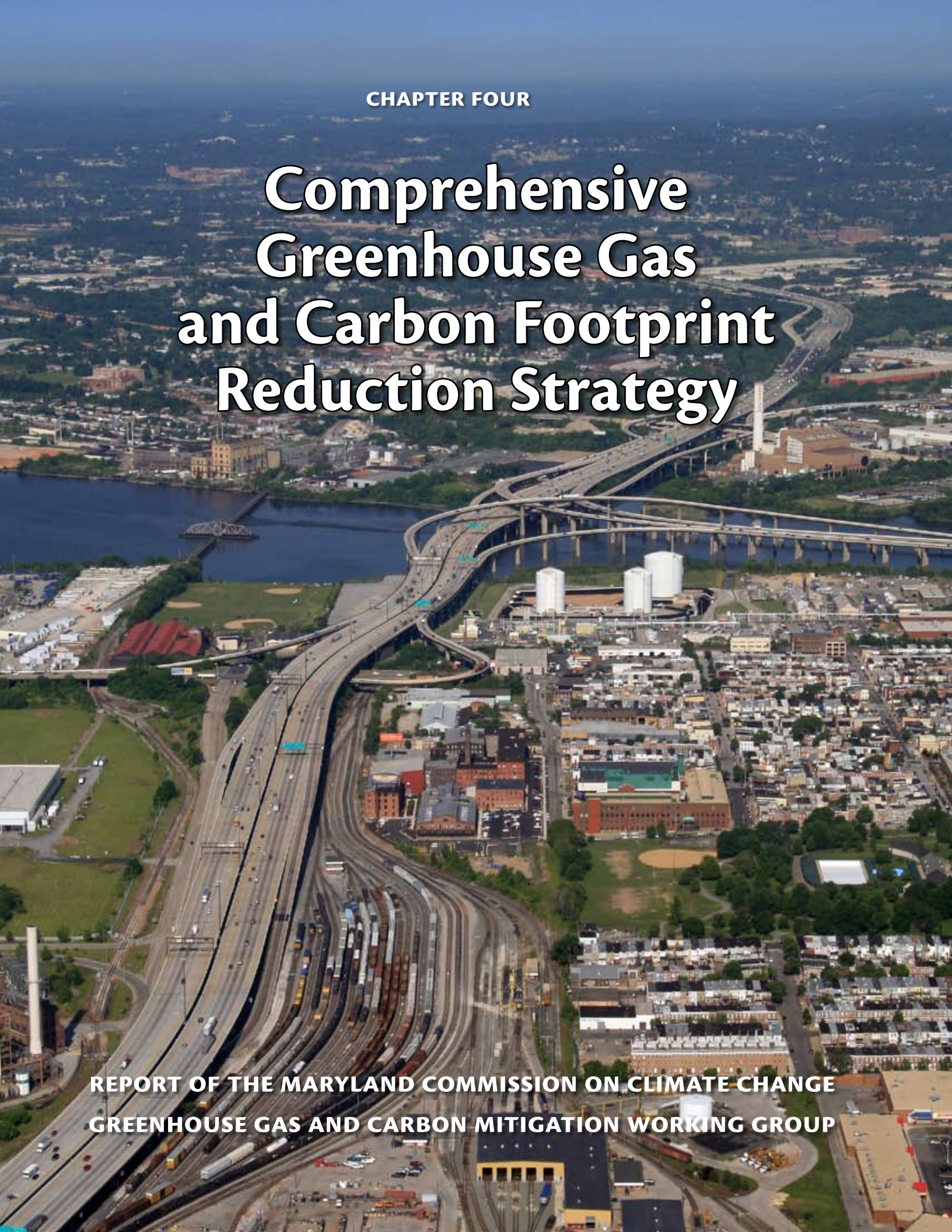

CHAPTER FOUR

Comprehensive Greenhouse Gas and Carbon Footprint Reduction Strategy

REPORT OF THE MARYLAND COMMISSION ON CLIMATE CHANGE

GREENHOUSE GAS AND CARBON MITIGATION WORKING GROUP

GREENHOUSE GAS AND CARBON MITIGATION WORKING GROUP

Chair: Tad Aburn (Maryland Department of the Environment)
Co-Chair: Malcolm Woolf (Maryland Energy Administration)

Uri Avin (Parsons Brinkerhoff), Paul Chan (Citizen), William Chandler (Transition Energy), Drew Cobbs (Maryland Petroleum Council), Richard D'Amato (Synergics, Inc), Robert Driscoll (Mirant), Joel Dunn (The Conservation Fund), Nancy Floreen (Montgomery County Council), Jonathan Gibralter (Frostburg State University), Ed Guigliano (AES Warrior Run), Michelle Harris Bondima (Baltimore City Community College), Brad Heavner (Environment Maryland), Frank Heintz (Citizen), William Hellman (Rummel, Klepper & Kahl), Peggy Horst (W.L. Gore), Debra Jacobson (DJ Consulting), Mark Joseph (Yellow Transportation), Thomas Koch (Curtis Engine & Equipment), Michael Mallinoff (City of Annapolis), Elizabeth Martin-Perera (Natural Resources Defense Council), Dr. Cindy Parker (Johns Hopkins Bloomberg School of Public Health), John Quinn (Constellation Energy), Michael Replogle (Environmental Defense), Matthias Ruth (University of Maryland, Center for Integrative Environmental Research), Scot Spencer (Annie E. Casey Foundation), John Szallay (BP Solar), Lise Van Susteren (The Climate Project)

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Public Service Commission
University System of Maryland

Maryland Department of the Environment
1800 Washington Boulevard
Baltimore, Maryland 21230
www.mde.state.md.us

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Comprehensive Greenhouse Gas and Carbon Footprint Reduction Strategy

Report of the Maryland Commission on Climate Change

Greenhouse Gas and Carbon Mitigation Working Group

August 2008

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EARLY ACTIONS ARE KEY

Not Your Grandfather's Air Pollution

Greenhouse gases (GHGs) are not like other air pollutants. Ozone and other pollutants create hotspots over a city or a region and typically dissipate in period of hours, days or weeks. GHGs, on the other hand, accumulate in the atmosphere and stay there for a very long time. A pound of carbon dioxide (CO_2) we emit today by driving a car or using electricity generated by burning fossil fuels, such as coal, may still be in the atmosphere decades to hundreds of years from now. (In this sense it *is* your grandfather's air pollution.) Industrial GHGs have even longer residence times. For example, sulphur hexafluoride (SF6), used as insulation in electronic switching equipment and other industrial applications, has a residence time of several *thousand* years.

It does not matter if the GHG is emitted in Maryland, China, or elsewhere – the climate impact is the same.

What Happens When GHGs Accumulate?

Simply stated, the accumulation of GHGs in the atmosphere traps heat from the sun and warms the planet. As synthesized by the Intergovernmental Panel on Climate Change (IPCC), when GHG concentrations in the atmosphere – expressed in CO_2 equivalents or CO_2e – reach 445-490 parts per million (ppm), it will increase the annual mean temperature of the Earth's surface 2 - 2.4°C (3.6 - 4.3°F) above pre-industrial levels. The scientific evidence assembled by the IPCC indicates that temperature increases above this level are very likely to result in dangerous consequences in terms of food production, biodiversity, and initiation of uncontrollable and unpredictable changes in the Earth's climate system, such as rapid melting of polar ice caps and changes in the ocean circulation that regulate the planet's climate. Thus, GHG concentrations would have to be held to around 450 ppmCO_2e to avoid this level of global warming.

So What's the Rush?

To stabilize GHGs at this level requires substantial early action because it now seems that atmospheric concentrations are fast approaching, if they haven't already reached, 450 ppm. Furthermore, considering the atmospheric residence time of the CO_2 and other GHGs that have been and are being emitted, global reductions in emissions by 60 to 85 per cent below 2000 levels would be required by 2050 in order to reach the 450 ppm level of stabilization. Because developed countries such as the United States are responsible for the majority of the GHG emissions and have much higher emissions on a per capita basis than developing nations, they would have to achieve reductions on the high side of this range in order to achieve this result. Consequently, governments ranging from the European Union to a number of states in the United States have been adopting policies and goals based on reducing emissions at least to 1990 levels by 2020. These climate action plans call for taking immediate actions to stem the growth in emissions and then beginning to reduce them, with a heavy emphasis on energy efficiency and conservation. The ***Climate Action Plan*** sets long-term goals of achieving 90 per cent reductions in emissions by 2050, relying on new energy sources and technologies that will have to be developed.

> "The climate crisis is real and while it threatens our shorelines today, its causes and symptoms threaten life on our planet in the generations ahead unless we act.
> As a state and -- I would submit to you -- as a nation and a planet, there's no time to delay. We have to take control of our own future in the face of this threat. The decisions we make today will determine, in a very real way, the future character of our state and nation."
>
> Governor Martin O'Malley
> September 26, 2007

Commission's Science-based GHG Reduction Goals

The Commission recommends reducing Maryland's GHG emissions by 25 per cent to 50 per cent below 2006 levels by 2020 and a goal of 90 per cent below 2006 levels by 2050. It also recommends interim reduction targets of 10 per cent reductions by 2012 and 15 per cent reductions

by 2015, again using the 2006 baseline. The basis for these targetss is laid out in this Chapter and in the Commission's ***Interim Report***. These targets, like those of the European Union and leadership U.S. states, are based on the scientific conclusions of the IPCC regarding the level and pace of reductions that industrialized societies will need to achieve in order to keep global concentrations of GHGs below the 450 ppm threshold.

Continued Efforts to Work with Stakeholders

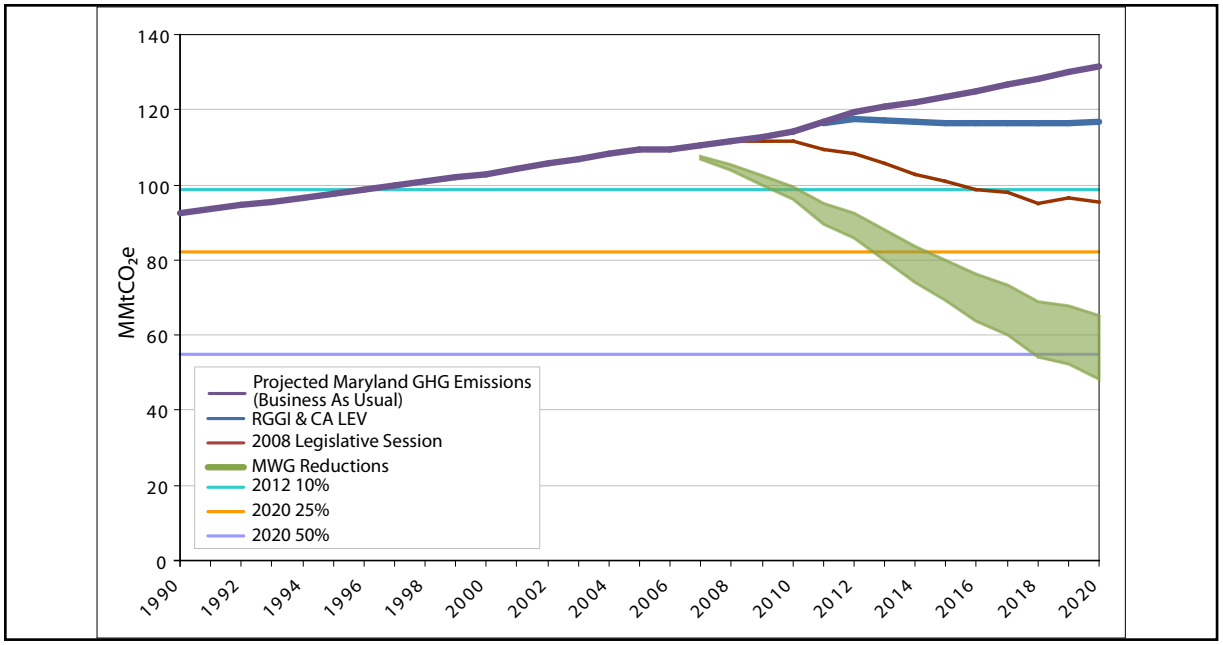
As the Commission and the Mitigation Working Group (MWG) developed the policy options in the ***Plan***, many additional stakeholders expressed an interest in being involved as the State begins to implement the strategies contained in the ***Plan***. Because of this, the lead implementation agencies will be setting up strategy-specific stakeholder processes for appropriate measures.

For example, there was tremendous interest from stakeholders to work with the State on how the Regional Greenhouse Gas Initiative (RGGI), a regional cap-and-trade program focused on the power sector, may evolve over time or blend into a federal program. Because of this interest, the Maryland Department of the Environment (MDE) has already begun to set up a separate stakeholder process focused on just this issue.

More Is Needed

Although Maryland has taken some important first steps, as illustrated in the "alligator jaws" graph below, more reduction programs are needed to "close the jaws" and stabilize emissions below the critical atmospheric concentration of 450 ppm CO_2e by 2050. The Commission has developed forty-two policy options that, if implemented aggressively, could close the jaws and, in fact, could reduce emissions below the 25 per cent reduction goal for 2020 at a net savings to Maryland citizens, businesses and the State's overall economy.

GHG Reduction Potential from Maryland's Recent and Proposed Actions



As the graph above illustrates, Maryland has already made significant progress in enacting programs that will dramatically reduce GHG emissions. The Maryland Clean Cars Program (CA LEV), RGGI, and the recent 2008 legislation aimed at GHGs get Maryland about 70 per cent of the way to our 2020 goal (25 per cent reduction).

STEPS IN THE RIGHT DIRECTION

Maryland has already taken some important early actions toward reaching these goals.

- *The Healthy Air Act.*
  Adopted as State law in 2006, the Act included a provision for Maryland to join the Regional Greenhouse Gas Initiative (RGGI), a groundbreaking cap and trade program designed to reduce CO_2 emissions from power plants in participating states in the Northeast and Mid-Atlantic. The Maryland allocation in RGGI is expected to reduce CO_2 emissions by approximately 8.7 million tons by 2020. Maryland will participate in RGGI's historic first auction of CO_2 allowances in September 2008, the first ever in the U.S.

- *The Clean Cars Act.*
  Adopted as State law in 2007, this law requires implementation of the California Clean Cars program (CA LEV). By requiring more rigorous emissions standards beginning in vehicle model year 2011, it will start reducing GHG emissions in Maryland as early as 2010, achieving reductions of about 6 million metric tons by 2020.

- ***EmPOWER Maryland** Program.*
  Launched by Governor O'Malley in July 2007 and codified by the General Assembly in its 2008 Session, this program is designed to reduce per capita electricity use by Maryland consumers by 15 per cent in 2015. This could reduce GHG emissions by about 7 million tons in 2020.

- *Commission on Climate Change.*
  Governor O'Malley established the Commission by executive order in April 2007 to advise the Governor and General Assembly on matters related to climate change and to develop a ***Climate Action Plan***.

- *2008 Legislation*
  As summarized in Chapter 7 of this ***Plan***, nearly all of the Commission's Early Action recommendations for legislation were adopted as law in the General Assembly's 2008 Session. Significant early reductions will be achieved through the following 2008 laws:
  - ***EmPOWER Maryland** Energy Efficiency Act of 2008*
  - *Regional Greenhouse Gas Initiative – Maryland Strategic Energy Investment Program*
  - *High Performance Buildings Act of 2008*
  - *Renewable Portfolio Standard Percentage Requirements – Acceleration*

  The General Assembly adopted other laws in 2008 designed to reduce GHG emissions that weren't part of the Commission's Early Action recommendations. These include increased grants and tax incentives for solar and geothermal installations, a law to spur development around transit stations, low interest loans for energy efficiency projects, and establishment of the Maryland Clean Energy Center. These are discussed in greater detail in Chapter 7.

It Won't Get Any Easier: Living Within a Greenhouse Gas Budget

Staying below the 450 ppm threshold is another way of saying we must live within a GHG budget. How we spend this account depends on policy decisions we make today. We can think of it in this way: a program that keeps a ton of GHGs out of the atmosphere today is worth more than the same program started five years from now, because five years of GHG accumulation will be avoided if we start today. Let's consider two scenarios:

1. **"Business as Usual" Scenario.** Under this scenario, we spend most of our GHG account in the early years by continuing activities that cause GHGs to accumulate rapidly. This requires us to borrow against future years. Like compounding interest on an unpaid credit card debt, the accumulating GHGs will make our payments – the needed emissions reductions per year – larger every year we delay, until we may reach a point where the reduction measures are vastly harder, or impossible, and too expensive, and our 2020 and 2050 goals are not achievable. Our "glide path" to leveling off and staying below the 450 ppm threshold in these time frames may simply become too steep to travel.

2. **"Early Action" Scenario.** Under this scenario, we budget the timing and pace of our GHG expenditures by implementing early and significant GHG reduction programs now, and phasing in medium- and long-term programs on an aggressive "ramp up" schedule. In so doing, we avoid continued rapid GHG accumulations – the compounding interest – and stabilize and start reducing emissions by about 2012. This puts us on a sustainable glide path to our 2020 and 2050 goals without overspending our GHG account and borrowing with interest against the later years. ***Even programs that won't yield reductions in the early years may need to be launched now in order to ramp up to their full effectiveness within the needed time frame.***

CLIMATE CHANGE OR GLOBAL WARMING?

The term climate change is often used interchangeably with the term global warming, but according to the National Academy of Sciences, "the phrase 'climate change' is growing in preferred use to 'global warming' because it helps convey that there are [other] changes in addition to rising temperatures."

Climate change refers to any significant change in measures of climate (such as temperature, precipitation, or wind) lasting for an extended period (decades or longer). Climate change may result from:

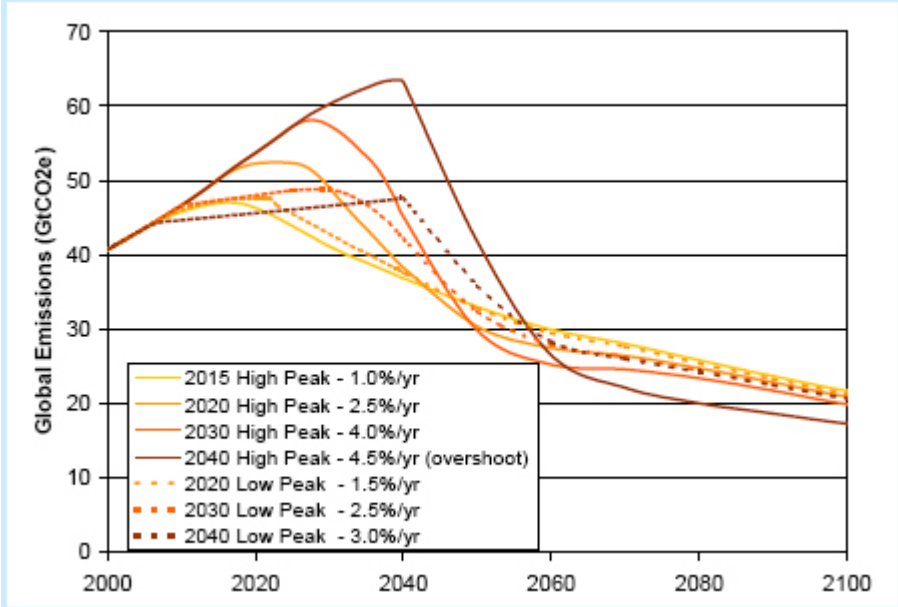
- natural factors, such as changes in the sun's intensity or slow changes in the Earth's orbit around the sun;
- natural processes within the climate system (e.g. changes in ocean circulation);
- human activities that change the atmosphere's composition (e.g. through burning fossil fuels) and the land surface (e.g. deforestation, reforestation, urbanization, desertification, etc.)

Global warming is an average increase in the temperature of the atmosphere near the Earth's surface and in the troposphere, which can contribute to changes in global climate patterns. Global warming can occur from a variety of causes, both natural and human induced. In common usage, "global warming" often refers to the warming that can occur as a result of increased emissions of greenhouse gases from human activities.

Source: U.S. EPA

THE COST OF DELAY: A GLOBAL PERSPECTIVE

The graph below illustrates different pathways to global stabilization of GHGs. By delaying reductions (shifting the peak to the right), the larger tonnage of emissions in early years (higher peak) requires steeper, more rapid emission cuts in later years (expressed in %/yr) to reach the same stabilization goals.



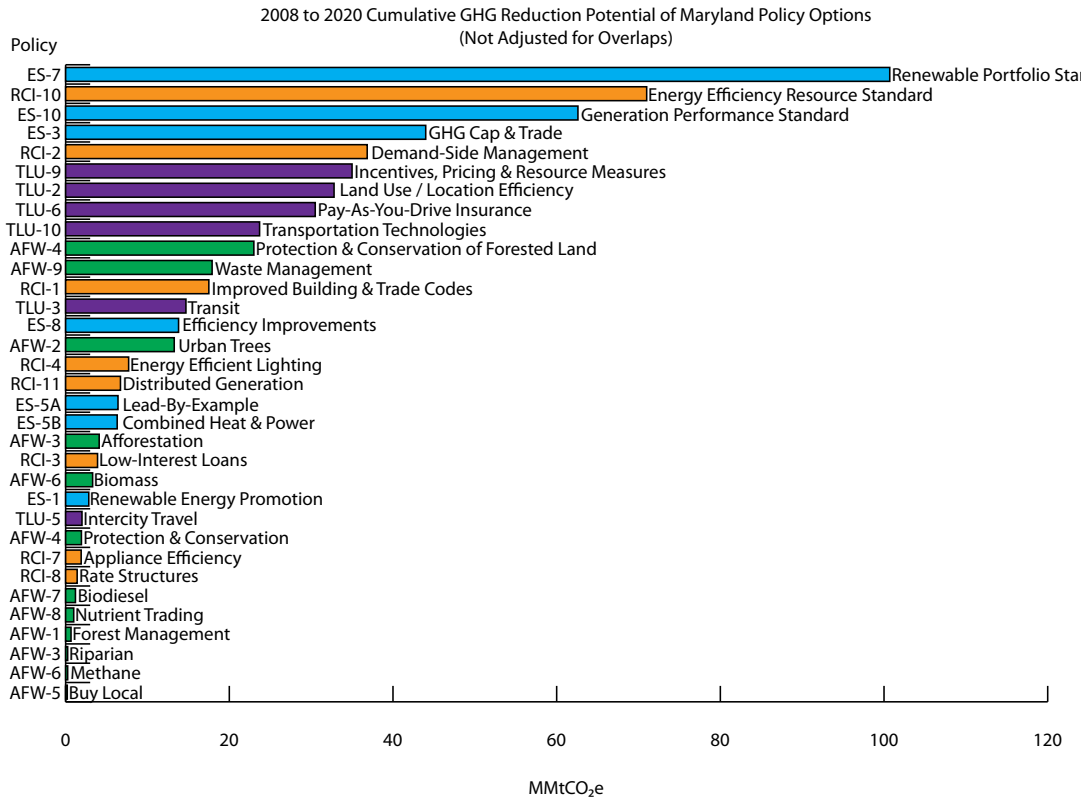
"There is a high price to delay. Delay in taking action on climate change would make it necessary to accept both more climate change and, eventually, higher mitigation costs. Weak action in the next 10-20 years would put stabilization even at 550 ppm CO_2e beyond reach – and this level is already associated with significant risks."

The Economics of Climate Change: The Stern Review, Executive Summary, p. xv.

Excerpted from: Stern, Nicholas. The Economics of Climate Change: The Stern Review. Cambridge: Cambridge UP, 2007; Executive Summary, p. xii. Commissioned by the Chancellor of the Exchequer, reporting to both the Chancellor and to the Prime Minister of Great Britain. HM Treasury. <http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/stern_review_Report.cfm>.

EARLY ACTIONS: BIG HITTERS IN MARYLAND

The graph below illustrates the cumulative GHG reductions achieved between 2008-2020 by each quantified policy recommendation of the Commission. The bars on the top show policies that would achieve the largest tonnage of reductions between 2008 and 2020. The policy options are described and analyzed in detail later in this Chapter and in Appendix D to this ***Climate Action Plan***.



SHRINKING OUR FOOTPRINT WILL GROW MARYLAND'S ECONOMY

The Commission has identified a suite of cost-effective GHG reduction programs which, if implemented, will benefit Maryland consumers, businesses and the State's economy as a whole.

Energy Efficiency – The Low Hanging Fruit

Energy efficiency is the fastest and least expensive approach available to reduce GHG emissions. Most of the Commission's policy recommendations for reducing energy demand can be implemented right now. According to the *EPA-DOE National Action Plan for Energy Efficiency*, energy efficiency will not only help to address GHG emissions but actions in this area can also lower energy bills, help stabilize energy prices, enhance electric and natural gas system reliability, and reduce harmful air pollutants. In fact, in some states with well-designed energy efficiency programs, these programs are saving energy at an average cost of about one-half of the typical cost of building new electric power generating sources.

Maryland research suggests even greater savings for our State. A study funded by Maryland's Department of Business and Economic Development (DBED) and the Maryland Energy Administration (MEA) and carried out by the Baltimore-based International Center for Sustainable Development (ICSD) found that energy efficiency can reduce energy costs to homeowners, businesses, institutions and government at a cost 60 per cent to 70 per cent cheaper than building new generating capacity in Maryland.

As noted earlier, Maryland has already launched some important energy efficiency programs such as ***EmPOWER Maryland***, RGGI, and Maryland Clean Cars, which will start yielding GHG emission reductions as early as 2009. This ***Climate Action Plan*** includes many energy efficiency programs that will yield additional early, significant and cost-effective GHG reductions. They are examined in greater detail in the Commission's Recommended Policy Options section, later in this Chapter.

Growing Clean Energy Industries and Green Collar Jobs

Maryland can position itself as a national leader in developing clean energy industries and growing an indigenous green collar work force. The ICSD study found that by developing clean energy industries, Maryland could create between 144,000 and 326,000 jobs in the State over the next 20 years, contributing $5.7 billion in wages and salaries to Maryland citizens, boosting State and local tax revenues by $973 million and increasing gross state product by $16 billion. It noted that Maryland's existing capacity to capture energy efficiency savings suffers from a lack of businesses that deliver energy efficiency services, such as energy service companies and home weatherization contractors.

Other examples of Maryland's robust business and job opportunities abound. They include: designing and constructing green buildings; retrofitting older buildings with energy efficient appliances and technologies; expanding and maintaining public transit systems; designing, constructing, and operating windmills, biomass generators, and solar collectors; and research and development (R&D) in a wide array of new practices and technologies.

The ICSD study found that although a number of states are investing aggressively in the clean energy industry, valued at $50 billion a year worldwide and growing at the rate of 30 per cent a year, Maryland is lagging behind in this sector and missing out on huge economic development and job growth potential. As one example, it found that Maryland has vast untapped renewable energy resources that could produce from 30 per cent to 137 per cent of all the State's electricity from solar photovoltaics and on-shore and off-shore wind

power at costs often competitive with conventional sources.

Shrinking Energy Bills

In addition to paying lower monthly utility bills through energy savings from RGGI, ***EmPOWER Maryland*** and other programs recommended in the ***Climate Action Plan***, Maryland consumers will be able to offset higher prices at the gas pump through the Maryland Clean Cars program, as well as other programs designed to reduce vehicle miles traveled such as Smart Growth and Transit-oriented Development, and a suite of policy options proposed by the Commission for the transportation sector.

ECONOMIC BENEFITS FROM RGGI

- **Lower utility bills for consumers**
- **Net economic benefit to State**
- **Job creation**

The University of Maryland's Center for Integrative Environmental Research (CIER) has studied the economic impact to Maryland of joining the Regional Greenhouse Gas Initiative (RGGI), the multi-state cap and trade program designed to cut GHG emissions from power plants. CIER concluded that through its participation in RGGI, Maryland's citizens will enjoy lower utility bills and a positive economic benefit to the State, increasing the gross state product by about $100 million by 2010 and $200 million by 2015 and subsequent years, and creating approximately 1,200 new jobs statewide by 2010 and 2,800 jobs by 2025.

WHAT WE DO IN MARYLAND MATTERS IN MARYLAND

Maryland Is Small – Why Should We Care?

Small Geography, Big Footprint

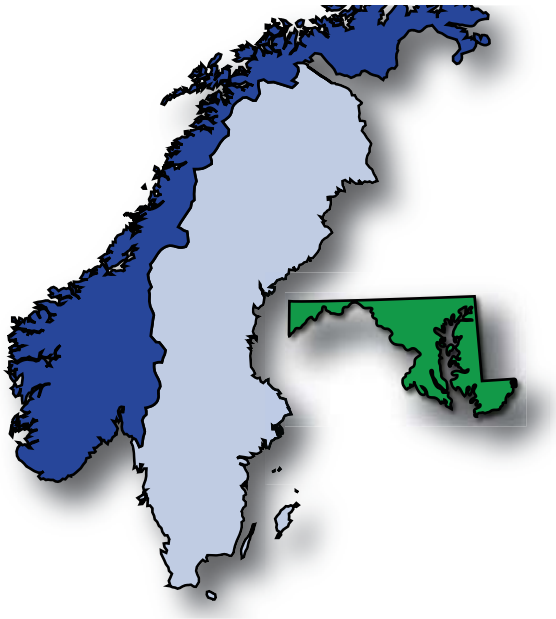
Although Maryland is a small state, it is responsible for as nearly many GHG emissions as Sweden and Norway combined. Our gross emissions have increased by about 18 per cent since 1990, a faster rate of growth than the U.S. as a whole. Per capita GHG emissions by Maryland citizens also grew between 1990 and 2005, during a period when per capita emissions for the U.S. as a whole decreased. Relative to its size, Maryland has a big and growing carbon footprint. As a GHG "Bigfoot", it is incumbent on our State to take leadership responsibility to shrink both our statewide and our per capita GHG emissions.

Local Actions Yield Local Benefits

In addition to stimulating economic development and creating jobs, GHG reduction programs will have other local benefits for Maryland citizens. For example, reducing GHG emissions will also reduce air and water pollutants in Maryland. Planting urban trees – a key recommendation of the Commission – is an effective strategy for reducing GHGs because trees sequester carbon and cool nearby buildings, reducing the need for air conditioning and the demand for electricity. By contributing to lower summertime temperatures at street level, trees also improve our ambient air quality. The lower temperatures slow the formation of ground-level ozone and reduce concentrations of volatile organic compounds, nitrogen oxides, fine particulate matter and other air and water pollutants.

Other synergies abound. Managing forests for enhanced carbon sequestration also promotes forest health, biodiversity and water quality and reduces soil erosion. Smart Growth and transit-oriented development programs not only reduce GHGs by reducing vehicle miles traveled, they also reduce air pollution, highway congestion and lost productivity, as well as public expenditures for roads, sewers and water infrastructures and school bus transportation driven by development sprawl. Agricultural nutrient trading programs promote soil carbon sequestration and protect the Chesapeake Bay by reducing nitrogen and phosphorus loads from fertilizer run-off.

