Governor's Commission on Climate Change

Findings

***Final Draft,* November 11, 2008**

The Commission is mindful of Governor Kaine's charge to us, and we accept his views on certain foundational issues as our starting point. As Governor Kaine stated, the fact global climate change is happening and is largely human-caused is now widely accepted.[*]

We have used the Intergovernmental panel on Climate Change's (IPCC) Fourth Assessment Report as our primary reference point on the science of climate change. The IPCC projects that, to avoid catastrophic changes to the world's climate, greenhouse gas (GHG) emissions will need to be reduced by 25% below the 1990 level by 2020, and 80% below the 1990 level by 2050.

As Governor Kaine noted, since climate change is a global problem, a national solution is needed in order to achieve the most significant reductions in greenhouse gas (GHG) emissions. However, because the effects of climate change on Virginia will be profound, we cannot wait for the federal government to act. Moreover, many steps to reduce GHG emissions require state action.

We believe that the actions taken by U.S. states can have a significant effect on global GHG levels. The importance of the role of states in addressing climate change is illustrated by data from the World Resources Institute that shows the combined emissions of Virginia, North Carolina and South Carolina are equivalent to those of South Korea. GHG emissions from just six southeastern states (Virginia, North Carolina, South Carolina, Georgia, Alabama, and Tennessee) are greater than all but five countries in the world.

According to the IPCC, current climate models predict that global mean warming at the end of the 21st century (2090 - 2099) will range from 1.1°C to 6.4°C for various models and various scenarios, and the best estimate for one of the moderate emission scenarios (the so-called A1B scenario) is global warming of 2.8°C. Scientists from George Mason University and Center for Ocean-Land-Atmosphere Studies in Maryland have examined the original IPCC data for the moderate A1B scenario for 15 global models and calculated the twenty-first century warming for Virginia and the adjoining areas (36.5°N-42°N; 73°W-84°W). They found that the average warming for Virginia and the adjoining areas would be 3.1 degrees Celsius (5.6 degrees Fahrenheit) and that precipitation would increase by 11%. The warming would be higher for high emission scenarios.

In pursuing actions to combat climate change, Virginia is not acting in a vacuum. Indeed, we join 37 other states in preparing a climate change action plan. Based upon our review of information from other Mid-Atlantic states' climate change plans and what we have learned from the experts who have made presentations before the Commission, from our discussions, and from

[*] While we have acknowledged these points as being beyond debate in our deliberations, we have we have heard testimony providing contrary information during public comment periods at our meetings.

the many external documents we have shared with one another and posted on the Commission's website, we now make the following findings:

Effects on the Built Environment and Insurance

- Sea level rise is a major concern for Coastal Virginia, particularly the highly populated Hampton Roads region. The Chesapeake Bay Program's Scientific and Technical Advisory Committee projects that sea levels in the Chesapeake Bay region will be 0.7-1.6 meters (2.3-5.2 feet) higher by 2100. Specific impacts will vary by location, depending on changes in land elevation.

- Based on an analysis by RMS (a catastrophe modeling company) that has been reviewed and approved by Organization for Economic Cooperation and Development (OECD), Virginia Beach-Norfolk Metropolitan Statistical Area is the 10th largest coastal city in the world in terms of assets exposed to increased flooding from sea level rise.

- Modeling and simulation tools are already being used to improve our understanding of how sea level rise and storm surge may affect certain areas of coastal Virginia. However, the fact that LIDAR (Light Detection and Ranging) elevation data does not exist for most of Coastal Virginia is a major obstacle to the ability to plan effectively for these changes.

- Climate changes such as sea level rise pose serious and growing threats to Virginia's roads, railways, ports, utility systems and other critical infrastructure.

- Climate change is widely viewed as a threat to national security. In Virginia, there are several major military installations located in low-lying areas that will be affected by sea level rise and storm surge.

- The continued affordability and availability of insurance for Virginia's landowners is a concern as our climate changes. These effects are already being felt in Coastal Virginia. The frequency and severity of storms in the future are expected to exceed those of the past, and the insurance industry may not have the ability to handle several concurrent events. It is also important to make sure that federal flood insurance programs discourage development in sensitive coastal areas.

