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Maryland Energy Outlook

Prepared with assi

Maryland Energy ADMINISTRATION

Powering Maryland's Future

Prepared with assistance from Energetics Incorporated, Princeton Energy Resources International, LLC (PERI), and New West Technologies, LLC (NWT)

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Appendix A: Maryland Energy Outlook Advisory Committee A-1

1.0 Executive Summary

Maryland, like many states, is on the cusp of an energy transformation. We face a number of significant energy challenges, including growing power demands, volatile energy prices, increasing dependence on imported fuels, and climate change. At this critical juncture, it is appropriate to objectively examine our State energy goals and assess our progress in achieving them. This review will help guide energy policy so that State energy programs continue to provide affordable, reliable, and clean energy for Maryland's citizens.

Governor O'Malley and the Maryland General Assembly have set forward-looking energy goals and enacted policies to reduce electricity consumption, level peak demand, and improve the market for renewable energy in Maryland. Achieving these ambitious goals requires a long-term commitment to eliminate persistent market barriers and effect lasting market transformation. Accordingly, the Maryland Energy Administration (MEA) has benchmarked the State's progress to date and evaluated additional policy options to increase momentum in advancing the following objectives:

- Reduce energy consumption
- Improve the market for renewable energy
- Reduce GHG emissions
- Grow a green economy with a robust workforce
- Promote energy independence through alternative transportation policies and use of alternative fuels for vehicles.

This document is not a comprehensive roadmap or energy plan. To avoid duplicating activities under active consideration by other agencies, it does not address some key issues, such as transmission, new base load generation, and comprehensive energy planning. Rather, this report focuses on how Maryland is meeting its energy goals and what additional steps the State should consider to accelerate progress.

To assist in the development of this report, MEA assembled a broad group of energy experts and stakeholders from across Maryland. Members of this ad hoc Advisory Committee, listed in Appendix A, provided valuable assistance and expertise. The report and its recommendations, however, reflect the opinions of the Maryland Energy Administration and may not represent the views of any particular member of the Advisory Committee.

1.1 Maryland's Energy Goals

Governor O'Malley and the General Assembly have established a set of ambitious energy goals for Maryland, described below.

Energy Reduction

The *EmPOWER Maryland Energy Efficiency Act of 2008* sets targets to reduce per capita electricity consumption and per capita peak demand each by 15% by the end of 2015, based on a 2007 baseline.

Renewable Energy

Maryland's Renewable Portfolio Standard (RPS) requires that 20% of Maryland's electricity be generated from renewable energy sources by 2022, including 2% from solar energy.

Climate Action

The *Greenhouse Gas Emissions Reduction Act of 2009* requires Maryland to reduce GHG emissions 25% by 2020, relative to 2006 levels.

Green Jobs

In 2009, Governor O'Malley announced his ***Smart, Green, and Growing*** legislative agenda, which set a target to create 100,000 new green jobs in Maryland by 2015.

1.2 What Actions Have Been Taken and What Are the Results So Far?

Maryland has pursued energy targets in each of the four areas mentioned above. The variety of programs employed show impressive results.

EmPOWER Maryland

Maryland has made remarkable progress toward achieving the peak demand reduction target set by EmPOWER Maryland. Utilities have committed to reduce peak demand by 1,933 MW in 2011 and by 2,850 MW in 2015.[1] If realized, these reductions will, in fact, surpass the EmPOWER Maryland target.

Maryland has also made significant progress towards achieving the EmPOWER Maryland energy efficiency/consumption target. State energy efficiency rankings, prepared by the American Council for an Energy Efficient Economy (ACEEE), show that Maryland rose from 20th in the nation in 2006 to 11th in 2009.[2] Per capita consumption was down from 12,325 kWh in 2007 to 12,059 kWh per person in 2008, a 2.2% reduction.

Specifically, utilities have received regulatory approval to implement a variety of programs and consumer incentives that promote efficiency and conservation, such as essentially free home energy audits, up to $1,300 for implementing recommended measures, and rebates for purchasing energy efficient appliances. In addition, MEA has also launched programs funded by the Strategic Energy Investment Fund (SEIF) and the *American Recovery and Reinvestment Act of 2009 (ARRA*), to promote energy efficiency in virtually every market sector in Maryland, including low and moderate income families, farmers, commercial and industrial businesses, and local and State government. Together, these programs are expected to reduce statewide electricity consumption by approximately 4,670 gigawatt-hours (GWhs) by 2015, which is equivalent to avoiding construction of a large, 600 megawatt (MW) coal plant. Nevertheless, much work remains, as the State is less than half way to achieving the EmPOWER Maryland 15% reduction goal (a reduction of approximately 11,200 GWh.)[3]

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[1] PSC, *BGE EmPOWER MD Staff Initial Comments*, Tables ES1a-ES1b; EmPOWER Maryland Targets and Population established by the PSC.

[2] American Council for an Energy Efficient Economy, *2009 State Energy Efficiency Scorecard*, at http://aceee.org/pubs/e097.htm; and the *2006 State Energy Efficiency Scorecard*, p. iv.

[3] Maryland PSC, *BGE EmPOWER MD Staff Initial Comments*; EmPOWER Maryland Targets and Population established by the PSC.

In addition to the utility energy efficiency and new MEA initiatives, Maryland is also working on several other fronts to push for increased energy efficiency. Adoption of the 2009 International Energy Conservation Code (IECC) significantly strengthened the State's building energy codes. Maryland continues to adopt and enforce efficiency standards for appliances not covered by federal standards, and the State is actively promoting efficient combined heat and power (CHP) systems. The proposed deployment of advanced meters and smart grid technology also promises to contribute significantly to the EmPOWER Maryland goal.

Renewable Portfolio Standard

Maryland is just beginning to show progress in fulfilling the State's Renewable Portfolio Standard (RPS) mandate.[4] RPS obligations are satisfied through Renewable Energy Credits (RECs). Renewable energy generated in Maryland represented approximately 16% of the RECs used for compliance in 2007, with the rest generated out of state. Alternative compliance payments (ACPs), which enable utilities to comply with the RPS, generated over $1 million in 2008.

This rate of progress is not surprising, as a number of supportive provisions in the RPS do not go into effect until 2011: the changes enacted in 2008 to enhance REC prices; the increase in RPS obligation; and the narrowing of the eligible territory to exclude projects outside of the Pennsylvania-New Jersey-Maryland (PJM) footprint (or a control area adjacent to the PJM footprint). Nevertheless, if Maryland is to meet a significant portion of its RPS requirement through in-state generation, new commercial-scale renewable sources must be developed, including solar energy and land-based and offshore wind.

Maryland is working actively to promote renewable energy generation within the State. Grants to residential consumers for solar, wind, and geothermal heat pumps have soared from a few hundred last year to over a thousand expected to be awarded in fiscal year 2010. The Clean Energy Production Tax Credit offers a State income tax credit for electricity generated from qualified renewable sources. The State and the University of Maryland announced a long term power purchase agreement with four developers to jumpstart commercial scale renewable energy production, including on-shore wind, offshore wind, and solar. The State has also launched a technical study in 2009 of the potential for offshore wind and released a Request for Expressions of Interest and Information (RFI) from wind energy developers interested in developing wind energy generation facilities in Maryland's offshore waters. Maryland also spearheaded a Mid-Atlantic Off-Shore Wind Memorandum of Understanding (MOU) with Virginia and Delaware to work collaboratively to develop our shared coastal resources.

Climate Action

The recently enacted *Greenhouse Gas Emissions Reduction Act of 2009* requires Maryland to reduce GHG emissions 25% compared with 2006 levels by 2020. Actions taken by the State to implement this Act along with the work of the Maryland Commission on Climate Change are positioning Maryland to achieve its GHG emission reduction goal of 25% by 2020. The *Maryland Climate Action Plan*, published in 2008, lays out an extensive set of 42 policy options that are currently being

[4] Maryland's RPS law encompasses Tier 1 resources including solar, wind, certain biomass, landfill methane, geothermal, ocean, fuel cell, small hydropower, and poultry litter, and Tier 2 resources including hydroelectric (larger than 30 MW) and waste-to-energy.

assessed. In addition, the Regional Greenhouse Gas Initiative (RGGI), in which Maryland is a participant, has proven highly successful. While legislators in Washington D.C. continue to debate a national climate solution, the RGGI states are implementing a market-based mechanism that has established a price for carbon emissions (most recently, $2.05 per ton). Not only does this encourage investments in less carbon-intensive technologies, the six auctions held since September 2008 have generated $96.3 million for the State, a significant portion of which is being spent on projects to reduce climate change-causing emissions.

Green Jobs

The Governor's Workforce Investment Board (GWIB) estimates that Maryland's green economy includes roughly 22,000 businesses directly employing nearly 250,000 people and generating total wages of $14.6 billion.[5]

To expand and attract more clean energy businesses, Governor O'Malley and the General Assembly created the Maryland Clean Energy Center (MCEC), launched in January 2009, to focus on clean energy economic development. The State has also begun to offer educational and training programs at four year colleges, universities, and community colleges that will result in a trained workforce for a green economy. Finally, MEA is partnering with the Clean Energy Center and the Department of Business and Economic Development (DBED), using federal stimulus funding, to establish the Clean Energy Economic Development Initiative (CEEDI) program to provide funding for clean energy businesses and organizations.

1.3 What More Can Maryland Do?

Maryland has deployed aggressive programs to address its energy challenges and meet its energy goals. Nevertheless, more will be required to create a truly clean, affordable, and reliable energy marketplace for Maryland's citizens. This Maryland Energy Outlook begins that task by investigating key options that could be effective in helping the State meet its goals. These options have been analyzed for their current level of deployment in Maryland and their success in other states. Both the costs and potential benefits of each option are presented.

A number of options in the Outlook address efforts to increase energy efficiency. Others relate to increasing renewable energy capacity. Additional options are designed to improve Maryland's clean energy economy, as well as its transportation infrastructure and use of alternative fuels for cars and other vehicles. The options discussed in this Outlook are listed below.

Energy Efficiency and Conservation

- Implement time-of-sale disclosure of energy performance for residential and commercial buildings
- Offer tax credits for zero energy and zero energy-ready buildings
- Design and implement combined heat and power (CHP) initiatives
- Adopt new appliance efficiency standard for televisions sold in Maryland
- Promote the Commuter Connections alternative transportation program

[5] Maryland Governor's Workforce Investment Board, *Maryland's Energy Industry Workforce Report: Preparing Today's Workers for Tomorrow's Opportunities* (September 2009), http://www.mdworkforce.com/pub/pdf/energyworkforce.pdf.

Increased Use of Renewable Energy

- Modify the solar RPS "carve-out" by accelerating the phase-in of the solar RPS requirement and adjusting the Alternative Compliance Payment (ACP) penalty
- Evaluate the benefits of extending the eligibility of the waste-to-energy RPS requirement
- Establish a "carve-out" for ocean energy in the RPS
- Extend and expand Maryland's Renewable Energy Production Tax Credit program
- Increase the availability and use of biodiesel and high-level ethanol blends
- Promote electric drive vehicles
- Lead-by-example to "green" the State fleet of vehicles

Clean Energy Economic Development

- Develop a comprehensive strategy for clean energy economic development

1.4 Recommendations

Creating a cleaner, more reliable and more affordable energy landscape for Maryland will require that residents, businesses and government make dedicated and effective decisions on energy use and development of new, renewable energy resources. Much has already been accomplished through legislative and regulatory effort, but more could be done. Working collaboratively with other State agencies, businesses, utilities, municipalities, and non-governmental organizations, MEA has identified a number of key policy options that could further create a cleaner, more reliable, and more affordable energy environment in Maryland. These options are presented below.

Recommendations to Decrease Energy Demand

- #### Time-of-Sale Disclosure of Energy Performance for Residential and Commercial Buildings

MEA recommends that prior-year energy consumption data be required to be disclosed at the time of listing for sale of all residential and commercial buildings. The requirement would be modeled after the time-of-sale disclosure requirement currently in force in Montgomery County. Introducing energy performance information for residential and commercial buildings into the market place could drive the market toward more efficient buildings, and therefore increase their value. Disclosure of historical energy use information – rather than a requirement for an energy audit for the property – incurs virtually no additional cost to building owners and is administratively straightforward to implement.

