recommend** that the Governor direct the Department of Conservation and Recreation to continue work with local Soil and Water Conservation Districts to vigorously prioritize, through enhanced cost-share, the increased adoption of those agricultural best management practices that most reduce agriculture's fuel and fertilizer consumption and associated greenhouse gas emissions and that provide methods for increasing carbon sequestration on Virginia's agricultural lands. The G.A. should provide adequate and consistent funding to the Natural Resources committed fund to further implement this recommendation.

b. **We recommend** that all state discretionary funding programs foster a policy that infrastructure projects receiving state funding are designed to be resistant to climate change impacts over the projected life of the project, through incentives. For example, the Stormwater Local Assistance Fund (State budget item 363 C.1 and C.2) grant program should prioritize for funding local government projects that address cost efficiency, commitments related to reducing water quality pollutant loads, and resiliency. Resiliency investments through WQIF funds should be explored for such use after 2022, provided all TMDL requirements are met and all water-related infrastructure has been sufficiently upgraded.

c. **We recommend** that the Governor invest in restoration of three-dimensional oyster reefs to increase coastal resilience and underwater grasses to provide significant carbon sequestration. These measures would support the Governor's commitments in the 2014 Bay Agreement to restore oyster habitat and populations by 2025 and achieve and sustain 185,000 acres of aquatic vegetation Bay-wide necessary for a restored Bay, as well as tap greater NOAA and Army Corps funding streams.

d. **We recommend** that the Governor explore using the Opportunity Fund or other funding mechanisms as a revolving loan fund targeting the increased resiliency of coastal businesses that face higher flood premiums, to be paid off via reduced flood insurance premiums.

e. **We recommend** that the Governor direct the Chief Resiliency officer to conduct an inventory and prioritization of assets currently at risk, so resiliency-related funding streams may be most cost-effectively deployed.

Recommendation 3: Fully leverage the opportunity of federal funding streams to make coastal communities, southside, and southwest national models of resilience planning.

a. **We recommend** that the Governor establish a funding program to incentivize landowner adoption of shoreline protection practices that emphasize use of living shorelines and avoid shoreline hardening (e.g. bulk heads, sea walls, rip rap)

wherever feasible, particularly as a way of leveraging the NDRC funding and going beyond the General Permit program.

b. **We recommend** that the Governor establish a revolving loan fund for increasing the resiliency of residences, to be repaid through decreased flood insurance premiums. Loan efficacy should be maximized by first targeting the most highly stressed jurisdictions, according to the Housing and Community Development economic distress index; second, by focusing on the homeowners most severely impacted, according to the NFIP database.

c. **We recommend** that the Governor, in the event the NDRC grant is awarded to the Commonwealth, ensure through Executive Order that the program be a model for the rest of the Commonwealth. To maximize the funding award, the Governor should also request additional funds in the budget and any G.O. bond request.

4. Land Use and Transportation Workgroup Report

Introduction

The Land Use and Transportation Workgroup of the Climate Change and Resiliency Update Commission was established to focus on ways to support improved planning, inter-locality cooperation, and improved transportation infrastructure. The Workgroup was specifically tasked with examining ways in which state policy, permitting, and fee structures all encourage or discourage smarter growth settlement and commuting patterns. The Workgroup was also asked to focus on concrete and systemic recommendations rather than individual projects or localities. In addition to the three meetings of the full Commission (held in September 2014, December 2014, and April 2015), the Workgroup met three times on its own (April 10, 2015, July 20, 2015, and August 21, 2015).

The initial Workgroup meeting in April 2015 included discussion of a wide range of potential recommendations, with a focus on first assessing the continued viability of recommendations from the previous Climate Commission's work. The Workgroup elected early on to focus on recommendations that could be primarily implemented by the Governor and state agencies within the next two years. However, the Workgroup recognized that establishing and maintaining partnerships, particularly with federal agencies, would be important. The Workgroup also felt it would be important to make recommendations that would have statewide impacts. Specific proposals that were discussed included urban development area regulations, state vehicle fleet composition requirements, zero emission vehicle standards, infrastructure design standards, floodplain management regulations, conservation easement reform, and reform of the wetlands impact permitting process.

Over the last two Workgroup meetings in July and August, the Workgroup came to a consensus on three focus areas for the final recommendations: mitigation (reducing greenhouse gas emissions), land use adaptation, and transportation adaptation. The Workgroup considered various recommendations using these categories. In addition, the Workgroup also considered whether action from other levels or branches of government would be required, what costs might be, and how quickly recommendations could be implemented. Based on these criteria, the Workgroup finalized its three recommendations on August 21, 2015.