Effects on Natural Systems

- Climate change will have a significant impact on Virginia's ecosystems. At varying rates, vegetation ranges are moving from current locations to higher altitudes and latitudes. The effect of this will be that suitable habitat for some species will decline, other species will become extirpated, and others species will become extinct. Climate change will also exacerbate threats already faced by Virginia ecosystems, such as invasive species, pathogens and pollution.

- The effects of climate change on many of Virginia's ecosystems and species will be better understood as more research becomes available. Research and conservation efforts will need to be increasingly focused on managing resources to maintain healthy,

connected and genetically diverse ecosystems, and plant, wildlife, and fisheries populations.

- Some of the Chesapeake Bay's "foundation species," such as blue crabs, eelgrass and oysters, could decline or disappear as salinity and temperatures continue to increase and weather patterns continue to fluctuate widely from year to year. Foundation species support many other species, so these impacts would be felt throughout the ecosystem.

- Oxygen levels in the Chesapeake Bay are expected to decrease due to increasing temperatures and increasing storm runoff, which will have a negative impact on species like striped bass, blue crabs and oysters. Acidification of the Bay and Atlantic Ocean is also a concern as waters absorb more CO_2.

- Coastal wetlands, a critical habitat for many of the Chesapeake Bay's plants and animals, are being lost as sea levels rise, and freshwater coastal wetlands are similarly threatened by saltwater intrusion.

- Virginia's agriculture and forestry industries, as well as commercial and sport fishing industries and park land, will be impacted by climate change. More research to determine specific effects is needed. The lack of specific information on the impacts hinders Virginia's ability to adapt and prepare for these changes.

- Virginia's forestlands sequester approximately 23 million metric tons of carbon dioxide per year. Unless current land conversion trends are reversed, however, this number will decline every year, as Virginia loses on average 27,000 acres of forestland annually to development. The loss of agricultural lands, which also can sequester carbon depending on the management practices applied, is also a concern. In 2003, Virginia had 15.8 million acres of forestland which represents a decline of 180,600 acres since 1992.

<u>Effects on Human Health</u>

- Climate change is likely to have wide-ranging and mostly adverse direct and indirect impacts on human health. Extreme weather events (e.g., floods, droughts, hurricanes or windstorms, wildfires and heat waves) can directly affect health through injuries, drownings, or mental health problems. These extreme weather events could lead to compromised water and food supplies, resulting in increases in waterborne and food-borne illnesses. Climate change will lead to the alteration or disruption of natural systems, making it possible for vector-borne diseases (e.g., arthropod-borne diseases such as West Nile virus and Lyme disease) to spread or emerge in areas where they had been previously limited or non-existent. These alterations or disruptions also could result in the disappearance of some vector-borne diseases by making the environment less hospitable to the vector or pathogen. Climate change is also expected to increase the incidence of diseases associated with air pollutants and aeroallergens and exacerbate other respiratory and cardiovascular conditions.

- The Emergency Preparedness and Response Program for Virginia is available to address and mitigate the impacts of extreme weather events on human health and safety as well as on our buildings and infrastructure.

- Certain groups of people are recognized as being more vulnerable to the health impacts of climate change. These vulnerable populations include the following: children and the elderly, people of low socioeconomic status, members of racial and ethnic minorities, people living in coastal areas and flood plains, and people with pre-existing health conditions and disabilities.

General Principles Regarding Strategies

- It is not possible to effectively address impacts of climate change without significant public and private investment. Either new funding sources, redirection of existing resources, or both, will be required. Actions to combat climate change should be quantifiable or meaningful and chosen in a manner cognizant of their costs and benefits. State actions should be taken in the context of national goals and strategies.

- Strategies that are focused on conserving existing natural carbon sinks and increasing the capacity of those carbon sinks represent an important and cost-competitive strategy to decrease net GHG emissions. Some strategies, such as conserving land and planting trees and other vegetation also produces a plethora of co-benefits like improving air and water quality, providing habitat for wildlife, assisting in stormwater management, minimizing impacts of sea level rise, producing food and fiber, reducing heat in urban areas, and providing recreational opportunities.