Maryland, a relatively small state, releases nearly as much GHGs as Sweden and Norway combined



Maryland's water-based livelihoods, cultural heritage and unique quality of life derive from the Chesapeake Bay and its many tributaries. Our exceptional vulnerability to sea level rise reposes a unique leadership responsibility on Marylanders to reduce our State and personal GHG footprints. We have a tremendous amount to lose. We also have a tremendous amount to gain.

State Leadership Is Pushing Federal Action

It's true that acting alone, Maryland can't reduce the world's GHGs by much. But together with more than half of the states in the U.S. that have adopted climate action plans, our cumulative impact is significant and we are moving the federal government to adopt comprehensive climate change legislation, a vitally needed step toward achieving reductions globally.

LESSONS LEARNED IN MARYLAND

Top 10 Things We Need From a Federal Program to Build the Federal-State Partnership Needed to Address Climate Change

1. A comprehensive national program that demonstrates leadership and allows the United States to be a strong, committed, pro-active voice in the international debate over global warming.
2. A strong effective national cap-and-trade program that creates a level playing field and directs allowance or auction proceeds to achieve greenhouse gas (GHG) reductions as expeditiously as possible.
3. A system, like the one now being piloted by the Regional Greenhouse Gas Initiative (RGGI), that insures that allowance or auction proceeds from a national cap-and-trade program are converted into maximum reductions in GHGs as quickly and efficiently as possible. Because the fastest path to GHG emission reductions is through energy efficiency and conservation, State and Local governments, working in partnership with citizens and the business community, are uniquely positioned to develop and implement programs to maximize energy efficiency, energy conservation and GHG reduction for each dollar spent.
4. Recognition of the strong connection between transportation choices and reducing GHGs in a process like the Clean Air Act's Transportation Conformity requirements to insure that GHG reduction efforts and transportation planning work hand-in-hand.
5. A process for coordinating with coastal states on adaptation policies.
6. A national program to implement the GHG reduction requirements of the California Low Emission Vehicle Program (CA LEV).
7. More and stronger national standards for energy efficiency (lighting, appliances, etc.).
8. Recognition that there is more a to comprehensive, national GHG reduction program than just cap-and-trade and that there is a critical role for State and Local governments in reducing GHG emissions from other critical areas like smart growth, transportation, energy efficiency, agriculture and programs to reduce Vehicle Miles Traveled (VMT) and adaptation.
9. Recognition and support for the comprehensive, cutting edge work, now being undertaken in many states to incubate and develop economy-wide climate action plans to address GHG reductions on all fronts.
10. A well funded, national research and development program to kick-start technological development, like clean-coal technologies, zero emission vehicles and new technologies for energy efficiency, that is needed to achieve very deep reductions in GHG emissions.

UNCERTAINTY IN EMISSION ESTIMATES AND EMISSION REDUCTIONS

It is important to understand the range of uncertainty there is with greenhouse gas emission calculations. Calculating emission reduction potential is not an exact science and there are numerous assumptions that need to be made for each policy. These assumptions are always based on the most recent data but there is certainly a need to caveat both the emission projection calculations and the emission reduction calculations with a degree of uncertainty.

Greenhouse gases in Maryland will continue to rise unless policies are developed at the local and national level to meet the challenge.

Other reasons for uncertainty include:

- **The emission inventory created for this report was a "top-down" inventory and should not be considered a compliance level inventory**
- **The process of creating a consumption-based emission inventory is relatively complex and certainly new to Maryland**
- **Many of the policy options reviewed overlapped to some degree. The emission estimates were carefully evaluated to ensure overlap was minimal but it is important to note for transparency that this adds to the uncertainty of the final emission reduction estimates**

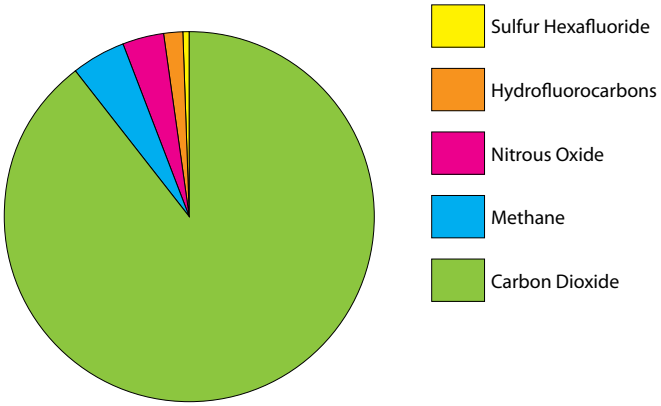
The Commission discussed the uncertainty issues and it is important to note for the reader of this report that concerns exist over the clarity of the emission reduction calculations. These numbers were generated by some of the nation's most qualified experts and reflect the "state of the science" as current but should not be considerd absolute.

The technical team that conducted the analysis discussed different approaches for communicating this uncertainty. After lengthy discussion, it was concluded that an explicit, quantitative estimate of the uncertainty was beyond the scope of the current effort. There was an agreement, however, to communicate the uncertainty associated with the aggregated reductions (of all mitigation strategies) using a range. The range uses 80 per cent of the estimate for the lower bound and 100 per cent for the upper bound.

THE INVENTORY

GHG Emissions in Maryland

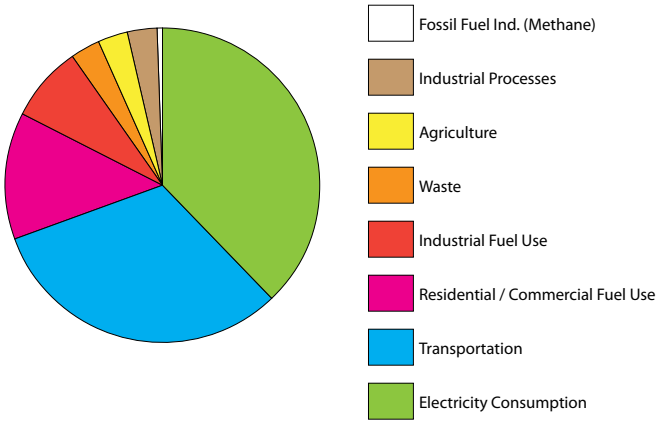
- More detail on the inventory and forecast is available in Appendix C.
- Carbon dioxide (CO_2) comprises about 90 per cent of Maryland's GHG emissions, when considering the CO_2 emission equivalents in terms of their impacts on global warming.
- The remaining emissions, while not as prevalent as CO_2, can be more reactive in the atmosphere so it is important that they are not ignored.
- For the purposes of this analysis, most GHG emission inventory engineers use the term $MMtCO_2e$, which stands for Million Metric Tons of CO_2 equivalent - a mathematical formula that equates all GHG emissions to CO_2 to facilitate comparisons.



Major GHG Emission Sources for Maryland

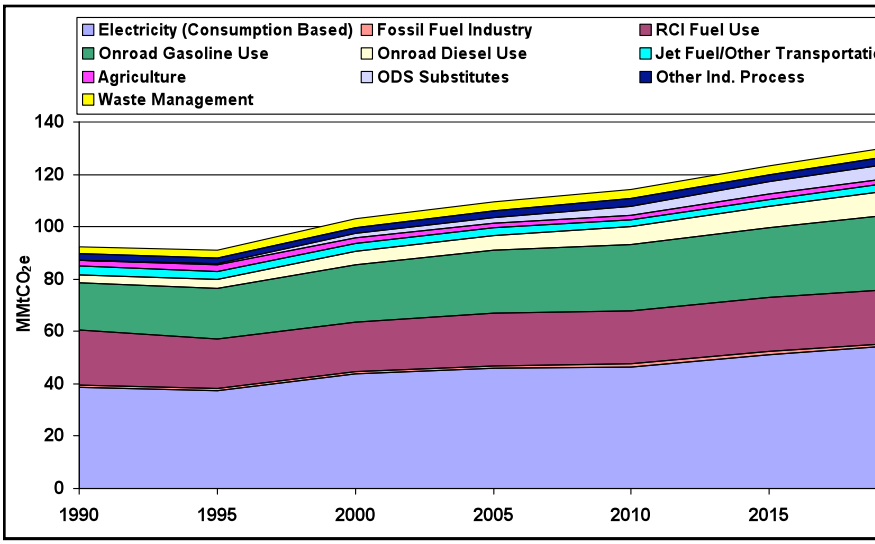
This graph shows the GHG emissions associated with Maryland's footprint in 2007. The graph includes emissions from within the State's borders and emissions from out-of-state that are created by consumption in Maryland.

- Approximately 30 per cent of the electricity used in Maryland is imported.
- Maryland is very similar to the national average when it comes to GHG emissions.
- The largest source sectors in Maryland are Electricity Consumption (38 per cent) and Transportation (32 per cent).



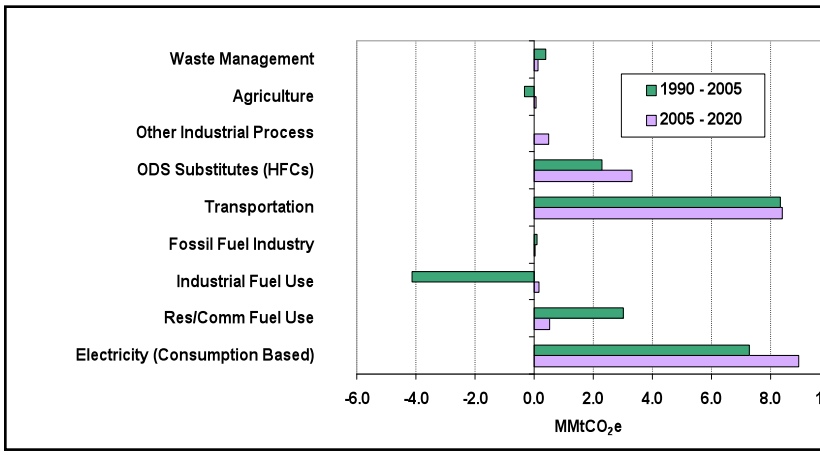
Are Maryland's GHG Emissions Growing?

- Due to increases in population and consumption, Maryland's GHG emissions are expected to continue to grow.
- The chart to the right shows projected growth out to 2020 in a "Business As Usual" scenario that does not include any programs to reduce GHGs.
- In total, if you take a snapshot of 2007, Maryland's total emissions are in excess of 100 million metric tons of CO_2 equivalent.
- Based on these projections, Maryland can expect to exceed 130 million metric tons of CO_2 equivalent by 2020 without any new CO_2 reducing programs.



In What Sectors are Maryland's GHG Emissions Growing?

- The chart to the right shows historical and predicted GHG emissions by sector.
- The green bars represent historical emission trends from 1990 to 2005. The purple bars represent 2005 to predicted 2020 totals.
- A few source sectors show a net loss in future emissions growth – agriculture and industrial processes
- Historically industrial fuel use was a decreasing emissions source, but according to projections, Maryland could expect a slight increase in emissions from that source sector.
- Overall, the two largest sources – transportation and electricity (energy supply) showed significant growth in emissions from 1990 to 2005 and are expected to continue to grow between 2005 and 2020 in a "Business As Usual" scenario.



Refining the Inventory

One of the policies recommended by the Commission is to have MDE develop a more detailed and comprehensive inventory and forecast. This will be a major effort for MDE over the next three years. The recommendation on inventory development is discussed in more detail later in this Chapter.

National GHG Reporting Requirements on the Horizon

The work of updating and refining Maryland's inventory will be made easier as a result of recent Congressional action. As part of its omnibus spending bill for FY2008 ("Reconciliation Omnibus Act", H.R. 2764), Congress appropriated funds to the Environmental Protection Agency (EPA) to adopt rules requiring the mandatory reporting of GHGs in all sectors of the U.S. economy. The stated purpose is to provide data that will inform and support development of national climate policy. The mandate covers all six GHGs and both upstream and downstream sources. Upstream sources include fuel and chemical producers and importers (e.g., oil refineries, natural gas processors, HFC producers). Downstream sources include GHG emitters such as power plants, iron and steel plants and cement manufacturers. EPA will establish reporting threshold levels. It is directed to publish draft rules by September 2008 and adopt final regulations by June 2009. It will build on the work of existing mandatory and voluntary GHG registries such as The Climate Registry, of which the Maryland Department of the Environment (MDE) is a founding member.

EARLY VOLUNTARY ACTION – CLIMATE REGISTRIES

The Climate Registry (TCR) is a voluntary initiative to establish a single greenhouse gas (GHG) registry for North America. It is supported by a Board of Directors including representatives from Maryland, 38 other U.S. States, the District of Columbia, 7 Canadian provinces, 6 Mexican states, and 3 Native American nations.
Encouraging early reductions is a critical element of Maryland's plan. TCR is intended to be a tool that early voluntary reducers can use to "bank" their reductions for potential credit at a later date.

MDE is a founding reporter, tracking and accounting for the Department's GHG emissions. TCR has developed a rigorous standardized protocol for reporting GHG emissions. This is based on the World Resources Institute and World Business Council for Sustainable Development's "The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard." TCR has also developed a protocol for third-party verification of reported GHG emissions, and software, the Climate Registry Information System (CRIS), for calculating and reporting emissions.

TCR is an example of voluntary programs around the country to encourage greenhouse gas tracking. Other examples include ICLEI: Local Governments for Sustainability, which assists cities around the world with tracking and reducing their GHG emissions, and the American College and University Presidents Climate Commitment (ACUPCC), which requires completion of an emissions inventory and a plan for becoming neutral in the college or university's impact on climate. TCR is working with ICLEI to develop a local government and community emissions reporting protocol and with ACUPCC to smooth out differences in programs.

Ben Longstaff, IAN Image Library (www.ian.umces.edu/imagelibrary/)

Background

On April 20, 2007, Governor Martin O'Malley signed Executive Order 01.01.2007.07 (the Order) establishing the Maryland Commission on Climate Change (the Commission). The Executive Order is in Appendix A.

The Commission's creation is based on near universally accepted science, as well as physical evidence here in Maryland, supporting the theory that the world's climate is changing and that human activities are contributing factors. It is clear that strong government action is necessary to protect the State's people, property, natural resources, and public investments from the ensuing impacts of climate change. The Commission was therefore tasked with developing a ***Plan*** to address the drivers and consequences of climate change, to prepare for the likely consequences and impacts of climate change to Maryland, and to establish firm benchmarks and timetables for implementing the ***Plan***.

A number of State initiatives over the past several years have provided a foundation for the Commission's work. These include the formulation and implementation of a State Sea Level Response Strategy (2000), passage of the Healthy Air Act (2006), passage of the Clean Cars Act (2007), participation in the Regional Greenhouse Gas Initiative (2007) and the ***EmPOWER Maryland*** initiative (2007).

Structure and Membership

The Commission was supported by three Working Groups whose members were appointed by the Commission Chair, Shari T. Wilson, Secretary, Maryland Department of the Environment (MDE). The Working Groups are as follows: Scientific and Technical Working Group (STWG), chaired by Donald Boesch, President, University of Maryland Center for Environmental Science, and co-chaired by Frank W. Dawson, Assistant Secretary of Maryland's Department of Natural Resources (DNR); Greenhouse Gas and Carbon Mitigation Working Group (MWG), chaired by George (Tad) Aburn, Director of MDE's Air and Radiation Management Administration, and co-chaired by Malcolm Woolf, Director, Maryland Energy Administration (MEA); and Adaptation and Response Working Group (ARWG), chaired by John R. Griffin, Secretary of DNR, and co-chaired by Richard Eberhart Hall, Secretary, Maryland Department of Planning (MDP).

These Working Groups and the technical working groups (TWGs) that support them represented diverse stakeholder interests and brought broad perspective and expertise to the Commission's work. The Commission's work was facilitated by a consultant, The Center for Climate Strategies (CCS). Membership rosters for the Commission, its three Working Groups and the TWGs are in Appendix B.

Overarching Goals Of The *Comprehensive Greenhouse Gas And Carbon Footprint Reduction Strategy*

The *Comprehensive Greenhouse Gas and Carbon Footprint Reduction Strategy* is the part of the ***Plan*** that makes recommendations of how to mitigate or reduce GHG emissions.

The *Strategy* was developed using comprehensive input from stakeholders and used the following principles to drive the process:

- Achieve significant long- and short-term emission reductions of GHGs in Maryland
- Demonstrate leadership
- Maximize the cost-effectiveness of the *Strategy*
- Provide savings to Maryland consumers and businesses
- Provide a net economic benefit to the State
- Drive job creation, business growth and economic development in Maryland

As Maryland begins to further analyze and implement the *Strategy*, there will be continued coordination with stakeholders. These same set of principles will be used to guide those efforts.

A Science-Based, Consensus-Building Process

The Commission's work was supported by the science-based, consensus-building stakeholder process of its Working Groups and their respective TWGs. Through these processes, the MWG, the ARWG and the supporting TWGs developed catalogs of policy options for consideration by the Commission. The catalogs built from options developed by other states with climate action plans. The TWGs added to, subtracted from and fine-tuned the Maryland catalogs. The TWGs supported and informed their respective Working Groups on Early Action Items and priorities for further analysis and possible legislation in their respective fields of expertise. The two Working Groups evaluated the TWGs' work and, from this,

developed and presented recommendations to the Commission.

The MWG was tasked with development of a *Comprehensive Greenhouse Gas and Carbon Footprint Reduction Strategy*. The *Strategy* (this Chapter) evaluates and recommends Maryland's GHG reduction goals, recommends short-, medium-, and long-term goals and strategies to mitigate GHGs and offset carbon emissions, and provides an implementation timetable for each recommended strategy. TWGs for this Working Group are: Residential, Commercial and Industrial; Energy Supply; Transportation and Land Use; Agriculture, Forestry and Waste; and Cross-Cutting Issues. The goal of the MWG was to develop a comprehensive, aggressive strategy that achieves the GHG reduction goals established by the Commission using a suite of control programs whose costs will provide a net economic benefit to the State and its citizens.

GOALS

Overview

Goals are one of the key elements of state climate action plans. Most state plans include early goals (2010 to 2015), mid-term goals (2020) and longer-term goals (2050). Different strategies may be needed to meet the different goals. Short-term strategies are usually based upon current technologies while longer-term strategies may depend on research and development and be more "technology forcing."

The Science Behind the Goals

As synthesized by the IPCC, the scientific evidence suggests that an increase in annual global mean surface temperature greater than 2 - 2.5°C (3.6 - 4.5°F) above pre-industrial levels is very likely to result in dangerous consequences in terms of food production, biodiversity, and initiation of uncontrollable and unpredictable changes in the Earth's climate system, such as rapid melting of polar ice caps and changes in the ocean circulation that regulates the planet's climate. (See p.26)

To avoid reaching this level of global warming, Earth system models indicate that greenhouse gas (GHG) concentrations in the atmosphere would have to be held to around 450 ppm in CO_2 equivalents, and certainly not more than 550 ppm. To stabilize GHGs at this level requires substantial early action because it now seems that atmospheric concentrations are fast approaching, if they haven't already reached 450 ppm. Furthermore, considering the residence time of the CO_2 and other GHGs that have been and are being emitted, reductions in emissions by 60 to 85 per cent below 2000 levels would be required by 2050 in order to reach this level of stabilization.

Consequently, governments ranging from the European Union to a number of states in the United States have been adopting policies and goals based on reducing emissions at least to 1990 levels by 2020. These climate action plans call for taking immediate actions to stem the growth in emissions and then beginning to reduce them, with a heavy emphasis on energy conservation. The plans set long-term goals of achieving 75-80 per cent reductions in emissions by 2050, relying on new energy sources and technologies that will have to be developed.

The Goal Setting Process in Maryland

The key themes used by the Commission in the goal setting process were:

- Build from the most current science available
- Demonstrate leadership and be aggressive – Maryland has a tremendous amount at risk because of climate change
- Place a high priority on cost-effective implementation strategies to achieve goals
- Incorporate innovative funding mechanisms to limit the need for new public funding
- Maryland is in a unique position to become a national leader in terms of goal setting
- Urge adoption of policies and practices to achieve the earliest possible reductions
- Include a science-based review of the goals at least every four years

The Commission closely modeled efforts in other states, including California and New Jersey, and also paid close attention to the most recent science and goal information being developed by the IPCC and the U.N.

State	*Earlier Goals*	*Mid-Term Goals*	*Later Goals*
California	**2000 levels by 2010**	**1990 levels by 2020**	**80 % below 1990 levels by 2050**
Florida	**2000 levels by 2017**	**1990 levels by 2025**	**80 % below 1990 levels by 2050**
New Jersey	**N/A**	**1990 levels by 2020**	**80 % below 2006 levels by 2050**
Massachusetts	**1990 levels by 2010**	**10 % below 1990 levels by 2020**	**75 % below 1990 levels by 2050**
IPCC	**N/A**	**25 % to 40 % below 1990 levels by 2020**	**80 % to 95 % below 1990 levels by 2050**

MARYLAND'S 6-STEP GOAL SETTING PROCESS

Step 1 - Should The Goals Be Based Upon "Consumption" Or In-State Generation?

- Consumption-based goals are designed to reduce emissions resulting from Maryland's footprint (the activities of Maryland and its citizens). For example, Maryland consumes more electricity then it generates. Our footprint includes the GHG emissions from all the electricity we consume.
- Generation-based approaches simply look at emissions being released within a state's geographic border.
- Most states have used consumption-based concepts in setting goals. ***The Commission's recommended goals are consumption-based.***

Step 2 - What Year Should Be The Starting Point?

- There is a tremendous amount of inconsistency on this issue.
- Many states have used 1990 as a base year. Others have used later years like 2005 or 2006, while others have used 2000. The Commission's goals are based upon reductions from a 2006 base year.
  - *These are the most recent data*
  - *Using an earlier year (like 1990) does not communicate the magnitude of the challenge sufficiently because 1990 to 2006 growth has been significant.*
- Generally, in Maryland, a 25 per cent reduction from 2006 levels by 2020 is about equivalent to meeting 1990 levels by 2020.
  - *Because so many states have used 1990 as a base year, whenever possible, Maryland will include a reference to what the equivalent reductions from a 1990 base would be.*

Step 3 - Should The Goals Be Aggressive Or Bottom-Up Minimums?

- What we'd like to do or what we know we can do?
- ***As a State with a tremendous amount at risk, the Commission felt strongly that Maryland's goals need to be very aggressive to both do our fair share and to demonstrate leadership.***
- Maryland's goals not only set reduction targets to drive State programs and reductions, they are also intended to send a message about the kind of reductions that Maryland believes other states, the federal government and the international community need to be pursuing to combat climate change.
- The Commission also included the feasibility of achieving the goals as part of the goal setting process.
- For example, the 2020 goal includes a minimum regulatory goal of 25 per cent reduction, but also advocates for the development of non-regulatory, market-based tools to reward reductions above 25 per cent and achieve a 50 per cent reduction by 2020.

Year	*Maryland's Goals (From a 2006 Baseline)*	*Equivalent Goals (From a 1990 Baseline)*
2012	**10 % Reduction - from 2006 Levels**	**15 % Above 1990 Levels**
2015	**15 % Reduction - from 2006 Levels**	**9 % Above 1990 Levels**
2020	**25 % Reduction - from 2006 Levels**	**4 % Reduction - from 1990 Levels**
2020	**50 % Reduction - from 2006 Levels**	**36 % Reduction - from 1990 Levels**
2050	**90 % Reduction - from 2006 Levels**	**87 % Reduction - from 1990 Levels**

Step 4 - For What Years Should The Goals Be Set?

- Generally states have set early goals (2010 to 2015), mid-term goals (2020) and later goals (2050/2100)
- ***Maryland has set goals for 2012, 2015, 2020 and 2050***
- The 2012 goal is intended to push very hard for early action. A key message from the science is that early reductions are critical.
- The 2015 goal is intended to strengthen and promote early reductions. Some existing Maryland initiatives, like the Clean Cars program and RGGI begin to pay dividends in this time frame.
- The 2020 goal of 25 per cent is intended to provide a regulatory driver consistent with Global Warming Solutions type programs in other states.
- The 2050 goal is designed to provide a regulatory driver that spurs research and development of climate-neutral technologies like clean coal power plants and zero emissions vehicles.

Step 5 - Should The Goals Be Regulatory Or Should They Be Reduction Targets for the State's *Climate Action Plan*?

- Other states have used goals to do both.
  - *California and New Jersey use their 2020 goal as a strict regulatory limit that is enforceable*
  - *Other states have often used the goals to guide their state action plan*
- Maryland's goals will be used to do both.
  - *The 2020 goal of 25 per cent reduction and the 2050 goal of 90 per cent reduction will, like those in California and New Jersey, be used as regulatory goals*
  - *The other goals will be used as reduction targets for the State* ***Climate Action Plan***

Step 6 - Should The Goals Be Science-Based?

- ***Maryland's goals have been developed using the most recent scientific findings on climate change and its drivers.***
- One key theme from the science is to push for early controls
  - *Maryland's 2012 and 2015 goals are intended to drive early reductions*
- Recent IPCC findings encourage industrialized nations to pursue reductions by 2020 in the 25 per cent to 40 per cent range (from 1990) to avoid the most catastrophic consequences of climate change. (See p.26)
  - *Maryland's 2020 goals (25 per cent and 50 per cent) are intended to push for this level of reduction*
  - *Recent and earlier IPCC findings push for global reductions as high as 80 per cent to 95 per cent (from a 1990 base) by 2050.*
- Maryland's 2050 goal is consistent with this level of reduction

RECOMMENDED GOALS

The key themes used by the Commission in the goal setting process were:

- Build from the best and most current science available
- Demonstrate leadership and be aggressive - Maryland has a tremendous amount at risk because of climate change
- Place a high priority on cost-effective implementation strategies to achieve goals
- Incorporate innovative funding mechanisms as much as possible to limit the need for new public funding to implement new programs

Maryland is in a unique position to become a national leader in terms of goal setting

Push for the earliest possible reductions

Mid Course Reviews: Conduct a science-based review of the goals at least every four years

Maryland should set early, aggressive GHG reduction goals with specific time frames as follows:

2012

- 10 per cent below Maryland's 2006 GHG emission levels (using a consumption-based approach) by 2012
- To be used as a reduction goal for Maryland's ***Climate Action Plan***

2015

- 15 per cent below 2006 levels by 2015
- To be used as a reduction goal for Maryland's ***Climate Action Plan***

2020

- 25 per cent to 50 per cent below 2006 levels by 2020
- 25 per cent used as the "minimum" enforceable, regulatory driver for the Global Warming Solutions legislation
- 50 per cent used as a science-based, non-regulatory reduction goal for Maryland's ***Climate Action Plan***
- Programs to implement the legislation would reward market-based reductions above 25 per cent

2050

- 90 per cent below 2006 levels by 2050
- A science-based regulatory goal in the Global Warming Solutions legislation
- A driver for research and development of climate neutral technology, programs and innovations

THE IPCC ON REDUCTION TARGETS – 2007

"Table 1 summarizes this analysis, which indicates that in order to achieve a stabilization level of 450 ppmv CO_2 eq., emissions from Annex I Parties would need to be between …
… 25 per cent and 40 per cent below 1990 levels in 2020, and between 80 per cent to 95 per cent below 1990 levels in 2050."[1]

Table 1. Characteristics of greenhouse gas stabilization scenarios

Category	CO_2 equivalent concentration	Global mean temperature increase above pre-industrial at equilibrium using 'best estimate climate sensitivity [a]	Change in global CO_2 emissions in 2050 (% of 2000 emissions)	Range of reduction in GDP in 2050 because of mitigation (%)	Allowed emissions by Annex I Parties in 2020 (% change from 1990 emissions)	Allowed emissions by Annex I Parties in 2050 (% change from 1990 emissions)
I	445-490	2.0-2.4	-85 to -50	Decrease of up to 5.5	-25 to -40	-80 to -95
II	490-535	2.4-2.8	-60 to -30			
III	535-590	2.8-3.2	-30 to +5	Slight gain to decrease of 4	-10 to -30	-40 to -90
IV	590-710	3.2-4.0	+10 to +60	Gain of 1 to decrease of 2	0 to -25	-30 to -80
V	710-855	4.0-4.9	+25 to +85			
VI	855-1,130	4.9-6.1	+90 to +140			

Source: IPCC Fourth Assessment Report (AR4). Contribution of Working Group III. Columns 1-4., table SPM.5; column 5, table SPM.6, columns 6 and 7, box 13.7.
[a]According to the AR4, the best estimate of climate sensitivity is 3 degrees Celsius.

[1]From the United Nations Framework Convention on Climate Change "Synthesis of information relevant to the determination of the mitigation potential and to the identification of possible ranges of emission reduction objectives of Annex 1 Parties" Technical Paper.

July 26, 2007

COMMISSION'S RECOMMENDED POLICY OPTIONS

From a catalogue of about 300 possible policy options for reducing GHG emissions, the Commission approved for further analysis fifty-four priority policy options selected by the MWG. These were identified in the Commission's ***Interim Report***, (Appendix C of the ***Interim Report***). Since then, the MWG's five TWGs have developed and refined each of these policy options from straw proposals into specific policy options. The process then further narrowed the list of policy options to forty-two. (Several options were consolidated and some were eliminated).

Each policy option includes a description, a design, and a goal, and each examines implementation mechanisms, feasibility and barriers, related existing programs, co-benefits, and key assumptions and uncertainties. The estimated reduction in GHG emissions has been calculated for the policy options amenable to quantification (expressed in million metric tons of CO_2 equivalent, or $MMtCO_2e$) based on the stated goal of each policy. The cost or cost savings of achieving the reduction (expressed in dollars per ton) is also calculated for each quantified policy.

The forty-two policy options approved by the Commission form the core of its ***Climate Action Plan*** mitigation recommendations. A summary of each is included in the report of each TWG, later in this Chapter. Some of the policy options have well-developed implementation mechanisms. Because of the scope of the Commission's work and its compressed time frame, the details of implementation for some policy options will need to be further analyzed and worked out by State agencies after this ***Plan*** is submitted to the Governor and the General Assembly. Where this is the case, it is noted in the policy option summary.

The technical analysis that was performed to estimate reductions and cost-effectiveness of the policy options is the best possible analysis that could be completed in a six-month time frame. MDE and other State agencies will conduct additional analysis of many of the policy options over the next several years.

The analysis in this document and the results of these analyses are appropriate for setting the general policy direction for the State of Maryland to pursue in reducing GHGs and addressing climate change. As implementation of the ***Plan*** begins, the inventory and the estimates of reductions and cost-effectiveness will be refined and updated.

Commission's Policy Options Bins

With forty-two measures to consider, the Commission decided to place the policies in "bins" based on the following criteria:

Bin 1: Higher Emission Reductions / Easier to Implement
Bin 2: Lower Emission Reductions / Easier to Implement
Bin 3: Higher Emission Reductions / Harder to Implement
Bin 4: Lower Emission Reductions / Harder to Implement

In addition to placing the forty-two policies into "bins", the Commission also identified lead agencies for each policy option. These lead agencies, that are responsible for further analysis and implementation of the policies, and co-lead agencies or assisting agencies (in parentheses) are identified in the Bin Charts on the following two pages.