- #### Tax Credits for Zero Energy and Zero Energy-Ready Buildings

A tax credit program for zero energy and zero energy ready buildings should be established for both residential and commercial buildings. Incentivizing construction of highly efficient buildings will provide significant long-term energy savings and help transform the building industry. Maryland's successful Commercial Green Building Tax Credit program should be used as a financing/tax credit model.

- Combined Heat and Power (CHP) Initiatives

State agencies should consider coordinated actions to enhance the economic viability of combined heat and power (CHP) systems. Such regulatory actions may include increasing the size range of generators that are covered by existing interconnection rules and instituting output-based emissions regulations to encourage clean distributed generation (DG) and CHP technologies. CHP applications are integrated systems that generate both electricity and thermal energy. These systems are significantly more efficient than separate systems for electricity and thermal energy generation.

- New Appliance Efficiency Standard

MEA recommends implementing a new energy efficiency standard for televisions, modeled after the California Tier 2 standard. Adopting the same standard as California leverages Maryland's market power to implement a standard that is fair to manufactures and suppliers, retailers, and consumers with no cost increases for these devices, all while significantly reducing energy consumption in Maryland.

Recommendations to Advance Renewables to Meet Maryland's Renewable Portfolio Standard (RPS)

- Modify the RPS Solar Requirement

MEA recommends that the General Assembly modify the Maryland RPS solar carve-out to: 1) accelerate the phase-in of the solar requirement to make it more evenly distributed over the RPS lifetime; and 2) set the Alternative Compliance Payment (ACP) for solar Renewable Energy Credits (S-RECs) at a high enough price point to encourage electricity suppliers to pursue power from solar installations rather than choosing to pay the ACP.

- Evaluate the Waste-to-Energy RPS Requirement

MEA, in conjunction with MDE and other relevant State agencies, should evaluate and report to the Governor and the General Assembly on: 1) the potential for waste-to-energy projects in Maryland to contribute to satisfying Maryland's RPS; 2) the environmental impact of waste- to- energy facilities; and 3) the effectiveness of RECs in incentivizing development of waste-to-energy and large hydroelectric resources.

- Ocean Energy

It is recommended that funding be allocated to accelerate the commercial development of Maryland's vast offshore wind energy resource potential. Funds could be leveraged with federal dollars for: wind measurements, pilot turbine demonstration, compatible use studies, economic analyses, and environmental issue/benefit assessments. MEA has considered, but does not recommend, the adoption of an ocean energy RPS carve-out at this time. This is primarily because of current uncertainty regarding cost, resource effectiveness, and potential sites. However, the State should devote resources to help motivate developers overcome high capital costs and other barriers to offshore wind energy projects and should modernize its regulatory framework to account for the potential development of the State's coastal wind resources.

- Renewable Energy Production Tax Credit Program

It is recommended that the Maryland Renewable Energy Production Tax Credit program be extended until 2022, to coincide with the State's RPS schedule, and that a minimum project size be established for the credits. To date, the tax credit program has been underutilized. Thus, the State

should analyze and consider if other modifications to the program, such as increasing the payment level or extending the payment period, could make it a more effective policy tool to incentivize in-state renewable energy production.

Recommendations to Advance Clean Energy Economic Development and Green Jobs

- Clean Energy Economic Development Strategy

Maryland should develop a comprehensive strategy for clean energy economic development. This strategy should be based upon the State's demand for clean energy as stipulated by its aggressive energy efficiency and renewable energy goals and should be dedicated to guiding the State's efforts to foster clean energy business and employment growth. Maryland's ability to compete with other, larger states to attract clean energy investment capital, new private energy business ventures, and a skilled professional energy workforce, will require a clean energy economic development strategy that includes financial incentives, institutional and policy initiatives, and a focus on technologies that match our indigenous resources.

Recommendations to Increase Transportation Energy Independence

- Increase the Availability and Use of High-Level Ethanol Blends

Maryland should focus on State government lead-by-example initiatives to promote the use of ethanol and provide targeted assistance for key infrastructure development. Currently, most of the gasoline sold in Maryland is blended with 10% ethanol. Consideration should be given to the fact that the environmental benefits of corn ethanol are limited and that currently there is no in-state production of ethanol in Maryland, before the State contemplates committing significant financial resources to increasing ethanol consumption.

- Increase the Availability and Use of Biodiesel Blends

Maryland should consider mandating the use of low-level biodiesel blends. The blending level mandate should increase gradually and be in line with federal Renewable Fuel Standard requirements. Since Maryland has existing biodiesel production facilities and the potential to increase production, higher biodiesel consumption would likely result in increased economic activity and employment.

- Promote Electric-Drive Vehicles

The purchase and use of electric-drive vehicles should be encouraged, as they become available in the marketplace, through incentives such as State tax benefits and designated high occupancy (HOV) lanes for their use. Similar state programs were effective for hybrid-electric vehicles when they were in the early commercialization stage to help increase use. Since only a relatively small number of electric-drive vehicles are anticipated to be sold in Maryland in the next few years, this option should not result in an immediate large fiscal impact.

- Lead-by-Example to "Green" the State Fleet

The State should implement policies and initiatives to ensure that vehicle selection and use of its own vehicle fleet is optimized and that alternative fuel use is maximized. Pilot programs to integrate plug-in hybrid-electric vehicles and battery-electric vehicles into the State fleet should also be launched. While the State fleet represents a very small percentage of the total number of vehicles in the Maryland, its fleet operation provides an example to residents, business, and local governments

on how best to fuel and use vehicles. Beyond showing leadership, the experiences and lessons learned from the State's programs can be shared with others to speed decisions for new vehicle technologies and fuels.

- Increase Support for Commuter Connections Program

The State should consider increasing its support of the Commuter Connections program. This may include increased State funding, subject to the State's revenue projections for the coming years. The program, which is being implemented in the Baltimore and Washington, D.C. metro areas, advocates for numerous commuting options, including: teleworking, mass transit use, commuter buses, rideshare/carpool/vanpool, alternative work schedules, bicycling and walking to work, etc. Eliminating vehicle trips, decreasing the number of trips, or increasing the number of people per vehicle can have a meaningful impact on fuel demand and traffic congestion. To date, this program has been effective in reaching its goals on a relatively small budget.

2.0 Maryland's Energy Landscape and Goals

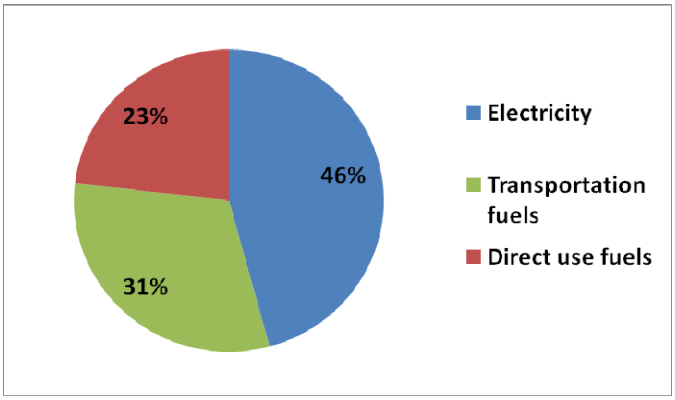
The State of Maryland seeks affordable, reliable, and clean energy to fuel our future prosperity. While we face a number of serious challenges, legislation enacted by Governor O'Malley and the General Assembly over the last three years have created ambitious energy-related goals that chart a path toward a more sustainable and green future. These goals have established Maryland as a national energy leader.

Setting a goal, however, is not the same thing as achieving it. This chapter focuses on Maryland's energy landscape, the State's adopted energy goals, and identifies steps already taken toward achieving them. It also looks at preliminary results that gauge our progress to date. Following chapters will build on this data to evaluate what more we can do to accelerate our progress to improve the lives of all our citizens, expand the State's economy, and improve the region's natural environment.

2.1 Maryland's Energy Landscape

Maryland consumers use energy for all of their daily activities. According to the latest data from the U.S. Department of Energy (DOE), overall energy demand in Maryland totaled 1,489 trillion British thermal units (Btus) in 2007, or approximately 1.5% of all energy demand in the United States.[6] Exhibit 2.1 shows consumption by energy type in Maryland across all end-use sectors. Electricity consumption accounts for nearly half, or 46%, of all energy used in the State.

Exhibit 2.1. Maryland Energy Consumption - Electricity, Transportation & Direct Use Fuels*

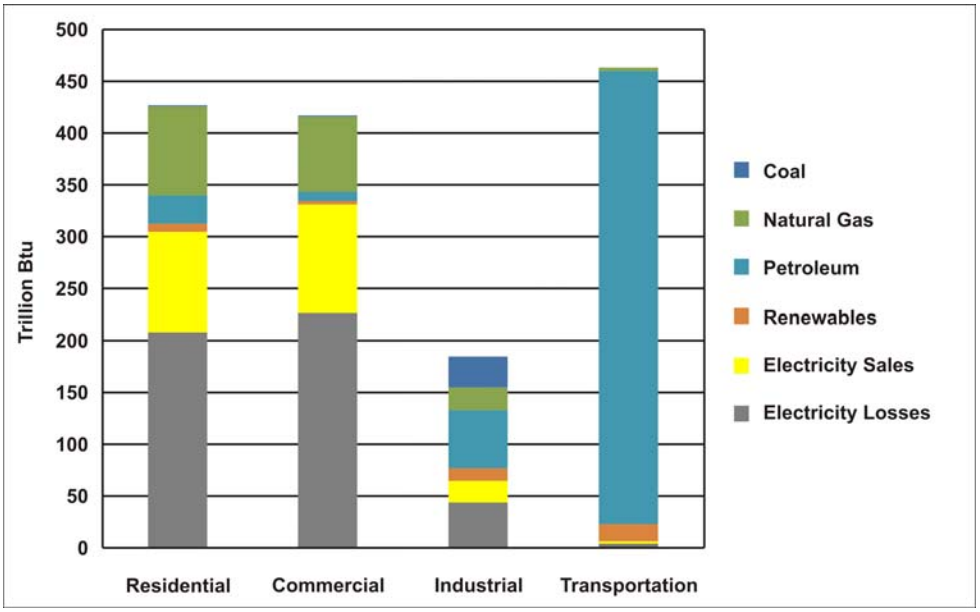


Source: EIA, *State Energy Data 2007: Consumption*
* Direct use fuels are fuels other than electricity that are used directly in homes and businesses, such as natural gas, propane, and heating oil.

Maryland's energy use by economic sector and fuel is portrayed in Exhibit 2.2. The transportation sector is the major consumer in Maryland, using 31% of total energy. The industrial sector consumes approximately 12% of total energy, with the residential and commercial sectors using 29% and 28%, respectively. Note that electricity losses (losses during the generation, transmission and distribution of electricity) are 31% of overall energy consumption,[7] which highlights that small improvements in efficiency could make a significant difference.

[6] U.S. Department of Energy (DOE), Energy Information Administration (EIA), *State Energy Data 2007: Consumption* (latest data available), http://www.eia.doe.gov/emeu/states/_seds.html.
[7] EIA, *State Energy Data 2007: Consumption, Maryland,* http://www.eia.doe.gov/emeu/states/_seds.html.