Recommendation #1: Adopt a Zero Emission Vehicle Program

Virginia should adopt a Zero Emission Vehicle (ZEV) program in order to improve air quality, reduce greenhouse gas emissions, and provide increased flexibility and reliability in the electric power sector.

a. Goal

The goal of the recommendation is to increase the prevalence of zero emission vehicles in the state of Virginia. Clean, non-polluting transportation options are part of an economy-wide transition to cleaner energy sources that protect public health and reduce the greenhouse gas emissions driving climate change. The ZEV program requires manufacturers to sell a certain number of zero-emission vehicles, which include battery electric, fuel cell, and plug-in hybrid electric vehicles. At full implementation in 2025, the ZEV program will result in approximately 15 percent of new cars sold having advanced technology drivetrains (battery electric, plug-in hybrid, or fuel cell).

b. Prior or Current Related Efforts

Virginia reduced the carbon-intensity of electricity generation by 34 percent from 2005-2012. The cleaner grid means that the carbon emission savings available through switching from gasoline combustion to electric charging are even greater than in 2008, when the Commission last considered the California Low Emission Vehicle (CALEV) program. Additionally, the Clean Power Plan, which limits carbon pollution from the power sector, was finalized at the beginning of August 2015. This rule sets the state and nation on a path towards reliance on more diverse electricity resources that will benefit from the grid storage services that electric vehicles offer. The National Highway Traffic Safety Administration (NHTSA) and the Environmental Protection Agency (EPA) paired the Corporate Average Fuel Economy (CAFE) standard and the national greenhouse gas (GHG) emissions standard in a joint final rule.

The regulation was updated in August 2012 to extend the rule to model years 2017 and beyond. These standards will require an average fleet-wide fuel economy of 49.7 mpg and 163

g/mi CO2 in 2025. Currently, Virginia abides by federally established fuel economy, GHG, and exhaust emissions limits. States must comply with the federal standards, but Section 177 of the Clean Air Act allows California to set its own standards at least as stringent as the federal standards. In March 2014 EPA set Tier 3 vehicle emissions standards that "are closely coordinated" with California's LEV III standards as well as with EPA's and California's programs for GHG emissions.

c. Actions Needed

Promulgation of a rule by the Department of Environmental Quality and through the State Air Pollution Control Board to waive Virginia into the California ZEV program. Consideration of incentives for ZEV ownership, such as increasing ZEVs in public fleets, encouraging private fleets to utilize ZEVs, promoting workplace charging, planning for ZEV infrastructure and investment, and facilitating access, compatibility, and interoperability of charging networks.

d. Cost Assumptions

This action could be achieved minimal public cost through administrative action.

e. Implementation Period

1 year.

f. End Result

At full implementation in 2025, the ZEV program will result in approximately 15 percent of new cars sold having advanced technology drivetrains (battery electric, plug-in hybrid, or fuel cell).

Recommendation #2: Develop an Adaptation Plan for Transportation Infrastructure

The Governor should direct the Secretary of Transportation and relevant agencies (including the Department of Rail and Public Transportation (DRPT) and the Department of Transportation (VDOT)) to develop an interim report on efforts to assess the vulnerability of the Commonwealth's transportation infrastructure to climate impacts (including sea level rise and recurrent flooding). Based on this interim report, the Governor should direct the Secretary of Transportation and request the cooperation of the Commonwealth Transportation Board (CTB) to develop a statewide vulnerability assessment and adaptation plan for reducing those impacts.

a. Goal

The goal of this recommendation is to improve understanding of how and where the Commonwealth's transportation infrastructure is vulnerable to climate impacts and to better plan and design projects so that they are more resilient. Transportation infrastructure is both a vital component of the Commonwealth's economy and a major investment of local, state, and federal resources. It is therefore important that these investments be made in a way that ensures that they will function effectively for their intended lifespans.

b. Prior or Current Related Efforts

VDOT's Structure and Bridge Division is currently evaluating the impact of climate change on design guidelines. The Transportation Research Council is preparing a work plan to address issues associated with climate change impacts on transportation assets and structures. Several regional organizations, including the Accomack-Northampton Planning District Commission (PDC), Hampton Roads PDC, the Hampton Roads Transportation Planning Organization, the Middle Peninsula PDC, and the Northern Virginia Regional Commission, have already conducted vulnerability assessments.

c. Actions Needed

Development of an interim report on past and ongoing planning efforts, a vulnerability analysis (including research on impacts, data collection, and spatial analysis), an adaptation planning process (including designation of project team and scope for each agency), and an adaptation plan composition (including policy development and public outreach).

d. Cost Assumptions

Costs for current studies are included in FY15-16 budgets. Costs for the vulnerability analysis would depend on the availability of data and the type and scale of analysis selected. Planning process would require funding for agency staff time. Proposal could be implemented in-house, in partnership with local governments and planning district commissions, or through consultants.

e. Implementation Period

The interim report should be delivered to the Governor within 90 days of the adoption of this recommendation. The adaptation plan should be completed within 1-2 years.

f. End Result

The interim report will provide a comprehensive review of ongoing efforts within the Department of Transportation to address climate change impacts. This report will guide a comprehensive assessment of the vulnerability of the Commonwealth's transportation infrastructure to climate change impacts. The adaptation plan developed would provide guidance to state, regional, and local transportation agencies on additional reviews and investments to better prepare infrastructure facility design, siting, and planning for climate change impacts.