Implementation actions for policy options related to land use and planning will be incorporated into the ***State Development Plan*** which will be implemented by the Maryland Department of Planning (MDP), the Smart Growth Subcabinet and all State agencies.

The actual policy options are reviewed and explained later in this Chapter and appendices. The following tables illustrate the Commission's approach.

These abbreviations refer to the Technical Work Group (TWG) that developed the policy options referenced throughout this Chapter:

AFW	Agriculture, Forestry and Waste
ES	Energy Supply
RCI	Residential, Commercial and Industrial
TLU	Transportation and Land Use
CC	Cross Cutting Issues

Bin 1: Higher Emission Reduction / Easier Implementation

Policy Number	Policy Name	Lead Agency
ES-3	GHG Cap-and-Trade	MDE
TLU-10	Transportation Technologies	MDOT (MDE)
RCI-10	Energy Efficiency Resource Standard	MEA
CC-4	State & Local Government Lead by Example	MDE (MEA, MDOT)
RCI-4	Improved Design, Construction, Appliances & Lighting in Government	MDE (others)
AFW-9	Waste Management / Advanced Recycling	MDE
ES-7	Renewable Portfolio Standard	PSC (MEA)
RCI-2	Demand Side Management & Energy Efficiency	MEA (PSC)
RCI-1	Improved Building & Trade Codes	DHCD (MEA)

Bin 2: Lower Emission Reduction / Easier Implementation

Policy Number	Policy Name	Lead Agency
CC-1	GHG Emission Inventories & Forecasting	MDE
CC-2	GHG Reporting & Registries	MDE
CC-3	Statewide GHG Reduction Goals	MDE
CC-5	Public Education & Outreach	MDE (MSDE, MEA)
CC-8	Participate in Regional, Multi-State & National Efforts	MDE
CC-7	Review Institutional Capacity	Commission
CC-10	After Peak Oil	MEA (MDE)
CC-11	Public Health Risks	DHMH (MDE)
RCI-11	Promotion & Incentives for Energy Efficient Lighting	MEA
ES-5	Clean Distributed Generation	MEA (PSC)
RCI-3	Low-Cost Loans for Energy Efficiency	MEA
ES-1	Promotion of Renewable Energy	MEA (PSC)
ES-6	Integrated Resource Planning	PSC (MEA)
RCI-7	More Stringent Appliance / Equipment & Efficiency Standards	MEA
CC-9	Promote Economic Development Opportunities	DBED (MEA)
ES-2	Technology Focused Initiatives for Electricity Supply	MEA
AFW-2	Managing Urban Trees & Forests	DNR
AFW-3	Afforestation, Reforestation, & Restoration of Forests & Wetlands	DNR (MDA)
AFW-4	Protection & Conservation of Agricultural Land, Coastal Wetlands & Forested Land	MDA
AFW-1	Forest Management for Enhanced Carbon Sequestration	DNR
AFW-5	Buy Local Programs	MDA (DNR)

Bin 3: Higher Emission Reduction / Harder Implementation

Policy Number	Policy Name	Lead Agency
ES-8	Energy Improvements & Repowering Existing Plants	MEA (PSC)
ES-10	Generation Performance Standards	MDE (PSC, MEA)
TLU-2	Land Use & Location Efficiency	MDOT (MDP, MDE)
TLU-3	Transit	MDOT (MDP, MDE)
TLU-5	Intercity Travel	MDOT (MDP, MDE)
TLU-6	Pay-As-You-Drive Insurance	MDOT (MDP, MDE)
TLU-8	Bike & Pedestrian Infrastructure	MDOT (MDP, MDE)
TLU-9	Incentives, Pricing & Resource Measures	MDOT (MDP, MDE)
TLU-11	Evaluate GHGs from Major Projects	MDOT (MDP, MDE)

Bin 4: Lower Emission Reduction / Harder Implementation

Policy Number	Policy Name	Lead Agency
AFW-6	Expanded Use of Forest & Feedstocks for Energy Production	DNR (MDA)
AFW-7b	In-State Liquid Biodiesel Production	MEA (MDA)
AFW-8	Nutrient Trading with Carbon Benefits	MDE (MDA)

Lead State Agencies:

MDE Maryland Department of the Environment
MDOT Maryland Department of Transportation
MEA Maryland Energy Admisinstration
PSC Public Service Commission
DHCD Department of Housing and Community Development
DHMH Department of Health and Mental Hygiene
MSDE Maryland State Department of Education
DBED Department of Business and Economic Development
DNR Department of Natural Resources
MDA Maryland Department of Agriculture

The remainder of this Chapter provides a summary of the mitigation policy options that the Commission is recommending be included in the ***Climate Action Plan***.

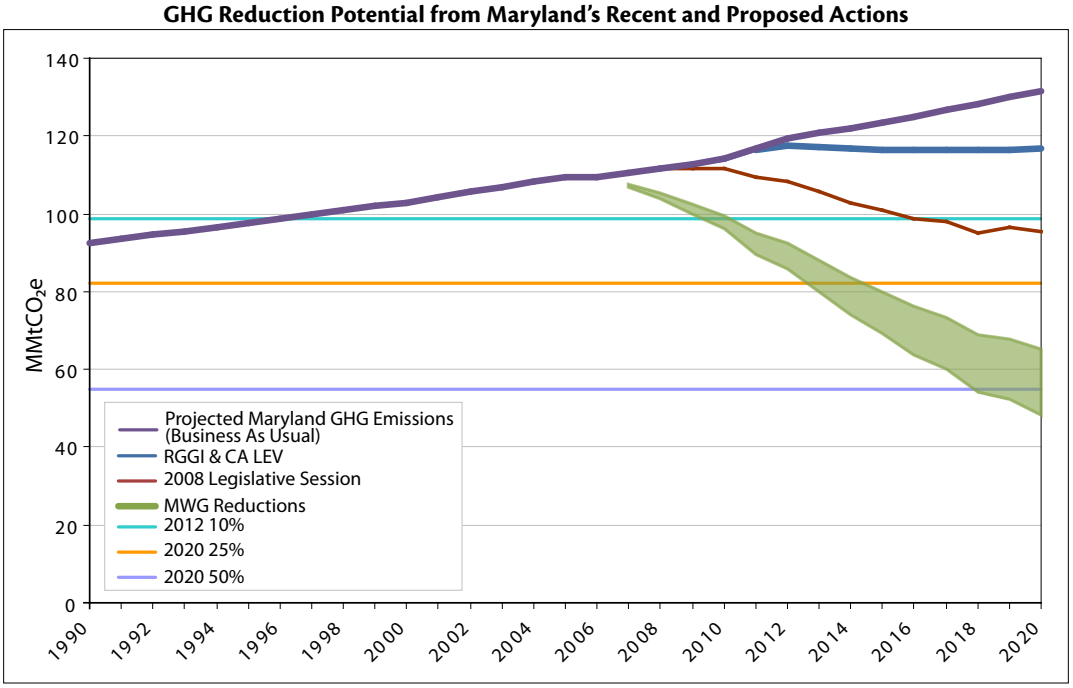
- The forty-two strategies combined result in reductions that are very consistent with the goals discussed earlier.
- The technical analysis that was performed to estimate reductions and cost-effectiveness for each policy option is the best possible analysis that could be completed in a six-month time frame. There will be additional analysis of many of the policy options conducted by MDE and other State agencies over the next several years.
- The analysis in this document and the results of these analyses are appropriate for setting the general policy direction the State of Maryland wants to pursue in reducing GHGs and addressing climate change. As implementation of the ***Plan*** begins, the inventory and the estimates of reductions and cost-effectiveness will be refined and updated.

The figure below, "GHG Reduction Potential from Maryland's Recent and Proposed Actions", shows the potential reductions that Maryland projects based on the full implementation of the forty-two measures included in the *Comprehensive Greenhouse Gas and Carbon Footprint Reduction Strategy*. The figure shows that by 2020, the ***Plan*** can achieve reductions that will be consistent with the goals established by the Commission. Because of the uncertainty in some of the analysis, the Commission expects the 2020 reduction levels to be between 40 and 55 per cent, approaching the higher-level target of a 50 per cent reduction by 2020.

Another key policy embodied in the ***Plan*** is that the current trend of continuing growth in GHG emissions should be reversed as quickly as possible. This figure shows that Maryland can start reducing that trend soon if the MWG policies are implemented.

The figure also shows that recent actions by Maryland, like the Regional Greenhouse Gas Initiative (RGGI) and the Clean Cars Program (CA LEV), and new programs adopted through legislation in 2008 will get the state close to the 25 per cent reduction target by 2020.

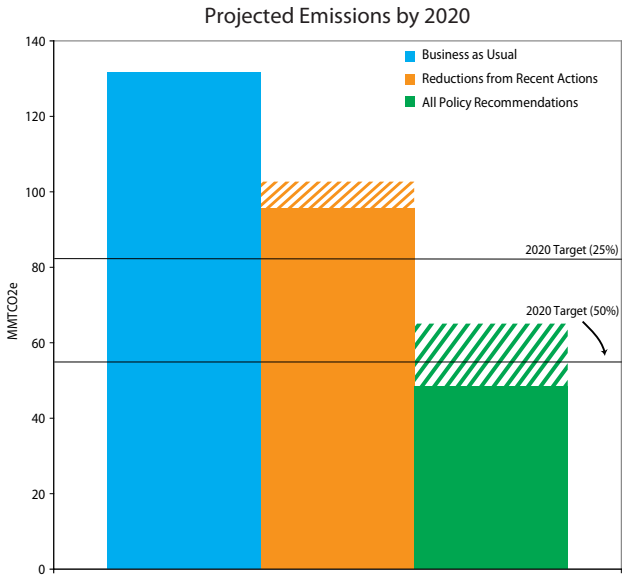
GHG Reduction Potential from Maryland's Recent and Proposed Actions

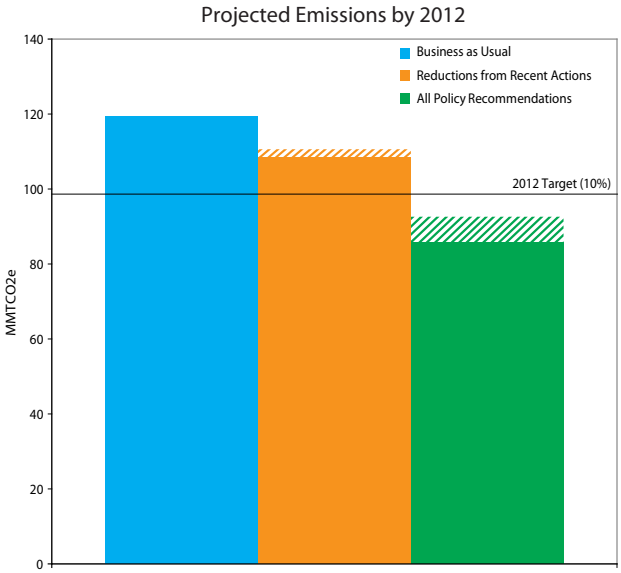


The next six figures show the potential emission reductions from recent actions and the Commission's quantified policy options (reduction strategies).

The two figures below, "Projected Emissions by 2020" and "Projected Emissions by 2012" show the annual benefits in 2020 and 2012. They illustrate that by 2020, the strategies are expected to achieve reductions that are consistent with the reduction goals set by the Commission. The Commission's 2020 goal is to achieve a 25 per cent to 50 per cent reduction from 2006 levels. The forty-two strategies are projected to achieve an approximate 40 per cent to 55 per cent reduction from 2006 levels by 2020. As discussed earlier, there is considerable uncertainty associated with calculating the aggregate benefits of the policy options. "Projected Emissions by 2020" also shows that early actions, already taken in Maryland, will achieve about 60 per cent to 70 per cent of the reductions needed to meet the 25 per cent reduction goal.

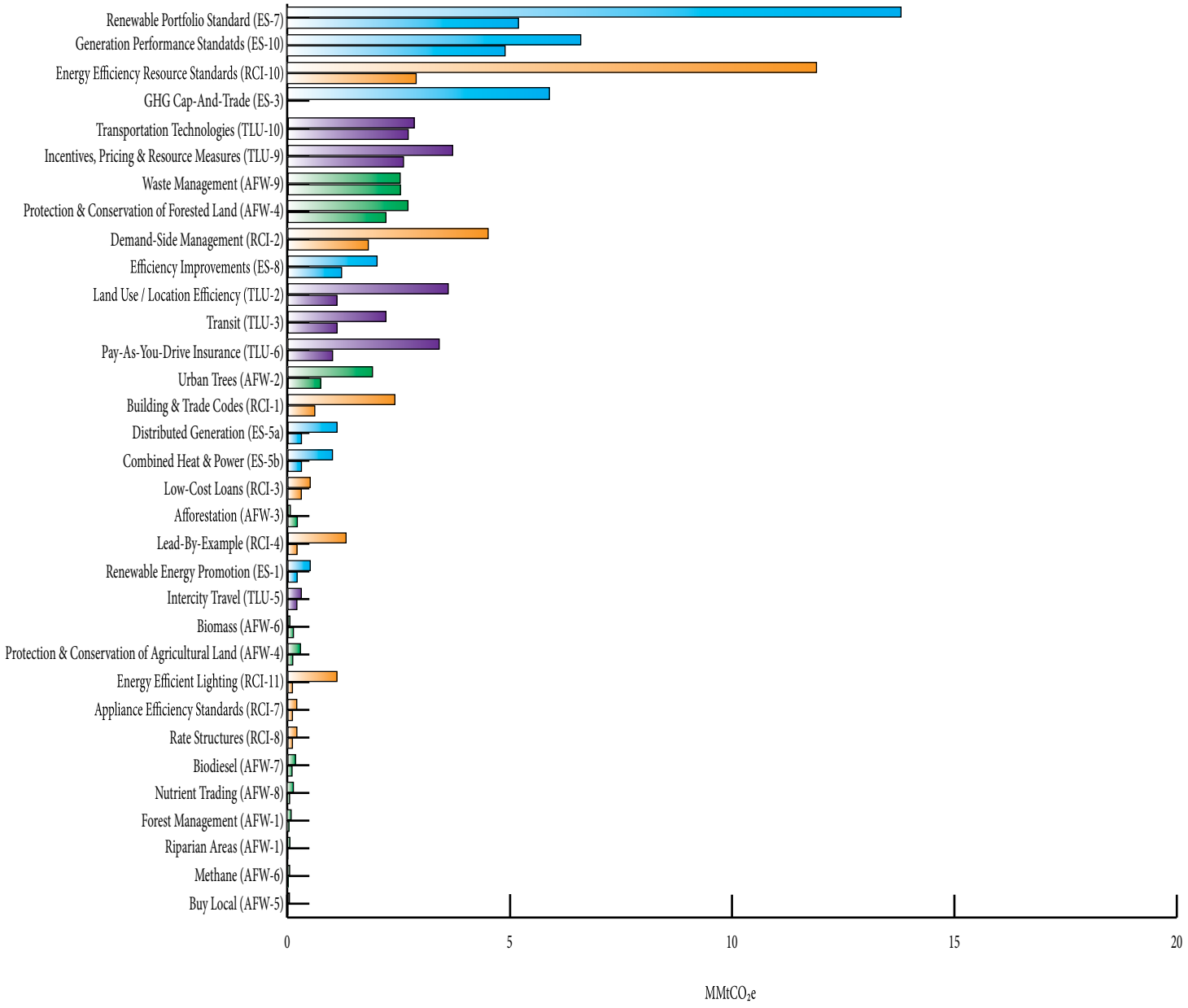
"Projected Emissions by 2012" shows the same information for 2012. 2012 is an important milestone as early reductions are critical. The science tells us that a ton of reduction in 2012 is much more effective than a ton of reduction in 2050. The reductions from the quantified policy options are expected to exceed the Commission's 2012 10 per cent reduction goal. They are projected to achieve an approximate 25 per cent to 30 per cent reduction from 2006 levels by 2012. Early actions also contribute significantly in 2012. Early actions are expected to achieve about 40 per cent to 50 per cent of the reductions needed to meet the 2012 goal.



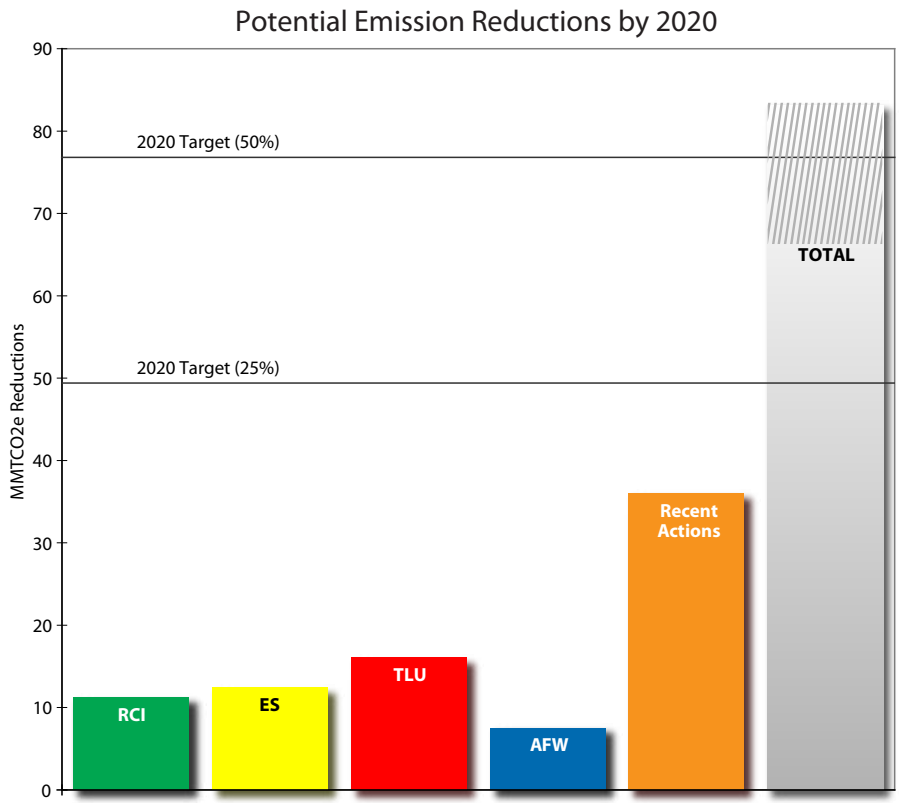


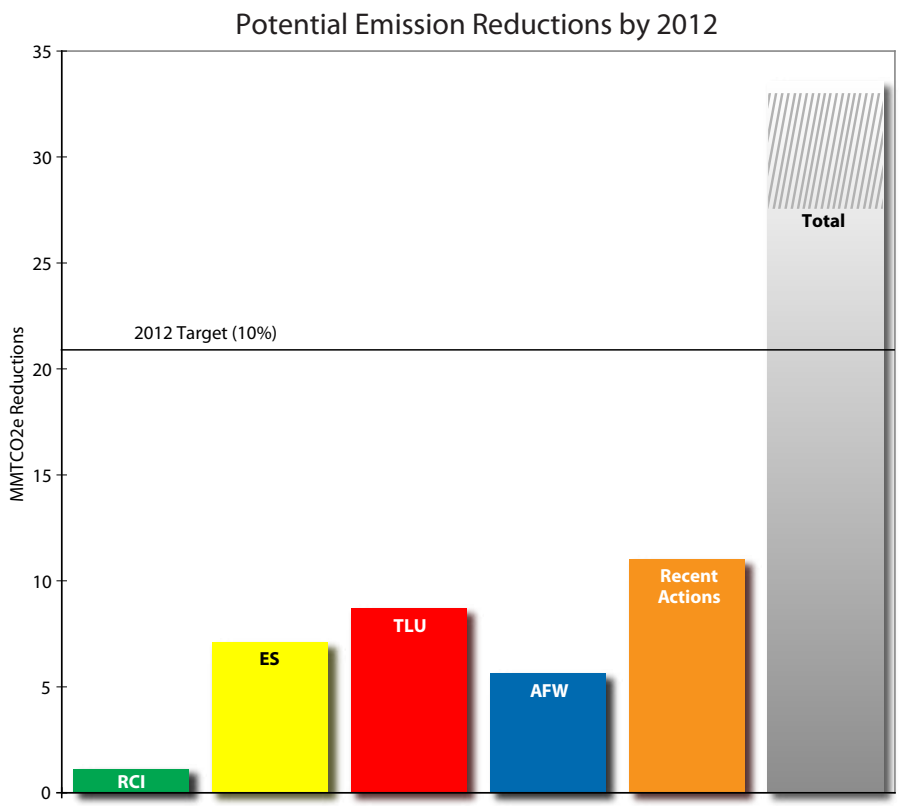
The figure below shows the individual reductions from each of the quantified policy options in 2020 and 2012.

Annual Greenhouse Gas Reduction Potential of Maryland Policy Options in 2020 and 2012
(The top bar in each pair represents 2020 emission reduction potential.
The bottom bar in each pair represents 2012 emission reduction potential.)



The next two figures, "Potential Emission Reductions by 2020" and "Potential Emission Reductions by 2012", summarize the estimated emission reductions from the four different sectors analyzed by the TWGs and recent actions for both 2020 and 2012. They also show the total reduction estimated from the ***Plan***, measured against the 2020 and 2012 targets.

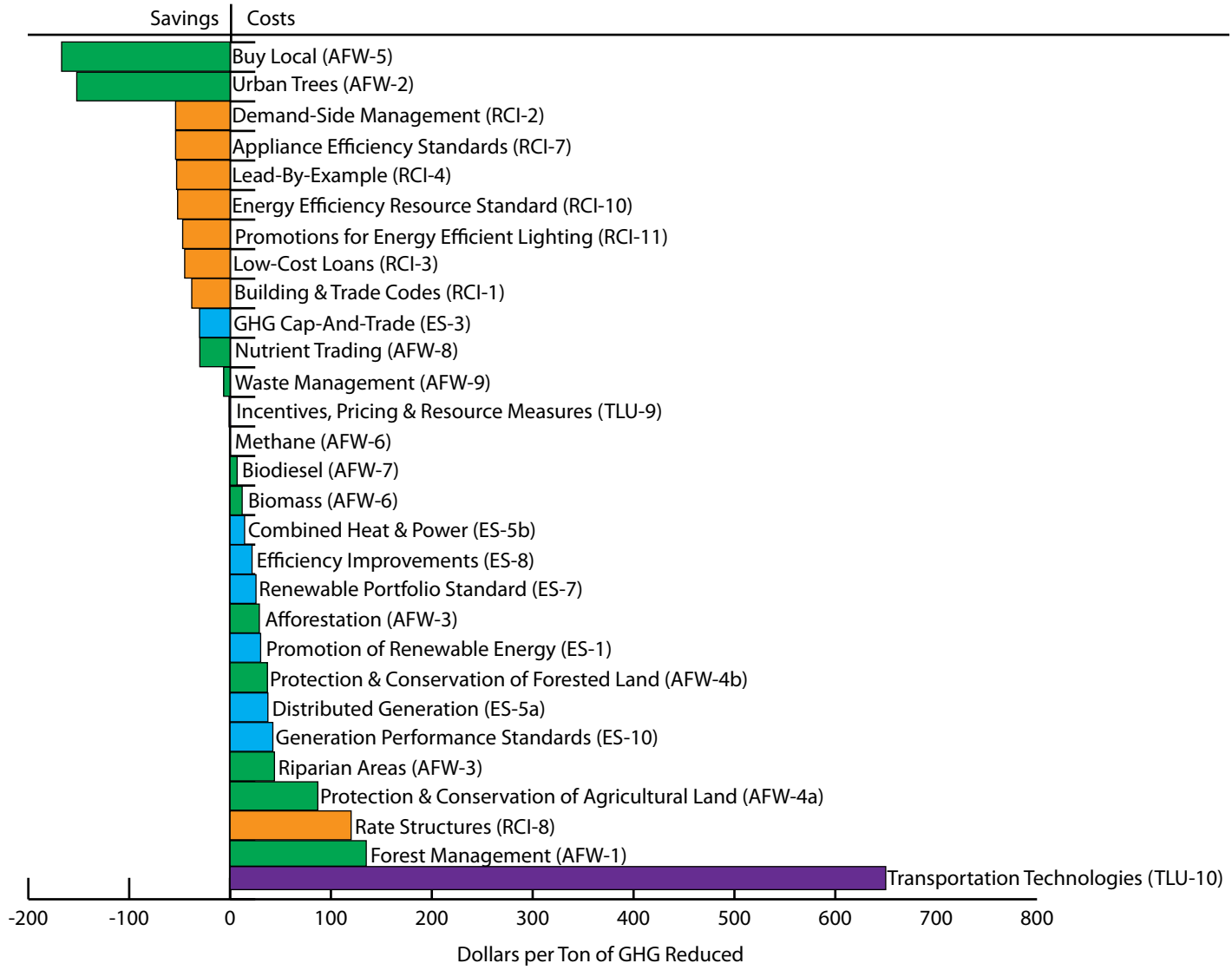




In addition to the emissions benefits of these policy options, the Commission attempted to calculate the cost-effectiveness of the quantified policy options to see what economic impact they might have in Maryland. These cost estimates should be considered the "best available" and by no means should be reviewed as being completely accurate. As the State agency leads review and potentially implement the policy options, a much better estimate of the costs of the policies can be drawn.

The chart below shows the quantified policy options ranked by their cost-effectiveness. The measures to the left have a benefit to the State economy and the measures to the right have a direct cost to Maryland. In the aggregate, the policies yield a net economic benefit to Maryland, estimated to be approximately 2 billion dollars in 2020.

Maryland Policy Options Ranked by Cost / Savings per Ton GHG Reduced



The charts in this Chapter are really illustrative in nature as quantifying emission reductions from GHG policies is a very complicated process. MDE has started to develop the resources necessary for a close review of GHG emission reduction potentials but the numbers generated by this process should be considered to be "based on the best available estimates" – they are in no way perfect.

A MORE SUSTAINABLE FUTURE

Selected Strategies that Provide Both Short- and Long-Term Benefits

Much of the Commission's effort in developing this initial *Comprehensive Greenhouse Gas and Carbon Footprint Reduction Strategy* and the rest of this Chapter focus on pushing for early reductions in the 2010 to 2015 timeframe and analyzing strategies to achieve deep, cost-effective reductions by 2020. These are both critical goals, driven by the science, to begin the process of reducing GHG emissions, reverse the current emissions growth trend, and to slow the build-up of GHGs in the atmosphere. Short-term reductions are an important component of a comprehensive GHG reduction strategy.

However, the Commission has also established longer term goals that are intended to push policy changes, technological advances and changes in behavior that will result in a dramatically more sustainable, carbon friendly future for Maryland in the 2030 to 2050 timeframe. The Commission's goal for 2050 is to set into motion a series of policy innovations that could reducce GHGs by up to 90 per cent (from a 2006 base) by 2050.

Many of the forty-two strategies that the Commission is recommending provide both short- and long-term benefits. The table on the next page summarizes the nine most important strategies that begin to push Maryland toward the more sustainable future needed to reverse global warming. These strategies will yield significant and lasting benefits in later years but they require long planning horizons and early implementation to achieve their full potential. Present policy decisions on transit and land use, building codes, strategic energy planning, technology initiatives, waste management, and forest, farmland and wetland stewardship will channel capital investments for the future, and help achieve the numerous aggressive goals identified in this ***Climate Action Plan***. The Commission recognizes that many of the longer-term policies are transitional and require dramatic changes in the way Maryland operates – these changes will not come easily and they will not come cheaply – but the Commission agrees that early actions now will lead us down a sustainable pathway.

To reach the Commission's 2050 goal, there will need to be major transitions in several areas that are fundamental to the lifestyles that Marylanders desire. These include: the way we use energy; the way we travel; and the way we, as consumers and environmental stewards, influence the markets that manufacture and sell products. These transitions are critical, as is the challenge to implement programs to bring about the desired changes. The transition will need to be cost-effective, consumer friendly and efficient.

As the implementation process for the forty-two strategies being recommended by the Commission begins, the process will continue to focus on reducing emissions in the 2012 to 2020 timeframe. However, starting next year, the Commission intends to also increase emphasis on the even more long-term changes that will be needed to move Maryland into that sustainable, carbon friendly, future needed to reverse global warming.

Strategies that are Critical to a More Sustainable Future

Strategy	Strategy Number	Lead & Supporting State Agencies
Land Use and Location Efficiency (Smart Growth)	TLU-2	MDOT (MDP, MDE)
Reducing Vehicle Miles Traveled (VMT)	TLU Area-1	MDOT (MDE, MDP)
Integrated Resource Planning	ES-6	PSC (MEA)
Technology Focused Initiatives	ES-2	MEA
Public Education and Outreach	CC-5	MDE (MSDE, MEA)
Afforest, Reforest, Restore Forests and Wetlands	AFW-3	DNR (MDA)
Protection of Agricultural / Forested Lands & Wetlands	AFW-4	MDA
Waste Management	AFW-9	MDE
Improving Building and Trade Codes	RCI-1	DHCD (MEA)

Southern Maryland Farm
Photo by Kathleen Perry

Overview of GHG Emissions

The agriculture, forestry and waste (AFW) sector contributes a small but important part of Maryland's overall GHG emissions profile. Significantly, agriculture and forest lands offer carbon sequestration opportunities that are not possible in other sectors. Through appropriate management, technology and energy conscious choices, these sequestration potentials can be maximized and the amount of GHG emissions from the AFW sector reduced.

Forests make up 44 per cent of Maryland land cover. In 2000, they absorbed an estimated 11.5 million metric tons more of carbon dioxide equivalents ($MMTCO_2e$) than they emitted. Urban forests added an additional savings of 2.4 $MMTCO_2e$. Science informs us that forest carbon sequestration will become less effective if we do not reduce our GHG emissions generally, due to the increasing dominance of pine trees and more frequent forest fires in a warmer Maryland climate. (See Chapter 2 of this ***Plan*** for greater detail on this subject.)

Agriculture and waste sectors were net emitters of GHGs, contributing 2.3 $MMTCO_2e$ (2 per cent of Maryland's total emissions), and 4.3 $MMTCO_2e$ (3 per cent of Maryland's total emissions) respectively. Both of these sectors are below the national average by 5 per cent and 1 per cent respectively. Even though these are a small per cent of Maryland's total, there are opportunities for decreasing energy use and reducing climate-affecting factors.

Agricultural emissions include methane (CH_4) and nitrous oxide (N_2O) emissions from enteric fermentation (digestion), manure management, agricultural soils, and agricultural residue burning. Emissions from agricultural soils account for the largest portions of agricultural emissions. The agricultural soils category includes N_2O emissions resulting from activities that increase nitrogen in the soil, such as fertilizer application (synthetic, organic, and livestock) and production of nitrogen-fixing crops.

The waste management sector includes both solid waste management and wastewater treatment. As organic waste decomposes in landfills, it generates methane. This methane was included as a potential energy source. Wastewater treatment plants produce both methane and nitrous oxide emissions; both gases are significantly more deleterious than an equal amount of carbon dioxide.