Exhibit 2.2. Maryland Energy Consumption by Sector and Fuel



Source: EIA, *State Energy Data 2007: Consumption*

Maryland's Energy Supply Infrastructure

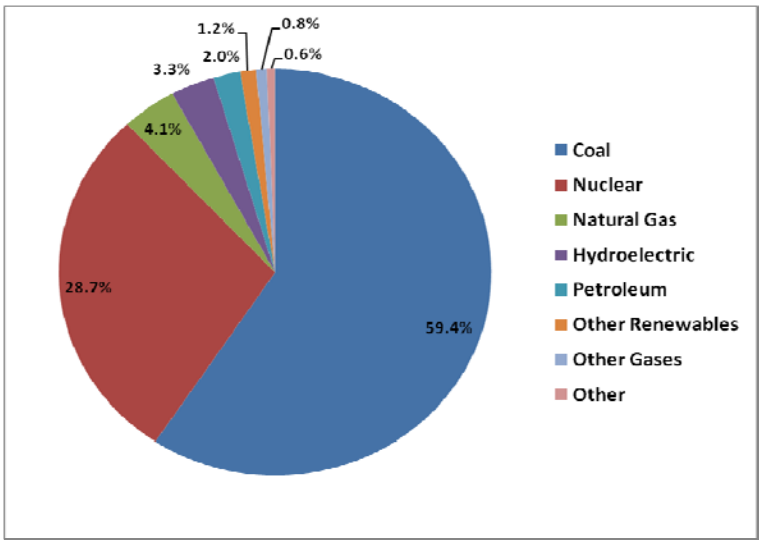
Lacking any significant indigenous fossil fuel resources, Maryland currently relies on imported energy resources for most of its energy needs.

All petroleum and natural gas products are transported to Maryland via pipeline or through other entry points, such as the Port of Baltimore or Maryland's liquefied natural gas (LNG) facility, Cove Point, on the Chesapeake Bay's western shore.

Maryland imports approximately 30% of its electrical energy from surrounding states.[8] The State is part of the Pennsylvania-New Jersey-Maryland (PJM) Interconnection, or power grid. PJM encompasses 13 states and the District of Columbia, and its installed capacity of 163,000 MW serves more than 50 million people.

Maryland imports coal to generate electricity in-state. As shown in Exhibit 2.3, nearly 60% of electricity generated in Maryland is coal-fired. Coal-fired power plants contribute approximately 5,000 MW to in-state

Exhibit 2.3. Electricity Generated (MWhs) in Maryland (2007)



Source: Maryland PSC, *Ten-Year Plan (2008-2017) of Electric Companies in Maryland*

[8] EIA, *State Electricity Profiles 2007, Maryland*, http://www.eia.doe.gov/cneaf/electricity/st_profiles/maryland.pdf.

summer peak capacity. Maryland also operates two nuclear power plants at Calvert Cliffs, which provide 1,735 MW of capacity and generate approximately 29% of the electricity produced in Maryland. On the other hand, hydroelectric plants and other renewable resources contribute roughly 700 MW of capacity and approximately 4.5% of in-state generation.[9]

To reduce electricity congestion and increase capacity, a number of new transmission projects are being proposed, three of which would impact Maryland: the Trans Allegheny Interstate Line (TrAIL); the Potomac-Appalachian Transmission Highline (PATH); and the Mid-Atlantic Power Pathway (MAPP). The Mid-Atlantic region has been designated as a National Interest Electric Transmission Corridor (NIETC). This designation means that additional transmission capacity is so critical that the Federal Energy Regulatory Commission (FERC), under limited conditions, may issue permits for regional transmission line projects that are deemed to be in the national interest.

Energy Prices in Maryland

Residential, commercial, and industrial customers are all impacted by energy prices, which are in turn driven by many different factors. Availability of supply, electricity markets, economic downturns, transport issues, financial market speculations, and a myriad of other factors impact the price of energy.

Maryland consumers have faced high energy prices in recent years. According to the U.S. Department of Energy (DOE), as of August 2009, Maryland's residential electricity price averaged 15.70 cents per kWh. This places Maryland as the 9th highest in the nation, below New York and New Jersey, and slightly higher than Delaware and the District of Columbia. By contrast, the national average in August 2009 was 12.05 cents per kWh, approximately 20% less.[10]

Maryland also ranks 12th in the nation in the price of residential natural gas. Natural gas – used primarily for heating purposes – costs Maryland consumers more than $20/thousand cubic feet, as compared to the national average of $15/thousand cubic feet.[11]

What Drives Energy Supply, Demand, and Prices in Maryland?

Energy demand is a result of a number of drivers, including population growth. In Maryland, population is expected to grow 12.5% between 2008 and 2020.[12] This is due, in part, to the completion of the Base Realignment and Closure (BRAC) process, which will add thousands of workers and their families to the State in the coming years. New electrical capacity and new transmission and distribution infrastructure will be needed to meet the needs of our new residents.

Historically, economic growth rates have had a significant effect on the rate of growth for energy demand. Periods of strong economic growth have been accompanied by robust growth in energy demand, and times of slower economic growth have meant less rapid growth in energy consumption.

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9 Maryland PSC, *Ten-Year Plan (2008-2017) of Electric Companies in Maryland,* http://webapp.psc.state.md.us/Intranet/psc/Reports_new.cfm.
10 EIA, *State Rankings, Electricity Residential Prices, August 2009*, http://tonto.eia.doe.gov/state/state_energy_rankings.cfm.
11 EIA, *State Rankings, Natural Gas Residential Prices, August 2009*, http://tonto.eia.doe.gov/state/state_energy_rankings.cfm.
12 Maryland Department of Planning, *Historical and Projected Total Population for Maryland's Jurisdictions (* December 2008), http://www.mdp.state.md.us/msdc/popproj/TOTPOP_PROJ08.pdf.

Over the last few years, transmission congestion and constraints in the PJM region have put upward pressure on electricity prices and caused concern about the reliability of the electricity delivery system in Maryland. However, the success of the EmPOWER Maryland program in prompting effective peak demand reduction strategies, combined with the effects of the current economic recession and the Maryland Public Service Commission (PSC) "Gap RFP" proceedings,[13] have delayed the threat of significant capacity deficits and the potential for rolling "brownouts" for several years.[14]

Maryland consumers are significantly affected by the global and national prices for primary energy. For example, oil prices are determined on the global market. Natural gas and coal prices are also affected by international developments, but domestic supply and demand balance plays a significant role in determining market prices. Further, the price of natural gas in Maryland is high in comparison to many other parts of the country, largely due to the cost of transporting it over greater distances.

Addressing the threat of global climate change is a significant driver for energy policies at all levels of government. Even though the federal government has yet to enact legislation to curb GHG emissions, international negotiations are underway to enhance the existing framework for reducing them. Efforts to reduce more localized criteria pollutants are also an important impetus for developing new, cleaner energy resources.

2.2 What Are Maryland's Energy Goals?

EmPOWER Maryland

Recognizing that the cheapest kilowatt is the one not needed, Governor O'Malley championed the *EmPOWER Maryland Energy Efficiency Act of 2008* to establish energy efficiency and demand response goals for the State. Based on 2007 electricity consumption, EmPOWER Maryland establishes a 15% reduction target in per capita electricity consumption and a 15% reduction target in per capita peak demand by the end of 2015. These targets are among the most ambitious energy efficiency goals in the nation and, if achieved, would help reduce household electricity bills, address the State's electric reliability concerns, and help curb GHG emissions and other harmful pollutants.

Electric utility companies are responsible for achieving the majority of the EmPOWER Maryland targets. The legislation gives the Maryland Public Service Commission the responsibility for approving cost-effective utility-run energy efficiency and conservation programs. Utilities submitted their first plans for achieving energy reduction goals in 2008, with new plans required every three years thereafter. The PSC approved BGE's suite of energy efficiency programs in 2008, and similar programs for the other major electric utilities in 2009.

[13] Maryland PSC, Case Number 9149, Order No. 82511. The "Gap RFP" process was initiated by the PSC to address the possibility of a shortage in electrical capacity in Maryland as early as 2011 or 2012. The PSC ordered utilities to enter into agreements to secure approximately 400 MW of demand response capacity for summers 2011-2013.

[14] PSC Public Conference 14: *2008 Summer Reliability Status Conference*, and PSC Public Conference 18: *2009 Summer Reliability Status Conference*, at http://webapp.psc.state.md.us/Intranet/AdminDocket/index_new.cfm. PJM testimony and transcripts, at http://webapp.psc.state.md.us/Intranet/AdminDocket/index_new.cfm.

Renewable Portfolio Standard (RPS)

The RPS for Maryland requires that renewable sources generate 20% of Maryland's electricity by 2022, including 2% from solar.[15] Renewable energy resources are classified in the RPS statute in two tiers. Tier 1 resources include solar, wind, certain biomass, landfill methane, geothermal, ocean, fuel cell, small hydropower, and poultry litter. Tier 2 resources include hydroelectric (larger than 30 megawatts (MW)) and waste-to-energy.

The RPS creates a market-based mechanism to incentivize new generation of renewable power. Electricity suppliers demonstrate compliance with the RPS by accruing renewable energy credits (RECs). A REC is equal to the renewable attributes related to one megawatt-hour (MWh) of electricity generated using certain types of renewable energy. A REC has a three-year life during which it may be transferred, sold, or otherwise redeemed. Starting in 2011, RECs must be generated from power projects within or delivered into the 14-state Pennsylvania-New Jersey-Maryland (PJM) region. Until the end of 2010, RECs may also be derived from PJM-adjacent states.[16] Each electricity supplier must present RECs equal to the percentage specified by the RPS statute or pay compliance fees equal to shortfalls. Generators and suppliers are allowed to trade RECs using the PJM Generation Attributes Tracking System (GATS), a system approved for Maryland REC use by the PSC.[17]

Climate Action

The international scientific community has agreed that reducing GHG emissions is critical to mitigating the worst climate change impacts. Compared with other political entities around the world, Maryland is relatively small. However, the State is accountable for almost as many GHG emissions as Sweden and Norway combined. In addition, Maryland's per capita and statewide GHG emissions are growing faster than those of the U.S. as a whole.[18]

In 2008, Governor O'Malley signed an Executive Order that established the Maryland Commission on Climate Change.[19] Sixteen State agency heads and six members of the General Assembly serve as Commission members. Using a baseline year of 2006, the Commission has called on Maryland to reduce GHG emissions by 10% by 2012, 15% by 2015, 25-50% by 2020, and 90% by 2050.

Building on this effort, the *Greenhouse Gas Emissions Reduction Act of 2009* requires the State to reduce GHG emissions 25% from 2006 levels by 2020. The Act also directs the Department of the Environment to develop a comprehensive GHG reduction plan by 2012.

To help reduce Maryland's emissions and to assist in adapting to possible future climate change impacts on Maryland's vulnerable coasts, farmlands, forests, and other areas, the Maryland Commission on Climate Change has developed 42 recommendations for State action. Energy

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15 Maryland Public Utility Companies Code § 7-703 et seq., http://mlis.state.md.us/asp/web_statutes.asp?gpu&7-703.

16 Ibid., http://mlis.state.md.us/asp/web_statutes.asp?gpu&7-703.

17 Public Service Commission of Maryland. *Renewable Energy Portfolio Standard Report of 2009* (February 2009), p. 2, http://webapp.psc.state.md.us/Intranet/Reports/MD%20PSC%20Renewable%20Energy%20Portfolio%20Standard%20Report%20of%202009%20with%20Data%20for%20Compliance%20Year%202007.pdf.

18 Maryland Commission on Climate Change. *Climate Action Plan Executive Summary* (August 2008), p. 18, http://www.mde.state.md.us/assets/document/Air/ClimateChange/Executive_Summary.pdf.

19 Maryland Commission on Climate Change. *Climate Action Plan Executive Summary* (August 2008), p. 3, http://www.mde.state.md.us/assets/document/Air/ClimateChange/Executive_Summary.pdf.

related recommendations range from adopting performance standards for power plants to increasing the use of energy-efficient lighting.

100,000 Green Jobs

An emerging "green-collar economy" has the potential to be an important component of a growing and prosperous society in the 21st century. Green jobs are employment opportunities that can help contribute to Maryland's future through the development of clean energy and/or the reduction of GHG emissions and other pollutants. Some of these jobs may involve new technologies, such as solar photovoltaic installers or smart grid operators. However, many more will be in traditional fields that will incorporate sustainable energy practices, including heating, ventilating and air conditioning (HVAC), construction, and manufacturing.