Recommendation #3: Update Natural Resources Regulations

The Governor should direct the Secretary of Natural Resources and relevant agencies (including the Department of Conservation and Recreation (DCR), the Department of Environmental Quality (DEQ) and the Virginia Marine Resources Commission (VMRC)) to assess the potential impacts of climate change on the Commonwealth's natural resources and update any regulations pertaining to those resources if necessary.

a. Goal

The goal of this recommendation is to determine whether the Commonwealth's regulations protecting natural resources and ecologically sensitive areas (wetlands, floodplains, and water bodies) will continue to be effective as a result of climate change impacts. If issues are identified, this recommendation would result in suggested changes to better protect those resources.

b. Prior or Current Related Efforts

Several planning district commissions have considered the impacts of climate change on natural resources. State and federal agencies are also in the process of studying potential climate change impacts on natural resources in Virginia. Assessments of potential climate change impacts on Virginia have been completed by the Virginia Institute of Marine Science, the Chesapeake Bay Program, and the U.S. Global Change Research Program, among others.

c. Actions Needed

An initial survey of natural resources regulations likely to be affected by climate change, including regulations pertaining to Chesapeake Bay Preservation Areas, tidal wetlands, floodplain management, stormwater management, and coastal primary sand dunes. An assessment of potential climate change impacts on these resources and if current regulations are

sufficient to maintain these resources. Development of recommended changes to regulations to account for climate change impacts.

d. Cost Assumptions

There would be some costs associated with collecting information on climate change impacts and with coordinating the process to determine if changes are necessary and what changes should be made. Most if not all of this work could be done by state agencies and academic institutions.

e. Implementation Period

1-2 years.

f. End Result

The end result from this proposal would be a determination of whether existing regulations pertaining to natural resources will be sufficient to achieve their purposes under impacts from climate change and a set of recommended changes to those regulations.

Concluding Remarks

As stated above, the Workgroup agreed to recommendations addressing both mitigation and adaptation that were perceived to be cost-effective and implementable by the Governor during the next one to two years. Each of the three recommendations can be implemented via executive branch action under the Administrative Process Act. In addition to increasing the Commonwealth's climate resilience, the Workgroup believes that these recommendations, if implemented, will have other significant benefits to residents and businesses of the Commonwealth.

5. Energy Workgroup Report

Introduction and Background

The Energy Workgroup of the Climate Change and Resiliency Update Commission was established to "focus on how to lower the state's carbon footprint related to energy generation." The charge to the Workgroup included "identifying implementable actions and should include specific recommendations for policy and process changes." It was anticipated that the Workgroup would not consider the state's work on the federal Clean Power Plan, which is a regulatory process that the state is negotiating outside the scope of the Commission.

The Workgroup met four times (January, April, May and July 2015) outside of the three meetings of the full Commission (September 2014, December 2014 and April 2015). During the Workgroup meetings, discussions were wide ranging but centered primarily on (1) policies that can be implemented with immediate impact and (2) barriers to help move the Commonwealth toward a more diverse and less carbon-intensive energy system. The workgroup focused on recommendations that would deliver greater access to clean energy resources including renewable energy and energy efficiency.

Recommendation #1: ***Establish a renewable energy procurement target for the Commonwealth's agencies***

a. Goal

The Energy Workgroup recommends that the McAuliffe Administration set a State agency procurement requirement for renewable energy through Executive Order. Some members of the Workgroup have suggested that the requirement would include a target that state agencies purchase 30% of their energy from renewable resources by 2025. Another member suggested that the requirement should be 25% renewable energy procurement by 2025.

b. Overview

The procurement target would be structured similarly to Governor McAuliffe's Executive Order Number Thirty One, which states that the Commonwealth "is seeking to reduce electricity consumption in state facilities by 15% by 2017, using 2009-2010 as a baseline." While Virginia has a voluntary renewable energy goal calling for 15 percent of 2007 baseline electric production to come from renewable sources by 2025, the Commonwealth does not currently have a state renewable energy procurement policy in place.

Such policies are in place at the federal level and in other states. For example, President Obama issued a presidential memorandum establishing a goal that directs federal agencies to derive 20% of its energy from renewable sources by 2020.[8] This goal included an interim target of 10% from renewable sources by 2015. In addition, the presidential memorandum established a variety of mechanisms in which to achieve this target, including:

1. Installing agency-funded renewable energy on-site at federal facilities and retain renewable energy certificates;

[8] https://www.whitehouse.gov/the-press-office/2013/12/05/presidential-memorandum-federal-leadership-energy-management.

2. Contracting for energy that includes the installation of a renewable energy project on-site at a federal facility or off-site and the retention of renewable energy certificates for the term of the contract;
3. Purchasing electricity and corresponding renewable energy certificates; and
4. Purchasing renewable energy certificates.