Opportunities for GHG mitigation in the AFW sector involve measures that reduce emissions across several sectors addressed in this ***Plan***. For example, production of liquid fuels from biomass can offset emissions discussed in the transportation sector, while biomass energy can replace fossil-fuel generated power and the associated emissions in the energy supply sector. Planting trees strategically reduces energy use in buildings as mentioned in the Residential, Commercial and Industrial (RCI) TWG Report later in this Chapter. Similarly, actions taken to increase waste recycling in the waste management sector can reduce emissions not only in the State (e.g., landfill methane) but also outside the State (e.g., emissions associated with the energy used to make products from virgin materials versus recycled materials).

Agriculture, forestry and waste GHG mitigation options most beneficial to Maryland were examined closely. (Individual policy options are summarized below; their full texts are in Appendix D-1). The following priority opportunities are:

- **Enhanced management of forests, wetlands, coastal shorelines and urban forests, including actions such as restoration, afforestation and reforestation.** Sustaining healthy, productive vegetation, as part of a thriving ecosystem, offers significant opportunities for carbon sequestration. Encouraging a full range of forest enhancing practices across public and private lands, in rural and urban settings, maximizes opportunities and positive impacts. Although the cost-effectiveness appears low in the quantifications of forest lands GHG reductions, note that natural services of healthy ecosystems has not been included as a savings. Urban forests provide very cost-effective GHG reduction opportunities, in part because their effect on energy use in buildings is readily quantifiable.
- **Protection and conservation of forest and agricultural lands, including riparian areas.** In addition to appropriate management, natural areas and agricultural lands need to be protected in balance with encroaching development to maintain sufficient acres of GHG "sponges".

- **Focus on local production and consumption of food and wood products.** Reduction of energy consumed in transporting goods contributes significantly to a smaller community carbon footprint while generating a plethora of social benefits. Farmer's markets prove to be very cost-effective in reducing GHG emissions.
- **Production of energy and biofuels from biomass (with targeted feedstocks).** Biomass as an energy source offers a range of exciting opportunities and noteworthy GHG emissions reductions. Conversely, biofuels can provide some relief from fossil fuel consumption but emerging science suggests that selection of feedstock figures prominently in actual GHG reductions and cause price perturbations in other markets. Concern over unintended consequences and embodied life-cycle energy lead to the exclusion of food and animal-feed as feedstocks in the biofuels policy recommendation.
- **Innovations such as nutrient trading.** Like a carbon market, sectors needing to use higher nutrient inputs (such as fertilizer) can purchase credits available from reduction of nutrient use by other producers, thus incentivizing reduced use of nutrients that release GHGs such as N_2O. Although the basic program is just being developed, its cost-effectiveness in reducing GHG emissions appears high.
- **Enhanced waste management and recycling.** The largest potential emission reductions in this sector come from enhancing recycling opportunities and technologies, and source reduction in waste streams across the State. Other options include using captured methane from municipal wastewater treatment and landfills as sources of energy. More work is necessary to specifically identify the best options.

Summary of Agriculture, Forestry and Waste Recommended Policy Options

The amount of carbon dioxide (CO_2) emissions reduced or sequestered in the policy options within the AFW sector overlaps with some of the quantified benefits and costs of policy options within other sectors. Those overlaps were identified and adjusted to eliminate double-counting as displayed in the chart at the end of this section.

For example, planting trees in urban settings helps to reduce energy use in buildings along with other benefits such as carbon sequestration. The RCI TWG also considered tree planting to improve the energy efficiency of buildings. Therefore the overlapping portion of the CO_2 reductions attributable to building energy savings in cities was removed from the AFW policy option quantifications. The related costs were then adjusted accordingly.

The availability of biomass in, and in proximity to, Maryland was determined. This added a constraint on the amount of energy and biofuels that could be produced. One of the AFW policy options recommends using biomass to produce energy. The Energy Supply (ES) TWG also considered biomass as an energy source. All emission reductions and costs associated with biomass to energy production are accounted for in the ES TWG's quantifications.

Both the AFW and Transportation and Land Use (TLU) TWGs eliminated food and animal feed sources as feedstocks for ethanol production. Current research suggests that the attendant life-cycle energy inputs are higher than outputs. Also, it appears that demand for competing uses and conversion of productive agricultural lands away from food production raises food prices thus making the inclusion of these feedstocks questionable as sound sustainable policy.

Background

The natural world offers abundant opportunities to increase the amount of carbon removed from the atmosphere and sequestered. Forests, grasslands, croplands, and wetlands all possess carbon-and energy-related benefits that are extensive, complex, and often beyond measure. Trees and plants remove carbon dioxide from the air and store carbon in their trunks and branches; absorb and filter nitrogen dioxide, sulfur dioxide, ozone, carbon monoxide, and particulate matter less than 10 microns in size; release oxygen and intercept rainwater and dust. The process of evapo-transpiration and shade from trees lowers summertime air and surface temperatures.

Shade and lower surface temperatures reduce the need for air conditioning in buildings thereby reducing the need for the production and transmission of electricity. Reduced energy production reduces emissions of GHGs and carbon from power plants. Shade and lower surface temperatures reduce maintenance needs of infrastructure which, in turn, reduces the conversion of raw materials to asphalt and concrete which reduces the production of GHGs from manufacturing plants, transportation and heavy equipment. Shade and lower surface temperatures reduce the evaporation of chemicals from car engines and reduces the need for air conditioning in cars. This reduces the amount of fuel burned and reduces the emissions from cars.

Sustainable forest and urban forest management is essential to healthy, productive forests and trees that maximize mitigation for GHGs and carbon sequestration. Additionally, these forests serve as the preferred land use for avoiding emissions. Increasing the amount and enhancing the condition of forests and trees is a critical component of mitigating climate change.

Baltimore City Urban Forest Project
www.bmore-ufp.org
Photo by Brett Gullborg

Forest Management for Enhanced Carbon Sequestration (AFW-1)

This policy option would promote sustainable forestry management practices in existing Maryland forests on public and private lands. The enhanced productivity of healthy, biodiverse and sustainable forests will yield increased rates of carbon dioxide (CO_2) sequestration in forest biomass, increased amounts of carbon stored in harvested, durable wood products, and increased availability of renewable biomass for energy production.

Policy Design: The recommended actions include a mix of legislative, programmatic, education/outreach and market measures. In addition to the General Assembly, various State agencies led by DNR (including Maryland Department of Agriculture (MDA), MDE, Maryland Department of Transportation (MDOT), and Maryland State Highway Administration (SHA)), as well as counties, private land owners, sawmill operators, artisans, and landscaping and nursery industries would be involved in implementing the following actions. Many of the agencies listed above are already implementing programs that are consistent with the goals of this policy option.

- Launch education/outreach for citizens and land managers on best forest management practices
- Proactively manage non-native pests and invasive species through:
  - *Outreach and education on control methods*
  - *Legislation restricting the sale of priority non-native, invasive species*
- Revise Forest Conservation Act (FCA) to achieve policy goals
- Use FCA offset funds to enhance forest management on private lands and reduce conversion to other land uses
- Support a Sustainable Forestry Act that encourages enhanced carbon storage in forests, use of durable wood products, and use of wood biomass for energy while maintaining healthy forest ecosystems
- Develop a certification program with the goal of certifying all State-owned forest lands as sustainably managed
- Include sustainable forest management in the RGGI offsets program
- Develop mechanisms to aggregate durable wood products from smaller land holdings to compete in meaningful markets.

Policy Goals:
Improve sustainable forest management on 25,000 acres of private land by 2020
Improve sustainable forest management on 100 per cent of State-owned resource lands by 2020

Implementation:
As lead agency, DNR's implementation plan is as follows:
Short-term (1-2 years)

- Recommend sustainable forest management be included in the RGGI offsets program
- Launch education/outreach for citizens and land managers on best forest management practices for carbon sequestration
  - *Species selection*
  - *Rotation length*
  - *Management intensity*
  - *Silvicultural system*
- Proactively manage non-native pests and invasive species through legislation restricting the sale of priority non-native, invasive species
- Contribute additional funds to the Maryland Agricultural Land Preservation Foundation (MALPF) specifically for the protection of forests to quickly implement an aggressive initiative to sequester carbon by avoiding deforestation and growing trees

- » *MALPF was created to preserve productive agricultural land and woodland to provide for the continued production of food and fiber*
- » *The majority of the funds have gone into the protection of agricultural lands, not forests.*

Medium-term (2-3 years)

- Proactively manage non-native pests and invasive species through outreach and education on control methods
- Develop mechanisms (e.g. Bay Bank, etc.) to aggregate durable wood products from smaller land holdings to compete in meaningful markets.
- Revise Forest Conservation Act (FCA) to achieve policy goals
  - » *Selection & management of retention areas*
  - » *Expand the use of funds for mitigation planting*
  - » *Promote community tree planting*
- Contribute funds to a Carbon Management Fund for improved land management
  - » *The Maryland Forest Service could use the Carbon Management Fund to enhance carbon sequestration through changes in management on State or private lands, such as: planting trees on barren lands (i.e. afforestation), changing tree rotation length, improving harvesting and regeneration techniques, selecting more productive native species, and improving silviculture techniques (such as implementing thinning regimes).*
  - » *Additional Forest Service staff will be required to implement, monitor and assess demonstration projects for their carbon sequestration value.*
  - » *The most productive techniques will be more widely implemented across the State. Private landowners would retain the carbon rights, stimulating the carbon market in the State.*

Long-term (3-5 years)

- Amend FCA to use offset funds to enhance forest management on private lands and reduce conversion to other land uses
- Support the introduction of a Sustainable Forestry Act that encourages enhanced carbon storage in forests, use of durable wood products, and use of wood biomass for energy while maintaining healthy forest ecosystems
- Participate in existing third-party forest certification programs (e.g. Forest Stewardship Council, Sustainable Forestry Initiative, etc.) with the goal of certifying all State-owned forest lands as sustainably managed
- Enroll 25,000 additional acres in forest stewardship plans by 2020. Will require a dedicated annual fund stream to increase technical service delivery of the DNR Forest Service.

Management strategies will need to be coordinated with the recommendations of the ARWG to address increasing salinity, soil saturation, and wetland migration.

Managing Urban Trees and Forests for Greenhouse Gas Benefits (AFW-2)

This policy option would maintain and improve the health and longevity of trees in urban areas and increase the urban tree canopy cover throughout the State. Trees in urban areas help absorb GHG emissions from power production, vehicles and the operation and maintenance of the built environment. Urban trees shield buildings from cold winds and lower ambient summertime temperatures, reducing heating and cooling costs and the demand for energy production. Reduced heat slows the formation of ground level ozone as well as the evaporation of fuel from motor vehicles.

This policy would be implemented through the following mix of education/outreach, legislation, funding, and planning measures:

- Provide outreach and education on the significance of trees and their role in the built environment and control methods for invasive species.
- Adopt legislation restricting the sale of invasive species
- Introduce an Urban Forest Canopy Act to add the urban tree canopy goals of this policy option
- Allocate a portion of Program Open Space (POS) funds to local governments to support urban tree canopy goals through comprehensive planning, planting, maintaining, expanding, monitoring and reporting of local street tree populations, and by developing incentives for wood recovery directed towards durable wood products
- The General Assembly, various State agencies led by DNR (including MDE, MDA, and SHA), as well as local governments, conservation organizations, private landowners, sawmills, the artisan community, arboreal industries and others would be involved in implementing this policy. Several of the agencies listed above are already implementing programs that are consistent with the goals of this policy option.

Policy Goals:
Establish an urban tree canopy in 50 per cent of Maryland's urban areas (averaged over all urban land use types) by 2020.

Implementation:

As lead agency, DNR's implementation plan is as follows:

Short-term (1-2 years)

- The General Assembly, DNR, MDE, MDA, and SHA, as well as local governments, conservation organizations, private landowners, sawmills, the artisan community, arboricultural industries and others would be involved in implementing this policy to define realistic canopy goals for GHG benefits and identify target areas and funding mechanisms.
- Provide outreach and education on the significance of trees and their role in the built environment and control methods for invasive species.

Medium-term (2-3 years)

- Adopt legislation restricting the sale of invasive species
- Introduce an Urban Forest Canopy Act to address the urban tree canopy goals of this policy option
- Contribute funds to a separate urban tree planting program (funded by FCA fee-in-lieu monies) to achieve avoidance and sequestration and to mitigate GHG emissions.
  - *Trees planted under the former objective would be planted strategically to maximize emissions avoidance objectives; they would have to be planted on the portions of the site that would result in the greatest emissions avoidance.*
  - *Trees planted under the latter objective could be planted anywhere, but sites and species should be selected to optimize biomass (large scale trees should be planted on sites with a minimum of constrictions on growing space).*

Long-term (3-5 years)

- Allocate a portion of Program Open Space (POS) funds to local governments to support urban tree canopy goals through comprehensive planning, planting, maintaining, expanding, monitoring and reporting of local street tree populations, and by developing incentives for wood recovery directed towards durable wood products.
- Establish an urban tree canopy in 50 per cent of Maryland's urban areas, subject to change as stakeholders are brought together and implementation is discussed (averaged over all urban land use types) by 2020.

Baltimore City Urban Forest Project
www.bmore-ufp.org

Afforestation, Reforestation and Restoration of Forests and Wetlands (AFW-3)

This policy option would promote forest and wetland carbon sequestration, both ecosystems being natural carbon "sinks". Healthy forests would be regenerated or established through afforestation (planting on lands that have not, in recent history, been forested) and reforestation where current beneficial practices are not displaced. To protect coastal wetlands from inundation due to sea level rise, this policy calls for acquiring adjacent lands to allow the wetlands to migrate landward. This strategy has significant adaptation co-benefits, since wetland protection is one of the best ways to save lives and prevent property damage in coastal areas. Riparian wetlands would be protected under this policy by increasing the acquisition of riparian buffers throughout the State.

Implementation strategies would include:

- Public outreach and education
- Green infrastructure planning
- Use of reforestation offsets under RGGI and allocation of RGGI allowances to forest management
- Tax incentives (Forest Conservation Management Act, property and inheritance tax), and incentives to encourage private landowners to produce non-traditional products and services
- Increasing fee-in-lieu payments under FCA to acquire easements
- Requiring utility company offsets for constructing transmission lines through forests
- Stepping up existing programs to protect wetlands, such as Maryland's no-net-wetland-loss goals / offsets, marshland creation as a shoreline erosion control measure, and acquisition of lands adjacent to coastal wetlands

The General Assembly, various State agencies led by DNR (including MDE, MDA, SHA, and the Maryland Port Authority), federal agencies including U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, Natural Resource Conservation Service, nonprofit conservation organizations, local governments, private landowners, Chesapeake Bay Foundation, and reservoir watershed management agencies would be involved in implementing this policy. Many of the agencies listed above are already implementing programs that are consistent with the goals of this policy option.

Policy Goals:

- ***Establish sufficient acreage in forests to offset loss of 900 acres each month to development, beginning in June 2008 and continuing through December 2020***
- ***Establish riparian buffers at a rate of 360 miles/year (50-foot width on either side of stream) to 2020, and continue until 70 per cent of all stream miles in the State are buffered***
- ***Increase wetland areas wherever feasible (non-quantified goal)***

Implementation:

As lead agency, DNR's implementation plan is as follows:

Short-term (1-2 years)

- Public outreach and education
- Green infrastructure planning
- Use of afforestation offsets under RGGI and allocation of RGGI allowances to forest management
- Step up existing programs to protect wetlands, such as Maryland's no-net-wetland-loss goals /offsets, marshland creation as a shoreline erosion control measure, and acquisition of lands adjacent to coastal wetlands

Medium-term (2-3 years)

- Tax incentives (Forest Conservation Management Act, property and inheritance tax), and incentives to encourage private landowners to produce non-traditional products and services

Long-term (3-5 years)

- Amend FCA to increase fee-in-lieu payments to acquire easements
- Require utility company offsets for constructing transmission lines through forests

Protection and Conservation of Agricultural Land, Coastal Wetlands and Forested Land (AFW-4)

Under this policy option, Maryland and its climate change partners would map, designate, prioritize and conserve existing forests, agricultural lands, and wetlands – all major carbon sinks – to sequester additional carbon and to avoid GHG emissions associated with development, degradation, and clearing. Deforestation and development now contribute up to a 25 per cent increase in GHG emissions. As noted in AFW-3, coastal wetlands, which protect lives and property from coastal storms, are at risk of inundation from sea level rise.

Green infrastructure planning tools would include land acquisition, conservation easements, purchase and transfer of development rights, tax incentives, and zoning. The toolbox would also include refining land use planning policies, dedicating proceeds from any future CO_2 budget trading program, authorizing local bond initiatives for GHG reduction programs, targeting POS funds, and creating other funding mechanisms to allow users of these tools — governments, nongovernmental organizations, and private citizens — to more effectively protect Maryland's existing green infrastructure network.

The General Assembly, MDA, DNR, MDE, and Maryland Department of Planning (MDP) would work in partnership with local governments, nonprofit organizations, foundations, and property owners to implement this policy option. Several of the agencies listed above are already implementing programs that are consistent with the goals of this policy option.

Policy Goals:

Decrease the conversion of agriculture land to developed land through the protection of 1.2 million acres of productive agricultural lands, to ensure no net loss by 2020.

Retain existing levels of forest cover (2.6 million acres) and protect an additional 250,000 acres of forest by 2020 through legal mechanisms, with more than half in areas of high value to water quality. In addition to existing programs, target upland forests.

Assess, then focus protection and restoration on wetland types with the greatest capacity for CO_2 sequestration.

Protect priority areas designated for coastal wetland retreat and coastal forest lands using nonstructural shore erosion controls (i.e. living shoreline) – keeping pace with wetland, forest and critical habitat loss due to sea level rise.

Implementation:

For those elements of this policy that cannot be implemented immediately, MDA, with the assistance of other State agencies, will be developing a more detailed implementation plan for the Commission to consider in its Spring 2009 meeting.

"Buy Local" Programs for Sustainable Agriculture, Wood and Wood Products (AFW-5)

This policy option would promote the sustainable production and consumption of locally produced agricultural and forest goods, displacing the production and consumption of goods with higher life-cycle GHG emissions from high-energy production (e.g. plastic and steel products) and from transport from other states and countries. In addition to reduced transportation- and production-related emissions, GHG reductions would derive from carbon storage in durable wood products, and enhanced forest health (through increased product demand).

MDA, with assistance from DNR and the Maryland Department of Business and Economic Development (DBED), would work with local governments, farmers and farmer's market associations, lumber mills, furniture makers and other value-added producers and trade associations to implement this policy. Implementation strategies would include the following.

- Put leverage on local governments to ensure that zoning does not preclude intelligent, sustainable uses that support "buy local" enterprises, by unduly constraining local value-added mills or siting/participation in local markets.
- Encourage and develop LEED-type certification programs for Maryland wood products, organic produce and livestock to enable participating producers to offer consumers products that meet established standards for being raised and/or harvested sustainably, with net reductions in GHG emissions.
- Encourage the creation of value-added products from local woods in lieu of shipping raw materials from long distances.
- Provide education for producers in marketing techniques and effective local distribution.

Policy Goals:

Increase the number of local farmer's markets by 25 per cent by 2015 and 50 per cent by 2020

Require 80 per cent of goods consumed by Marylanders be grown or produced locally by 2050

Displace imported wood by locally grown and processed lumber by 20 per cent by 2015 and 50 per cent by 2050

Implementation:

For those elements of this policy that cannot be implemented immediately, MDA, with the assistance of DNR and DBED, will be developing a more detailed implementation plan for the Commission to consider in its Spring 2009 meeting.

Don Merritt, IAN Image Libr
(www.ian.umces.edu/imagelibra

Expanded Use of Forest and Farm Feedstocks and By-Products for Energy Production (AFW-6)

This policy option would use local biomass from sustainable supplies of forestry and farming byproducts (chicken litter, methane, slash, switchgrass, corn stalks, food processing waste, etc.) for generation of electricity and thermal energy. Additionally, this option would reduce methane emissions by installing manure digesters and energy recovery projects. Energy from forest and farm feedstocks and by-products would offset fossil fuel-based energy production and associated GHG emissions. Shortfalls in supply could be met by local municipal solid waste such as paper, organics and yard waste.

All biomass products would be sustainably harvested without depriving soils of organic components essential for reducing erosion, maintaining soil nutrients and structure, conserving wildlife habitat and not jeopardizing future feedstocks in quantity and quality. Lifecycle energy costs and carbon emissions would be evaluated for each feedstock to ensure net energy and GHG reductions are achieved. Multi-facility manure digesters and energy recovery projects would be installed in confined animal feeding operations. Current laws could be amended to increase and/or equalize incentives for biomass energy production and use, and Fuels for Schools and biomass loan programs could be expanded. Maryland's energy policy could be adjusted to recognize thermal loads (40 per cent of the State's energy budget), and its Renewable Portfolio Standard (RPS) could be amended to include local biomass as a renewable energy source. Research, outreach and education are recommended to further these objectives.

The General Assembly and various State agencies led by DNR (including MDA, MEA, Maryland State Department of Education (MSDE), Maryland Department of General Services (DGS), and MDE, would implement this policy in cooperation with municipalities, power producers, local electric utilities and distributors, energy consumers in rural communities (hospitals, community colleges, and universities), and Soil Conservation Districts. Many of the agencies listed above are already implementing programs that are consistent with the goals of this policy option.

Policy Goals:

Use 10 per cent of available agricultural and 10 per cent of available forest residue biomass for electricity, steam, and heat generation by 2015, 25 per cent of available biomass in each sector by 2020.

Increase growth of energy crops and use 50 per cent of available energy crop biomass for electricity, steam, and heat generation by 2020

Utilize 50 per cent of available poultry litter and farm methane for renewable electricity, steam, and heat generation by 2020

Implementation:

As lead agency, DNR's implementation plan is as follows:

Short-term (1-2 years)

- Expand biomass loan programs
- Initiate research, outreach and education to further these objectives

Medium-term (2-3 years)

- Amend Maryland's Renewable Portfolio Standard (RPS) to include local biomass as a renewable energy source
- Amend current laws to increase and/or equalize incentives for biomass energy production and use
- Implement Fuels for Schools Program by providing funding to underwrite the conversion of boiler systems in Maryland's public institutions (e.g., schools and hospitals) to utilize the ample wood wastes available locally.

Long-term (3-5 years)

- Adjust Maryland's energy policy to recognize biomass opportunities for meeting thermal loads which constitute 40 per cent of the State's overall energy budget.

In-State Liquid Biofuels Production (AFW-7)

This policy option would promote sustainable in-state production and consumption of biodiesel from agriculture and/or agroforestry feedstocks to displace the use of fossil fuels. This would decrease the use of fossil fuel in the production of biodiesel, which will improve the GHG profile of in-state biodiesel production and consumption.

The ethanol portion of this policy option (AFW-7a), originally part of the AFW TWG's analysis, is not included in the Commission's suite of recommended actions. Further, the Commission has decided that this entire policy option (AFW-7a and 7b (biodiesel)) should not be included in the total GHG emission reductions or costs because of concern over food- and animal feed-based feedstocks. Using these feedstocks could be detrimental to consumers by raising food prices, to balanced and diverse crop production, and to embodied life-cycle GHG emissions. This option focuses on supply and is linked with TLU-4, "Low Greenhouse Gas Fuel Standard" (also removed from the Commission's recommendations). Dropping food-related biomass left marginal amounts available for in-state fuel production on a commercial scale. Local sustainable production of fuels should not be discouraged.

The full text of the AFW TWG's analysis of AFW-7a is included in Appendix D-1 for informational purposes.

The following strategies for increasing the production of biodiesel would be implemented by MEA, with assistance from MDA and other State agencies, all working in partnership with suppliers of feedstocks, distributors, communities adjacent to potential facilities, and environmental groups.

- Integrate State and regional strategies.
- Promote fractionalization of black liquor.
- Provide research and financial incentives for algal biofuels.
- Give bonuses to in-state production of biodiesel.
- Foster partnerships between users, suppliers, corporations, and adjacent communities.
- Provide incentives to communities that supply biomass for biodiesel.

Policy Goal:
Increase in-state biodiesel production from Maryland non-food feedstocks to offset diesel consumption in the State by 2 per cent in 2015, rising to 2.2 per cent in 2020.

Adrian Jones, IAN Image Libra
(www.ian.umces.edu/imagelibrary

Implementation:
Several State agencies are already implementing programs that are consistent with the goals of this policy option. For those elements of this policy that cannot be implemented immediately, MEA, working with MDA and other State agencies, will be developing a more detailed implementation plan for the Commission to consider in its Spring 2009 meeting. There is currently no in-state biodiesel production in Maryland. Facilities would come online if the production credit were increased. This would require legislative authorization. One to two years would be needed to construct new facilities.

Nutrient Trading With Carbon Benefits (AFW-8)

Originally designed as a market-based, cost-effective means of achieving water quality improvements through improved agricultural practices, nutrient trading can also provide significant GHG reduction benefits. Tradable nutrient credits are created through nutrient reduction – specifically nitrogen and phosphorus – achieved through practices that increase soil carbon sequestration and reduce use of nitrogen fertilizers that release nitrous oxide (N_2O), a GHG with 310 times the effect of one unit of CO_2.

Entities who need to apply or release more nutrients than are currently permitted under their nutrient management plans can obtain credits from sellers who have reduced their use. Carbon and enhanced nitrogen credits would be "stacked" onto existing nutrient credits as tradable commodities, adding more value to the total credit package, creating a robust nutrient trading market. Encouraging trade between non-point sources (e.g. agricultural operations) and point sources (e.g. wastewater treatment plants, industrial dischargers, highway contractors and developers) would create even more opportunities for GHG reductions, while also improving water quality, reducing fertilizer use and soil erosion, restoring wildlife habitat and wetlands, expanding economic opportunities for farmers and foresters, and promoting Smart Growth goals by preserving agricultural and forested lands.

Using EPA guidelines and grants from the U.S. Department of Agriculture, MDE, MDA and DNR are currently developing an intra- and interstate pilot cap and trade program for managing nutrient loads from point and non-point sources in the Upper Chesapeake Bay. Building on this, MDA and MDE, working with agricultural and urban non-point sources, municipal wastewater treatment plants, industrial and commercial dischargers, Soil Conservation Districts and other stakeholders, would develop guidelines that incorporate carbon credits and an enhanced value for nitrogen credits as tradable commodities. It is important for Maryland policy makers to understand how this program will work, what the currency of trade will be, etc., because Pennsylvania has already made a substantial commitment to participating in it.

Essential elements include:

- Allowance of credit stacking or credit nesting of carbon and enhanced-value nitrogen with regulated nutrients
- Flexibility to trade between point and non-point sources under a watershed-based general permit issued by MDE
- Mechanisms to ensure longevity of nutrient management plans (longer than 10 years)
- Reporting and certification protocol for trading entities
- A system for entering credits into a State registry
- Eligibility criteria for trading registered credits

Policy Goals:
Adopt a final trading policy in 2008.
By 2020, increase nitrogen fertilizer efficiency by 20 per cent through implementation of a nutrient trading scheme.

Implementation:
Several State agencies are already implementing programs that are consistent with the goals of this policy option. For those elements of this policy that cannot be implemented immediately, MDE, working with DNR, MDA and other State agencies, will be developing a more detailed implementation plan for the Commission to consider in its Spring 2009 meeting.

Waste Management Through Source Reduction and Advanced Recycling (AFW-9)

This policy option would reduce the volume of waste from residential, commercial, and government sectors through programs that reduce the generation of wastes, expand recycling and upcycling (adding value to the re-manufactured product), and enhance reuse of product components and manufacturers' lifetime product responsibility. Increased recycling and reduced waste generation ("source reduction") would limit GHG emissions at landfills as well as in upstream production (i.e. energy used to extract and process raw materials and produce value-added commodities). This policy would also reduce landfill methane emissions by reducing and recycling the biodegradable fraction of landfill waste.

Implementation strategies include the following:

- Require or encourage State and local government agencies to preferentially purchase goods made from reused and recycled materials and goods from manufacturers who take "cradle to cradle" responsibility for their products.
- Identify incentives to reduce use of raw materials in manufacturing.
- Identify incentives for increased product quality to increase product life.
- Phase out subsidies that encourage wasteful manufacturing methods.
- Educate the public on the need for reducing Maryland's waste stream through better production and increased re-use and recycling.

The parties involved would be the General Assembly, MDE and all State and local government agencies, manufacturers, trade associations, consumers' associations, consumers, and retail outlets.

Policy Goals:

Reduce Maryland's waste stream by 15 per cent in 2012, 25 per cent by 2015, 35 per cent by 2020, and 80 per cent by 2050.

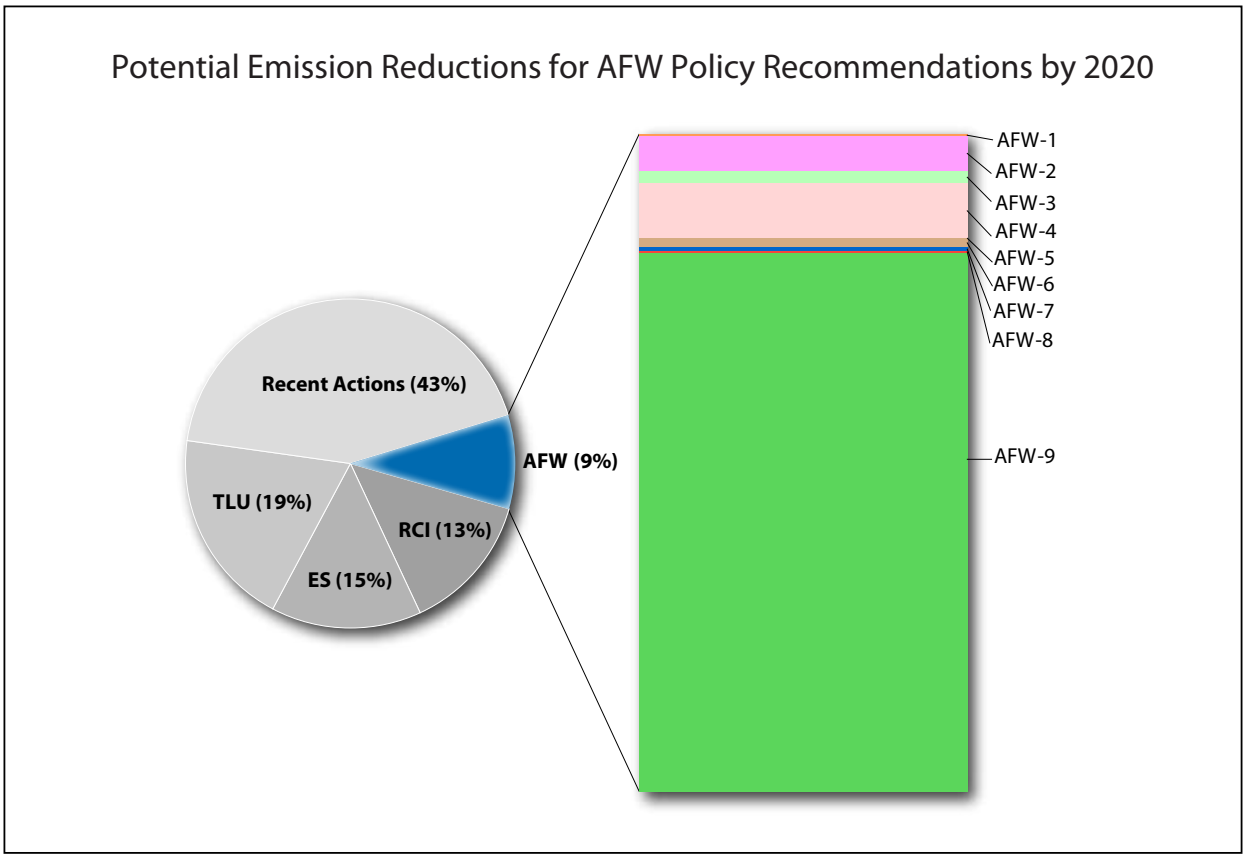
Increase Maryland's recycling stream by 10 per cent in 2012, 20 per cent by 2015, 30 per cent by 2020 and then show a gradual decrease to 10 per cent by 2050 as more products are reused and new source use is decreased.