In 2009, Governor O'Malley established his Administration's *Smart, Green, and Growing* legislative agenda. Among other directives, this agenda has established a target to create 100,000 additional green jobs in Maryland by 2015.

Examples of Green Jobs

Energy Efficiency
- Building Inspector
- Building Operator/Building Technician
- Energy Analysis and Auditor
- Insulation Worker
- Resource Conservation/Efficiency Manager

Environmental Quality
- Environmental Engineer, Scientist
- Environmental Technician, Planner
- Environmental Program Manager
- Water & Natural Resources Scientist
- Stream Restoration Specialist
- Water Conservation Director
- Water Quality Laboratory Technician
- Water Treatment Manager
- Water Production Operator

Renewable Energy
- System Designer (Solar, Wind, Ocean)
- Test Technician (Solar, Wind, Biomass, Ocean)
- Solar Cell and Module Manufacturer
- Solar Energy Engineer
- Solar Energy System Installer
- Wind Turbine Machinist
- Wind Turbine Electrical Engineer
- Wind Field Technician

Source: Governor's Workforce Investment Board

2.3 What Action Has Maryland Taken?

Recognizing that there is no "silver bullet" that will solve our energy challenges, Maryland has adopted the "silver buckshot" approach to transform Maryland's energy marketplace for future generations and to achieve our ambitious energy goals. The State has taken numerous steps with respect to: 1) conservation, energy efficiency, and demand response; 2) renewable energy development; 3) State government programs that "lead by example"; 4) regulatory actions to improve the State's energy supply and demand landscape; 4) alternative transportation fuels and efficient vehicle powertrains; and 5) clean energy industry and workforce development. Below are some of the actions taken by the PSC, MEA, our utilities, and other State organizations in the last three years.

Conservation, Energy Efficiency, and Demand Response

- RGGI/SEIF Funding for Conservation, Energy Efficiency, and Demand Response

Maryland has established the Strategic Energy Investment Fund (SEIF), which helps fund energy efficiency, demand response, and conservation projects, as well as low-income bill payment and general rate relief. SEIF is funded through the proceeds from the Regional Greenhouse Gas Initiative (RGGI), an effort by ten Northeast and Mid-Atlantic States to reduce carbon dioxide emissions from electricity generating plants.

- Energy Consumption and Peak Demand Reduction Targets

The major electric utilities are required by the *EmPOWER Maryland Energy Efficiency Act of 2008* to implement, after approval by the PSC, cost-effective energy efficiency and conservation programs designed to achieve a 10% reduction in per capita electricity use and 15% reduction in per capita peak demand by the end of 2015. The additional 5% reduction in per capita electricity use will be achieved through other means.

- Utility Incentives/Decoupling

The PSC has approved decoupling (separating utility profits from energy sales volume) for the three investor-owned electric utilities in Maryland: Potomac Electric Power Company (Pepco), Delmarva Power and Light (DPL), and Baltimore Gas and Electric (BGE). Natural gas decoupling has been implemented for Washington Gas Light Company (WGL) and BGE.

- Clean Energy Communities

The MEA has awarded grants or zero interest loans to 60 communities in FY 2009 and over 160 communities in FY 2010 to leverage local government investment in energy efficiency, conservation, and renewable energy projects.

- AMI/Smart Grid

BGE piloted a Smart Grid/Advanced Metering Infrastructure (AMI) program in its service territory. BGE, Pepco and DPL have recently submitted system-wide Smart Grid/AMI proposals to the PSC, and hearings are underway.

- Rebates for Energy Efficient Appliances

Maryland provides rebates for the purchase of ENERGY STAR-qualified appliances, including refrigerators and clothes washers. Some appliance rebates are being offered by the major electric utilities under PSC-approved EmPOWER Maryland programs.

- Energy Efficiency Standards for New and Retrofit Buildings, Education and Training for Building Code Officials

The State has required that the Department of Housing and Community Development adopt the International Energy Conservation Code (IECC) as part of the Maryland Building Performance Standards. The IECC specifies minimum insulation levels, HVAC performance, and lighting levels for new construction. The MEA is supporting code compliance and energy training through the Maryland community college system and independent training providers.

- Combined Heat and Power (CHP) Education and Outreach

The PSC has established standard interconnection rules. Twenty CHP installations are in place in Maryland with a combined total capacity of 836 megawatts (MW).

- State-Level Appliance Standards

The *Maryland Energy Efficiency Standards Act of 2007* required the adoption of minimum efficiency standards for a number of different appliances, including bottle-type water dispensers and commercial hot food holding cabinets. Many of these items have also been included in subsequent federal standards.

- Transforming Residential Efficiency Retrofits and Renewable Energy Installations

In 2009, HB 1567 was enacted to enable local governments to create property-assessed Clean Energy Loan Programs, which will allow local jurisdictions to provide loans to property owners for financing energy efficiency improvements and renewable energy installations. MEA is partnering with the Maryland Clean Energy Center to support and build upon loan programs initiated by the City of Annapolis and Montgomery County because of the truly transformative potential of property-assessed financing. Property owners choosing to finance an extensive efficiency or renewable project through the Clean Energy Loan Program will receive information about measures and incentives, certainty regarding audits and contractor verification, and an up-front source of capital for the significant initial investment.

Renewable Energy Development

- Renewable Portfolio Standard (RPS)

Maryland's Renewable Portfolio Standard was amended in 2007 to include a 2% carve-out for solar generation and to increase the overall requirement by more than double for all renewables, so that the goal is now 20% by 2022. This market-based incentive significantly enhances the economic viability of renewable energy projects and has triggered interest in renewable energy in every corner of the State.

- Tax Credits for Solar, Biofuels, and Wind

The Clean Energy Incentive Tax Credit, enacted in 2006, offers a State income tax credit for energy generated from qualified renewable sources.

- Generating Clean Horizons

MEA, the Department of General Services, and the University of Maryland issued a Request for Proposals (RFP) to jumpstart commercial scale renewables by offering a long term power purchase agreement to provide energy to the University and the State. In December 2009 the State announced that it would enter into power purchase agreements with four renewable energy projects, including two large-scale solar projects, one land-based wind project, and one offshore wind project.

- Offshore Wind Planning and Development

MEA launched a technical study in 2009 of the potential for offshore wind and released a Request for Expressions of Interest and Information (RFI) from wind energy developers interested in constructing wind energy generation facilities in Atlantic Ocean areas adjacent to Maryland's coast.

- RGGI/SEIF Funding for Renewables

The SEIF, which derives its revenue from RGGI auctions, funds multiple renewable energy projects, such as MEA's grant programs for solar, wind, and geothermal heat pumps.

Lead-by-Example in State Government

- Energy Performance Contracts

Maryland State government is leading by example through efforts of the Department of General Services and MEA. Together, the two agencies are using energy performance contracts to evaluate and install energy management improvements in State buildings. The State has leveraged approximately $250 million that will result in anticipated annual energy and operational savings of

over $25 million. In addition, over 88,000 tons of CO_2 is estimated to be avoided through this energy performance contracting initiative. Several examples include:

- **Department of General Services** – 37 buildings; $18 million in anticipated contracts; $2 million annual savings
- **Spring Grove Hospital** – 38 buildings; $19.5 million in anticipated contracts; $3 million annual savings
- **University of Maryland College Park** – 9 buildings; $20 million anticipated contracts; $1.8 million annual savings

- Energy Reduction Plans

Every State agency has committed to reducing its energy consumption. Using a database of 15,000 State agency accounts, the Department of General Services is working with each agency to measure current energy consumption against reduction initiatives. To date, preliminary energy reduction plans have been submitted by each agency.

PSC Proceedings Related to Generation, Transmission, and Electric Reliability

- Transmission Line Proceedings

PSC has before it two major cases relating to transmission lines. The MAPP (Mid-Atlantic Power Pathway) is proposed as a 150-mile, 500 kV high voltage transmission line and PATH (Potomac-Appalachian Transmission Highline) is proposed as a 275-mile, 765 kV transmission line. A third transmission line, TrAIL (Trans-Allegheny Interstate Line), which is currently under construction, will have financial and energy flow impacts in Maryland, but will not be physically built in the State. Proceedings on the MAPP are under way, while proceedings relating to the PATH line are expected to begin early in 2010.

- PSC Proceedings Related to Reliability

PSC initiated a "Gap RFP" process to address the possibility of a shortage in electrical capacity in Maryland beginning as early as 2011 or 2012. The PSC ordered utilities to enter into agreements to secure approximately 400 MW of demand response capacity for summers 2011-2013 and beyond.

- PSC Proceedings Related to New Electric Generating Resources

Under its authority relating to the procurement of electricity for Standard Offer Service (SOS), the PSC initiated a proceeding to investigate whether it should order the electric utilities to enter into long-term contracts to anchor new generating facilities, or to acquire, construct, or lease and operate new electric generating facilities.

- Clean DG/CHP for New Generation

Maryland currently hosts combined heat and power plants situated at commercial, industrial, and institutional facilities. The Maryland PSC has removed two barriers to new CHP generation by standardizing interconnection rules and initiating CHP-friendly standby rates.

- CPCNs for New Electric Generation Facilities

In the past year, the PSC has approved applications for Certificates of Public Convenience and Necessity (CPCN) for an additional, 1,600 MW reactor at Calvert Cliffs nuclear power plant and a natural gas power plant to be located in Charles County. In 2009, the PSC also approved CPCN exemptions for three wind generating stations in Western Maryland.

PSC Challenges to Energy Market Rules

- ### Ongoing PSC Challenges to RPM

PJM's reliability pricing model (RPM) was designed to provide generators with longer-term pricing signals for capacity resources. Under the design of RPM, a Base Residual Auction (BRA) occurs each May, in which power generators bid capacity for a particular "power year" three years in the future. For the resources that clear the BRA, PJM makes payments in the amount of the RPM clearing price, and load serving entities pay for the capacity. Capacity charges add approximately 20% to the energy portion of the average Maryland residential electric bill.

The PSC is engaged in challenges to the RPM on several fronts:

- The PSC is actively engaged in various committees at PJM, which operates the wholesale electricity market.
- The PSC is part of a multi-state effort to reform the RPM, including an RPM Symposium at PJM in January 2010. The Maryland PSC is active in (and currently is president of) the Organization of PJM States, Inc. (OPSI).
- The PSC sued PJM in 2008 seeking refunds after the RPM transitional auctions.
    - The PSC formed a coalition of state PSCs, consumer advocate groups, and large industrial users and filed a complaint at FERC.
    - The complaint alleged that the rates generated by the auctions were unjust and unreasonable and demanded $12 billion in refunds (approximately $2 billion for Maryland).
    - FERC dismissed the complaint, but the PSC appealed the dismissal. The case is pending before the United States Court of Appeals for the D. C. Circuit.

- ### PSC Participation in FERC Cases

The PSC has intervened and is participating in several wholesale market cases before the Federal Energy Regulatory Commission (FERC). PSC victories at FERC include:

- A successful challenge to an increased Cost of New Entry (CONE) in 2008
- The inclusion of demand response and energy efficiency as resources in the RPM
- Success in its "Offer Capping" complaint, which was granted by FERC and forced a rule change worth $85 million/year to Maryland
- A successful Independent Market Monitor settlement (as part of OPSI), which will ensure an independent monitor for wholesale electricity markets

Climate Action Initiatives

Implementation of the Climate Action Plan prepared by the Maryland Department of the Environment, along with the *Greenhouse Gas Emissions Reduction Act of 2009*, will address climate change in Maryland and will lead to clean energy economic development and green jobs.

- ### *Maryland Climate Action Plan*

The *2008 Maryland Climate Action Plan* includes preliminary inventories of greenhouse gases, estimates of greenhouse gas reductions from a variety of measures, and projections of how those reductions will help us reach our mandated targets. Actions aimed at reducing GHG emissions are represented in the 42 GHG emission and carbon mitigation policies approved by the Maryland

Commission on Climate Change, which are outlined in the plan. Implementation of the plan will also result in economic development opportunities and additional green jobs. For example, under the cap and trade policy, studies by the University of Maryland's Center for Integrative and Environmental Research projected that participation in the RGGI program would result in several thousand new Maryland jobs, many of them considered green jobs, along with a boost in the State's domestic gross product.