These mechanisms could similarly be utilized in Virginia and they should be identified in the Executive Order establishing the Commonwealth's renewable energy procurement target.

c. Action Items

Governor McAuliffe should issue an Executive Order requiring that all state agencies procure a defined percentage of renewable energy as part of their purchase of electricity. Some members of the workgroup have suggested that the overall target should be 30% renewable energy procurement by 2025. Another member suggested that the requirement should be 25% renewable energy procurement by 2025. In addition, based on the significant opportunity for more growth in the renewable energy sector in Virginia, the Executive Order should include more immediate interim goals. One such suggestion is that state agencies should procure 5% of their energy from renewable energy sources by the end of 2016. In addition, the program should provide a mechanism that would allow local governments to opt in and participate should they wish.

Recommendation #2: ***Create pilot programs for innovative mechanisms to reduce carbon emissions and improve resiliency.***

a. Goal

Governor McAuliffe should encourage the development of new and existing energy technologies that address climate change through creative public policy initiatives including but not limited to incentives that encourage the deployment of these technologies through pilot programs, public private partnerships, and other means. The technologies that will benefit from expanding market opportunities might include, among others: 1) combined heat and power (CHP or cogeneration) in public, commercial and industrial sectors; 2) solar cells and storage batteries (separate or in combination); 3) clean-energy micro-grids; 4) distributed renewable energy; and other technologies.

b. Overview

The purpose of a pilot program would be to integrate climate risk and resiliency into core development planning and implementation. Pilot programs should aim to establish incentives for scaling-up activities that demonstrate measurable success in addressing climate change

challenges or new technologies that might be successful in addressing these challenges in the Commonwealth of Virginia. Virginia's policies, regulatory environment and incentives should acknowledge and not thwart the proven benefits of many of these technologies (combined heat and power (CHP) systems and distributed renewable energy, among others) thus supporting sustainable technologies that already exist in the market.

i. CHP and Distributed Energy

CHP systems and many distributed renewable energy generation systems are directly connected to customers. This allows onsite electricity production and eliminates transmission and distribution losses. In fact, these systems are generally owner operated and not subject to traditional regulation. However, they do require timely interconnection agreements with the local utility in order to operate in synchronized or in parallel to the local grid. These CHP and distributed renewable systems do have the ability to offer excess power for resale back to the grid, but are primarily designed to meet the needs of the end customer. CHP and distributed renewable energy systems also contribute to grid reliability, can allow buildings to produce some of their electricity thus reducing stress on the grid and, during peak power use, displacing part of the need for more costly power generation. Virginia is home to many ideal properties that could benefit from CHP deployment and distributed renewable energy generation, including local and federal buildings, medical centers, laboratories, research facilities and educational institutions, to name a few.

ii. Public-Private Partnerships

Virginia policies should encourage public-private partnerships (PPP) in the area of energy infrastructure. PPP introduces private sector technology and innovation in providing better public services through improved operational efficiency. Such partnerships could expand market opportunities and incentivize the private sector to create new, clean energy projects. Costs and risks associated with CHP and renewable energy projects are likely to vary from one project to another, but the formation of a PPP provides the processes needed to manage both costs and risks. In order to maximize PPP potential, Virginia must develop a clear set of incentives and policies to achieve the optimal sustainable solution.

iii. Clean Energy Pilot Programs

Virginia should strongly consider pilots or other incentives to further develop emerging technologies such as the combination of solar cells with storage batteries. Lithium ion batteries are becoming a lower cost platform for energy storage, and the number of solar panel installations continues to surge. A solar-battery pilot program, under a PPP, is likely to provide an affordable and gradual way for Virginia to take advantage of the solar-battery trend, which has captured the attention of many companies.

b. Action Items

Going forward, Virginia policymakers should consider the following actions and pathways to advance CHP, distributed renewable energy generation, solar-battery development, and other opportunities:

- Evaluate CHP, distributed renewable energy generation, and solar-batteries as energy efficiency strategies to help meet energy and emissions reduction goals;
- Review critical infrastructure and energy resiliency needs in conjunction with the potential role of CHP, distributed renewable energy generation, or solar-batteries;
- Examine new facility and facility modernization planning policies for proper evaluation of CHP, distributed renewable energy generation, or solar-battery options;
- Consider CHP, distributed renewable energy generation, and solar-battery as key resources to meet renewable energy portfolio targets or goals; and
- Create governmental funding mechanisms to encourage local governments, public sector universities and hospitals, and other entities to create PPPs with the energy industry for CHP, distributed renewable energy generation, solar-battery options, or other clean-energy developments.