Start in 2010 and ramp up to higher levels in 2012 and 2015, consistent with goals.

Implementation:

Several State agencies are already implementing programs that are consistent with the goals of this policy option. For those elements of this policy that cannot be implemented immediately, MDE, working with other State agencies, will be developing a more detailed implementation plan for the Commission to consider in its Spring 2009 meeting.

Option No.	Policy Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008 - 2020 (Million $)	Cost Effectiveness ($/$tCO_2e$)
		2012	2020	Total 2008 - 2020		
AFW -1	Forest management for enhanced carbon sequestration	0.04	0.09	0.66	89.1	135
AFW-2	Managing urban trees and forestts	0.73	1.9	13.27	-2,017	-152
AFW-3	Afforestation, reforestration, & restoration of forests and wetlands					
	a. Afforestation	0.21	0.6	3.9	112.7	29
	b. Riperian areas	0.01	0.05	0.25	11	44
AFW-4	Protection & conservation of agricultural land, coastal wetlands and forested land					
	a. Agricultural land	0.11	0.28	1.93	168.6	87
	b. Coastal wetlands	NQ	NQ	NQ	NQ	NQ
	c. Forested land	2.2	2.7	30.5	1,128.7	37
AFW-5	Buy local programs					
	a. Farmers' market	0.01	0.03	0.2	-33.1	-167
	b. Local produce	NQ	NQ	NQ	NQ	NQ
	c. Locally grown & processed lumber	NQ	NQ	NQ	NQ	NQ
AFW-6	Expanded use of forest & farm feedstocks and by-products for energy production					
	Biomass	0.12	0.5	2.83	34.1	12
	Methane utilization from livestock manure & poultry litter	0.01	0.04	0.25	0.06	0.2
AFW-7	In-state liquid biofuels production					
	Ethanol	For Information Only - Further Study Needed				
	Biodiesel	0.1	0.17	1.41	10.5	7
AFW-8	Nutrient trading with carbon benefits	0.05	0.14	0.99	-29.7	-30
AFW-9	Waste management through source reduction & advanced recycling	8.8	29.27	184.00	-1,118	-6.0
	Sector Total	*12.39*	*35.77*	*240.19*	*-1,643.04*	*-7*
	Sector Total After Adjusting for Overlaps	*5.62*	*7.53*	*83.48*	*-159.96*	*-2*



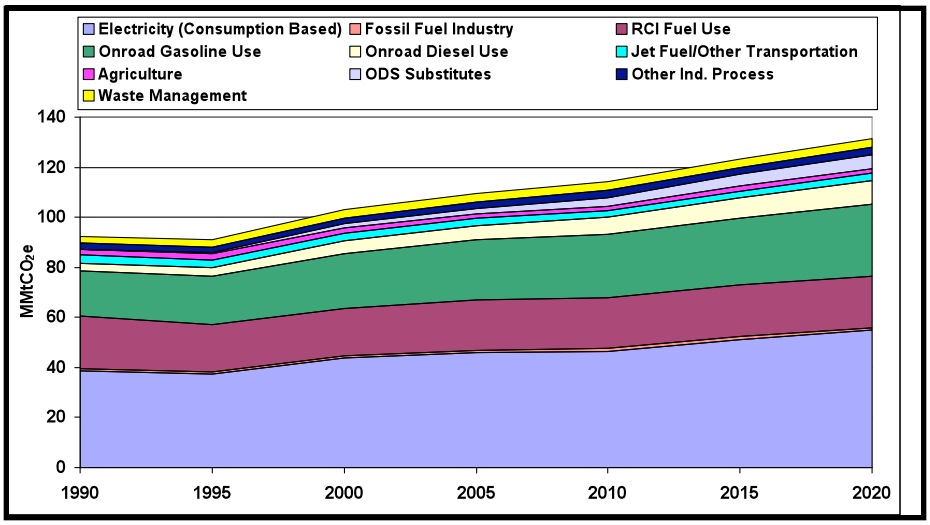
The pie chart above shows the potential emission reduction contribution to Maryland's goals from the AFW policies. The percentages are based on the total potential emission reductions from recent actions and all of the Commission's quantified policy options. Each AFW policy option's potential emissions reduction is graphically displayed on the right in the bar chart.

Southern Maryland Farm Land
Photo by Katy Perry

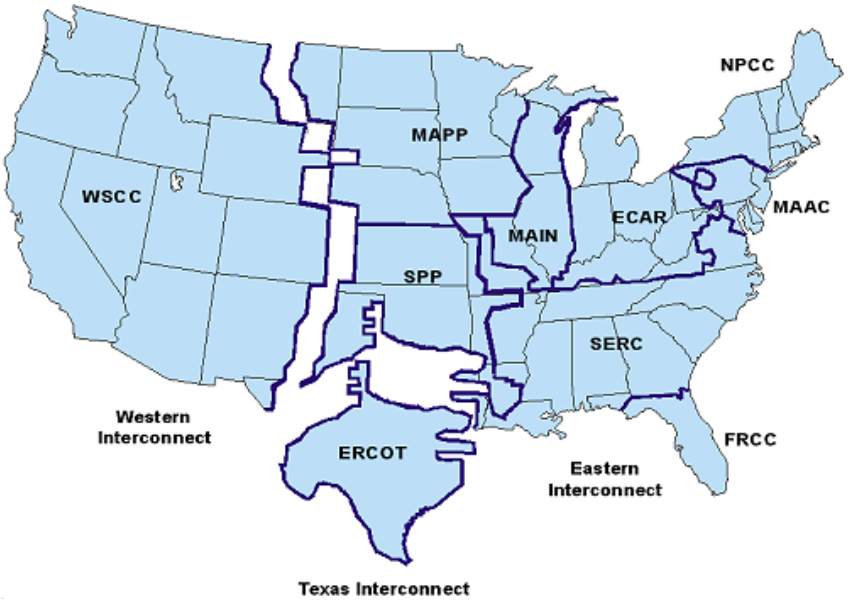
Coal Power Plant Along the Patapsco River, Baltimore
Joanna Woerner, IAN Image Library
(www.ian.umces.edu/imagelibrary/)

Overview of GHG Emissions

GHG emissions from the energy supply (ES) sector in Maryland include emissions from electricity generation and represent a substantial portion of the State's overall GHG emissions (approximately 42 per cent of gross emissions in 2005). On a production basis, a significant portion of Maryland's gross GHG emissions are associated with fossil fuel-fired electricity generation – roughly 85 per cent of the State's electricity-related fossil fuel emissions were associated with coal in 2005. On a consumption basis, Maryland imports a substantial amount of electricity generated out-of-state in the surrounding Mid-Atlantic Area Council (MAAC) region to meet retail electricity demand. The chart below shows the projected growth in Maryland's emissions and includes electricity consumption.



The Main Interconnections of the U.S. Electric Power Grid and the 10 North American Electric Reliability Council Regions



In the absence of State policies, such as RGGI, to curb emissions – the "Business-as-Usual" or Reference Scenario – the level of GHG emissions associated with meeting electricity demand in Maryland is expected to increase significantly.

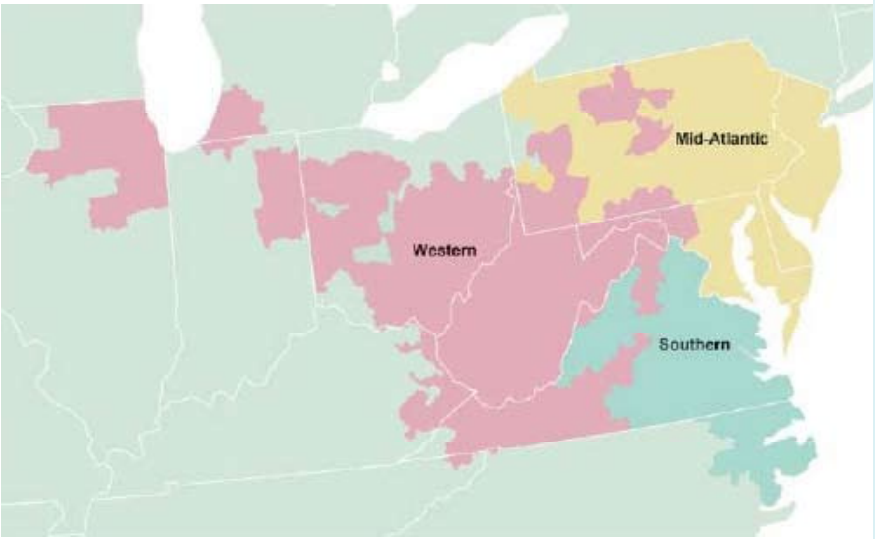
Key Challenges and Opportunities

The Business-as-Usual scenario shows a growing reliance on imported power for the foreseeable future. Absent a major policy shift, these imports would likely have a carbon footprint comparable to the PJM average. However, the enactment of a strengthened RPS and the decision to join RGGI show that Maryland has chosen a dramatically different course. These policies require three strategies: first, reduce expected demand with energy efficiency; second, replace new coal imports with renewable generation, either Maryland-based or imported, and third, enforce these emissions limits through a regional cap under RGGI.

The RGGI modeling that has been performed indicates that Maryland has substantial "reserves" of GHG emissions reduction opportunities at negative or low cost. While power sector reductions are typically among the more expensive, under RGGI, Maryland will likely derive an economic benefit by reducing emissions beyond those required to meet the goal.

Opportunities for additional reductions have been identified through energy efficiency and biomass co-firing at existing fossil fuel power plants, promotion of renewable generation, clean distributed generation and combined heat and power, re-establishment of Integrated Resource Planning, further enhancement of the RPS, and enactment of a Generation Performance Standard.

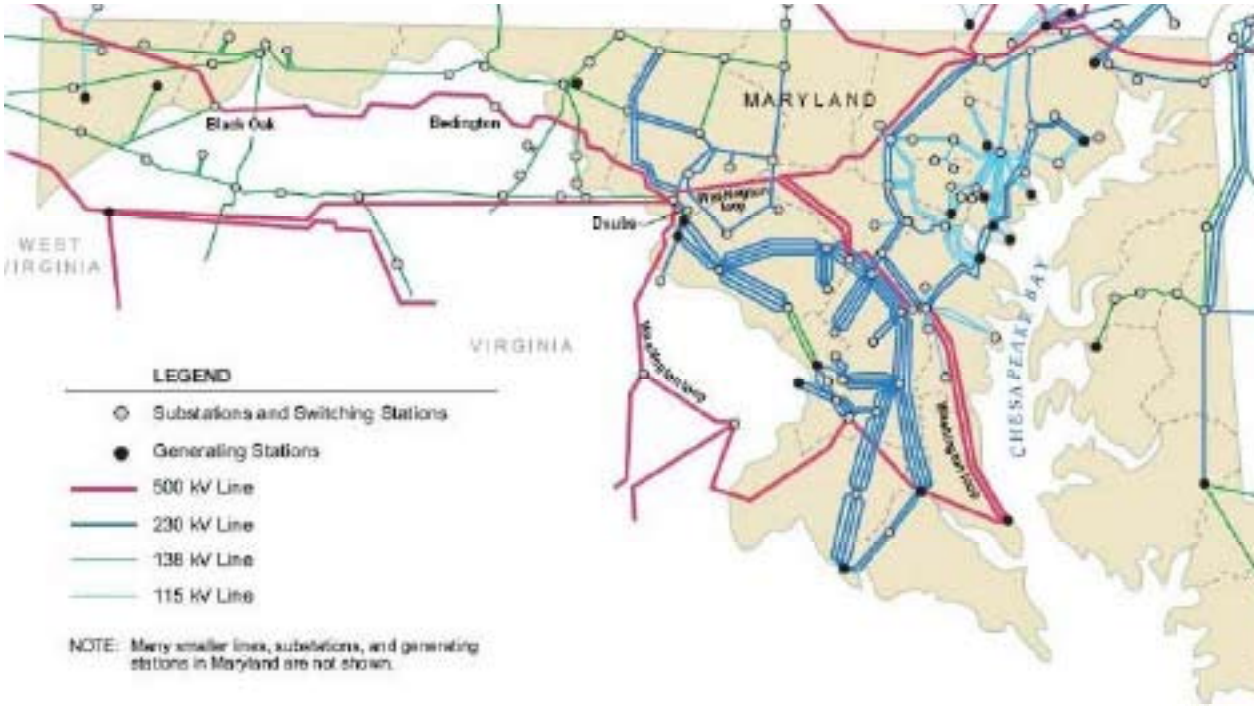
The PJM Region



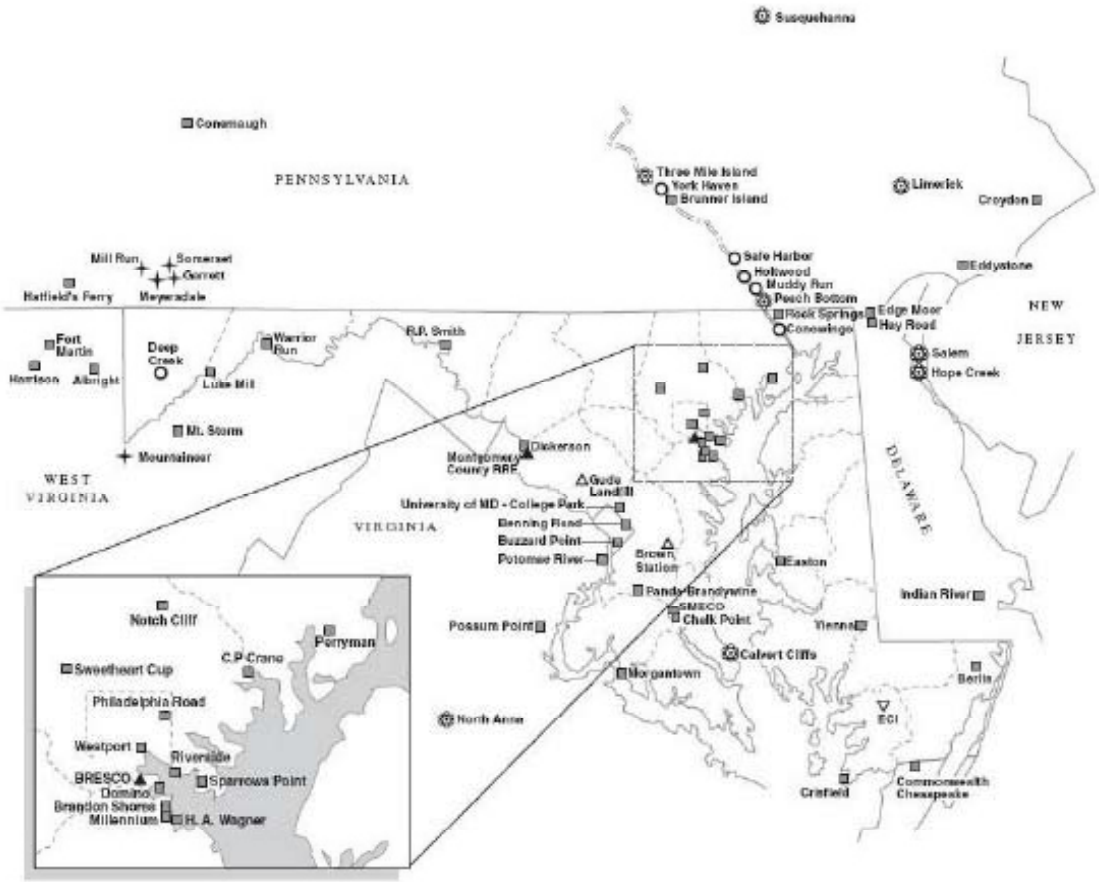
PJM Interconnection, a regional transmission organization, plays a vital role in the U.S. electric power system.

- **PJM ensures the reliability of the electric power supply system in 13 states and the District of Columbia.**
- **PJM operates an efficient, effective wholesale electricity market.**
- **PJM manages a long-term regional electric transmission planning process to maintain the reliability of the power supply system.**

Maryland Electricity Transmission Lines



Power Suppliers



GOVERNOR O'MALLEY COMMITS MARYLAND TO 20% RENEWABLE ENERGY

Governor O'Malley sponsored and signed into law in 2008 a bill that requires 20 per cent of the electricity used in the State to come from renewable resources by 2022. Increasing the amount of electricity coming from renewable resources will reduce greenhouse gas emissions and further spur development in new renewable electricity generation.

Promotion of Renewable Energy Resources (ES-1)

This policy option focuses on encouraging renewable energy development by removing regulatory and financial barriers to large-scale centralized facilities as well as on-site generation. Energy sources identified as Tier I in Maryland's Renewable Portfolio Standard (RPS) law would be targeted in the 2009-2020 timeframe, including wind, methane from landfills and wastewater treatment plants, biomass, solar, geothermal, ocean (energy from waves, tides, current and thermal differences), fuel cells and small hydro power.

The policy would be implemented primarily through the adoption and revision of State and local laws, regulations, programs and planning processes to:

- Streamline, encourage and modernize zoning and siting for renewable energy projects
- Ensure that any State resource planning process include consideration of renewable projects
- Develop a clean energy fund to provide for revolving loans (through bonds or other financing mechanisms)
- Make use of long-term contracts for offshore wind and other renewables
- Facilitate greater use of existing State authority for performance-based contracting of renewable energy projects

Parties involved would include the MEA, DBED, MDE, DNR, PSC, MDP and local governments, as well as members of the financial community, renewable energy developers, energy service companies, and the environmental community. Many of the agencies listed above are already implementing programs that are consistent with the goals of this policy option. Recent legislation, described in more detail in Chapter 7, will also be useful in implementing this effort.

In the 2007 Solar Decathlon, the University of Maryland's LEAFHouse took 2nd place overall and won the People's Choice award for the second time in a row. < http://solarteam.org/page.php?id=250>

Policy Goal:

This policy is an enabling mechanism for other climate-related policies. It would come into effect in 2009 and continue indefinitely. Policy quantification is based on an assumed increase of Tier 1 renewable energy alternatives at the rate of 0.1 per cent of total Maryland utility production each year from 2009 through 2020.

Implementation:

For those elements of this policy that cannot be implemented immediately, MEA, working with the PSC and other State agencies, will be developing a more detailed implementation plan for the Commission to consider in its Spring 2009 meeting. Contingent on RGGI revenues, promoting renewable energy could commence in January 2009. MEA currently administers several programs to promote renewable energy, including grants for wind, solar, E85 (ethanol blend gasoline) infrastructure, biodiesel infrastructure, and grants to local governments.

Technology-focused Initiatives for Electricity Supply (ES-2)

Technology and innovation play a critical role in energy production and use. This policy option is an umbrella covering several technology-related policies that would provide State government and other parties with resources and incentives for analysis, targeted research and development (R&D), market development, and adoption of GHG-reducing technologies not covered by other policies. It would especially target landfill gas combustion for power generation, use of biomass co-firing in existing fossil fuel fired units (complementing ES-8, "Efficiency Improvements and Repowering Existing Plants", below), energy storage and use of fuel cells.

The policy would be implemented by MEA, DBED, MDE, DNR and the PSC primarily through State funding and tax incentives for public and private R&D programs, as follows:

- Fund and conduct R&D to follow technology trends and identify critical technology pathways and opportunities for collaboration.
- Continue to fund the "Maryland Clean Energy Center" program created by the General Assembly in 2008 (HB 1337) to incubate and promote the development of the clean energy industry in Maryland.
- Provide grants and incentives to utilities and other applicants for targeted programs identified as priorities through public input. The California Public Interest Energy Research (PIER) program and the New York State Energy Research and Development Agency (NYSERDA) are program models.
- Provide a tax incentive to utilities, independent power producers, and manufacturers to invest in substantial R&D projects by allowing advantageous cost recovery for capital expenditures.
- Provide incentives for technological development in the manufacturing sector.

Policy Goals:

This policy is unquantified. It would take effect in 2008 and 2009 and continue indefinitely as an enabling mechanism for other climate-related policies. Its specific goals would be:

To position Maryland as a world leader in climate-related technology development and deployment

To achieve actual emission reductions from technology investments

To develop State industries with high in-state and export capability.

Implementation:

Several of the agencies listed above are already implementing programs that are consistent with the goals of this policy option. Recent legislation, described in more detail in Chapter 7, will also be useful in implementing this effort. For those elements of this policy that cannot be implemented immediately, MEA, working with other State agencies, will be developing a more detailed implementation plan for the Commission to consider in its Spring 2009 meeting. Technology-focused initiatives program development could possibly commence 6 months after the first RGGI auction, scheduled for September 2008. Certain initiatives may require authorization by the General Assembly.

Cap and Trade (ES-3)

Maryland, because of the Healthy Air Act of 2006, is already a partner in RGGI, a first of its kind cap-and-trade program for large electric power plants. This policy option would support continued active involvement in RGGI and encourages consideration of the expansion of RGGI to sectors beyond the power sector if the federal government fails to enact a credible national cap and trade program in 2009. For the purpose of this recommendation, a credible national program would require at least a 20 per cent reduction from current emission levels for covered sectors by 2020.

The cap-and-trade policy option is considered an existing action for the purpose of this report. Analysis of the GHG reduction benefits, costs and cost savings resulting from Maryland joining RGGI has been performed and confirms that the cap-and-trade program will result in greater emissions reductions and greater cost savings than would be likely without it. As for the potential of expanding the cap-and-trade beyond the power sector, this policy option recommends as the preferred strategy that the federal government enact a credible national program in 2009. An effective national cap-and-trade will be given precedence. Failing that, this policy advocates the expansion of the RGGI program to new sectors. Therefore this policy proposes advocacy and joint action with the other member states of RGGI. A key issue that surfaced during discussions of this policy was how to credit manufacturers for actions that indirectly reduce GHG emissions or reduce GHG emissions upstream or downstream of the manufacturing process. This is an important issue and will be discussed during the future stakeholder meetings described below.

Parties involved would be MDE, DNR, the PSC, MEA, the federal government, affected sector stakeholders, other RGGI states, and the environmental community.

Policy Goals:

The first goal of this policy is to continue Maryland's membership in the RGGI program at least for the balance of Phase 1 (2019). The second goal is to encourage the federal government to enact a national cap-and-trade program requiring at least a 20 per cent reduction from current emission levels for covered sectors by 2020. The third goal is to advocate the expansion of RGGI to additional sectors if the federal government does not enact a national program in 2009.

Implementation:

Maryland is already participating in RGGI. Therefore, much of this policy is already being implemented. For those elements of this policy that cannot be implemented immediately, like the expansion of RGGI to other sectors, MDE, with assistance from the PSC, DNR and MEA, has begun a stakeholder process. Some of the issues under consideration are summarized in stakeholder letters, attached to this ***Plan*** as Appendix F. MDE will be developing a more detailed implementation plan for the Commission to consider in its Spring 2009 meeting.

Federal legislation on this issue is also being actively discussed. The best approach for expanding RGGI to other sectors is through federal legislation. RGGI will also be discussing changes to the RGGI program between 2009 and 2012. RGGI has already agreed to a 2012 review.

Clean Distributed Generation (renewables and combined heat and power) (ES-5)

This policy option encompasses a suite of financial incentives and other strategies to encourage investment in distributed renewable energy (e.g. solar, wind, geothermal) and combined heat and power (CHP). CHP is any system that generates electricity and uses the thermal energy thereby produced – and normally wasted – for space heating, water heating, air conditioning, industrial processes, etc. It is sometimes called "recycled energy" because the same energy is used twice. The end result is significantly increased efficiency over generating electric and thermal energy separately.

This policy could require the General Assembly to enact financial incentives such as: (1) direct subsidies, tax credits or exemptions for purchasing, selling or operating distributed renewable or CHP systems;** (2) tax credits for each kWh or BTU generated from a qualifying facility; and (3) feed-in tariffs. Additional incentives for renewable technologies would include R&D funding; net metering; cost recovery for regulated utilities that make reasonable and prudent investments in utility-owned or customer-owned distributed renewable energy resources; and a clean energy grants program. Other strategies for both distributed renewables and CHP would include: (1) improved interconnection policies; (2) improved rates and fees policies, (3) streamlined permitting; (4) financing packages and bonding programs; (5) power procurement policies, and (6) education and outreach on the emission reduction value provided by these systems. MEA, MDE, the PSC and the Maryland Clean Energy Center (MCEC) would develop and administer the financial incentives programs, technical assistance, regulatory policies and codes and standards.

*****The Solar and Geothermal Tax Incentive and Grant Program (SB 207/HB 377), passed by the General Assembly in its 2008 Session, accomplishes part of this recommendation by increasing grant awards and tax incentives for purchasers of solar and geothermal systems.***

Policy Goals:

Achieve 1 per cent of all electricity sales in the State from distributed renewable generation by 2020, with a phase-in beginning in 2010.

Achieve 15 per cent of in-state CHP technical potential at commercial and industrial facilities by 2020, with a phase-in beginning in 2010.

Implementation:

Several of the agencies listed above are already implementing programs that are consistent with the goals of this policy option. Recent legislation, described in more detail in Chapter 7, will also be useful in implementing this effort. For those elements of this policy that cannot be implemented immediately, MEA, working with the PSC and other State agencies, will be developing a more detailed implementation plan for the Commission to consider in its Spring 2009 meeting. MEA currently facilitates wind and solar distributed generation with grants as financial incentives. An increase in market penetration would require additional funds from the RGGI auctions.

Integrated Resource Planning (ES-6)

Critical comprehensive planning is necessary to meet Maryland's future electricity demands. Integrated Resource Planning (IRP) is a regulatory and planning process that evaluates meeting future electricity demands and selects the optimal mix of resources that minimizes the cost of electricity supply while meeting reliability needs, aligning environmental and energy supply policies, and other objectives. Under this policy option, an objective review of energy supply options from both conventional and renewable energy sources as well as energy efficiency options would be considered prior to approving utility expansions of electricity generation or transmission. IRP would better align GHG emissions reduction and other environmental goals and energy supply policies by requiring consideration of more options than under current law and a longer time horizon in making resource decisions.

The Commission recommends that Maryland enact regulatory or legislative changes as needed to implement an IRP process consistent with the policy design described here.

This policy is very consistent with Maryland's Strategic Electricity Plan. Over the next few years, the PSC and MEA will analyze and define the State's energy needs and then implement a plan to achieve those goals. New or amended PSC laws and / or regulations may be needed to implement an IRP process consistent with this policy option.

Policy Goals:

This policy option is unquantified. It would take effect in 2009 and continue as a mechanism for meeting future electricity demands. The specific goals are as follows:

Develop a comprehensive plan that supports and balances reliability, environmental, and economic policies of the State, effective 2009.

Evaluate all options, on both supply and demand sides, in a fair and consistent manner.

Minimize risks of cost increases to all stakeholders, including evaluation of:

- ***The risk of cost increases associated with future regulation of GHG emissions, conventional pollutants and hazardous pollutants when evaluating both supply-side and demand-side resource options;***
- ***A broad range of possible fuel costs and risks of fuel price increases and volatility; and***
- ***The risk mitigation benefits of energy efficiency and renewable energy.***

Consider environmental impacts, including GHG emissions from both in-state and out-of-state generation sources serving Maryland customers.

Create a flexible plan that allows for uncertainty and permits adjustment in response to changed circumstances.

Implementation:

Several State agencies are already implementing programs that are consistent with the goals of this policy option. For those elements of the policy that cannot be implemented immediately, the PSC, working with MEA, will be developing a more detailed implementation plan for the Commission to consider in its Spring 2009 meeting.

Renewable Portfolio Standard (ES-7)

A renewable portfolio standard (RPS) is a policy requiring retail electricity suppliers and power importers to supply a certain percentage of retail electricity from renewable energy sources by a stipulated date. Utilities can satisfy the RPS requirement by generating renewable energy themselves or by purchasing renewable energy credits from a renewable energy generator. Maryland has had an historic RPS and in 2008 enacted an enhanced RPS (Renewable Portfolio Standard Percentage Reqirements – Acceleration (SB 209/HB 375)). The RPS proposed in this policy option goes slightly beyond the new RPS legislation enacted in 2008, although much of what is recommended is included in the new legislation.

The principal difference between the RPS adopted by the General Assembly in the 2008 Session and the RPS proposed here is the timing of meeting the 20 per cent Tier 1 standard. The current Maryland law specifies the 20 per cent goal be met by 2022, while this policy option sets the date as 2020. Thus, this policy recommends strengthening the existing RPS to achieve 20 per cent renewable energy by 2020, ramping up from a start date of 2008. No changes are recommended to the Tier 2 timeline or percentages. The RPS requirement would apply to electricity supplied to Maryland customers. Parties involved include the PSC, MEA and MDE, and all load serving entities (LSEs) providing electricity over utility distribution lines in Maryland.

Policy Goal:
Most of this policy's goals have been adopted through the enactment of the Renewable Portfolio Standard Percentage Requirements – Acceleration legislation in 2008.

Implementation:
The PSC is already working to implement the Renewable Portfolio Standard Percentage Requirements - Acceleration Act of 2008. No change to the PSC's regulations would be needed should the General Assembly so act, and such an increase in acceleration would have no substantial impact on the PSC's current tracking and enforcement activities. PSC would be able to implement an increasingly accelerated RPS standard as soon as it took effect. At this time, PSC is considering the implementation of an online compliance filing system, which will enhance the PSC staff's ability to receive and analyze RPS information.

The PSC notes that it would be undesirable for a further increase in the acceleration of RPS requirements to interfere with existing contracts for electricity supply under standard offer service ("SOS"). Therefore, prior to the enactment of legislation to implement this policy option, consideration should be given to timing so as not to interfere with existing contracts and their dates of expiration.