- The three largest sources of GHG emissions in Virginia are electricity generation, transportation, and non-utility uses of fuel in industrial, commercial and residential facilities. Emissions from all of these sources must be addressed in order for our climate-change mitigation efforts to be successful and fair.

- The nation's movement toward a GHG emission-constrained economy represents an opportunity for Virginia researchers, inventors, and investors to accelerate and deploy technologies in the areas of energy efficiency, indigenous renewable and low-emission energy as well as carbon capture and storage.

- Fossil fuels are a significant part of Virginia's current fuel mix. Carbon capture and storage technology offers the potential to reduce GHG emissions while continuing to produce energy from fossil fuels, but this technology is still in development and is not expected to be commercially available within the next ten years. In addition, its cost, especially with regard to coal-fired electric generation, is yet to be determined.

- As stated in the Virginia Energy Plan, energy efficiency and conservation provide the least costly and most readily deployable energy resource options available to Virginia. It is essential to identify and remove fiscal, regulatory and other barriers to investments in energy efficiency and conservation. Many of the technologies needed to reduce emissions are already available and are becoming more affordable every day.

- According to the US Energy Information Administration, annual per capital energy consumption in Virginia (345 million BTU/capita, 2005 data) far exceeds European countries like the United Kingdom (165 million BTU), Germany (176 million BTU), France (182 million BTU) and Italy (138 million BTU). The annual per capita energy

consumption for the United States was 1.7 percent lower than in Virginia in 2005 (339 million BTU/capita). Virginia ranks 27th highest of the states and District of Columbia. States ranged from 1,194 BTUs/capita in Alaska, 912 BTUs/capita in Wyoming down to 217 BTUs/capita in New York and 213 BTUs/capita in Rhode Island.

- Based on 2008 load forecast projections from the PJM Interconnection, electric demand is projected to grow by 26.8% in the Dominion zone and 14.7% in the AEP zone over the next 15 years. (See table below.)

  In calculations completed during development of the Virginia Energy Plan DMME projected that natural gas consumption will grow 3.6% from 2007 through 2016 (10-year growth rate) under a business as usual scenario. Natural gas is increasingly being used for electric generation because it is the cleanest of the fossil fuels. This may cause an increase in demand for natural gas supply above this BAU projection.

  Based on the projected growth rates, the Virginia Energy Plan states that efficiency and conservation efforts should be accelerated to reduce these projected growth rate increases. The Plan further states that, even with increased conservation, new electricity generation capacity will be needed. How Virginia supplies this electricity will have a bearing on the Commonwealth's GHG emissions. Additional supplies of other energy sources will also be needed to meet growing demand due to population growth.

15-Year Growth Rate Projection	**kWH**	**Summer kW Peak**	**Winter kW peak**	
Dominion	1.6%	1.6%	1.3%	Annual
	26.8%	27.8%	21.6%	15-Year
AEP	0.9%	1.0%	0.7%	Annual
	14.7%	16.0%	11.3%	15-Year

- While recently-enacted federal fuel efficiency standards will reduce the level of GHGs that would otherwise be emitted by automobiles, if there is a significant increase in vehicle miles traveled, that would mean that transportation emissions would still grow over time. Regardless, near-term improvements in fuel efficiency, increased fuel costs and concomitant changes in driver behavior can significantly reduce emissions generated from driving.

- Areas with compact development patterns and readily available transit services have lower vehicle miles traveled per capita than areas with sprawling development and limited transit, while conserving more fields, forests and farmlands. Indeed, areas of compact development generally have lower per-capita energy consumption overall.

- Local governments are the Commonwealth's critical partners in both reducing the level of GHGs and mitigating the impacts of climate change. Localities have authority over land use, zoning, and development decisions, the maintenance and operation of local infrastructure and vehicle fleets, and the enforcement of building codes. The response to climate change will be most effective if the mechanisms that are in place properly

coordinate between state and local levels of government. Planning district commissions (PDCs) may be a useful mechanism for this coordination.

- Virginia does not currently have an institutional infrastructure to monitor impacts of climate change on Virginia, the effects of efforts to reduce GHG emissions, or to make Virginia-specific predictions of the future climate and its impacts.