Recommendation #3: ***Create of a Climate Change Officer within the Department of Environmental Quality.***

a. Goal

The Energy Workgroup recommends creating the permanent position of Climate Change Officer within the Virginia Department of Environmental Quality (DEQ).

b. Overview

The Energy Workgroup recommends creating the Climate Change Officer as a permanent position within DEQ. There is precedent to support taking this action. New York State has an entire "Office of Climate Change" that was "created to lead the development, in concert with other DEC [Department of Environmental Conservation] programs and New York State agencies, of programs and policies that mitigate greenhouse gas (GHG) emissions and help New York communities and individuals adapt when changes in our climate cannot be avoided."

c. Action Items

The DEQ Climate Change Officer shall be created as a permanent position with the following duties:

i. Annual Emissions Inventory

The DEQ Climate Change Officer would be charged with calculating an annual emissions inventory—in tons per year—of greenhouse gas pollution emitted from the energy sector in-state. The inventory should be publicized through a simple-to-read "online dashboard" on the website of the Department of Environmental Quality, and in other formats as needed to ensure that the information can be easily understood by lay persons. The inventory should be designed to allow policy leaders and concerned citizens alike to track whether the Commonwealth is:

(1) slowing the rate of emissions and also reducing the total amount of greenhouse gas pollution emitted (i.e., tons per year of greenhouse gas pollution);

(2) slowing the rate of greenhouse gas emissions but still increasing the total amount of actual, annual pollution in greenhouse gases; or

(3) increasing both the rate of growth and total annual emissions.

ii. Energy Efficiency Funding

Although the Virginia Department of Mines, Minerals and Energy (DMME) has maintained an energy efficiency program, this Workgroup recommends that the DEQ Climate Change Officer take a lead role in ensuring increased state funding for Energy Efficiency public policy development resulting in measured and verified electricity savings. Alternatively, the DEQ Climate Change Officer may wish to work with DMME on achieving the goals of increasing state funding for energy efficiency and ensuring that savings are measured and verified.

III. MONITORING RECURRENT FLOODING AND SEA LEVEL RISE IN VIRGINIA

The following is the recommendation prepared by the Center for Coastal Resources Management at the Virginia Institute of Marine Science, The College of William & Mary.

A. Background

Sea level along the Virginia coastline has risen more than a foot over the past century and there is recent evidence that the rate of rise is accelerating.[9] Along with increasing sea level has come increasing flooding[10], both associated with storm events and short term flood events associated with high water levels, which is expected to accelerate. Currently, over 1,400 miles of road in Virginia are at risk of flooding from water levels likely to be attained in the next 50 years.[11] As coastal populations increase, the costs associated with flooding become an increasing concern. Protecting people, properties and infrastructure from future flooding requires projections of future water levels that can be used for planning purposes.

As with any type of projection, certainty decreases moving into the future. This is particularly true with local sea level rise, which is affected by changes in both local and global processes that may change over time, leading to unexpected changes in sea level rise rates. To help minimize uncertainty, water levels at tide gauges should be monitored on a continual basis, with projections updated on a regular basis to incorporate the most recent data. We propose that water levels should be monitored on three time scales: 1) a very short term forecast (~3 days) which projects flooding from wind, unusual tides and storm surge; 2) a short term (~30 year) window which is relevant to both individual property owners and local planning; and 3) a long term (until 2100) window which is relevant to longer term planning efforts. In addition, with the exception of the short term forecast, all projections should use an ensemble approach, using different models to explore the full range of possible projections. Projections should be made available to relevant stakeholders and the public through a data portal.

B. Recommendations for Projections on Each Time Scale

Time scale 1: 3 day forecast

The early projection of high water levels has utility to a number of different stakeholders, all of which help reduce the costs associated with flooding. For city and emergency managers, it allows the early placement of materials to block water (e.g. sandbags, etc.) and the potential for evacuation or road closures prior to flooding. For homeowners, it allows removal of cars from low-lying streets into parking garages or other safe location. Businesses could use projections to re-route time sensitive deliveries.

[9] Boon & Mitchell (2015) Nonlinear Change in Sea Level Observed at North American Tide Stations. Journal of Coastal Research In-Press.

[10] Ezer, T., & Atkinson, L. P. (2014). Accelerated flooding along the US East Coast: on the impact of sea-level rise, tides, storms, the Gulf Stream, and the North Atlantic oscillations. *Earth's Future*, *2*(8), 362-382.

[11] Mitchell, M., C. Hershner, J. Herman, D. Schatt, E. Eggington and S. Stiles. 2013. Recurrent Flooding Study for Tidewater Virginia. Virginia Senate Document No. 3. Richmond, Virginia.

We recommend that the need for short term forecasts be filled with an existing product, Tidewatch. Tidewatch[12] is capable of making 36-hour water level projections at 10 tide gauges through the Chesapeake Bay and along the Virginia Atlantic coast.

Although already being used by a number of stakeholders, there are plans to extend its user base by 1) modeling water levels between tide gauges, allowing water level forecasts along the entire Virginia coastline, 2) referencing the tide gauge information to local land elevations, which are more meaningful to residents, and 3) incorporating new tide gauges as they are installed to increase coverage and improve between-gauge projections.

Time Scale 2: Short term Projection

Sea level changes are affected by both long term shifts (e.g. melting ice sheets and warming waters) and shorter term, decadal/multidecadal shifts. Therefore, for any given window of time, the rate at which sea level is rising may be higher or lower than the long term trend. Short term trends can also reflect shifts in management (such as changes in groundwater extraction which affect subsidence rates[13]).