Efficiency Improvements and Repowering Existing Plants (ES-8)

This policy option would promote the identification and pursuit of cost-effective GHG emissions reduction opportunities from existing generating units through improving their operating efficiency or adding biomass. It would, in time, result in the identification of a portfolio of technological options for reducing emissions and allow Maryland utilities to share the opportunities they have identified. It complements ES-10, "Generation Portfolio Standard" (GPS), which covers new generating units, and ES-3, "Cap-and-Trade", by ensuring that utilities pursue cost-effective actual emission reductions rather than simply purchasing emission allowances.

Key implementation strategies would include: (a) requiring utilities to evaluate their existing generating units for opportunities to improve their GHG emissions profile through efficiency improvements or the addition of biomass. This evaluation would be part of an overall plan identifying cost-effective options for reducing system emissions on a short-term and long-term basis; b) requiring utilities to pursue cost-effective options identified above; and c) creating financial incentives that reward such emissions reductions. The term "cost-effective" would be defined by some objective measure, such as cost per ton of carbon equivalent.

The planning and emission reduction requirements would be implemented through planning processes already initiated by the PSC, in cooperation with DNR, MEA and MDE.

Policy Goal:
Co-fire biomass at existing coal-fired generating units at a maximum state-wide average rate of 8 per cent of total energy input by 2015. The policy would initiate in 2010 and reach the 8 per cent goal in 2014.

Implementation:
For those elements of this policy that cannot be implemented immediately, MEA, working with the PSC and other State agencies, will be developing a more detailed implementation plan for the Commission to consider in its Spring 2009 meeting. Implementation will likely be a long process. GHG savings would not be likely to occur before 2010.

Coal power plant on the banks of the Patapsco River, Baltimore. Route 95 is in the right bottom corner. Joanna Woerner, IAN Image Library (www.ian.umces.edu/imagelibrary/)

Generation Performance Standard (ES-10)

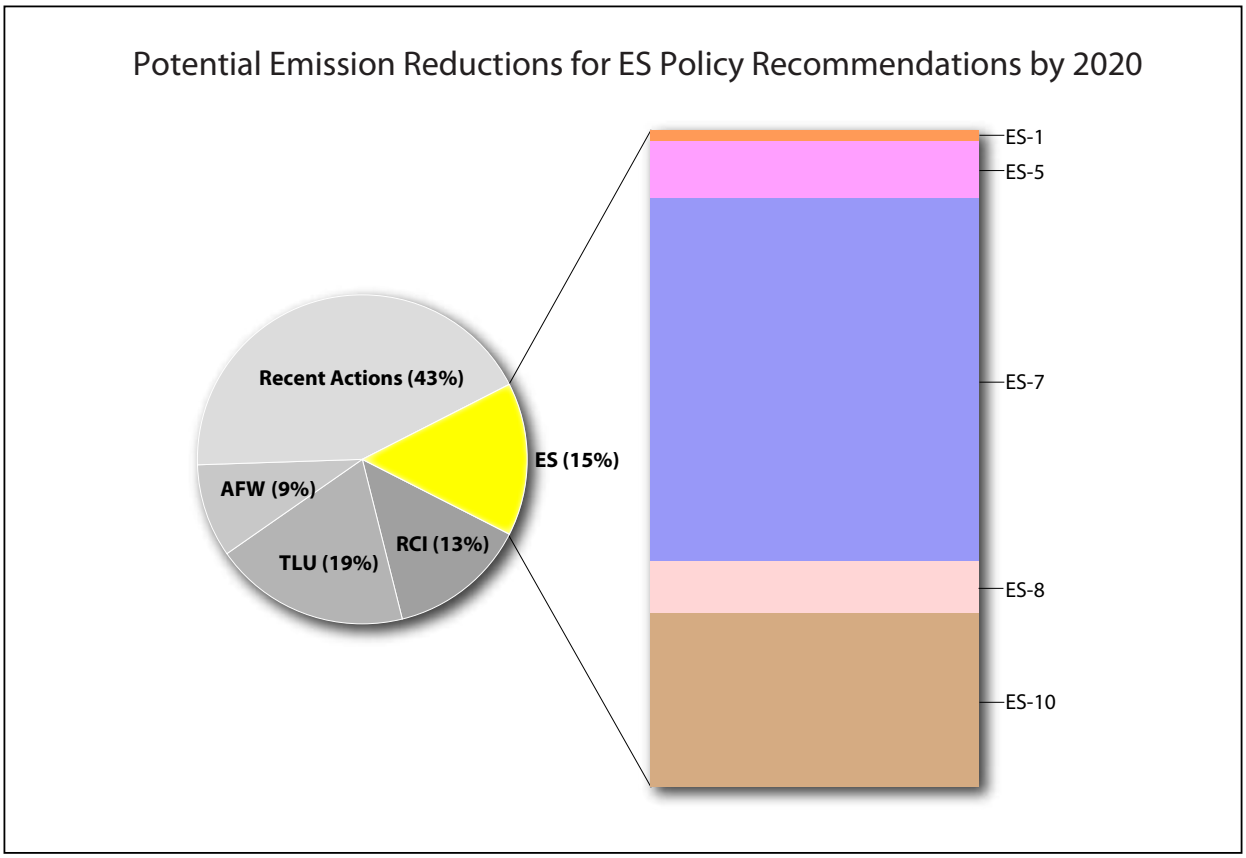
A generation performance standard (GPS) is a mandate that requires Load Serving Entities (LSEs) to acquire electricity on an average portfolio basis, with the portfolio meeting a per-unit GHG emission rate below a specified standard. This policy option would promote the purchase of energy and capacity from low-carbon or renewable technologies. This policy is complemented by ES-8, "Efficiency Improvements and Repowering Existing Plants", which is directed at reducing GHG emissions from existing plants.

The GPS portfolio would require that 100 per cent of an LSE's energy portfolio emit an average of no more than a specified number of pounds of CO_2 per megawatt-hour. The GPS would be modeled after Maryland's existing RPS with the exception that the GPS may rely on a more diverse mix of replacements for coal-fired electricity than the RPS. This would encourage renewable energy sources and would also fit well with any State resource planning process for new generation. Any LSE selling energy to retail consumers in Maryland would be required to meet the GPS. GPS is best done at the federal level, but until this occurs, a Maryland GPS is a good way to control leakage and imports of high-carbon intensity electricity from out-of-state. Implementation would be through MDE in coordination with the PSC and MEA. These agencies are already implementing programs that are consistent with the goals of this policy option.

Policy Goal:
Enact a GPS of 1,125 pounds of GHGs per MWh by 2013.

Implementation:
MDE, working with MEA and the PSC, will be setting up a stakeholder process in 2008. A more detailed implementation plan will be drafted for the Commission to consider in its Spring 2009 meeting. New legislation will be needed to implement this policy. Therefore, the Commission will be considering whether to push forward with a legislative proposal at its Fall meeting. The benefits from this strategy are greatly reduced if effective federal legislation is passed.

Option No.	Policy Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008 - 2020 (Million $)	Cost Effectiveness ($/$tCO_2e$)
		2012	2020	Total 2008 - 2020		
ES -1	Promotion of Renewable Energy	0.2	0.5	3.3	89	27
ES-2	Technology-Foccused Initiatives	U	U	U	U	U
ES-3	GHG cap-and-trade					
	ES-3a Account for all reductions under an auction-based cap-and-trade					
	ES-3b Account for only capped level of reduction	U	6.95	U	-253	-36.4
ES-4	CCSR incentives	For Information Only - Further Study Needed				
ES-5	Clean Distributed Generation					
	ES-5a Distributed Generation	0.3	1.1	6.7	250	37.5
	ES-5b Combined Heat and Power	0.3	1	6.3	90	14.4
ES-6	Integrated Resource Planning	U	U	U	U	U
ES-7	Renewable Portfolio Standard	5.2	13.8	100.7	2,589	25.7
ES-8	Efficiency Improvements and Repowering Existing Plants					
	ES-8a Biomass component	1.2	2	17.9	389	21.8
	ES-8b Repowering component	For Information Only - Further Study Needed				
ES-9	Carbon tax	For Information Only - Further Study Needed				
ES-10	Generation Performance Standards	4.9	6.6	62.6	2,659	42.4
	Sector Total After Adjusting for Overlaps	*11.9*	*25*	*194.2*	*5,933*	*30.6*
	Reductions from Recent Actions	*4.8*	*17.2*	*88*	*2,076*	*23.6*
	Sector Total Plus Recent Actions	*16.7*	*44.2*	*282*	*8,009*	*28.4*



The pie chart above shows the potential emission reduction contribution to Maryland's goals from the ES policies. The percentages are based on the total potential emission reductions from recent actions and all of the Commission's quantified policy options. Each ES policy option's potential emissions reduction is graphically displayed on the right in the bar chart.

Montgomery Park
Photo by Mary Jane Rutkowski

Back River, Baltimore
Jane Thomas, IAN Image Library (www.ian.umces/edu/imagelibrary/)

Key Challenges and Opportunities

The principal means to reduce emissions in the Residential, Commercial and Industrial (RCI) sector include improving building and operations energy efficiency, substituting electricity and direct fuel use with lower-emission energy resources (such as solar water heating and geothermal heat pumps), and various strategies to decrease the emissions associated with electricity production (see Report of the Energy Supply TWG, above). Although Maryland has pursued energy efficiency in the past, these were not sustained or were unevenly pursued. This lack of sustained commitment left many highly cost-effective opportunities on the table, such as measures to improve the efficiency of buildings, appliances, and industrial practices. These opportunities can help the State achieve substantial progress in meeting its GHG emissions reduction goals.

Maryland has already taken important steps in this direction. Three recently passed pieces of legislation are particularly relevant for the RCI sector: HB 374, SB 268, and SB 208. The ***EmPOWER Maryland*** goal, set by Governor O'Malley in July 2007 and codified in HB 374 in April 2008, establishes a statewide goal to reduce by 2015 per capita electricity consumption and per capita peak electricity demand by 15 per cent. SB 268 established the Maryland Strategic Energy Investment Program and Fund, which enables RGGI auction proceeds to be used to decrease energy demand and increase clean energy supply. SB 208, "High Performance Buildings Act", requires new or renovated State buildings and new schools to be high performance, energy efficient buildings. The Green Building Task Force was created in 2006 by the Maryland General Assembly (via House Bill 1211). In its December 2007 final report (see <http://www.mdp.state.md.us/pdf/Final_Report_GBTF.pdf>), the Task Force provided recommendations to the Governor and the General Assembly for facilitating green building efforts within the residential and commercial building sectors.

There are significant opportunities to reduce GHG emissions growth attributable to the RCI sectors in Maryland. An overview and summary of policy options follows.

Overview of Policy Recommendations and Estimated Impacts

The Commission recommends a suite of eight policies for the RCI sector that offers the potential for significant and cost-effective GHG emission reductions in Maryland. The State is already implementing programs that are consistent with the goals of this policy option. Recent legislation, described in more detail in Chapter 1, will also be useful in implementing this effort.
If implemented early and aggressively, these policies could collectively reduce emissions below the reference case or "business as usual" scenario, at a net savings to the State and its citizens, as follows: **

- Over 11 $MMtCO_2e$ per year by 2020 (annual reductions); and
- Cumulative savings of roughly 54 $MMtCO_2e$ from 2008 through 2020 (cumulative reductions).
- Net cost savings of over $5.4 billion through the year 2020 on a net present value (NPV) basis. The weighted average cost of these policies is a net savings of $48 per $MMtCO_2e$.

** RCI-8 is included in these calculations, which were prepared prior to the Commission removing it as a recommended option. The numbers will require minor adjustment to reflect its removal.

All of the recommended policies focus on demand side management (DSM), but they are distinguished by their different approaches, their focus on varied types of energy use, or the specific energy users they target. RCI-2 implements general DSM programs on a widespread basis, and RCI-10 engages utilities in planning and market-based procurement of efficiency services for electricity and natural gas. Together, they are the chief tools for implementing the ***EmPOWER Maryland*** program. RCI-4 targets State and local government buildings, and RCI-3 focuses on small businesses and residences, particularly low-income energy users, which are often difficult to reach, or have issues like split incentives for rental properties that have frustrated previous efforts to reduce energy demand in this sector. RCI-1 covers the residential and commercial sectors but focuses on incorporating energy efficiency into the design of new and renovated buildings. RCI-7 and RCI-11 target specific end-uses of electricity and

natural gas – appliances and lighting – but cover all sectors. RCI-5 (jointly considered with the Cross-Cutting Issues TWG) seeks to affect choices by students, their families, and consumers in general.

Policies RCI-2, 3, 5, 10, and 11 are all structured to provide incentives for energy efficiency or other measures to reduce GHG emissions. RCI-1 (building codes), RCI-4 (energy efficiency of government buildings and operations), and RCI-7 (appliance standards) involve implementation of mandatory measures to reduce energy consumption.

There is overlap in the expected emissions reductions and costs or cost savings among several policies. Some (such as RCI-2) are defined by their usage reduction goals, while others are defined by addressing a specific type of energy use. Overlaps are expected to occur where policies have the same target audience and implement the same measures. RCI-3, for example, involves the creation of revolving low-interest loan fund(s) for small-scale residential and commercial energy efficiency projects and implementation of individual measures that are usually included within more comprehensive energy efficiency programs such as RCI-2 and RCI-10 (the ***EmPOWER Maryland*** tools). DSM programs addressing the residential and commercial sectors in RCI-2 and RCI-10 would include appliance and lighting upgrade programs, which would overlap with the results for RCI-7 and RCI-11. By design, RCI-2 and RCI-10 are mutually exclusive. RCI-2 focuses on DSM programs funded by RGGI revenues and implemented by MEA, while RCI-10 DSM measures would be implemented by utilities. Finally, RCI-1 (focused on new construction within the residential and commercial sectors) and RCI-4 (focused on government and school buildings) partially overlap with RCI-2 and RCI-10, which are designed to drive a comprehensive response across all sectors.

The RCI policy suite impacts the efficacy of some policies in other sectors as well. By decreasing overall electricity demand, RCI policies would reduce the impact of a Renewable Portfolio Standard (ES-7), which is designed to generate a certain per centage of electricity from renewable sources. Similarly, the reduction in demand would decrease the impact of efficiency improvement in power plants (ES-8a and ES-10), as these plants would be producing less power. Overlaps also occur between AFW and RCI sectors. Trees that are strategically placed to reduce building heating (by providing wind breaks during the winter) and cooling loads (by shading buildings during the summer) in AFW-2 would reduce the operation of high-efficiency HVAC systems or HVAC system components recommended under RCI-1, RCI-2, RCI-4, RCI-7, and RCI-10.

The policy recommendations described briefly below and in more detail in Appendix D-3, result not only in significant emissions and costs savings, but offer a host of additional benefits as well. These benefits include: reduction in spending on energy by homeowners and businesses; reduced risk of power shortages, energy price increases, and price volatility; improved public health as a result of reduced pollutant emissions by power plants; reducing dependence on imported fuel sources; and green collar employment expansion and economic development. In addition, several of these policies have water conservation benefits, not only through reduced cooling demands for power plant operation, but also by reducing water consumption by the end users (e.g., RCI-1 and RCI-7). As part of the effort to implement the Policy Options within the Residential, Commercial, and Industrial Strategies section, State agencies also will refer to the Final Report of the Green Building Task Force (see <http://www.mdp.state.md.us/pdf/Final_Report_GBTF.pdf>) for guidance.

REDUCING GREENHOUSE GAS EMISSIONS WITH SOLAR

Maryland commits to reducing greenhouse gas emissions by increasing incentives to replace traditional electricity generation with solar power. Maryland increased its grant to $2,500 per kilowatt installed for up to 4 kilowatts. These small systems are ideal for homes and small businesses. In addition, solar equipment is exempt from sales and property tax. Combined with the solar requirement in the Renewable Energy Portfolio Standard, Maryland now has a comprehensive set of incentives that promote solar in all settings, from homes to large commercial buildings.

Improved Building and Trade Codes & Beyond – Code Building Design and Construction in the Private Sector (RCI-1)

This policy option would reduce energy consumption in new or renovated residential and commercial buildings through improvement and enforcement of building and trade codes, updated periodically to reflect state-of-the-art practices. Builders and owners would also be encouraged to go beyond code standards and improve building performance through construction design and, thereafter, through maintenance practices, by using Leadership in Energy and Environmental Design (LEED) Certification for New and Existing Buildings or other similar protocols.

The Maryland Department of Housing and Community Development (DHCD), working in partnership with MEA, MDE, the PSC, MPD, DBED, Maryland Departments of General Services (DGS) and Labor, Licensing, and Regulation (DLLR), the Maryland Green Building Council, local government building code agencies, and builders and trade associations, would:

- Periodically review and update building, trade and energy codes to improve energy efficiency in new construction and renovations.
- Develop a training and certification program and technical assistance for code officials and contractors on energy efficiency and related Green Building and trade codes.
- Formulate a system to ensure enforcement of a uniform building permit program.
- Identify and encourage owners and contractors to go beyond code standards and construct and maintain buildings using high performance building practices such as LEED or similar standards through tax rebates and other incentive programs.
- Establish a state-wide threshold for mandatory compliance with the adopted building/energy codes.
- Provide incentives such as permitting and fee advantages, tax credits, and "green mortgages" to encourage retrofit of existing residential and commercial buildings and energy efficient new home construction.
- Seek assistance from utility companies and regional energy efficiency partners for conducting energy audits and incorporating other energy efficiency practices into building design, renovation, and maintenance.

Many of the agencies listed above are already implementing programs that are consistent with the goals of this policy option.

Policy Goal:

Reduce energy consumption per square foot of floor space by 15 per cent by 2010, and 50 per cent by 2020.

Implementation:

For those elements of this policy that cannot be implemented immediately, DHCD, working with MEA and other State agencies, will be developing a more detailed implementation plan for the Commission to consider in its Spring 2009 meeting. DHCD will continue its ongoing efforts relating to improving the energy efficiency of buildings through its Codes Administration unit and Single Family Housing and Multifamily Housing Programs, partnerships with other State agencies, and active participation on the Green Building Council. In addition , DHCD will assemble a panel of building code experts, including the International Code Council experts, State and local building code authorities and governments, State and local planning agencies and boards, architects and engineers, building materials manufacturers, trade associations, federal government agencies, State agencies, and other stakeholders.

1-2 yrs: The panel will submit its final report to the General Assembly no later than October 1, 2010, with recommendations for designing and implementing enhanced building codes.

2-3 yrs: Adopted recommendations (which may include new legislation, materials, guidelines, code documents, and technical assistance units) will be in place and implementation will have begun or been completed.

3-5 yrs: Full implementation of all recommendations is expected along with a process to ensure ongoing updates of enhanced building codes, including integration into the existing statewide process for code adoption in Maryland.

Demand-Side Management (DSM)/Energy Efficiency Programs, Funds, or Goals for Electricity and Natural Gas (Including Expansion of Existing Programs and Peak Load Reduction) (RCI-2)

This policy option focuses on increasing investment in electricity and natural gas demand-side management (DSM) strategies through programs run by the MEA, energy service companies (ESCOs), utilities, or others, in order to meet the goals of overall reduction in energy consumption and peak load demands. It is intended to achieve the incremental difference between the energy efficiency gains from RCI-10, "Energy Efficiency Resource Standard" (EERS), and statewide application of the Governor's EmPOWER Maryland goals (15 per cent reduction in per capita electricity and natural gas use and peak load demand by 2015). The "Regional Greenhouse Gas Initiative – Maryland Strategic Energy Investment Program" legislation (SB268/HB 368) in the 2008 General Assembly Session accomplished an important part of this policy by creating a public benefit fund using RGGI auction revenues.

MEA and its State partner agencies, MDE, DHCD, the PSC, MDP, DBED, DGS, DLLR, and the Maryland Green Building Council, would adopt and revise programs and planning processes to:

- Implement a public benefit fund using revenues from RGGI allowance auctions with the goal of increasing the funding, scope, coverage and marketing of energy efficiency programs.
- Develop an administrative framework for coordination and oversight of energy efficiency programs, including a procurement process for energy service companies and other providers.
- Establish ongoing, high-level statewide resource planning in coordination with the PSC.
- Scale-up training and education in energy efficiency measures
- Expand energy audit programs and establish recycling/scrapping programs for old appliances.
- Use tax policy or other incentives to facilitate implementation of energy efficiency measures.
- Review efficiency best practices for specific industries and conduct training on these practices.

Much of this policy option is now required as part of the 2008 legislation referenced above and described in detail in Chapter 7.

Policy Goals:

Together with RCI-10, achieve a 15 per cent reduction in per capita electricity and natural gas use by 2015, starting in 2008.

Capture 100 per cent of achievable cost-effective energy efficiency by 2025, starting in 2008.

Implementation:

For those elements of this policy that cannot be implemented immediately, MEA, working with the PSC and other State agencies, will be developing a more detailed implementation plan for the Commission to consider in its Spring 2009 meeting. The implementation plan will build from the recently enacted Strategic Energy Investment Fund legislation and the full recommendation in Appendix D-3, but may also include additional analysis and appropriate modification by the State implementation team.

Low-Cost Loans for Energy Efficiency (RCI-3)

This policy option would create a revolving loan fund to enable residents and businesses to purchase energy efficient equipment such as appliances, furnaces, boilers, hot water heater upgrades, and to support structural efficiency upgrades. This policy is intended to complement RCI-2 (Demand Side Management) and RCI-10 (Energy Efficiency Resource Standard), the chief tools for implementing the EmPOWER Maryland program.

The MEA, in cooperation with private sector lending firms, would oversee a revolving loan fund. Fund revenues would come from auctioned RGGI allowances and private sector capital. MEA would establish criteria for eligibility to ensure benefits reach low-income homes and would delineate loan purposes and repayment terms. A Pay-As-You-Save program or other mechanism may be required to demonstrate energy efficiency has been achieved. MEA would also coordinate with other State agencies and the real estate industry to establish guidelines and regulations to help achieve energy efficiency in rental properties in Maryland.

Policy Goals:

Establish loan funds in sufficient amounts to begin making loans by 2009 and continue indefinitely.

Achieve government funding at the minimum level of $15 million ($10 million for the residential sector and $5 million for the commercial sector) and leverage with private capital at the minimum level of $60 million ($40 million for the residential sector and $20 million for the commercial sector).

Implementation:

MEA is already implementing programs that are consistent with the goals of this policy option. It currently administers the Jane E. Lawton Loan Program, passed in the 2008 Session of the General Assembly (SB 885/HB 1301), and the State Agency Loan Program. These programs target State buildings, other government buildings, and small businesses for low-interest energy efficiency loans. Contingent on RGGI revenue and approval by the General Assembly, additional loan programs targeting the residential sector could begin in Spring 2009.

Government Lead-by-Example: Improve Design, Construction, Appliances, and Lighting in New and Existing State and Local Buildings, Facilities and Operations (RCI-4)

Under this policy option, State and local governments would adopt practices beyond established building codes, such as LEED-NC for construction and LEED-EB for operation, to obtain high performance and energy efficient buildings.

Policy Design:

- DGS and other capital improvement authorities within the State system would construct new buildings and renovate existing ones to meet the LEED-NC silver standard. This would conform with the High Performance Buildings Act of 2008 (SB 208) which mandates LEED silver rating in new and renovated State buildings.
- DGS would analyze options to enhance the High Performance Buildings Act of 2008 to:
  - *Require new construction and major renovations for which permits are requested between 2013 and 2020 to meet LEED Platinum ratings or a comparable standard.*
  - *Require buildings undergoing major renovations for which permits are requested between 2009 and 2013 to meet LEED Gold ratings or a comparable standard.*
- All State agencies led by MEA would:
  - *Commission State buildings to ensure building systems are installed and are performing as designed to meet high performance criteria.*
  - *Collect data on energy use in government buildings and maintain it in a database to measure improvements over time.*
  - *Benchmark State buildings to compare efficiency among similar buildings to set priorities for improvement.*
  - *As soon as possible provide meter, energy accounting systems, and trained staff to measure and verify energy consumption and account for improvements and implementation of energy efficiency programs.*
  - *Require architects and engineers to design buildings to meet a climate-neutral requirement and ensure that buildings will meet sustainable building guidelines.*

Policy Goal:
Reduce per-unit-floor-area consumption of carbon-based electricity by 15 per cent by 2010, 50 per cent by 2020 and become 100 per cent carbon neutral by 2030 within all government owned and leased buildings.

Implementation:
Many State agencies are already implementing programs that are consistent with the goals of this policy option. For those elements of this policy that cannot be implemented immediately, MDE, with support from DGS, MEA, MDP, DHCD and other State agencies, will be developing a more detailed implementation plan for the Commission to consider in its Spring 2009 meeting. This policy will require regulation changes to ensure that all government buildings meet improved efficiency standards. MDE will likely need to chair a team to include the supporting agencies, among others, that will need to develop a formal implementation strategy. It is likely that this measure will need at least two years for full implementation.

More Stringent Appliance/Equipment Efficiency Standards (State-level, or Advocate for Regional or Federal-level Standards) (RCI-7)

For appliances which do not have energy efficiency levels established by federal or Maryland laws, this policy option would call for the General Assembly to adopt legislation establishing energy efficiency standards recommended by the Appliance Standard Awareness Program.

MEA, in cooperation with the PSC and MDE, would:

- Analyze options, including State legislation, to implement this option.
- Periodically review appliance ratings by the Appliance Standard Awareness Program and seek legislation updating the standards accordingly for appliances not covered by existing laws.
- Continue to work with federal authorities and energy officials from other states to advocate for a national energy efficiency appliance standard.
- Continue to work with consumer groups to promote purchases of energy efficient appliances.

The agencies listed above are already implementing programs that are consistent with the goals of this policy option. The Energy Independence and Security Act of 2007 (EISA), enacted in 2007 by Congress, establishes new efficiency standards for certain residential and commercial appliances.

Policy Goal:
Adopt Maryland legislation in 2009 to establish energy efficiency standards for appliances which are not covered by federal laws or existing State legislation. Efficiency ratings would conform to recommendations by the Appliance Standard Awareness Program.

Implementation:
This policy option will require action by the General Assembly. Implementing regulations will take 6-9 months to develop once authority is granted to MEA.

Energy Efficiency Resource Standard (EERS) (RCI-10)

An EERS is a standard established by law which requires utilities to generate, transmit and use electricity and natural gas more efficiently. It includes energy savings programs for consumers, and may also include efficiency improvements in the distribution grid, combined heat and power (CHP) systems and other clean distributed generation systems such as solar collectors and windmills. This policy option is intended to complement RCI-2, (Demand Side Management), to achieve the EmPOWER Maryland goal of a statewide 15 per cent reduction in per capita electricity use and peak load demand by 2015. The legislation recommended in this policy has been accomplished by the passage of the EmPOWER Maryland Energy Efficiency Act of 2008 (HB 374), which codified Governor Martin O'Malley's EmPOWER Maryland goal.

This policy requires setting a mandatory, measurable energy efficiency standard for utilities to meet by a certain date, with oversight by MEA, the PSC and MDE. Design features include the following:

- Utilities submit plans for efficiency programs to the PSC for approval.
- The plan must include a diverse portfolio of programs, including home energy assessments, energy efficiency rebates, commercial and industrial programs, training for contractors and facility managers, and demand response programs.
- PSC evaluates the plan based on cost-effectiveness, ability to capture opportunities for energy efficiency that would otherwise be lost, and fair distribution of funds and programs geographically and among sectors.
- After PSC approves plans, utilities issue requests for proposals (RFPs) for service companies to perform the work identified in the portfolio.

Policy Goals:

Together with RCI-2, require utilities to achieve EmPOWER Maryland energy savings goal of 15 per cent of electricity per capita demand by 2015.

Mandate electricity and natural gas reduction targets for utilities of 0.5 per cent of demand in 2009, ramping up to 2 per cent in 2014-2015.

Implementation:

With the enactment of the ***EmPOWER Maryland*** legislation, the legislative recommendation in this policy option has been largely accomplished. However, since the legislation only covers electricity, there is an opportunity to implement a similar policy for natural gas. This will require action by the General Assembly.

Promotion and Incentives for Energy Efficiency Lighting (RCI-11)

The Energy Independence and Security Act of 2007 (EISA) establishes new federal minimum efficiency standards for common light bulbs, requiring them to use about 20-30 per cent less energy than present incandescent bulbs by 2012-2014. This policy option would support the new federal standards by phasing out the sale or use of energy-inefficient incandescent light bulbs in Maryland, through education and incentives for voluntary replacements of inefficient incandescent light bulbs with energy efficient compact fluorescent light (CFL) bulbs or other energy efficient light bulbs.

Policy Design:

- MEA would design and implement a public awareness campaign to encourage residential customers to purchase CFL or other energy efficient bulbs such as light emitting diodes (LEDs) instead of incandescent light bulbs.
- MEA would explore incentive programs to further encourage the transition from incandescent bulbs to CFLs.
- MDE would explore current disposal problems associated with CFLs, such as minute mercury content within the bulbs, and ensure that appropriate disposal/recycling facilities are available to protect the environment from contamination.

MEA and MDE are already implementing programs that are consistent with the goals of this policy option.

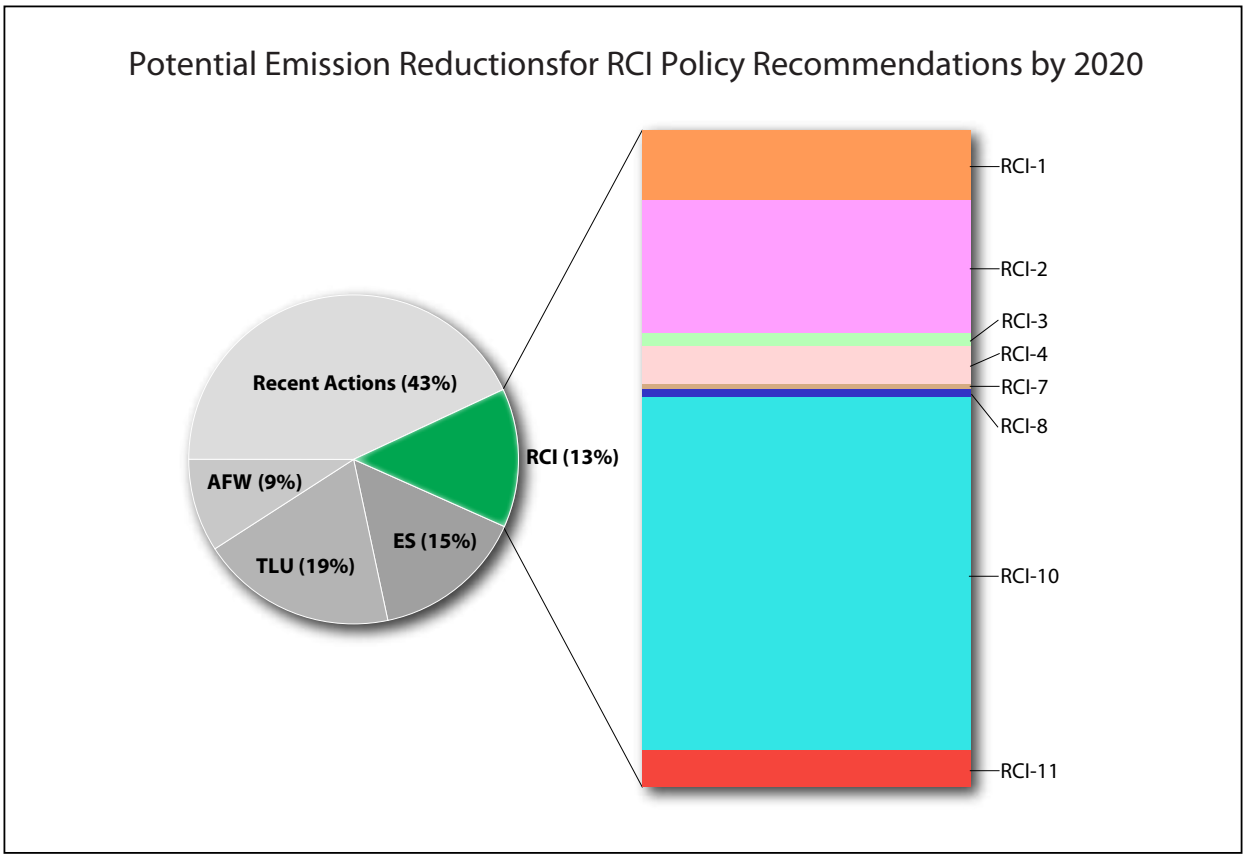
Policy Goal:

By 2014, have screw-in compact fluorescent bulbs make up 95 per cent of residential light bulb sales in Maryland.