- Regional Greenhouse Gas Initiative

The Regional Greenhouse Gas Initiative (RGGI) is being successfully operated through the Maryland Department of the Environment.

Alternative Transportation Fuels and Efficient Vehicle Powertrains

- Transit-Oriented Development

Maryland has built an extensive transit infrastructure and continues to encourage transit-oriented development. Success stories include transit development in downtown Silver Spring and Rockville in Montgomery County. Recently, Governor O'Malley announced a new Purple Line on the D.C. Metro System and a new Red Line on Baltimore's Light Rail System.

- Adoption of the California Low Emission Vehicle (CALEV) Program

One important measure that Maryland has undertaken to promote the use of plug-in hybrid electric vehicles (PHEVs)/electric vehicles (EVs) is the adoption of the CALEV Program. In addition to requiring lower vehicle emission standards for on-road vehicles, the CALEV Program includes a zero emissions vehicle (ZEV) requirement. The ZEV requirement stipulates that auto manufacturers produce an increasing amount of ZEVs for sale in states that have adopted the CALEV Program. The ZEV requirement can be met by the introduction of plug-in hybrids, electric vehicles, or fuel cell vehicles. Maryland adopted this program in 2007 and will begin implementing it for the 2011 model year. By adopting this program, Maryland has taken an important step in assuring that it will be one of the earliest states to receive new advanced technology vehicles.

- *Maryland Clean Cars Act*

The *Maryland Clean Cars Act* and implementing regulations are poised to become effective in March of 2010.

- Commuter Choice Maryland Program

In 2000, Maryland adopted the Commuter Choice Maryland Program, which is an incentive program that encourages Maryland employees to choose transit or join vanpools instead of driving individually to work. This program allows employers to offer transit passes to employees at less than full cost. Employers are rewarded with special federal and State tax deductions. Similar incentives are available for van poolers. The Commuter Choice Maryland Program also offers strong incentives for employees and employers to use mass transit.

- MEA Transportation Program

Eleven transportation projects were funded through MEA in fiscal year 2009. These projects include the purchase of electric vehicles and hybrid trucks, the establishment of a fuel fund, installation of two E85 and biodiesel fueling pumps, and the installation of biodiesel production and collection equipment. A total of $171,133 was disbursed for these eleven projects, displacing an estimated 1.6 million gallons of fossil fuel per year.

Clean Energy Industry and Workforce Development

- Maryland Clean Energy Center (MCEC)

Maryland created the MCEC in January 2009 to help transform the energy economy in Maryland by increasing clean energy jobs, spear-heading technical innovations, supporting entrepreneurial businesses, and encouraging widespread adoption of energy-efficient products. MCEC has partnered with the MEA in developing clean energy loan programs based on a "property assessed clean energy – PACE" model and launched a clean energy incubator program at UMBC.

- Community College Training for Audits and Retrofits

Maryland offers green job training at more than a dozen community colleges in the State. Allegheny, Anne Arundel, Baltimore City, Montgomery, and Prince George's County community colleges offer training programs such as Home Energy Analysis courses.

- Governor's Workforce Investment Board (GWIB)

Maryland issued a comprehensive study of energy workforce related issues in September 2009. The study was conducted by the GWIB, a business-led board of 45 members.

- Clean Energy Economic Development Initiative

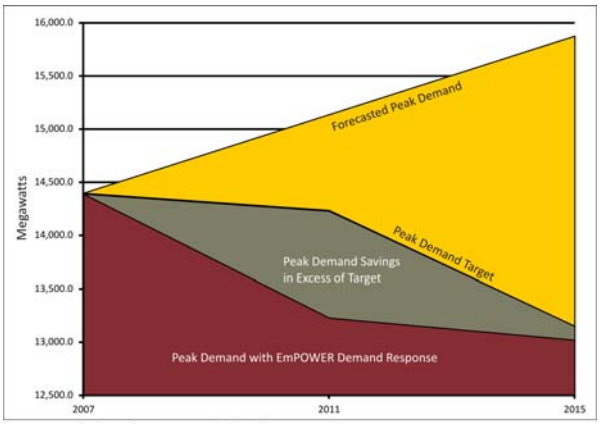
The State has established the Clean Energy Economic Development Initiative (CEEDI) Support Program to assist in the growth of a clean energy industry. The Program provides funding opportunities to businesses and organizations that are in the process of advancing new technologies, creating jobs, and furthering consumer products and services related to the clean energy sector.

2.4 What Are The Results So Far?

EmPOWER Maryland and Peak Demand Reduction

Maryland appears on track to exceed 2015 EmPOWER peak demand reduction goals. According to utility filings in 2008, Maryland utilities seem well positioned (through programs approved by the PSC) to achieve the peak demand reduction goals set by EmPOWER Maryland, as illustrated in Exhibit 2.4. Utilities have committed to reduce peak demand by 1,933 MW in 2011, and 2,850 MW in 2015 – equivalent to avoiding five 600 MW peaking units in Maryland. The success of Maryland's utilities in designing effective peak demand reduction strategies, combined with the pilot AMI programs, the effects of the current economic recession, and the Maryland

Exhibit 2.4. EmPOWER Maryland Peak Demand Reduction



2011 Proposed Savings of 1,933 MW; equivalent of 3 new power plants.
2015 Proposed Savings of 2,850 MW; equivalent of almost 5 new power plants.

2011 Peak Demand Reduction Target: 894 MW. Proposed Reduction Savings: 1,933 MW. % of Goal: 216%.
2015 Peak Demand Reduction Target: 2,622 MW. Proposed Reduction Savings: 2,850 MW. % of Goal: 109%.
Proposed Reduction Savings based on March filing

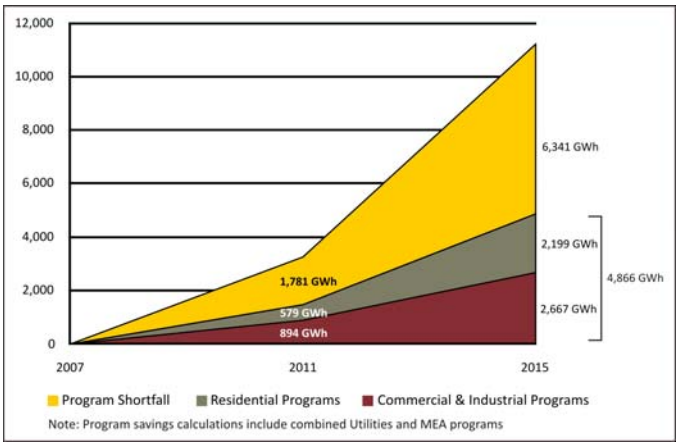
Source: EmPOWER Maryland Targets and Population established by the PSC. And, PSC, "BGE EmPOWER MD Staff Initial Comments," Tables ES1a - ES1b.

PSC's "Gap RFP" proceeding, have greatly diminished the threat of significant capacity deficits predicted only a short time ago.[20] This situation benefits all electricity consumers in Maryland. Data from 2008 indicates that the average per capita peak demand in Maryland was 2.49 kW, which is 2.5% above the 2.43 kW target for 2011.[21]

In addition to the utility peak demand reductions resulting from EmPOWER Maryland, PJM's Reliability Pricing Model (RPM) has also contributed to peak demand reduction and an improved reliability picture. The RPM market in the latest Base Residual Auction for the period 2012-2013 provided 1,767 MW of cleared demand resources contributing to peak demand reductions for the period. This amount includes demand resources from Curtailment Service Providers (CSPs) not captured in Exhibit 2.4.

Maryland has also made significant progress toward reducing overall electricity consumption, as seen in Exhibit 2.5. Under the EmPOWER Maryland initiative, the PSC has approved cost-effective programs for all the major utilities that are projected to reduce statewide electricity consumption by approximately 4,670 GWh by 2015. This is equivalent to avoiding the necessity of a 600 MW coal plant.[22] Nevertheless, there is still much work to be done as the State is less than half way to our overall 15% reduction goal of 11,206 GWh. Maryland total electricity consumption in 2008 was 68,089 GWh compared to 69,300 GWh in 2007. Per capita consumption was down from 12,325 kWh in 2007 to 12,059 kWh per person in 2008 – a 2.2% reduction.

Exhibit 2.5. EmPOWER Maryland Energy Consumption Savings and Shortfall



Renewable Portfolio Standard (RPS)

Maryland is beginning to show progress in fulfilling the State's RPS mandate. The slow progress is not surprising, however, as changes enacted in 2008 to increase the RPS obligation, enhance REC prices, and alter the eligible territory to exclude projects outside of the PJM footprint or a control area adjacent to PJM if the electricity can be delivered into the PJM grid, do not go into effect until 2011.

Maryland's RPS program is administered by the PSC. The State's RPS obligations are satisfied through submission of the appropriate level of Tier 1 and Tier 2 RECs or through alternative compliance payments. One measure of success in the RPS program is the portion of obligations

[20] PSC Public Conference 14: *2008 Summer Reliability Status Conference*, and PSC Public Conference 18: *2009 Summer Reliability Status Conference*, at http://webapp.psc.state.md.us/Intranet/AdminDocket/index_new.cfm. PJM testimony and transcripts, at http://webapp.psc.state.md.us/Intranet/AdminDocket/index_new.cfm.

[21] Maryland PSC and MEA data.

[22] A 600 MW coal-fired plant at 80% capacity factor will generate 4,205 GWh a year. Avoiding 4,670 GWh through energy efficiency is therefore equivalent to roughly 1.15 coal plants.

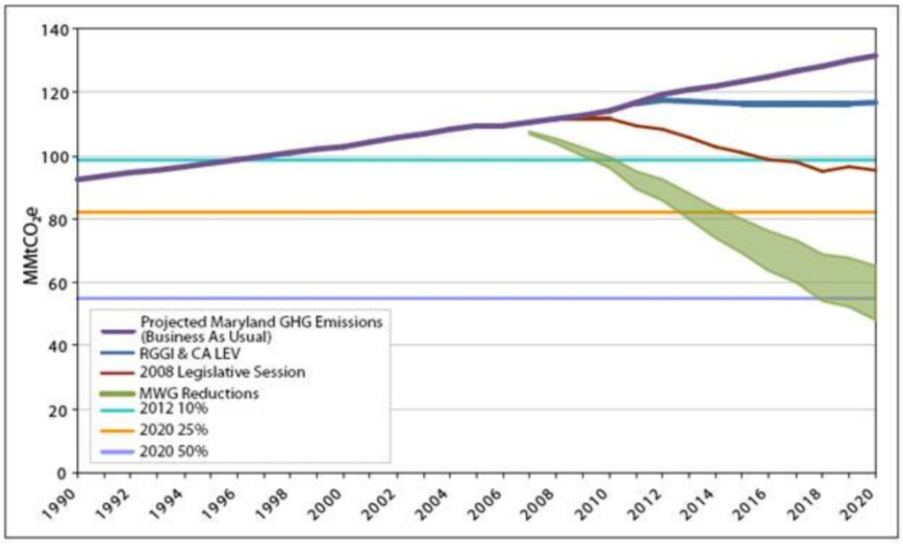
that are being met through renewable energy production rather than payment of compliance fees for shortfalls. In 2007, REC shortfalls, 0.04% for Tier 1 resources and 0.08% for Tier 2 resources, were minimal. However, in 2008 compliance fees generated over $1 million, mostly to comply with the solar carve-out provisions. Another measure of RPS program success is the share of RECs that are generated from within the State. Maryland was the source for approximately 16% of overall RECs used for compliance in 2007. However, when looking to the future, it appears that if Maryland is to meet a significant portion of its RPS requirement through in-state generation, new renewable sources, such as land-based and offshore wind, must be developed.