Short term projections should take advantage of the excellent and expanding tide gauge network in Virginia. Historic data analysis incorporated change resulting from multiple causes (subsidence, ocean dynamics, glacial isostatic adjustment, surface water impoundment on land) and can be easily reevaluated as new data become available. Projections based on historic sea-level data integrate all the different causes of local sea level rise in an area (without needing to understand the relative scale of each cause), and therefore can be resolved at the scale of each individual tide gauge, a significant advantage over downscaled global models.

Multiple models have been used to analyze the historic tide gauge record in Virginia, including regression analysis[14], Bayesian probabilities[15], and empirical mode decomposition[16]. All methods give similar but not identical results, and none are excessively complicated to run on an annual basis. Therefore, we recommend that the projections use an ensemble approach to give a small window of projected sea level in 30 years' time.

[12] http://www.vims.edu/bayinfo/tidewatch/index.php.
[13] Boon & Mitchell (2015) Nonlinear Change in Sea Level Observed at North American Tide Stations. Journal of Coastal Research In-Press.
[14] Boon, J.D., 2012. Evidence of sea level acceleration at U.S. and Canadian tide stations, Atlantic Coast, North America. Journal of Coastal Research, 28(6), 1437–1445.
[15] Boon & Mitchell (2015) Nonlinear Change in Sea Level Observed at North American Tide Stations. Journal of Coastal Research In-Press.
[16] Ezer, T. and Corlett, W.B., 2012. Is sea level accelerating in the Chesapeake Bay? A demonstration of a novel new approach for analyzing sea level data. Geophysical Research Letters, 39(19).

In addition to re-running this analysis on an annual basis, we recommend that the analysis be done for several different tide gauge stations throughout Virginia with sufficient historic data. Subsidence levels and the influence of tidal propagation and water circulation patterns vary throughout Virginia, making it reasonable to expect small variations in sea level rise throughout the coastal plain. These differences should be apparent in the historic record, allowing for local 30 year projections.

Time Scale 3: Long term Projection

Long-term projections are critical for many locality and state planning efforts, especially high cost infrastructure investments. However, they are the least certain of the three time scales. In addition, although they can be informed by historic tide gauge records, there are difficulties in the direct extension of historic records due to the potential for the crossing of thresholds in global or local processes, anthropogenic shifts in behavior, and unforeseen changes in management.

Due to the uncertainty inherent in projecting so far into the future, we recommend that the projections use a scenario approach, which allows consideration of multiple different futures. Planning efforts should maximize the resilience of their decisions by considering all scenarios. For long term projections, we recommend the National Climate Assessment scenarios. The National Climate Assessment scenarios incorporate multiple models, and have the advantage of being regularly updated. The disadvantage of the National Climate Assessment scenarios is that they are being developed for the southeast region, not Virginia specifically. This can be fixed by adding in an average subsidence rate for the Virginia, as recommended in the Recurrent Flooding Study.

The National Climate Assessment model is based on a downscaled global model of sea level rise which does not incorporate small differences in subsidence or water patterns. In addition, any differences between areas in Virginia would be far less than the differences between scenarios. Therefore, we see no advantage in trying to produce different 100 year projections for different parts of the state.

APPENDICES

APPENDIX A

Members of Governor McAuliffe's Climate Change and Resilience Update Commission

Commission Members

Molly Ward, Secretary of Natural Resources (Co-Chair)
Brian Moran, Secretary of Public Safety and Homeland Security (Co-Chair)
Aubrey Lane, Secretary of Transportation
Maurice Jones, Secretary of Commerce and Trade
Ralph Northam, Lieutenant Governor of the Commonwealth of Virginia
Richard Stuart, Senate of Virginia
Barbara Favola, Senate of Virginia
Gordon Helsel, House of Delegates
Eileen Filler-Corn, House of Delegates
Michael Karmis, PhD, Virginia Tech
Ray Toll, Old Dominion University
Patrick Taylor, NASA
John Wells, Virginia Institute of Marine Science, College of William and Mary
Michael Mann, PhD, Pennsylvania State University
Brett Vassey, Virginia Manufactures Association
Katie Frazier, Virginia Agribusiness Council
Francis Hodsoll, E&E Frontiers
Christy Everett, Chesapeake Bay Foundation
Anne Gambardella, Virginia Automobile Dealers Association
Robert M. Blue, Dominion Virginia Power
Charles Patton, Appalachian Power
Bernice McIntyre, Washington Gas Light Company
Jerome Barber, Sixth Mount Zion Baptist Temple
Nikki Rovner, The Nature Conservancy
Cale Jaffe, Southern Environmental Law Center
Walton Shepherd, Natural Resources Defense Council
Ivy Main, Sierra Club
Michael Town, League of Conservation Voters
Hap Connors, Commonwealth Transportation Board
Kenneth Wright, Mayor of Portsmouth
Dan Lashof, NextGen Climate America Inc.
Neil Gray, International Brotherhood of Electrical Workers
Richard Groover, Virginia Academy of Science
Mike Toalson, Home Builders Association of Virginia
Dr. JoAnn Haysbert, Hampton University
Jagadish Shukla, Institute of Global Environment and Society, George Mason University
Greg White, Northern Neck Electric Cooperative

APPENDIX B
Workgroup Descriptions

Workgroup Descriptions

A. Energy Workgroup

This group will focus on how to lower the state's carbon footprint related to energy generation. The members of this group will focus on identifying implementable actions; it should include specific recommendations for policy and process changes. This workgroup will not consider the state's work on the new Carbon Rule, which is a regulatory process that the state is negotiating outside the scope of the Commission.