Implementation:

Initial programs are underway by MEA. A full suite of programs will be developed over the summer of 2008. Contingent on RGGI funding and budget approval by the General Assembly, MEA will ramp up to full implementation by Spring 2009.

Option No.	Policy Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008 - 2020 (Million $)	Cost Effectiveness ($/$tCO_2e$)
		2012	2020	Total 2008 - 2020		
RCI -1	Improved Building and Trade Codes	0.6	2.4	13.8	-527	-38
RCI-2	Demand-Side-Management	1.8	4.5	35.0	-1,898	-54
RCI-3	Low-Cost Loans for Energy Efficiency	0.3	0.5	4.1	-187	-45
RCI-4	Improved Design, Construction, Appliances and Lighting	0.2	1.3	6.4	-337	-53
RCI-5	Energy Efficiency and Environmental Awareness	Jointly considered with the Cross-Cutting TWG, Policy CC-5				
RCI-7	More Stringent Appliance / Equipment Efficiency Standards	0.1	0.2	1.2	-63	-54
RCI-8	Rate Structures and Technologies	For Information Only - Further Study Needed				
		0.1	0.2	2.0	246	120
RCI-10	Energy Efficiency Resource Standard (EERS)	2.9	11.9	71.0	-3,670	-52
RCI-11	Promotion and Incentives for Energy Efficiency Lighting	0.1	1.1	7.7	-362	-47
	Sector Total After Adjusting for Overlaps	*101*	*11.2*	*54.1*	*-5,450*	*-48*
	Reductions from Recent Actions	*4.3*	*9.0*	*71.5*	*Not Quantified*	
	Sector Total Plus Recent Actions	*5.4*	*20.2*	*125.5*		



The pie chart above shows the potential emission reduction contribution to Maryland's goals from the RCI policies. The percentages are based on the total potential emission reductions from recent actions and all of the Commissions's quantified policy options. Each RCI policy option's potential emissions reduction is graphically displayed on the right in the bar chart.

Adaptive Land Use in Baltimore City
Source: U.S. Environmental Protection Agency

Bike to Work Day
Photo by Don Mauldin

Overview of GHG Emissions

GHG emissions from transportation are tied to carbon-based fuel consumption. In Maryland, the transportation sector accounted for approximately 32 per cent of gross GHG emissions in 2005 (about 32.5 million metric tons of carbon dioxide equivalent, or $MMtCO_2e$). From 1990 through 2005, transportation-related GHG emissions in Maryland increased by 8.3 $MMtCO_2e$, comprising 22 per cent of the State's net growth in gross GHG emissions during this period and reflecting a 2 per cent average annual rate increase in emissions due to transportation fuels.

As a result of Maryland's population and economic growth and a 40 per cent increase in total vehicle miles traveled (VMT), on-road gasoline vehicle use grew 36 per cent between 1990 and 2005. Meanwhile, on-road diesel vehicle use rose 91 per cent during that period, suggesting rapid growth in freight movement within or across the State. In 2005, on-road gasoline vehicles accounted for about 74 per cent of transportation GHG emissions, on-road diesel vehicles contributed 18 per cent, and aviation, marine vessels, and rail made up most of the remaining 8 per cent.

Under a business-as-usual (BAU) scenario, Maryland and the nation are projected to have rapid future growth in transportation GHG emissions. Historic growth for diesel fuel has been stronger than for gasoline. This trend is expected to continue for the 2005–2020 period, with gasoline and diesel fuel consumption projected to increase by 13 per cent and 58 per cent, respectively. Jet fuel, aviation gasoline and marine vessel fuel consumption could increase by almost 10 per cent between 2005 and 2020.

GHG Emission Reduction Goals

Recognizing the problem, the State has already taken a significant step to reduce GHG emissions from the transportation sector by enacting a program based on California's strict vehicle emissions standards (CA LEV). The Maryland Clean Cars Act was signed into law by Governor O'Malley in April of 2007 and regulations were adopted in November of 2007. These standards will become effective in Maryland for model year 2011 vehicles. Currently, the Clean Cars Program represents the only transportation program that directly regulates CO_2 emissions.
Numerous other State programs are currently serving to reduce GHG emissions. Such initiatives seek to reduce VMT and congestion through ridesharing and telecommuting; to increase transit usage by ensuring a "Guaranteed Ride Home" for transit users; to reduce gasoline consumption through biofuel use by State fleets; and to reduce congestion and improve system efficiencies through intelligent transportation systems like CHART (Coordinated Highways Action Response Team) and traffic signal synchronization, which cut idling and reduce emissions.

Maryland strives to maximize GHG emission reductions in a responsible manner, addressing, among other factors, the economic, social, health, and mobility needs of the State.

Reflecting the urgency and importance of reducing climate change, the Transportation and Land Use (TLU) TWG set aggressive goals and recommended a package of strategies to achieve these targets. Some of the policy options offered for consideration are new concepts and have not been widely tested; others will vary in their effectiveness depending on when and how they are implemented, the level of participation across the transportation sector, volatility in carbon-based fuel prices, future federal legislative and regulatory action, the pace of technological innovation and adoption of new fuels and vehicles, among other factors. For example, the targets sought by the TWG for VMT reduction in Maryland reach beyond what is largely considered to be viable by the national transportation policy community, i.e, reductions in the rate of VMT growth.

Maryland has set goals for reducing Maryland's GHG emissions in all sectors. The goals for total GHG emissions reductions are:

- 10 per cent below 2006 GHG emissions levels by 2012
- 15 per cent below 2006 GHG emissions levels by 2015
- 25-50 per cent below 2006 GHG emissions levels by 2020
- 90 per cent below 2006 GHG emissions by 2050

There is no intent or requirement to target emissions reductions for each sector commensurate with the current or projected contribution of the sector to total emissions. Effectiveness, cost, ease of implementation and timing may in fact be better considerations than respective contribution to emissions in the final implementation of solutions statewide. Nevertheless, the TWG did assign a corresponding

reduction to transportation for use as a benchmark against which to compare estimated reductions from the policy options.

Using the TWG methodology, if each sector is expected to contribute to the reduction efforts in proportion to its contribution, a 25-50 per cent reduction below 2006 GHG emissions levels would be expected from the transportation sector in 2020. If all of the TLU policy options were implemented, they are estimated to achieve a reduction of approximately 47 per cent from 2020 BAU emissions.

The recommended implementation strategy for the transportation sector is to start up a multi-member working group, led by the Maryland Department of Transportation, to analyze the relationship among the policies and identify steps for moving forward. The overall success in reducing GHG emissions from transportation will follow from the development of a comprehensive and achievable set of strategies with broad-based participation and support from businesses and individuals across the State.

Key Challenges and Opportunities

The solution to reducing transportation-related GHG emissions lies in restructuring our system to offer low GHG options, improving land use to better link existing and future development with transit and walkable communities, and educating individuals to make better transportation choices.

Transportation GHG emissions are generated from three areas: VMT, vehicle technologies, and the carbon intensity of the fuels used in our vehicles. Consumers have direct control over two of these areas: vehicles and VMT. The implementation of State and federal vehicle fuel efficiency standards provides potential for substantial reductions in GHG emissions. Early gains are made when consumers embrace new technologies such as hybrids and fuel cell vehicles. Other immediate benefits are realized when individuals reduce their VMT by carpooling, teleworking or taking transit, by living closer to their place of employment, and by combining their incidental travel and patronizing local businesses and services. Maryland has taken steps to increase transit options and encourage sustainable land use patterns to help citizens make better choices.

The next challenge will be to develop an implementation strategy that takes into account all of the relevant external, interstate and market influences and variables, to help us make real and meaningful progress toward the aspirational goals. The Commission, State and local government transportation and land use agencies, and others with influence on the transportation sector will need to work cooperatively to develop, implement and foster policies that will reduce mobile source GHG emissions and VMT growth, balancing a variety of needs for Maryland's citizens and businesses. Strategies will need to be frequently evaluated for their effect on GHG reduction as well as their impact on communities, on economic development, housing, and quality of life. The Commission recognizes that implementing statewide Smart Growth, transit-oriented development and VMT goals in the context of land use and zoning decisions made by local governments will remain a significant challenge.

Many of the transportation policy options will require further study in order to develop sound time frames and processes for future implementation. The TLU policy options illustrate programs and benefits designed to help achieve the statewide GHG emissions reduction targets. Implementation of the policy options presents a unique set of challenges including identifying key stakeholders, strategies, processes, and measurement and evaluation methods in order to meet the policy goals.

LESSONS LEARNED FROM THE CLEAN AIR ACT

Using the Transportation Conformity Process to Address Greenhouse Gases

Maryland has been successfully implementing the Transportation Conformity provisions of the Clean Air Act for over 20 years. In simple terms, the Transportation Conformity requirement insures that the State's transportation plans will not result in increased emissions that are inconsistent with the State's air quality plan. This process seems to be ideal for addressing greenhouse gases as well.

The cornerstone of the Transportation Conformity Program is the "Interagency Consultation" process, which brings together State and local air quality and transportation planners and public stakeholders in a partnership designed to insure that the State's transportation and air quality goals are met. The Interagency Consultation process has already built a strong technical approach for analyzing and modeling how emissions change as transportation plans are updated, as well as an effective system for stakeholder input.

Maryland will be investigating and potentially implementing a pilot program to blend greenhouse gas controls into the Transportation Conformity process. The Maryland Departments of the Environment and Transportation will be working with local governments in the Baltimore, Washington and Philadelphia areas to explore how this kind of a process could be started. The Metropolitan Washington Council of Governments Climate Change Steering Committee is also considering a similar effort.

Overview of Policy Recommendations and Estimated Impacts

The Commission originally recommended eleven transportation and land use strategies for implementation in the ***Interim Report*** submitted to the Governor and the General Assembly in January of 2008. Following further study, the Commission has combined TLU-7, "VMT Reductions" with TLU-2, "Land Use and Location Efficiency". The Commission has also consolidated TLU-1, Carbon Fuel Tax Fund" with TLU-9, " Incentives, Pricing and Resource Measures". TLU-4, "Low Greenhouse Gas Fuel Standard", needs further analysis and technological development before it can be implemented and has been removed from the recommended actions. There are now eight revised policy options recommended for implementation in the TLU sector.

The policy options represent a set of tools and associated targets designed to demonstrate how the transportation sector can significantly reduce GHG emissions while achieving other State transportation goals.

The Transportation and Land Use strategies are organized into three groups:

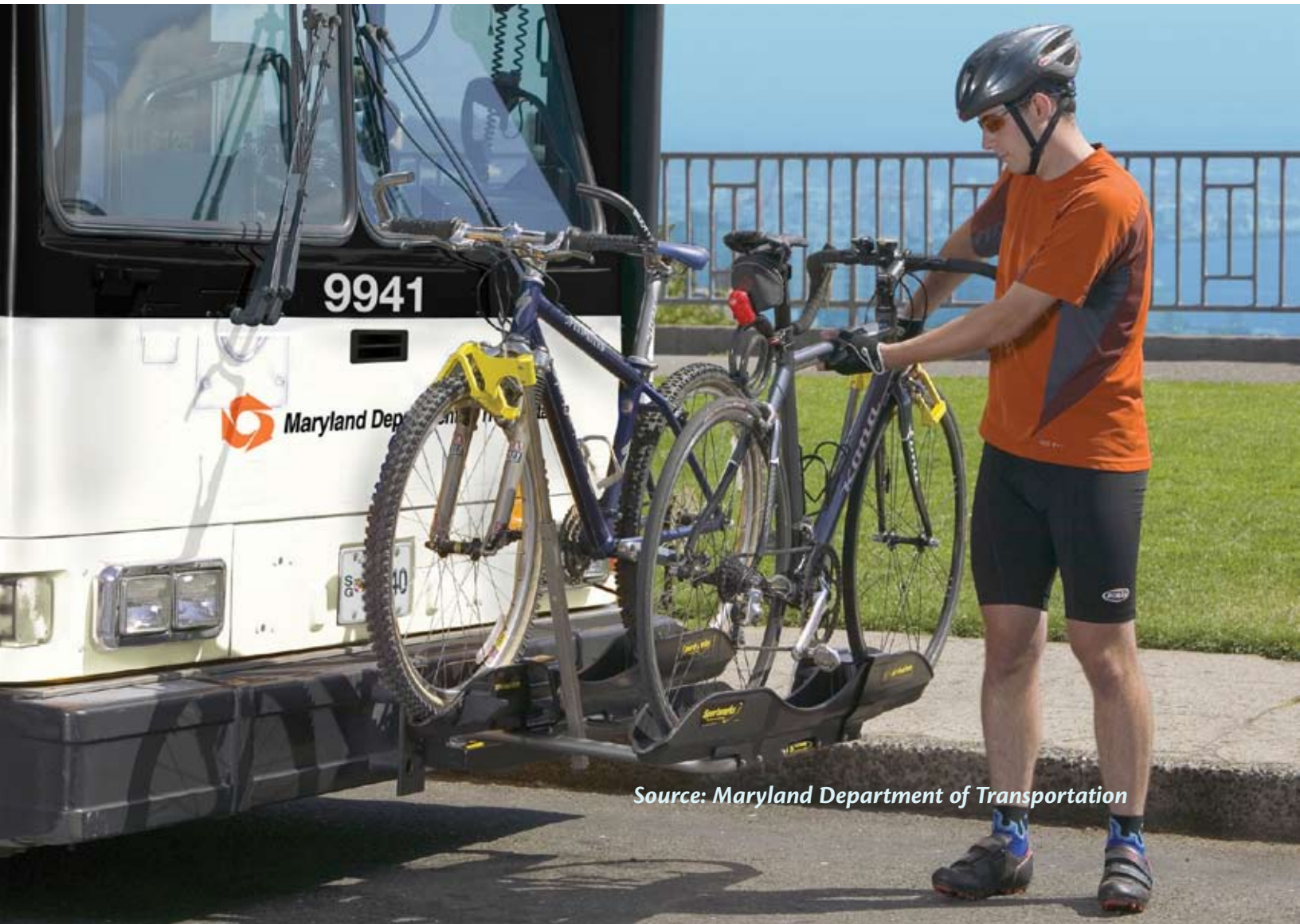
- TLU Area 1: Reduce the number of miles driven (VMT).
- TLU Area 2: Reduce carbon per unit of fuel (cleaner fuels).
- TLU Area 3: Reduce carbon per mile and/or per hour (improved vehicle efficiency).

Because the Clean Cars Act of 2007 was already in place, TLU Area 3 starts from a baseline which already includes the Clean Cars Program.

Executed together, and with consideration of the critical timing and implementation issues discussed in the key challenges and opportunities section, this suite of TLU policy recommendations has the potential to substantially reduce Maryland's transportation GHG emissions.

Commission Recommendations from Transportation

- The Commission recommends that the Governor convene an implementation working group of key stakeholders to include: MDOT (as the lead agency), MDE, MIA, MDP, MEA, DHCD, DBED, Metropolitan Planning Organizations (MPOs) and local governments. The working group would evaluate the TLU policy options and develop specific implementation strategies for selected policies.
- The State goal is to reduce GHG emissions. Transportation policies and strategies which are designed to support the State's overall goal should maintain the focus on GHG reduction through efforts to reduce VMT and fuel carbon intensity, and support vehicle technologies and efficiencies and other methods to achieve the overall GHG goals.
- Transportation-related policies should not be implemented to the extent that a detrimental impact on the future of Maryland's economy and the quality of life for its residents would be greater than the benefits of climate action. Socio-economic, environmental justice and competitiveness impacts must be considered.
- The linkage of the transportation policy options should be examined. Recommended strategies will likely work best when they are implemented in relation to other policies (for example, pricing or land use changes implemented together with transit expansion), and with consideration for appropriate order and phasing.
- Implementation strategies for each policy option should be reviewed with the objective of determining the level of responsibility for implementation, whether State, local, regional, multi-state or federal, or some combination thereof.



Source: Maryland Department of Transportation

TLU Area 1: Reduce VMT's Contribution to GHG Emissions

TLU Area 1 is a suite of policy options aimed at reducing vehicle miles traveled (VMT), as a means of reducing the GHG emissions associated with transportation. Aggressive implementation of all of the policy options in Area 1 would result in GHG reductions between 25 per cent and 50 per cent compared with current transportation sector emissions. Less aggressive implementation would reduce VMT by 20 per cent, contributing to meeting the lower end of the State's 25-50 per cent GHG reduction goal. Because of the interrelationships between policy options, the Commission recommends implementation of Area 1 policies as a package. The different elements of the package are often complementary and depend on mutual implementation for their success. For example, options that encourage alternatives to automobile use, such as TLU-6, "Pay-as-You-Drive Insurance", may be ineffective if alternatives such as mass transit (TLU-3) are not available. Within Area 1, the important variable is the strength of implementation of the individual policies. Taken together, these policies have substantial power to reduce GHGs.

MDOT will lead an implementation working group comprised of various stakeholders, including, MDE, Maryland Insurance Administration (MIA), MDP, the Office of Smart Growth and other State agencies, local government, and MPOs. The working group will evaluate the suite of policy options in Area 1 to assess the best approach and phasing for implementation. It will begin coordinating to achieve near-term implementation of the entire policy suite. Immediate action is especially important for options that require longer lead times, such as increasing transit capabilities (TLU-3), changes to land-use planning (TLU-2), and changes in the insurance industry (TLU-6).

Policy Goal:
Reduce the emissions associated with VMT by between 25 and 50 per cent of 2006 levels in 2020 by implementing the suite of policy options in TLU Area 1. Interim reduction goals are 10 per cent and 15 per cent reductions by 2012 and 2015, respectively.

Following are summaries of individual policy options within TLU Area 1: TLU-2, TLU-3, TLU-5, TLU-6, TLU-8, TLU-9 AND TLU-11.

Integrated Planning for Land Use and Location Efficiency (TLU-2)

This policy option calls for the implementation of integrated land use planning, transportation and development strategies that encourage people to drive fewer miles while ensuring a competitive economy, affordable housing opportunities, and community-based public schools and services for Maryland residents.

This policy could be implemented through legislation, integrated planning process reforms, investment incentives, pricing and other strategies to promote compact, transit-oriented development, community-based public schools and public services, and other growth management objectives. The Maryland Transit Administration – Transit-Oriented Development (HB 373/SB 204) legislation, enacted in the General Assembly's 2008 Session, furthers this policy by promoting integrated planning and incentives for transit-oriented development throughout the State. State and local governments should locate public schools, libraries, and government offices in areas that can be accessed by transit, walking or bicycling.

Policy Goal:
Return statewide VMT to 2000 per capita levels by 2020 and ensure continuing reductions in per capita VMT (excluding vehicles over 10,000 pounds engaged in commercial freight activity) of 30 per cent by 2035 and 50 per cent by 2050 from a 2020 baseline.

Transit (TLU-3)

This policy option seeks to shift passenger mode choice to transit and carpooling. This option is necessary to ensure that the mode-shift created by the other recommended policies away from single-occupant car use can be effectively accommodated.

State funds would be dedicated to implement this policy option. MDOT, MDE, MTA, SHA, MDP and MPOs would be directed to implement policies at the State and local levels that:

- Improve transit service and expand transit infrastructure (rail, bus) through increased funding, planning, and improved coordination of Rideshare, Transit, Park and Ride, Bike-Pedestrian, and the interstate transportation infrastructure.
- Focus new development and growth on transit-served corridors.
- Expand transit marketing and promotion.

Many of the agencies listed above are already implementing programs that are consistent with the goals of this policy option. The Maryland Transit Administration – Transit-Oriented Development (HB 373/SB 204) legislation, enacted in the General Assembly's 2008 Session, furthers this policy by promoting integrated planning and incentives for transit-oriented development throughout the State.

Policy Goal:
Double transit ridership statewide by 2020.

Intercity Travel: Aviation, Rail, Bus and Freight (TLU-5)

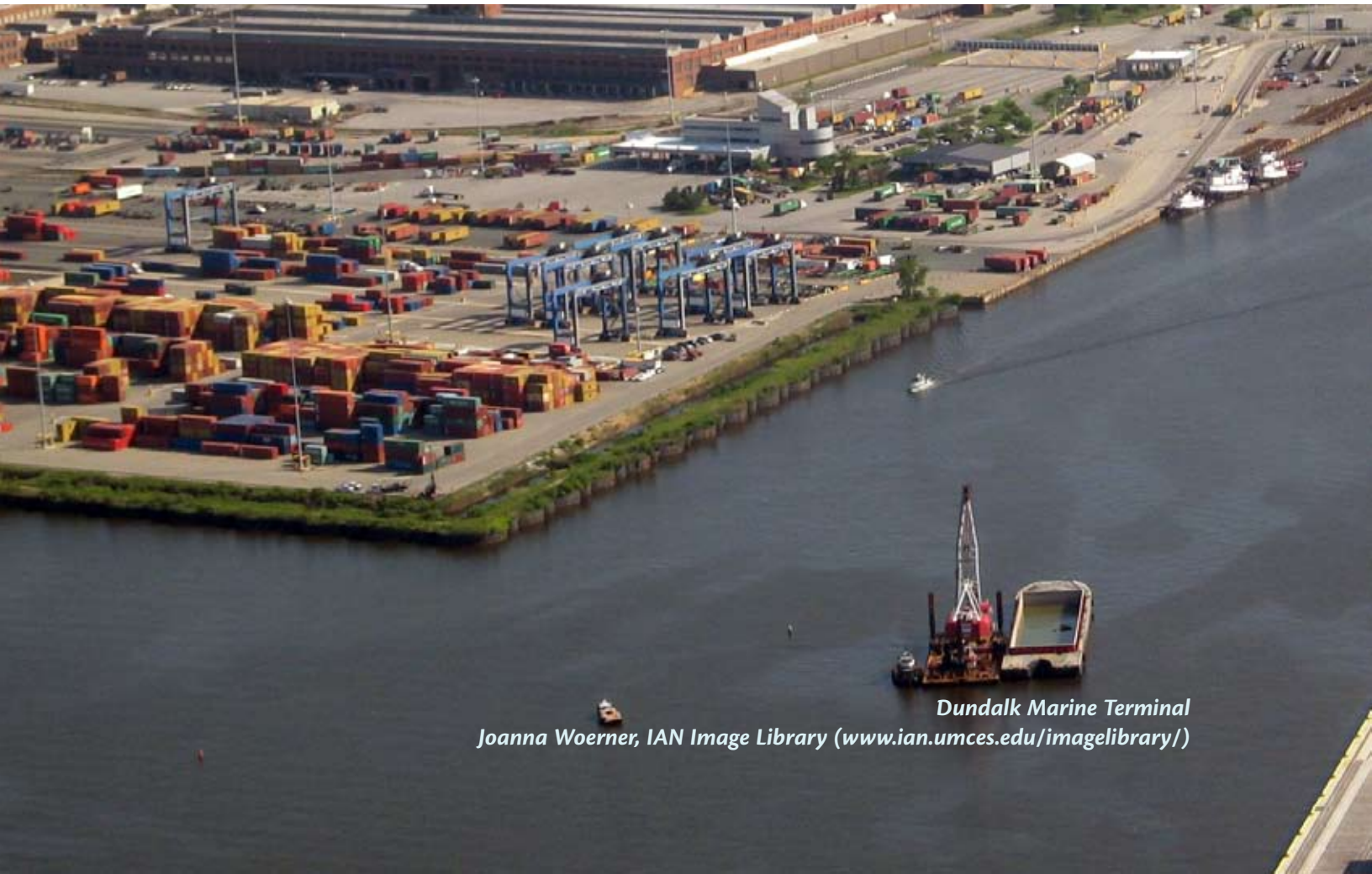
This policy option seeks to enhance connectivity of non-automobile transportation modes between cities through infrastructure and technology investments. An expansion of rail is especially encouraged to shift passenger trips away from short-range air travel and to increase rail freight transportation.

MDOT, MDE, MDP, Office of Smart Growth, SHA, and MPOs would work with passenger and freight rail providers to develop a plan with short-, medium-, and long-term projects directed toward achieving this policy's goals. The plan would incorporate existing plans developed by MDOT and proposals by outside groups such as the Mid-Atlantic Rail Operations (MAROPS) study and the National Association of Rail Passengers. Appropriate funding needs to be committed to insure rapid progress on the near-term goals.

Policy Goals:
Make passenger and freight rail more accessible, efficient, and available to help meet the 2020 GHG reduction goals by:

1. ***Building capacity of express rail and bus by expanding and/or improving current passenger and freight rail as needed.***
2. ***Marketing new and/or improved/expanded services.***
3. ***Shifting short- and mid-distance air travel to modern rail.***
4. ***Supporting auto-free tourism development in Maryland.***

Many of the agencies listed above are already implementing programs that are consistent with the goals of this policy option.



Dundalk Marine Terminal
Joanna Woerner, IAN Image Library (www.ian.umces.edu/imagelibrary/)

Pay-as-You-Drive Insurance (TLU-6)

This policy option would tie consumer insurance costs to actual motor vehicle travel use, so premiums would be directly related to hours or miles driven. This would provide price signals to consumers encouraging a reduction in miles driven, while allowing insurance companies to make premiums more actuarially accurate.

The Maryland Insurance Administration (MIA) would lead a work group including MDOT, MDE, the insurance industry, consumer advocacy groups and other stakeholders, to develop recommendations for implementation.

The Commission recommends that the MIA work with the insurance industry to explore pilot programs for implementation and marketing.

Policy Goal:
Make PAYD coverage available to all Maryland drivers as early as possible and push for adoption by Maryland drivers by the 2012 time frame.

Jane Thomas, IAN Image Library (www.ian.umces.edu/imagelibrary/)

Bike and Pedestrian Infrastructure (TLU-8)

This policy option seeks to improve, add, and promote sidewalks and bikeways to increase pedestrian and bicycle travel, thus reducing automobile use.

State agencies led by MDE, MDOT, SHA and MTA, working in partnership with local governments and private stakeholder interests, could develop the following infrastructure planning and designing tools/concepts. Some of the agencies listed above are already implementing programs that are consistent with the goals of this policy option.

- A state-wide "Complete Streets" policy, requiring new and renovated streets to be designed to accommodate all users. State transportation grants to localities could be made contingent on consistency with this policy.
- A rewrite of the Highway Design Manual, requiring all new engineering and construction to accommodate safe, convenient movement of bicycles and pedestrians along and, where possible, across all non-limited corridors.
- Installation of shower and bike storage facilities in new buildings, transit stations, and places of employment through a mix of incentives and, where possible, requirements.

State government could provide financial incentives to local governments such as:

- Grants to identify gaps in local bicycle and pedestrian infrastructures and to develop plans and policies to encourage biking and walking.
- Funding to install low-cost safety solutions that improve conditions for bicycling and walking.
- Grants and funding to improve pedestrian and bicycle infrastructure that provides more effective and safer pedestrian and bicycle access to and from public schools.
- New taxing authority and more flexibility with gas tax revenues to finance local improvements, including public education, safety, engineering, and revisions to local land use policies (requires legislative action).

Policy Goal:
Increase the bicycle and walking mode share of all trips in Maryland urbanized areas by 15 per cent from the current levels by 2020. The quantification of this policy's GHG emissions reduction potential and cost-effectiveness is included in TLU-3, "Transit".

Incentives, Pricing and Resource Measures (TLU-9)

Pricing and incentives encourage wise stewardship when consumers make transportation choices. Updating Maryland's current pricing and incentives and developing new incentives would reflect the true environmental and social costs of our transportation choices. This would amplify efforts to reduce GHG emissions through Smart Growth incentives and transit investments.

MDOT, MDE and MDP could implement a set of incentives, pricing, and resource measures, that together use (1) market signals to help Maryland agencies and citizens manage travel using better information about costs and benefits; and (2) a restructured transportation pricing system to fund investments in the system that accepts growth and maintains quality of life without increasing GHG emissions.

Commuter incentives and reforms in how pricing and incentives are considered in the State planning process should be developed. The Commission discussed a carbon fuel tax but decided not to move forward with a specific recommendation at this time. Some of the agencies listed above are already implementing programs that are consistent with the goals of this policy option.

Policy Goals:
By 2020, establish the following pricing measures throughout the State:
Appropriate GHG emission-based road user fees, with revenues used to fund transportation improvements and systems operations that advance State emission reduction goals.
Time-of-day emission-based cordon pricing in appropriate central areas as a local option to finance improved public transportation.
Incremental fees based on the carbon-intensity of fuels.
Parking pricing policies that ensure an effective use of urban street space for the highest and best uses – giving greater priority to low-carbon modes of transportation such as walking, cycling, and public transportation.

Evaluate the GHG Emissions from Major Projects (TLU-11)

This policy option would require State agencies to conduct an evaluation of the resulting transportation and land use GHG emissions related to State and local major capital projects such as major road construction or modifications, and State capital investments in new buildings including public school construction projects.

The Commission recommends that this requirement be established by executive order in 2008, with a directive to MDE, MDOT, the Office of Smart Growth, MDP, DGS and the Interagency Committee on School Construction to develop guidance for State agencies and other large capital project sponsors to use in evaluating the GHG impact of major capital projects. These agencies would seek federal guidance for models and best practices and to ensure compatibility with anticipated federal requirements. If needed, State legislation should be considered. Several of the agencies listed above are already implementing programs that are consistent with the goals of this policy option.