In addition, the solar generation carve-out segment of the RPS faces obstacles. As of August 2009, cumulative PV-installed capacity registered and certified by the PSC for delivery of RECs stood at 2.34 MW. Additional behind-the-meter installations bring Maryland's total PV capacity to approximately 2.9 MW. Even with those additions, total solar installations are well short of the 5.5 MW cumulative installed capacity required to meet the solar RPS goal for 2009. In order to meet Maryland's solar RPS carve-out goal by 2018, installed capacity will need to increase to approximately 550 MW.

Climate Action

Actions taken by the State to mitigate and adapt to climate change are poised for success. For example, the *Clean Cars Act*, which became law in 2007, is focused on adopting California's stricter vehicle emission standards for Maryland's fleet of automobiles. According to the Maryland Department of Environment (MDE), the *Clean Cars Act* will reduce CO_2 emissions in Maryland by 7.8 million tons per year, or 27.5% in 2025 compared with the 2012 baseline. However, as of 2009, no measurement of progress can yet be made for the program.[23] Several GHG reduction scenarios identified by the Maryland Commission on Climate Change are portrayed in Exhibit 2.6.

Exhibit 2.6. Maryland GHG Emission Reduction Scenarios



Source: Maryland Commission on Climate Change, *Climate Action Plan* (August 2008)

[23] Maryland Department of the Environment, "Facts About… COMAR 26.11.13 and the Clean Cars Program," http://www.mde.maryland.gov/assets/document/CALEV_Fact_Sheet.pdf.

In general, it will take a few years for programs to make a noticeable impact on Maryland's GHG emissions. It will take time to properly employ and assess the 42 options recommended in the *Maryland Climate Action Plan*. However, some progress can be observed already. The RGGI Initiative has proven to be successful, with emission auctions being conducted quarterly. The six auctions held since September 2008 have generated $96.3 million for the State, a significant portion of which is being spent on projects to reduce climate change-causing emissions.

100,000 New Green Jobs

The Governors' Workforce Investment Board (GWIB) estimates that Maryland's green economy includes roughly 22,000 business units directly employing nearly 250,000 people and generating total wages of $14.6 billion.[24] Several notable firms are located within the State, employing large numbers of people in green job fields. A 2009 report by the Pew Charitable Trust has ranked Maryland sixth in the nation in attracting venture capital for clean energy investments, with $324 million raised between 2006 and 2008.

To attract more green firms to Maryland, the State has begun to tailor education and training programs to relevant industries, deploying formal education opportunities for renewable energy and energy efficiency training to expand overall green job employment. For example, MEA and DHCD have launched home weatherization and home energy auditor training programs at 16 community colleges and Maryland has already trained hundreds of weatherization technicians.

Similarly, Frostburg State University offers a program on design, installation, and maintenance of residential PV and wind generation systems. The program includes an eight-week online course supported by three-day instruction and hands-on training. This education program prepares students for entry-level certification tests given by the North American Board of Certified Energy Practitioners, Inc. (NABCEP).[25] In addition, the University of Maryland at College Park houses the University of Maryland Energy Research Center (UMERC). The UMERC is a multidisciplinary initiative run by the School of Engineering that focuses on energy science and technology, with a special focus on alternative energy generation and energy storage.[26]

Both community colleges and universities in Maryland offer numerous programs and degrees in technology areas that are needed by companies that provide building construction, maintenance, and general contracting services. Among available resources is the newly created Maryland Center for Construction Education and Innovation at Towson University, whose purpose is to serve as a repository of information for prospective construction industry workers on existing training programs and other resources.[27]

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[24] Maryland Governor's Workforce Investment Board, *Maryland's Energy Industry Workforce Report: Preparing Today's Workers for Tomorrow's Opportunities* (September 2009), p. 5-6, http://www.mdworkforce.com/pub/pdf/energyworkforce.pdf.

[25] Interstate Renewable Energy Council, *Renewable Energy Training Catalog* (August 2009), http://www.irecusa.org/trainingCatalog/providerListing.php?id=109.

[26] University of Maryland Energy Research Center, *About the UM Energy Research Center*, http://www.umerc.umd.edu/about/index.html.

[27] Governor's Workforce Investment Board, *Maryland's Construction Industry Workforce Report* (September 2009), www.mdworkforce.com/news/constenforum/constructionlayout.doc.

2.5 What More Can We Do?

Maryland is working hard to meet its four primary energy related goals. If Maryland hopes to achieve significant additional energy efficiency improvements, GHG emission reductions, green job employment growth, and expansion of renewable energy, innovative and robust policy options must be deployed. The remainder of this Maryland Energy Outlook (MEO) takes a look at specific options for further decreasing energy demand; advancing renewable energy development to achieve the RPS; advancing clean energy economic development and green jobs; and increasing transportation energy independence. We can achieve a clean, reliable, and affordable energy future - serious consideration of these options can facilitate this goal.

3.0 Options to Decrease Energy Demand

This chapter explores policy and program options to promote achievement of the EmPOWER Maryland energy efficiency and peak demand reduction goals.

3.1 What Is Maryland Currently Doing?

As discussed in Chapter 2, the *EmPOWER Maryland Energy Efficiency Act of 2008* sets ambitious energy efficiency and demand response goals for the State. Maryland's electric utility companies are responsible for achieving all peak demand reductions – 15% per capita by 2015 – called for in the legislation. In terms of total electricity consumption, the utilities are expected to achieve a 10% reduction by 2015. To achieve the overall EmPOWER Maryland goal of 15% reduction in per capita electricity consumption by 2015, an additional 5% reduction in demand must be achieved through means that are in addition to utility programs. The Maryland Strategic Energy Investment Fund (SEIF) is intended, in part, to support these additional reductions.[28]

To the extent that the Maryland Public Service Commission (PSC) determines that cost-effective energy efficiency, conservation and demand response programs and services are available for each affected retail customer class, the EmPOWER Maryland legislation gives the PSC oversight to ensure that utility programs are enacted to achieve State goals. Utilities submitted their first plans for achieving energy reduction goals in 2008; new plans are required to be submitted every three years thereafter. The 2008 plans were approved, with some modifications, in 2008 and 2009. Utilities are also required to submit annual updates to the PSC. BGE began full-scale program implementation of energy efficiency programs in spring 2009. The remaining four utilities received their program approvals from the PSC in August 2009 and expect to start programs during the winter of 2009/2010.

Utility Demand Response Programs

To reduce demand during peak periods of electricity use, Maryland utilities, at the PSC's direction, have launched various demand response programs. The current programs are based on the concept that utilities have the ability to turn off, or "cycle," a customer's air conditioner or water heater during a high-demand event. In order for the utility to be able to control these customer devices, a special programmable thermostat or a switch must be installed at the customer's premises. To entice customers to sign up for the demand response programs, they are offered financial incentives. Most utilities offer a one-time rebate when a customer signs up for the program and the controlling device is installed. In addition, participating customers receive an annual bill credit for participating in the program. Most often the credit is spread out over several months.

Even though most demand response programs have similar elements, all Maryland utilities have developed their own unique programs. For example, Baltimore Gas and Electric Company's (BGE's) *PeakRewards* program covers central air conditioning units, electric heat pumps, and water heaters, but the Potomac Electric Power Company's (Pepco's) current *Energy Wise Rewards Program* is

[28] Department of Legislative Services, HB 374 *EmPOWER Maryland Energy Efficiency Act of 2008* Fiscal Note, http://mlis.state.md.us/2008rs/fnotes/bil_0004/hb0374.pdf. Also, HB 368 *Regional Greenhouse Gas Initiative - Maryland Strategic Energy Investment Program*, http://mlis.state.md.us/2008rs/billfile/HB0368.htm.

limited to air conditioning units. BGE also provides its customers with the ability to manage their thermostat through the internet and override scheduled cycling events online. The level of rebates offered by the different utilities to program participants varies.

Smart Grid technologies may offer significant potential for electric peak demand reductions. BGE conducted a pilot project with more than 5,000 customers in the Baltimore area in the summer of 2008. A number of different rate designs and technologies were offered to pilot program participants. Depending on the combination of rate designs and technologies, average load reductions over critical peak periods for program participants varied from 18% to 33%. Average total monetary savings for pilot program participants varied from $65 to $170.[29]

BGE has filed a request with the Maryland PSC to deploy its Smart Grid Initiative to all of its Maryland customers over a five-year time period. Potomac Electric Power Company (Pepco), Delmarva Power and Light Company (DPL), and Southern Maryland Electric Cooperative (SMECO) have also filed with the PSC to launch their own Smart Grid programs. The PSC is expected to rule on the utilities' applications by early 2010. The U.S. Department of Energy announced in October 2009 that BGE and Pepco will receive more than $300 million in federal grants to support the implementation of their Smart Grid initiatives in Maryland.[30]

Utility Energy Efficiency Programs

In addition to demand response programs, the 2008 EmPOWER Maryland filings by Maryland utilities included energy efficiency and conservation programs. The purpose of these programs is to encourage utility customers to implement energy efficiency measures through financial incentives and broad-based, system-wide consumer education efforts. As with demand reduction programs, all utilities have developed their own energy efficiency programs. However, many of the programs contain similar elements. Common program features include energy audits and rebates for lighting, efficient appliances, and other efficiency measures. Typically, utilities offer a different set of programs for residential and business customers.

To date, BGE has rolled out a very comprehensive energy efficiency program in Maryland. Its *Smart Energy Savers Program* offers a wide range of efficiency services and incentives. BGE's program includes three levels of energy audits for residential customers: 1) an online do-it-yourself energy assessment; 2) a one-hour walk-through audit by a professional auditor; and 3) a comprehensive, whole-house audit as part of the *Home Performance with ENERGY STAR* program. Besides home audits, BGE provides rebates for heating and cooling system improvements, compact fluorescent light bulbs, refrigerators, clothes washers, room air conditioners, and removal of old inefficient refrigerators and freezers. The company also offers a program to provide energy saving services and improvements for limited-income households. For business customers, BGE offers incentives for efficient lighting, motors, heating and cooling equipment, variable frequency drives, commercial refrigeration and kitchen equipment, and retro-commissioning of facilities. Custom rebates are also available for cost-effective site-specific energy efficiency measures. Four other major utilities – Pepco, Delmarva, Allegheny and SMECO – recently received PSC approval to implement energy efficiency programs in the residential, commercial and industrial sectors similar to those offered by BGE.

[29] BGE *Smart Grid Initiative* filing with Maryland PSC, July 13, 2009.
[30] U.S. DOE, http://www.energy.gov/recovery/smartgrid_maps/SGIGSelections_State.pdf.

Strategic Energy Investment Fund (SEIF) Programs

The Maryland Strategic Energy Investment Fund (SEIF) was established in 2008 to utilize proceeds from the Regional Greenhouse Gas Initiative (RGGI) emission allowance auctions. According to the enabling legislation, the purpose of the fund is "to decrease energy demand and increase energy supply to promote affordable, reliable, and clean energy to fuel Maryland's future prosperity."

The RGGI emissions allowance auctions are held quarterly. In the six auctions conducted since September 2008, Maryland has received a total of $96.3 million in proceeds.[31]

Monies in the SEIF are allocated according to the following formula set in the legislation. The formula was temporarily modified by the Budget Reduction Act of 2008 for FY2010 and FY2011, with the revised percentages shown in parenthesis:

- 23% to residential rate relief
- 17% (up to 50%) to low and moderate income energy assistance (administered by the Department of Human Resources)
- 46% (at least 17.5%) to energy efficiency, conservation and demand response programs (of which half must be used for low and moderate income family programs)
- 10.5% (at least 6.5%) to clean energy and climate change programs, and outreach and education
- 3.5% (3%) to administer the Fund

Except for the low-income energy assistance program managed by the Department of Human Resources, the Maryland Energy Administration (MEA) is tasked with developing and managing the energy efficiency and clean energy programs funded by the SEIF. MEA has launched the following energy efficiency programs under SEIF for FY 2010:

- Community Energy Efficiency Low-to-Moderate Income Grants
- Jane E. Lawton Conservation Loan Program
- Energy Efficiency Grants for Multi-Family Buildings with DHCD
- Specialized Industrial and Commercial Energy Assessments
- Farm Energy Technical Assistance and Incentives
- Financial Incentives for Commercial/Industrial/Institutional Custom Electricity Reduction Projects
- State Agency Loan Program (SALP)
- Public Outreach Campaign

3.2 What Are the Results So Far?

As seen in Exhibit 2.4 in Chapter 2, Maryland utilities appear to be well positioned to achieve the peak demand reduction goals set by EmPOWER Maryland. However, achieving the electricity consumption reduction goals will require additional efforts, as seen in Exhibit 2.5.