Members:

- Francis Hodsoll (Leader)
- Bob Blue
- Neil Gray
- Cale Jaffe
- Michael Mann
- Bernice McIntyre
- Charles Patton
- Michael Town
- Greg White

B. Information Workgroup

This group will focus on identifying and pulling together the essential information necessary to support effective and coordinated management and planning across state and local governments. Some of this is "easy pickings" since certain information needed by all government entities is relatively easy to identify (e.g., sea level rise rates and topography), as are the state capabilities for generating that information. What the Workgroup most needs to examine and recommend is the vehicle or program for the state to establish in order to successfully generate, present, and distribute the information.

Members:

- Nikki Rovner (Leader)
- Barbara Favola
- Katie Frazier
- Ivy Main
- Ann Swanson
- Patrick Taylor

C. Public Education Workgroup

This group will focus on available and needed state mechanisms for effective education of the public on the issue of climate change impacts and responses. The charge to the workgroup includes identifying key issues and messages, outreach opportunities and resources, and agency outreach responsibilities. In addition, the workgroup should develop an evaluation process to assess the success of the outreach according to measurable and verifiable metrics.

Members:

- John Wells (Leader)
- Eileen Filler-Corn
- Anne Gambardella
- Richard Groover
- Gordon Helsel
- Ralph Northam
- Jagadish Shukla

D. Funding Workgroup

This group will focus on ways to improve use of state mechanisms to accomplish maximum funding from federal and private sources. This workgroup will look at ways state mechanisms can assist to ensure prioritization and coordination in the pursuit of federal funds and private dollars. The goal of the workgroup is to determine what actions will accomplish better leveraging and, hopefully, increased resources for mitigation and adaptation efforts.

Members:

- Walton Shepherd (Leader)
- Joanne Haysbert
- Ann Jennings
- Michael Karmis
- Richard Stuart
- Brett Vassey

E. Land use and Transportation Workgroup

This group will focus on ways to support improved planning, inter-locality cooperation, and improved transportation infrastructure. Additionally, the group should examine ways in which state policy, permitting, and fee structures all encourage or discourage smarter growth settlement and commuting patterns. This group will focus on concrete and systemic recommendations rather than individual projects or localities.

Members:

- Ben McFarlane (Leader)
- Hap Connors
- Dan Lashof
- Ray Toll
- Kenneth Wright

APPENDIX C

Additional Recommendations Discussed by the Commission

Additional Recommendations Discussed During Commission and Workgroup Deliberations

- Establish policies that discourage expenditure of public funds on development of public infrastructure in areas highly vulnerable to climate change effects, especially sea level rise and increased risk of flooding from intense precipitation events. (Modified from Governor Kaine's Commission Recommendations)
- Recognizing that enhanced land management activities can both decrease emissions associated with certain agricultural practices and increase the sequestration capacities of agricultural lands, the Governor should direct the Department of Conservation and Recreation (DCR) to continue work with local soil and water conservation districts to vigorously prioritize, through enhanced cost share, the increased adoption of those agricultural best management practices that reduce agriculture's fuel and fertilizer consumption and associated greenhouse gas emissions and that provide methods for increasing carbon sequestration on Virginia's agricultural lands. The General Assembly should provide adequate and consistent funding to the Natural Resources Commitment Fund to implement this recommendation. (Modified from Governor Kaine's Commission Recommendations)
- All state discretionary funding programs should foster a policy that infrastructure projects be designed to be resistant to climate change impacts over the projected life of the project. As an example, the Stormwater Local Assistance Fund (State Budget Item 363 C.1. and C.2.) grant program, managed by the Department Of Environmental Quality, should prioritize for funding local government projects that address cost efficiency, commitments related to reducing water quality pollutant loads, and resiliency.
- Establish a funding program to incentivize landowner adoption of shoreline protection practices that emphasize the use of living shorelines and seek to avoid shoreline hardening (bulk heads, sea walls, rip rap) wherever feasible. (Modified from Governor Kaine's Commission Recommendations)
- The Governor should direct the Secretary of Transportation to adopt an incentive based strategy for ensuring that climate change impacts, particularly sea level rise and storm surge vulnerability in coastal areas of Virginia, are taken into account in all transportation planning, project design, and prioritization of projects for funding as well as transportation systems management, operations, and maintenance. (Modified from Governor Kaine's Commission Recommendations)
- The Commonwealth should invest in restoration of three-dimensional oyster reefs to increase coastal resilience and underwater grasses to provide significant carbon sequestration. These measures would also support Governor McAuliffe's commitments in the 2014 Chesapeake Bay Agreement to restore native oyster habitat and populations in 10 tributaries by 2025 and achieve and sustain the ultimate outcome of 185,000 acres of submerged aquatic vegetation Bay-wide necessary for a restored Bay.