- Although national, state and local actions can make a difference, climate change is a global problem that requires a global solution. That global solution is only achievable if the U.S. demonstrates a commitment to reducing emissions and exerts sustained public policy, political, diplomatic, business and technological leadership.

- The Commission anticipates that Congress will enact a cap-and-trade program within the next four years. The development of new technology will be accelerated by the market demand created by a cap on GHG emissions.

Greenhouse Gas Reduction Goals

The Governor's Executive Order 59 (2007) set a greenhouse gas emission target of 30% below the business as usual projection of emissions by 2025. This will require a reduction of 69 million metric tons of carbon dioxide equivalent (MMte) CO_2, reducing Virginia emissions to 161 MMte CO_2. This is slightly below the Virginia's 2000 emission level of 163 MMte CO_2. The target set in Executive Order 59 (2007) differs from the IPCC recommendations as well as federal, state and regional goals. See the table below.

Location	**Goal**
IPCC	25% below the 1990 level by 2020, and 80% below the 1990 level by 2050
United States (as per EPA testimony before the Commission)	Reduce GHG intensity of the American economy by 18 percent from 2002 through 2012
Virginia (Executive Order)	30% reduction from BAU by 2025 (equivalent to 2000 emission level)
Maine (legislation) New Hampshire (Executive Action) Vermont (Executive Action Rhode Island (Executive Action) ,	The Climate Change Action Plan developed by The New England Governors and the Eastern Canadian Premiers, set goals of 1990 levels by 2010, 10 percent below 1990 levels by 2020, and 75-85 percent below 2001 levels in the long term.1990 levels by 2010, 10 percent below 1990 levels by 2020, and 75-80 percent below 2003 levels in the long term.
Massachusetts (Legislation)	80 percent reduction in greenhouse gas emissions below 1990 levels by 2050. The Secretary of Energy and Environmental Affairs is to set an interim target of between 10 and 25 percent below 1990 levels by 2020, as well as targets for 2030 and 2040 (Legislation)

Location	Goal
Connecticut (Legislation)	10% below 1990 levels by 2020. Barring intervention at the federal level or through the Regional Greenhouse Gas Initiative (RGGI), 80% GHG reduction below 2001 levels by 2050
New Jersey (Legislation)	1990 levels by 2020 and to 80 percent below 2006 levels by 2050
New York (Executive Action)	5 percent below 1990 levels by 2010, and 10 percent below 1990 levels by 2020
Florida (Executive Order)	2000 levels by 2017, 1990 levels by 2025, and 80 percent below 1990 levels by 2050
Illinois (Executive Action)	1990 levels by 2020 and 60 percent below 1990 levels by 2050
Minnesota (Legislation)	15 percent by 2015, 30 percent by 2025, and 80 percent by 2050, based on 2005 levels
New Mexico (Executive Order)	2000 emission levels by 2012, 10 percent below 2000 levels by 2020, and 75 percent below 2000 emission levels by 2050
Colorado (Executive Order)	20% below 2005 levels by 2020 and 80% below 2005 levels by 2050
Arizona (Executive Order)	2000 levels by 2020, and 50 percent below 2000 levels by 2040
Utah (Executive Action)	2005 levels by 2020 (Estimated to be 28% below BAU)
California (Executive Order and Legislation)	EO: 2000 levels by 2010, 1990 levels by 2020, and 80 percent below 1990 levels by 2050 Legislation: 1990 levels by 2020, with enforceable penalties
Oregon (Legislation)	Stop the growth of greenhouse gas emissions by 2010, 10 percent below 1990 levels by 2020, and to 75 percent below 1990 levels by 2050
Washington (Legislation)	1990 levels by 2020, 25 percent below 1990 levels by 2035, and 50 percent below 1990 levels by 2050
RGGI	Caps power plant emissions at current levels in 2009, and then reducing emissions 10% by 2019; trading from all sources
Midwestern regional GHG Reduction Accord	Long-term target of 60 to 80 percent below current emissions levels; multi-sector cap-and-trade system
Western Climate Initiative	15 percent below 2005 levels by 2020, or approximately 33 percent below business-as-usual levels