[31] Regional Greenhouse Gas Initiative, http://www.rggi.org/co2-auctions/results.

3.3 What More Can We Do?

Additional utility programs are expected to be developed over the intervening years to continue to achieve the EmPOWER Maryland goals. For example, advanced metering and smart grid initiatives, currently pending before the PSC, may make a significant contribution. Independent of the utility programs, MEA efforts, such as those supported through the SEIF, will also assist in obtaining the 15% reduction in per capita electricity consumption required by 2015.[32]

Achieving the EmPOWER Maryland energy efficiency goals will require a multi-pronged approach. Thus, the State should evaluate other programs and policies to ensure that the EmPOWER Maryland goals are achieved.

During the Maryland Energy Outlook development process numerous additional financial incentives and various policy changes were considered. To incent energy efficiency retrofits and high-performance buildings, additional financing mechanisms, tax incentives, benchmarking of buildings, and time-of-sale disclosure requirements were analyzed. Options to further strengthen building energy codes and appliance standards were also considered, along with lead-by-example programs.

Based on policies and programs that already exist and the potential for efficiency improvements, the most promising options were selected for further analysis. These options are:

- Time-of-Sale Disclosure of Energy Performance for Residential and Commercial Buildings
- Tax Credits for Zero Energy and Zero Energy Ready Buildings
- Combined Heat and Power (CHP) Initiatives
- New Appliance Efficiency Standard

3.3.1 Time-of-Sale Disclosure of Energy Performance for Residential and Commercial Buildings

What Is a Time-of-Sale Disclosure Requirement of Energy Performance?

A time-of-sale disclosure requirement of energy performance provides information about a building's energy use to a prospective buyer. Ideally, this information would be provided at time of listing to better inform prospective purchasers' decision making. An energy performance disclosure requirement would enter energy efficiency information into the marketplace and drive the market toward more efficient buildings. There are many ways this information can be disclosed to a buyer.

In its simplest form, energy performance disclosure provides prospective buyers with information about the building's energy consumption and/or energy costs for the previous year(s). To provide more comprehensive information about a building's actual energy performance, conducting an energy audit of the property could be required prior to listing it for sale. If such an audit requirement is developed, uniform standards for the audits need to be used. For example, the Residential Energy Services Network's (RESNET's) Home Energy Rating System (HERS) can be

[32] Department of Legislative Services, HB 374 *EmPOWER Maryland Energy Efficiency Act of 2008* Fiscal Note, http://mlis.state.md.us/2008rs/fnotes/bil_0004/hb0374.pdf.

adopted as the standard for home energy audits. In the commercial sector, the energy assessments could be conducted using the EPA ENERGY STAR Portfolio Manager tool.

If a time-of-sale disclosure requirement is adopted, how best should the information be shared with prospective buyers? One possibility is to include it in the Multiple Listing Service (MLS) for the property. Alternatively, the information could be made available to the buyer prior to completing the sale.

What Is Maryland's Experience Regarding Time-of-Sale Disclosure?

Maryland has not imposed any statewide requirements regarding time-of-sale disclosure of energy performance. However, Montgomery County passed legislation in 2008 that requires home sellers to provide energy consumption and cost history to prospective buyers.[33]

The Montgomery County law became effective January 1, 2009. It applies to attached and detached single family homes. Prior to signing a sales contract for a home, the seller is to provide copies of electricity, gas, and home heating oil bills, or a cost and usage history, for the past 12 months immediately prior to the sale. The law also requires that the seller provide the buyer with information to assist home buyers in making energy conservation decisions. These informational materials must be approved by the Montgomery County Department of Environmental Protection (MCDEP). The law does not require that an energy audit be conducted before the sale, even though such a requirement was included in the original legislative proposal. There is no mechanism in place to try to estimate actual energy savings that will result from the disclosure requirement law.[34]

The MCDEP worked with the Greater Capital Area Association of Realtors to develop informational materials related to the requirements of the law, including legal disclosure requirements, recommended format for disclosing home energy consumption and cost information, and the energy efficiency information resources to be provided to the buyer.[35] According to MCDEP, there have been no major implementation problems or consumer backlash in the first year of the disclosure requirement.[36]

What Are Other States' Experiences Regarding Residential Disclosure?

Time-of-sale energy performance disclosure requirements are a relatively new tool to enhance energy efficiency in the real estate market place, but some states and localities have enacted policies in this area.

Berkeley, California

The City of Berkeley has had a Residential Energy Conservation Ordinance on the books since 1987, and it has been updated several times since then. This ordinance requires that the seller of a residential property install certain energy conservation measures prior to selling the property. The required efficiency measures include adequate ceiling insulation, sealed HVAC system ducts, and low-flow shower heads and faucets. The seller of the property must receive a certificate of

[33] Montgomery County Council Bill 31-07, http://www.montgomerycountymd.gov/content/council/pdf/bill/2008/20080422_31-07.PDF.
[34] Montgomery County Department of Environmental Protection (MCDEP), phone conversation with Eric Coffman, October 15, 2009.
[35] Maryland Homeowners' Association, blog post December 22, 2008, http://mdhoa.blogspot.com/.
[36] MCDEP, phone conversation with Eric Coffman, October 15, 2009.

compliance from the city prior to completing the sale. Although results data is scarce, energy savings in the 15-25% range have been reported.

Austin, Texas

The City of Austin's *Energy Conservation Audit and Disclosure Ordinance* took effect June 1, 2009. The ordinance requires home sellers in the City of Austin who are electricity customers of Austin Energy to hire a certified energy auditor to conduct an energy audit performed by either BPI (Building Performance Institute) or RESNET (Residential Energy Services Network). The audit evaluates attic insulation levels, duct system performance, HVAC equipment, weather stripping, and sun-exposed window area. Austin Energy estimates that an audit for a typical single family home costs $200-$300.[37]

The *Energy Conservation Audit and Disclosure Ordinance* is an important component of the city's strategy to achieve 700 MW of energy savings by 2020 under the *Austin Climate Protection Plan*. The city's goal is that by 2013, cost-effective energy efficiency improvements will be made in 85% of sold residential properties within one year of the closing.[38] According to Austin Energy, no projections about estimated actual energy savings specific to the audit and disclosure requirement have been made. However, the utility expects that this requirement to conduct audits will assist the city in achieving its overall energy reduction goal by helping the utility identify properties with energy efficiency improvement potential.[39]

Kansas

A 2007 Kansas law requires new home builders to disclose specific energy information about the home at time of closing. The required information includes insulation values for the attic, walls, and foundation; window U-values; heating and cooling system efficiency; and water heating efficiency.[40] Actual energy use impacts of the disclosure requirement have not been analyzed. The requirement is considered a purely informational and educational tool for homebuyers and builders.[41]

Nevada

Nevada passed legislation in 2007 requiring that sellers of residential properties provide an energy evaluation prior to completing the sale transaction.[42] The enabling legislation provides some exemptions from the disclosure requirement, including sales of foreclosed properties, transactions between close relatives, and transactions where both seller and buyer agree to waive the requirement. An efficiency evaluation completed within five years of the sale is considered valid. The program regulations are required to be developed by January 2011; the disclosure requirement will not be in effect until the regulations are adopted.[43]

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37 Austin Energy, *Energy Conservation Audit and Disclosure Ordinance*, http://www.austinenergy.com/about%20us/environmental%20initiatives/ordinance/ecadOrdinanceHomes.pdf.
38 Austin City Council, Resolution No. 20081106-048, http://www.austinenergy.com/About%20Us/Environmental%20Initiatives/ordinance/councilResolution.pdf.
39 Austin Energy, Tim Art, phone contact on October 27, 2009.
40 *Kansas Energy Efficiency Disclosure* form, http://www.kcc.state.ks.us/energy/energy_efficiency_disclosure.pdf.
41 Kansas Corporation Commission, State Energy Office, email correspondence with Liz Brosius, October 27, 2009.
42 Nevada Senate Bill No. 437 (2007), http://www.leg.state.nv.us/74th/Bills/SB/SB437_EN.pdf.
43 Nevada State Office of Energy, phone conversation with Kim Fischer, October 15, 2009.

Voluntary Disclosure

Alaska, Colorado, Rhode Island, and Florida allow voluntary disclosure of a HERS rating on the MLS. Florida has also created a database of all rated homes in the State to enable people to search for the rating for a specific address.[44]

What Are Other States' Experiences Regarding Commercial Disclosure?

California

A 2007 California law requires electric and gas utilities to maintain records of energy consumption data for all non-residential buildings to which they provide service. The information is required to be uploaded into the U.S. Environmental Protection Agency's ENERGY STAR Portfolio Manager, for at least the most recent 12 months. As of January 2010, a non-residential building owner or operator will be required to disclose ENERGY STAR Portfolio Manager benchmarking data and ratings, for the most recent 12-month period, to a prospective buyer, lessee, or lender.[45]

Washington D.C.

The *Clean and Affordable Energy Act of 2008* establishes a requirement for the District to benchmark all of its own buildings greater than 10,000 square feet. The benchmarking is to be done annually utilizing the ENERGY STAR Portfolio Manager tool. Starting in 2010, annual benchmarking of privately owned buildings will also be required. The private sector requirement will be phased in, starting with buildings of more than 200,000 square feet in 2010. By 2013, all privately owned buildings of more than 50,000 square feet are to be benchmarked. The benchmarking results are to be made public through the District of Columbia Department of the Environment website.[46]

How Will Time-of-Sale Disclosure Help Achieve Maryland Goals?

Maryland's existing energy efficiency programs primarily focus on addressing financial barriers to energy efficiency implementation. However, lack of information about the energy performance of residential and commercial buildings also stands in the way of wise consumer choices. For example, commercial building owners may not have any information about the energy performance of a building compared to other similar buildings, and so may not realize that significant efficiency improvements could be implemented. On the residential side, energy efficiency is an issue that a prospective buyer should consider at the time of sale, but it is not a quality that he/she can easily observe in a normal walk-through.

Time-of-sale disclosure requirements would create positive market "pull" to bolster the EmPOWER Maryland goals. Residential and commercial building sellers would be more likely to implement energy efficiency improvements prior to sale if they knew that energy information will be disclosed to prospective buyers. Similarly, buyers would pay attention to energy consumption if energy information were provided for all buildings in the market. Buyers would want to purchase properties with good energy performance, creating higher demand for efficient buildings and lessening demand for inefficient ones.

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[44] MEA, *Maryland Strategic Electricity Plan* (January 2008), p. 29, http://energy.maryland.gov/about/reports/index.asp.

[45] California Public Resources Code, Section 25402.10, http://www.leginfo.ca.gov/cgi-bin/displaycode?section=prc&group=25001-26000&file=25400-25405.6.

[46] *Washington D.C. Clean and Affordable Energy Act of 2008*, http://bcap-energy.org/files/DC_Clean_Affordable_Energy_Act_2008.pdf.

Time-of-sale disclosure requirements do have a cost impact, depending on the type of information required. Historical energy use and cost information for prospective buyers is available through utility companies and imposes negligible burden on the seller. If a requirement to conduct an energy audit prior to sale is adopted, costs will depend on the type of audit that is required and the size and type of the building being evaluated. The City of Austin estimates that the type of audit it requires will cost $200-$300 for an average home. More extensive audits can cost more. For example, obtaining a HERS rating in Maryland typically costs $300-$700.[47]

EPA's ENERGY STAR Portfolio Manager tool for evaluating commercial building energy performance is available free of charge. However, to actually conduct the evaluation requires a time commitment by either in-house staff or an outside vendor. In either case, the building owner incurs costs for the actual energy audit.