- The Governor should explore an adjustment to the Opportunity Fund to use as a revolving loan fund targeting the increased resiliency of coastal businesses that face higher flood premiums. The loan may then be paid off via reduced flood insurance premiums.
- Establish a revolving loan fund for increasing the resiliency of residences to be repaid through decreased flood insurance premiums. The efficacy of such loans should be maximized by first targeting the most highly stressed jurisdictions, according to the Housing and Community Development economic distress index. The loans should also focus on the homeowners most severely impacted according to the NFIP database.
- Encourage policies that ensure resiliency measures are "baked into" all funding requests, while also maximizing the opportunity to blend different programmatic funding streams. E.g. road reconstruction that increases environmental benefits and increases evacuation readiness could draw from a single, larger funding stream, rather than two separate and smaller funding programs. (Modified from Governor Kaine's Commission Recommendations)
- Explore free market-based carbon allowance trading mechanisms with the Governors of higher-carbon emitting states that might purchase allowances from lower-carbon emitting Virginia. To ensure the value of any such revenues are maximized and reward Virginia for early action on reducing carbon, the Governor should also direct the Department of Commerce to identify the most efficacious mitigation and adaptation uses of any such revenue streams. (Modified from Governor Kaine's Commission Recommendations)
- Establish policies to increase zero emission electricity supply in Virginia to offset growth in electric vehicles.
- Adopt design standards to incorporate sea level rise into infrastructure design.
- Reform the conservation easement process to focus on projects with high biodiversity and adaptation benefits.
- Reform Virginia's wetlands preservation program by moving permitting decisions from local wetlands boards to the Virginia Marine Resources Commission (VMRC) or providing an expanded role for VMRC in permitting decisions.
- Develop a standard for assessing the cumulative impact to wetlands, with a focus on impacts associated with climate change and solutions that would build resilience.
- The Commonwealth should better coordinate with the Navy, Department of Defense, and other federal agencies on planning for climate change impacts, especially those impacts affecting Hampton Roads.
- The Department of Housing and Community Development should work with stakeholders to incorporate increased energy efficiency requirements into the 2009 and 2012 uniform statewide building codes, so that by 2012, the resulting codes are at least 30% more efficient than the 2006 code. (Modified from Governor Kaine's Commission Recommendations)

- Within its allocation formula and funding decisions, the Commonwealth Transportation Board (CTB) should target available transportation funds towards existing communities and designated urban development areas and promote compact, walkable, transit-oriented development areas. The Virginia Department of Transportation (VDOT) and natural resources agencies should provide technical assistance, funding, and authority to localities to amend comprehensive plans and zoning ordinances to promote compact, walkable, transit- oriented development areas and to guide development to such areas. (Modified from Governor Kaine's Commission Recommendations)
- Virginia should require that environmental analysis and review of major transportation projects/networks should include projections of the resulting GHG emissions. Virginia's metropolitan planning organizations (MPOs) should include consideration of GHG emissions in their regional transportation analyses and seek outcomes that help reduce GHG emissions. The Commonwealth Transportation Board should use such analyses in its consideration of project selection. (Modified from Governor Kaine's Commission Recommendations)
- Virginia should establish a no net loss goal for natural carbon sequestration areas based on the 2010 baseline. Modified from Governor Kaine's Commission Recommendations)
- The Department of General Services (DGS) should establish miles per gallon (MPG) standards for state government vehicles.
- Solar microgrids should be evaluated as part of disaster preparedness throughout Virginia, but especially in Tidewater communities most at risk from hurricanes and other extreme weather events.

APPENDIX D

Statement of the Virginia Automobile Dealers Association

Statement of the Virginia Automobile Dealers Association

The Virginia Automobile Dealers Association opposes the recommendation to adopt the California zero emissions vehicle program.

In 2007, Congress directed NHTSA alone to increase fuel economy by 40% under CAFE. However, in 2009 the Obama Administration added two new regulators, EPA and CARB, to also regulate fuel economy. Currently three regulators write three different fuel economy rules pursuant to three different laws.

VADA supports allowing NHTSA to continue to regulate fuel economy according to the CAFE program that Congress established, but opposes a duplicative set of rules from California. Additionally, California should not dictate national fuel economy rules that are not directly related to localized criteria pollutants or smog. Virginia should not make itself subject to California regulators.

Congress set rules that consider consumer affordability when setting a fuel economy standard. These additional requirements will increase the average price of a new vehicle by about several thousand dollars and shut millions of Americans out of the new car market. Older, polluting vehicles remaining on the road longer because consumers are unable to find or afford newer, cleaner vehicles that meet their needs will negatively impact the emissions goals these programs seek to achieve.