Policy Goals:

This is an enabling goal with no quantification of GHG emission reductions or cost-effectiveness. It would require State agencies and sponsors of other large capital projects, including public school construction projects, to:

- ***Understand the impacts of new capital projects on the Governor's GHG commitment by performing a GHG impacts analysis on all major capital projects.***
- ***Where appropriate, include the analysis of potential alternatives, such as transit-oriented land use and investment; adding toll lanes and express buses; adding high occupancy toll (HOT) lanes; adding hybrid transit-oriented HOT lanes; adding rail and express bus alternatives; and an analysis of alternative public building and public school sites including no-build, renovation/addition, and re-use of existing buildings for GHG emissions and reduction strategies.***

TLU Area 3: Reduce Carbon per Mile and/or per Hour

This policy option seeks to reduce GHG emissions from both on-road vehicles and off-road engine vehicles (including marine, rail and other off-road engine and vehicles such as construction equipment) through deploying technology designed to cut GHG emission rates per unit of travel activity. This option constitutes TLU Area 3, "Reduce Carbon Intensity per Mile and/or per Hour".

Transportation Technologies (TLU-10)

This policy would require State regulatory action, led by MDOT and MDE, and legislative action to promote transportation options with reduced emissions and to improve transportation system management policies to reduce emissions. Implementation mechanisms that relate to engines/vehicles would include the following:

- Provide incentives to increase purchases of fuel-efficient or low GHG vehicles.
- Increase the use of alternate fuels or low sulfur diesel to reduce GHG emissions.
- Reduce idling time (i.e. long-haul trucking, locomotives, and construction equipment).
- Initiate marketing and education campaigns to operators of off-road vehicles.
- Adopt "Green Port Strategy" for Baltimore area port facilities.
- Adopt State contracting and fleet standards for low GHG equipment procurements.

State-level transportation system management implementation mechanisms would include:

- Traffic management center(s)
- Traffic signal synchronization
- Managed lanes and dynamic roadway and full corridor pricing
- Smart parking systems
- Bus signal priority

Policy Goals:

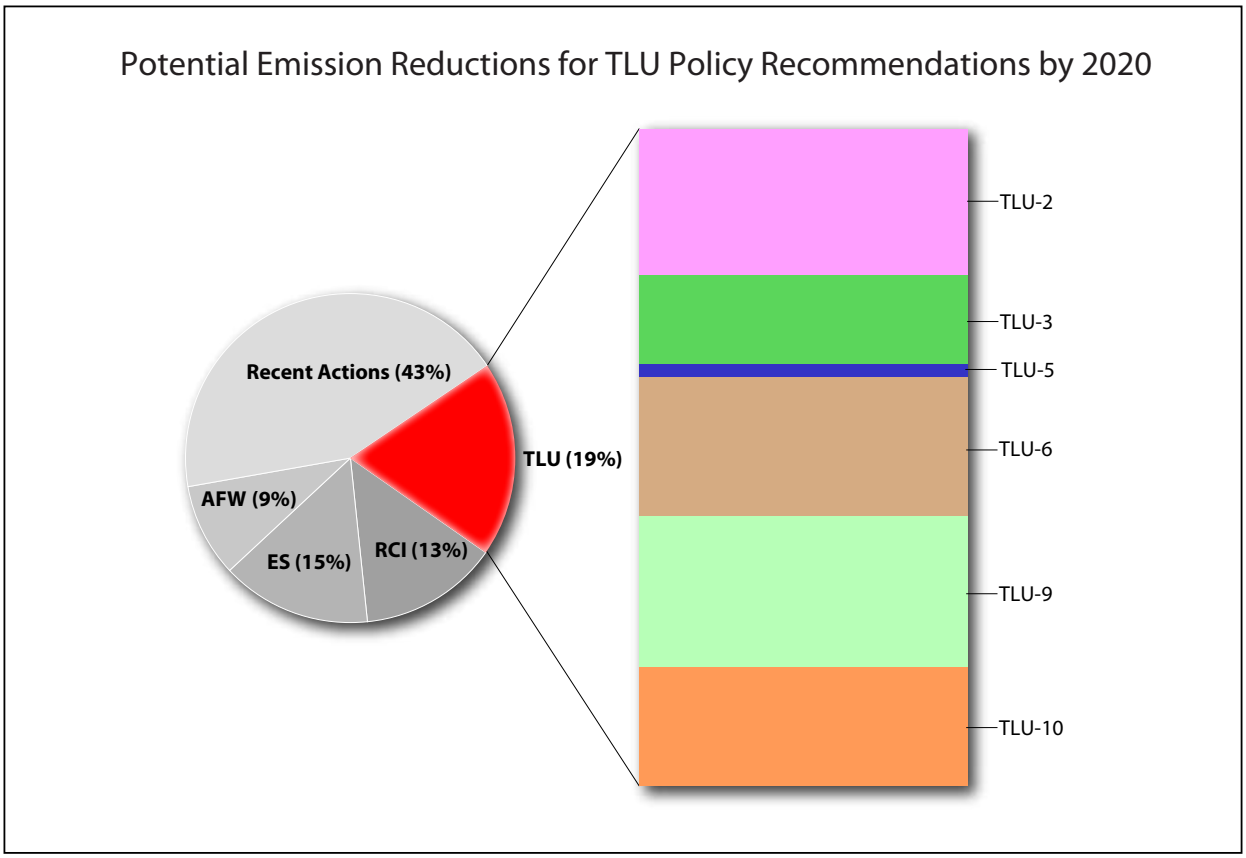
- ***Reduce emissions from on-road engines / vehicles by an additional 7.5 per cent by 2020 from the current baseline.***
- ***Reduce emissions from off-road transportation sources by 15 per cent by 2020.***

Implementation:

Several State agencies are already implementing programs that are consistent with the goals of this policy option. For other elements of this policy that cannot be implemented immediately, MDOT, working with MDE and other State agencies, will be developing a more detailed implementation plan for the Commission to consider in its Spring 2009 meeting. MDE is already implementing the Clean Cars Program. This program includes a technology-forcing provision called the Zero Emission Vehicle (ZEV) requirement.

Option No.	Policy Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008 - 2020 (Million $)	Cost Effectiveness ($/$tCO_2e$)
		2012	2020	Total 2008 - 2020		
TLU Area 1: Reduce VMT's contributions						
TLU-2	Land Use and Location Efficiency	1.1	4.6	27.6	Large Net Savings	
TLU-3	Transit	1.1	2.8	20.3	Net Savings	
TLU-5	Intercity Travel	0.2	0.3	2.4	TBD	
TLU-6	Pay-As-You-Drive Insurance	1	4.3	27.2	Net Savings	
TLU-8	Bike and Pedestrian Infrastructure	Included in TLU-3				
TLU-9	Incentives, Pricing and Resource Measures	2.7	4.7	37.4	Net Savings	
TLU-11	Evaluate GHG from Major Projects	NA	NA	NA	NA	NA
TLU Area 1: Total of Individual Options		6.1	16.7	114.9		
TLU Area 2: Reduce Carbon per Unit of Fuel - For Information Only - Further Study Needed						
TLU-4	Low GHG Fuel Standard (For Information Only)	0.7*	1.9*	12.8*	501.7*	30 - 90*
TLU Area 3: Reduce Carbon per Mile and or per Hour						
TLU-10	Transportation Technologies	0.40	0.44	4.17	610.3	-200 - +1,500
TLU Area 3: Total of Individual Options		0.40	0.44	4.17	610.3	-200 -1,500
	Sector Total Before Adjusting for Overlaps, Using Only the Area Totals	*7.2*	*19.04*	*131.87*		
	Reductions from Recent Actions	*0.08*	*0.11*	*1.13*		
	Sector Total Plus Recent Actions	*7.28*	*19.5*	*133.0*		

*The sector totals include the quantified reductions from TLU-4. These calculations were made prior to the Commission's decision to remove TLU-4 as a recommendation pending further analysis and technological innovation.



The pie chart above shows the potential emission reduction contribution to Maryland's goals from the TLU policies. The percentages are based on the total potential emission reductions from recent actions and all of the Commission's quantified policy options. Each TLU policy option's potential emissions reduction is graphically displayed on the right in the bar chart.

Carroll Park
Photo by Mary Jane Rutkowski

Overview

Some issues relating to climate policy cut across multiple or all sectors. The MWG addressed such issues explicitly in a separate TWG as "cross-cutting" issues rather than assigning them to any individual sector. Cross-cutting recommendations typically encourage, enable, or otherwise support emissions mitigation activities and/or other climate actions. The types of policies considered for this sector are not readily quantifiable in terms of GHG reductions and cost-effectiveness. Nonetheless, if successfully implemented, they would likely contribute to GHG emission reductions and enhance the economic benefits described for each of the other policy recommendations that were quantified.

The Cross-Cutting Issues (CC) TWG developed recommendations for each of ten policies that were then reviewed, revised, and ultimately adopted by the Commission. All of the CC policy options are focused on supporting the quantified policy options recommendations developed by the other TWGs.

The "Statewide Goals and Targets" recommendation (CC-3) is the over-arching Commission recommendation, and it is based on the goals established in the Commission's ***Interim Report***. These goals are designed to reduce Maryland's GHG emissions by 25 per cent to 50 per cent below 2006 levels by 2020 and 90 per cent below 2006 levels by 2050. The goals include interim reduction targets of 10 per cent reductions by 2012 and 15 per cent reductions by 2015, again using the 2006 baseline.

The quantified policy options in Commission's ***Climate Action Plan*** are projected to achieve these levels of reductions. The full text of each policy recommendation is in Appendices D-1 through D-5.

Key Challenges and Opportunities

One of the key challenges facing Maryland and other states is the lack of clear federal climate change goals, policies and programs. Recent enactment of the Federal Energy Independence and Security Act of 2007 (EISA) will provide some direction on auto mileage and energy efficiency requirements, but there are many other facets of the climate change problem that will need to wait a year or more for federal policy to become more apparent.

In the meantime, Maryland's participation in important regional ventures such as RGGI offers the State the clear opportunity to help develop regional and collaborative initiatives that will have broader applicability than just within Maryland borders.

The State has begun to implement a number of activities recognized in the Lead-by-Example policy option (CC-4). It will need to build on these efforts and take such initiatives to the next level. Additionally, the State will need to organize efforts across State agency boundaries in order to realize some of the reductions anticipated from State government.

Although in the aggregate, the policy recommendations in the ***Climate Action Plan*** are projected to result in a net cost savings to Maryland, implementation of some of the individual policies may entail additional costs to State government that the State will need to determine how to finance. Determining how to finance implementation of the ***Plan*** will remain an ongoing challenge.

A key opportunity for the State is in the arena of building more business and economic development opportunities and developing substantial numbers of additional green jobs associated with reducing GHG emissions. The ***Plan*** calls for the creation of a special task force to promote such efforts.

GHG Inventories and Forecasting (CC-1)

GHG emissions inventories and forecasts are essential for understanding the magnitude of all emission sources and sinks (both anthropogenic and natural), the relative contribution of various types of emission sources and sinks to total emissions, and the factors that affect trends over time. Inventories and forecasts inform State leaders and the public on statewide trends, opportunities for mitigating emissions or enhancing sinks, and verifying GHG reductions associated with implementation of Climate Action Plan initiatives.

This policy option would be implemented by MDE, with assistance from DNR, MEA, PSC, MDOT, and MDA. Its essential elements include a statewide GHG inventory and forecast and implementation of GHG reporting by emission sources and sinks as soon as possible, as allowed by current funding and supplemented with budget amendments.

Policy Goals:

Develop a consistent and complete inventory of emission sources and sinks

- ***Include a production-based inventory for all man-made and natural emissions generated within Maryland***
- ***Include a consumption-based inventory for all emissions associated with energy imported and consumed in Maryland***

Develop a protocol for preparing the statewide emission and sink inventory

Develop a consistent and complete forecast of future GHG emissions

- ***5 and 10 year increments extending at least 20 years in the future***
- ***Include projected growth***

Develop a standardized protocol for periodic forecasting of statewide GHG emissions

Refine the inventory for manufacturers - This is particularly important if an expanded cap-and-trade program is considered.

Implementation:

MDE has already begun to implement this recommendation. For those elements of this policy that cannot be implemented immediately, MDE, with assistance from DNR, MEA, PSC, MDOT and MDA, will be developing a more detailed implementation plan for the Commission to consider in its Spring 2009 meeting. This policy speaks to the necessity for Maryland to establish the necessary framework to implement an accurate and accountable climate change program. It is more of a measure that is required as part of an overarching climate change and GHG reduction plan and program. Provided there is adequate staffing, this policy could be implemented immediately and would be necessary to meet the overall goals of the Commission. This policy would require constant attention so the staffing needs would be permanent but necessary for the implementation of the entire ***Climate Action Plan.***

GHG Reporting and Registry (CC-2)

This policy option focuses on reporting GHGs and establishing a GHG registry. GHG reporting, including measuring GHG emissions in order to support the management of emissions, would, among other benefits, help sources reduce their emissions, prepare for possible GHG reduction mandates, and support the construction of GHG inventories. A GHG registry would enable the recording of GHG emissions reductions in a central repository, and could provide a mechanism for regional and cross-border cooperation and a foundation for trading programs.

Led by MDE, the State government would oversee a common GHG emissions reporting system including building the GHG emission reduction requirements into air permits, developing protocols for reporting, and allowing for calculation of GHG emissions where MDE determined that was appropriate. MDE and participants benefiting from the registry would share the costs of developing and managing the system. The system would:

- Provide an accurate, complete, consistent, transparent, and verified set of GHG emissions data from reporting entities;
- Report emissions annually for all six traditional GHGs, and, to the extent possible, for black carbon;
- Require reporting of direct emissions and phase in power- and heat-related emissions;
- Maximize consistency with other GHG reporting programs;
- Allow flexibility as GHG mitigation approaches evolve; and
- Provide guidance to assist participants.

Policy Goal:
Implement a GHG registry for Maryland sources as soon as possible.

The Climate Registry

Implementation:
Much of this strategy is already being implemented as MDE has joined the effort to develop a national GHG registry by joining The Climate Registry. For those elements of this policy that cannot be implemented immediately, MDE will be developing a more detailed implementation plan for the Commission to consider in its Spring 2009 meeting. This policy speaks to the necessity for Maryland to establish the necessary framework to implement an accurate and accountable climate change program. It is more of a measure that is required as part of an overarching climate change and GHG reduction plan and program. Provided there is adequate staffing, this policy could be implemented immediately and would be necessary to meet the overall goals of the Commission. This policy would require constant attention so the staffing needs would be permanent but necessary for the implementation of the entire ***Climate Action Plan***.

Statewide GHG Reduction Goals and Targets (CC-3)

Governor O'Malley's Commission on Climate Change concluded in the Interim Report that it is necessary to adopt science-based goals for reducing Maryland's GHG emissions. Reductions occurring earlier in time have more mitigation value than reductions later in time. Reductions in the 25 per cent to 50 per cent range by 2020 (2006 year base) appear to be needed to avoid the IPCC's most catastrophic forecasts. Specific targets for reduction by 2012/1015 are essential to provide a framework for Maryland's reduction efforts.

The goals should be adopted as part of the ***Climate Action Plan***. A report should be issued to the public periodically, beginning in 2010, to summarize Maryland's programs and progress in meeting target goals.

Policy Goals:
10 per cent GHG emission reductions below 2006 levels by 2012 (consumption based)
15 per cent GHG emission reductions below 2006 levels by 2015
25-50 per cent GHG emission reductions below 2006 levels by 2020
- ***25 per cent goal to be enforceable, a regulatory driver***
- ***50 per cent goal to be science-based, non-regulatory reduction goal with programs to reward market-based reductions above 25 per cent***

90 per cent GHG emission reductions below 2006 levels by 2050 (science-based regulatory goal to drive research and development of climate neutral technology/ programs/innovations)
Science-based review of goals every four years starting in 2012
Include progress from 1990 levels

Implementation:
The Commission has already adopted goals and has developed this *Comprehensive Greenhouse Gas and Carbon Footprint Reduction Strategy* to meet these goals. There may be a need to adopt regulations, an executive order or legislation to formalize these goals. MDE will be setting up a stakeholder group to discuss this process. To the extent legislation is desired, the Commission will be discussing new legislation at its meeting in the Fall of 2008.

State and Local Governmental GHG Emissions (Lead-by-Example) (CC-4)

This policy option would promote energy efficiencies and GHG reductions that can be achieved through State and local governmental procurement and purchasing processes. Taken together with policy option RCI-4, "Government Lead-by-Example", which promotes energy efficiency standards in new State-funded and other government buildings, facilities, and operations, these measures would result in significant reductions of GHG emissions by governmental entities. Additionally, and perhaps of a greater benefit, the example set by government would stimulate public and private organizations to adopt similar practices. The massive purchasing power of government to select efficient goods from companies that practice energy reduction and sequestration of carbon dioxide would also be a powerful market stimulant for green businesses and jobs.

This policy would require all agencies of State government to commit to a series of steps to reduce their carbon footprint and to encourage local governments and private business to do likewise. It would be initiated by executive order of the Governor. State and local governments would promote:

- Establishment of clear standards for government in the purchase of goods from firms that practice energy use reduction and conservation of resources.
- Evaluation of GHG emission reduction along the entire supply chain to increase the efficiency of operations throughout purchasing and end-of-life disposal.
- Establishment of policies for purchasing only energy efficient products and services by specifying ENERGY STAR certified or similar equipment and appliances for State/municipal consideration.
- Encouragement of business/private sector acceptance to follow government's lead by outreach/ education programs demonstrating the savings in resources, costs and improvement of health benefits.

Policy Goals:

Together with the efficiency measures recommended in RCI-4 and other strategies in this Climate Action Plan, reduce the carbon footprint of government and increase efficient use of resources.

Lessen public interest in consumption and promote use of materials that favor conservation and that are compostable, recyclable and reusable.

Encourage State and local government agencies and by extension private industry to consider at the purchase stage, the end-of-life disposal stage of equipment and goods.

Implement procedures for State-owned or leased facilities life-cycle costing in the selection and building designs for both new and renovated space.

Implementation:

Most State and local agencies are already implementing programs that are consistent with the goals of this policy option. For those elements of this policy that cannot be implemented immediately, all State agencies led by MDE will be developing a more detailed implementation plan for the Commission to consider in its Spring 2009 meeting. This policy would likely require significant State action, which could be championed by an effort led by MDE. An implementation team, led by MDE using possibly the Commission as its base would need to meet and agree on what State actions could be taken and by what means (regulation, legislation, executive order). This team would likely need to meet for approximately one year to develop its timeline/ schedule/ implementation plan and it would likely take 3-5 years to fully implement all the selected measures.

DNR LEADS BY EXAMPLE

The Maryland Department of Natural Resources (DNR) has initiated a forest carbon sequestration demonstration project to reduce emissions and offset a portion of DNR's carbon footprint. This project is a key recommendation set forth by ARWG in the Interim Report.

DNR has begun to conduct a carbon footprint analysis for all of the Department's lands, facilities, and managerial practices. A robust methodology is being developed and will be third-party certified to ensure that the final results are valid. The results of the project will provide a baseline that DNR can use to set GHG emission reduction benchmarks and determine what carbon sequestration demonstration projects should be implemented. Components of DNR's carbon footprint project include:

- Assess the agency's direct and indirect emissions, including but not limited to electricity use, heating and cooling, and transportation fleet.
- Develop methodology, borrowing from GHG protocols recommended by inventory experts.
- Publish results and detailed methodology in a final report.
- Create a tool and manual to streamline the carbon footprint analysis for other agencies.

The ARWG has identified the need for carbon sequestration through a variety of land use management practices including agriculture, wetlands and forestry. It is in the best interest of DNR to demonstrate innovative carbon techniques and programs. The components of the carbon sequestration demonstration program include:

- Identify potential funding sources and partners for the demonstration project
- Identify an afforestation site and determine the most appropriate forest management practices for capturing the carbon
- Ensure that the proposed sequestration project is real, quantifiable, permanent, monitored and additional to what would have happened but for the action taken
- Evaluate and select appropriate industry standards and registration protocols for both voluntary offsets and/or market-driven carbon credit sales to provide for future alternative options down the road

Demonstrate how long-term carbon sequestration can be achieved by using long-term forest rotations and executing product use agreements with building and furniture industries.

Public Education and Outreach (CC-5)

State-sponsored public education and outreach combined with community actions, economic incentives and disincentives provided by other State climate change policies, form the foundation for behavioral and life style changes necessary to reduce GHG emissions. This policy is designed to encourage continuation of existing efforts and to promote new actions.

The State would build upon current educational efforts and action campaigns of State agencies such as MDE, DNR, the Maryland State Department of Education (MSDE), and University System of Maryland, utilities (BGE, SMECO), non-profit organizations, faith communities, and others. The combination of efforts would insure that scientifically based factual information is made available through public education and outreach efforts and reaches all segments of the public.

Policy Goals:

Educate and coordinate legislature and agencies on climate change, conservation, and energy efficiency for government facilities, operations, and transportation.

Develop Maryland-specific lessons on climate change, energy conservation, and energy efficiency aligned with the Voluntary State Curriculum and Core Learning Goals, and integrate into K-12 curriculum.

Implement the Governor's Regional Environmental Education Network (GREEN).

Support on-going efforts by higher education institutions to include climate change as part of their overall educational and facilities-management practices.

Organize an annual one-day conference for regional public media representatives on: the state of climate change mitigation in Maryland and the level of attainment of State GHG goals; latest climate science and observations; climate change impacts on public health, regional environment, the Chesapeake Bay, and the economy; and applications of climate-friendly technologies.

Collaborate with county departments of environment and utilities to educate and stimulate commercial organizations and homeowners to adopt climate friendly measures and promote climate friendly products.

Develop/distribute guidelines to encourage farmers and forestry operators to practice climate friendly measures. Develop a website to host voluntary experts to answer climate-related questions from this target audience.

Implementation:

Many of the agencies listed above are already implementing programs that are consisent with the goals of this policy option. For those elements of this policy that cannot be implemented immediately, MDE, with assistance from MSDE, DNR, MEA, the University System of Maryland (USM), and the Commission's Outreach/Education work group, will be developing a more detailed implementation plan for the Commission to consider in its Spring 2009 meeting. This policy speaks to the necessity for Maryland to establish the necessary framework to implement an accurate and accountable climate change program. It is more of a measure that is required as part of an overarching climate change and GHG reduction plan and program. Provided there is adequate staffing, this policy could be implemented immediately and would be necessary to meet the overall goals of the Commission. This policy would require constant attention so the staffing needs would be permanent but necessary for the implementation of the entire ***Climate Action Plan.***

Review Institutional Capacity to Address Climate Change Issues Including Seeking Funding for Implementation of Climate Action Panel Recommendations (CC-7)

Addressing climate change will be a long-term project for the State and will cross into all sectors of State government. This policy option would call for the State to develop the governance, organizational capacity and funding to execute GHG mitigation and adaptation policies, implement programs, monitor and analyze results, and modify and update policies and programs over time.

The Governor's Office, General Assembly, MDE, and other executive departments and agencies would be involved in implementing this policy, which would require engagement at the highest levels of the Executive Branch. Essential elements include:

- Assignment of a member of the Governor's staff as liaison for GHG policies, a sub-cabinet committee to coordinate GHG programs across the government, and a department assigned as lead agency for implementing key GHG mitigation programs and acting as a coordinating point for GHG programs in other departments.
- Assignment of responsibility to all departments to consider GHG consequences when making decisions about departmental policies, programs, and activities.
- Full funding for the lead agency and all departments to carry out GHG responsibilities.
- Innovative State funding mechanisms to stimulate investment in cost-effective climate change solutions.
- Creation of institutional capacity and R&D efforts that remain in place to carry through to achievement of the 2050 goals

Policy Goal:
Establish organizational, staffing and funding capacity in the State government in 2008-2009 to oversee and carry out comprehensive GHG mitigation and adaptation programs and activities.

Implementation:
For those elements of this policy that cannot be implemented immediately, MDE will work with other State agencies to develop a more detailed implementation plan for the Commission to consider in its Spring 2009 meeting. One of the most significant policy decisions that the Commission considered dealt with the need to ensure Maryland has the institutional capacity to manage and implement an aggressive climate change program. Led by MDE, this policy option will require all the member agencies of the Commission to consider the staffing resources and physical structure needed to implement the ***Climate Action Plan***. Implementation will need to be further discussed by the Commission and likely will require at least 6 months to one year of review and discussion before a formal implementation plan for the Governor is available. In Chapter 7, "Legislative Update and Next Steps", the Commission makes specific recommendations for the first steps toward building institutional capacity.

Participate in Regional, Multi-State and National GHG Reduction Efforts (CC-8)

This policy option focuses on establishing and expanding regional approaches for controlling GHG emissions. Regional approaches such as RGGI can offer broader and more efficient means of controlling GHG emissions than in-state approaches alone. In addition, global warming is a problem requiring national and international action, and Maryland needs to help shape the national initiatives. This policy option calls for the Governor and the General Assembly to push for federal action to reduce GHGs.

This policy is already being implemented. Under this policy, Maryland would continue to develop aggressive GHG reduction programs and thus lead by example. Maryland should encourage regional programs, like RGGI, as well. Maryland's leadership should also work with Congress and the federal government to significantly reduce GHG emissions nationally and internationally. This effort, to lead by example while pushing for a strong federal and international effort, is absolutely critical.

Policy Goal:
Influence the national and international debate over reducing GHGs.

In Chapter 6 of this ***Plan***, "Building a Federal-State Partnership", the Commission makes specific recommendations for a federal regulatory program that would work in partnership with climate programs developed by Maryland and other leadership states.

RGGI States

Promote Economic Development Opportunities Associated with Reducing GHG Emissions in Maryland (CC-9)

This policy option focuses on promoting the economic and business opportunities associated with climate protection and growing Maryland businesses while achieving state-wide GHG reduction goals. The State would work with public and private entities to promote "green industry" by promoting the consumption of local goods and services and providing job opportunities related to green building, energy efficiency, public transportation, renewable energy sources, and research and development of new practices and technologies. The Maryland Clean Energy Center and Technology Incubator Program, created by the General Assembly in its 2008 Session (HB 1337), will provide significant support for this policy by promoting the development of clean energy industries and jobs in Maryland.

Maryland Department of Business and Economic Development (DBED) would:

- Establish a work group to identify and promote green industry opportunities, markets, and financing mechanisms.
- Work with labor unions and technical schools to promote green collar job training
- Identify new financing mechanisms to stimulate and incubate green business development
- Promote in-state R&D and establishment of green industries.

Policy Goals:

Implement task force recommendations and deliver training programs, financing mechanisms and loans to stimulate targeted businesses in 2009 and 2010

Create 2,500 new jobs in Maryland tied to green industry and energy efficiency by 2012

Implementation:

For those elements of this policy that cannot be implemented immediately, DBED, with assistance from MEA, will be developing a more detailed implementation plan for the Commission to consider in its Spring 2009 meeting.

Create Capacity to Address Climate Change in an After Peak Oil" Context (CC-10)

Oil will become expensive after the "peak" of oil production. The increased cost per barrel will lead to higher environmental risks and health costs of extracting oil from non-traditional sources and burning a higher per centage of coal. Under this policy option, Maryland would take a strategically proactive stance by establishing an "After Peak Oil" work group of experts and stakeholders under the umbrella of the Commission to review and evaluate all proposed climate change and energy-related policies and legislation for appropriateness and sensibility in the context of shrinking supplies of affordable oil.

A work group to analyze this issue would be established in 2008.

Policy Goal: By 2010, the work group would develop operating protocols and commence reviewing and evaluating proposed climate change and energy-related policies and legislation, and its recommendations would be considered and concerns addressed before the proposed measures move forward.

Implementation:

MEA, with assistance from MDE, will be developing a more detailed implementation plan for the Commission to consider in its Spring 2009 meeting.

Evaluate Climate Change Policy Options to Determine Projected Public Health Risks/ Costs/ Benefits (CC-11)

Both the potential health risks from climate change and the health benefits of certain mitigation and adaptation strategies are significant. Under this policy option, a State Climate Change Environmental Health and Protection Work Group would be established under the umbrella of the Commission to systematically review the health risks, costs, and benefits of all proposed climate change and energy-related policies and legislation before they move forward. Careful attention would be given to impacts of policies on vulnerable populations in Maryland.

The Governor would appoint a core group of Work Group members representing major stakeholders, content experts and others. The State would recruit additional Work Group members through a non-political process. Parties involved would include all State agencies led by DHMH, energy producers, consumers, environmentalists, and health professionals.

Policy Goal:
By 2010, the work group would commence reviewing and evaluating all proposed climate change and energy-related policies and legislation, and its recommendations would be considered and concerns addressed before the proposed measures move forward.

Implementation:
For those elements of this policy that cannot be implemented immediately, DHMH, with assistance from MDE, DNR and other State agencies, will be developing a more detailed implementation plan for the Commission to consider in its Spring 2009 meeting. Because this policy has significant cross-over with some of the recommendations of the Commission's Adaptation and Response Working Group (ARWG), the plan will focus on both the mitigation and adaptation policy goals. This policy speaks to the necessity for Maryland to establish the necessary framework to implement an accurate and accountable climate change program. It is more of a measure that is required as part of an overarching GHG reduction and climate change adaptation plan and program. Provided there is adequate staffing, this policy could be implemented immediately and would be necessary to meet the overall goals of the Commission. This policy would require constant attention so the staffing needs would be permanent but necessary for the implementation of the entire ***Climate Action Plan***.

Option No.	Policy Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008 - 2020 (Million $)	Cost Effectiveness ($/$tCO_2e$)
		2012	2020	Total 2008 - 2020		
CC -1	GHG Inventories and Forecasting	Not Quantified				
CC-2	GHG Reporting and Registry	Not Quantified				
CC-3	Statewide GHG Reduction Goals and Targets	Not Quantified				
CC-4	State and Local Government GHG Emissions (Lead by Example)	Not Quantified				
CC-5	Public Education and Outreach	Not Quantified				
CC-6	Tax and Cap Policies	Not Quantified				
CC-7	Review Institutional Capacity	Not Quantified				
CC-8	Participate in Regional, Multi-State, and National Efforts	Not Quantified				
CC-9	Promote Economic Development Opportunities	Not Quantified				
CC-10	Create Capacity for "After Peak Oil"	Not Quantified				
CC-11	Evaluate Policy Options to Determine Public Health Risks	Not Quantified				

CONCLUSION

The Commission's forty-two recommended GHG mitigation strategies have evolved in the course of a rigorous, comprehensive, ten-month long stakeholder process which drew upon the expertise and commitment of MWG and TWG participants representing broad and diverse interests. While the work of these dedicated individuals is complete, the actual work of implementing the ***Climate Action Plan*** and getting Maryland on a sustainable trajectory to the 2020 and 2050 reduction goals just begins now, building on early initiatives such as RGGI, the Clean Cars and ***EmPOWER Maryland*** programs, and Maryland's RPS. For those engaged in moving this work forward – ultimately all Maryland citizens – the Commission leaves these three take-away messages:

- **Early actions are key.**
- **Shrinking Maryland's GHG footprint will grow Maryland's economy.**
- **What we do in Maryland matters in Maryland, for us, our children, and theirs.**

Deep Creek Rainbow
Photo by Margie Wise