What Are the Advantages and Disadvantages of a Time-of-Sale Disclosure Requirement?

Advantages include:

- A time-of-sale disclosure requirement creates an incentive for sellers to make energy efficiency investments prior to the sale of a property.
- It addresses a market failure by making it easier for energy efficiency to be incorporated into market decisions.
- It strengthens the market for, and increases value of, energy-efficient buildings.
- Disclosure of energy consumption and cost information is administratively easy and incurs negligible cost to building owners.
- The requirement to conduct an energy audit, such as a HERS rating or ENERGY STAR Portfolio Manager analysis, provides an accurate and comprehensive analysis of a building's energy performance.
- A time-of-sale disclosure requirement minimally affects the State's budget.

Disadvantages include:

- Historical energy consumption and cost data may provide insufficient information about a building's actual energy-efficiency. The energy consumption habits of building occupants have a significant impact on energy consumption, and therefore energy use can vary widely for homes of similar size and characteristics.
- If a comprehensive analysis of a building's energy performance is required, it may impose an additional cost to home sale transactions.
- Any additional barriers to sale transactions can further weaken today's slow real estate market.
- If demand for energy audits increases significantly, there may not be adequate numbers of qualified auditors. This would need to be addressed by supporting auditor training and qualification efforts.
- Energy performance disclosure requirements may make new buildings look more attractive than older existing buildings and may encourage urban sprawl.
- The actual energy reduction impacts that result from the disclosure requirement are difficult to estimate.

[47] MEA, *Maryland Strategic Electricity Plan* (January 2008), p. 29, http://energy.maryland.gov/about/reports/index.asp.

Recommendation

MEA recommends that for all residential and commercial buildings, energy consumption for the previous year must be disclosed at the time of listing for sale, subject to size limitations. The requirement should be modeled after the time-of-sale disclosure requirement currently in force in Montgomery County and should include distribution of a fact sheet on the building that enables the buyer to put annual energy use information into context.

Rationale: While consumers are more aware than ever about the importance of a building's energy performance, such information is not readily available in the marketplace. Requiring disclosure of energy consumption at the time of listing will encourage residential and commercial property owners to invest in energy efficiency, which will increase the value of their buildings. Such disclosure will also help consumers make more informed purchases since the energy efficiency of a home or business makes a major impact on affordability, comfort, and quality of life. Requiring disclosure of the prior year's annual consumption at the time-of-sale will impose no added costs on consumers, while providing critical information to the real estate market and encouraging greater adoption of energy efficiency technologies.

3.3.2 Tax Credits for Zero Energy and Zero Energy-Ready Buildings

What Are Tax Credits for Zero Energy and Zero Energy-Ready Buildings?

Among design and construction professionals, great emphasis is being placed on developing technologies that go far beyond current existing building efficiency standards. The U.S. Department of Energy (DOE) defines a zero energy building as a residential or commercial building with greatly reduced needs for energy (60% – 70% less than conventional practice), with the balance of energy needs supplied by renewable technologies. DOE is creating technologies and design approaches that will lead to marketable zero energy homes by 2020 and zero energy commercial buildings by 2025.[48] While zero energy and zero energy-ready buildings do exist in the U.S., they are not widespread across the nation.

In 2007, the United Kingdom announced a goal of building all new homes as carbon-neutral by 2016.[49] The 2030 Challenge, issued by Architecture 2030, calls on building professionals to design and build carbon-neutral buildings by the year 2030. Architecture 2030 believes this goal can be accomplished by implementing innovative, sustainable design strategies, generating on-site renewable power, and/or purchasing renewable energy credits.[50]

Realizing that the cost of on-site renewable energy generation can be prohibitive at this time and a major obstacle to the construction of carbon neutral buildings, some building professionals talk about the concept of "zero energy-ready buildings" as an interim step toward achieving the long-term goal. A zero energy-ready building is constructed with the idea that on-site renewable energy generation can be easily incorporated into the building once it is cost-effective. The passive house ("passivhaus") design is an example of a zero energy-ready building already in existence.[51] It is

[48] U.S. DOE, Building Technologies Program, http://www1.eere.energy.gov/buildings/goals.html.
[49] Department of Communities and Local Government (UK), *Building a Greener Future: Policy Statement*, http://www.communities.gov.uk/documents/planningandbuilding/pdf/building-greener.pdf.
[50] Architecture 2030, http://www.architecture2030.org/.
[51] Passive House Institute, http://www.passiv.de/07_eng/index_e.html.

estimated that approximately 15,000 such homes already exist around the world. In Germany, the cost of a passive house has been estimated to be 5-7% higher than a conventional house.[52]

To incentivize the construction of zero energy and zero energy-ready buildings, income tax credits could be established for builders and contractors. In Maryland, the tax credits could be implemented by extending and modifying the State's existing Commercial Green Building Tax Credit program to specify energy savings levels for buildings.

What Is Maryland's Experience Regarding Tax Credits for High-Performance Buildings?

Through the Commercial Green Building Tax Credit program, personal and corporate income tax credits of 6-8% are available for residential and non-residential buildings of at least 20,000 square feet that are constructed or rehabilitated to meet Leadership in Energy Efficiency Design (LEED) criteria. In addition to meeting LEED criteria, new buildings are required to use 35% less energy than required by ASHRAE 90.1-1999; rehabilitated buildings must use 25% below the ASHRAE standard. Over the life of the program, $25 million in tax credits will have been made available. At this time, all of the available credits have been allocated.[53]

Created in 2001, the Green Building Tax Credit program is administered by the MEA. In order to qualify for the credit, the building project must be in a qualified brownfield site or a priority funding area as designated by the Maryland Department of Planning. The $25 million in credits available through the program have been distributed among 18 construction projects around the State. The total square footage of these building projects is approximately 2.4 million. The MEA estimates that the projects will achieve an average of 35% energy savings, or total savings of approximately 41.5 billion Btu per year.[54]

At the local level, Montgomery and Howard counties provide optional property tax credits for high performance buildings. The State also allows local governments to provide property tax credits for solar, geothermal and "qualifying energy conservation devices"; five Maryland counties have established such credits for one or more technologies.[55]

What Are Other States' Experiences with Tax Credits for High-Performance Buildings?

Based on review of information in the Database of State Incentives for Renewables and Efficiency (DSIRE), no states have been identified as offering tax incentives specifically aimed at zero energy or zero energy-ready buildings. A handful of states provide tax incentives similar to Maryland's Green Building Tax Credits for high-performance buildings. Arizona and New Mexico are the only states that offer tax incentives for high-performance residential buildings. Maryland, New Mexico and New York are the only states that provide tax incentives for high-performing larger commercial buildings or multi-family dwellings. (Eight states provide tax incentives for implementing energy efficiency measures, but these incentives are not tied to a building's overall energy performance.) [56]

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52 The New York Times, *No Furnaces but Heat Aplenty in 'Passive Houses'*, December 26, 2008, http://www.nytimes.com/2008/12/27/world/europe/27house.html.
53 MEA, Green Building Tax Credit program, http://energy.maryland.gov/incentives/business/greenbuilding/index.asp.
54 MEA, Green Building Tax Credit program data.
55 Database of State Incentives for Renewables and Efficiency (DSIRE), http://www.dsireusa.org/.
56 DSIRE, http://www.dsireusa.org/.

Arizona

Arizona provides an individual income tax deduction to the original owner of a new energy efficient home. The deduction may be claimed in the year that the house is sold. It is equal to 5% of the sales price and cannot exceed $5,000. The tax deduction is available for new single family residences, condominiums, or townhouses that exceed the 1995 Model Energy Code threshold by at least 50% (90 points) as determined by an approved rating program. The deduction is valid for taxable years beginning after December 31, 2001, and ending before December 31, 2010.[57]

New Mexico

New Mexico established a personal tax credit and a corporate tax credit for sustainable buildings in 2007. For commercial properties, a LEED certification and energy performance that is 50% better than a typical building of similar type is required. For residential homes, certifications are based on LEED or the Build Green New Mexico rating system; energy performance that is 40% better than a code compliant building is also required. For manufactured homes, the program requires an ENERGY STAR certification. The amount of the tax credit is based on the qualified occupied square footage of the building and the sustainable building rating achieved. The State grants $5 million worth of certificates for commercial buildings and $5 million for residential buildings per calendar year.

According to the New Mexico Energy, Minerals, and Natural Resources Department, less than one-fifth of the available credits have been used in years 2007, 2008 and 2009.[58] Despite this, the program is considered a success and ramp-up in number of tax credit applications has been faster than expected – especially in light of current economic conditions and the slow real estate market. For the residential tax credits, the number of applications increased from only two in the program's first year in 2007 to approximately 100 applications in 2008. It is expected that approximately 200 applications will be received in 2009. The State estimates that the 100 residential homes that received credits in 2008 yielded 4.3 billion Btus in annual energy savings compared to average code compliant homes. For commercial buildings that received credits in 2008, the annual energy savings are estimated at 3.3 billion Btus.[59]

New York

In 2000 New York established a Green Building Tax Credit for owners and tenants of eligible buildings which meet certain "green" standards. The original legislation allowed applicants to apply for the credits in years 2001-2004 and to claim the credits over five years. The program was extended in 2005, allowing applicants to apply for credits from 2005-2009, with nine years to claim the credits. The original law provided for $25 million in credit certificates; the 2005 legislation added another $25 million. The 2005 legislation also caps incentives at $2 million per building in aggregate.[60]

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57 Southwest Energy Efficiency Project, http://www.swenergy.org/buildingefficiency/zeh/incentives.htm.

58 New Mexico Energy, Minerals, and Natural Resources Department, Sustainable Building Tax Credit, http://www.emnrd.state.nm.us/ECMD/CleanEnergyTaxIncentives/sustainablebuildingtaxcredit.htm.

59 New Mexico Energy, Minerals, and Natural Resources Department, Susie Marbury, phone conversation on November 9, 2009.

60 New York State Department of Environmental Conservation, http://www.dec.ny.gov/energy/1540.html.

This tax credit has had mixed results. According to the New York State Department of Environmental Conservation, only seven buildings have applied for this tax credit since the program's inception in 2000.[61]

How Will Tax Credits for Zero Energy and Zero Energy-Ready Buildings Help Achieve Maryland Goals?

Buildings consume more than 70% of electricity and 40% of total energy consumed in the U.S.[62] Thus, addressing building energy efficiency is a very important part of a comprehensive energy efficiency strategy. Because buildings have long lifetimes and are difficult and costly to retrofit, it is most cost effective to address energy efficiency when buildings are first built. Mandatory building energy codes are the primary tool to ensure that new buildings are energy efficient. The Maryland Department of Housing and Community Development (DHCD) adopts, on a three-year cycle, the latest iteration of the International Energy Conservation Code (IECC) within 12 months of its promulgation, and local governments must implement and enforce the most current code within six months of adoption by DHCD.[63] The 2009 IECC for both residential and commercial buildings became effective in Maryland on October 1, 2009. The new code is expected to yield additional energy savings of approximately 15% compared to the 2006 IECC.[64]

As the experience with the Maryland Commercial Green Building Tax Credit program has shown, tax incentives can be an effective tool to push building owners and developers toward even greater efficiency – beyond the existing building energy code – in new and renovated buildings. While Maryland could choose to continue its currently successful tax credit program, it should consider establishing a new incentive program with even more stringent energy efficiency criteria.

Since DOE is working toward technologies and design approaches that lead to marketable zero energy homes by 2020 and zero energy commercial buildings by 2025,[65] it makes sense for Maryland to support building construction with similar targets. Zero energy and zero energy-ready buildings should meet very stringent efficiency criteria, similar to the efficiency guidelines developed by the 2030 Challenge of the Architecture 2030 initiative. The 2030 Challenge sets a "fossil fuel reduction standard" (compared to the regional average for that building type) for all new buildings and major renovations. This proposed standard is 60% reduction in 2010, 70% in 2015, 80% in 2020, 90% in 2025, and finally carbon-neutral in 2030.[66]

Following New Mexico and Arizona's example, Maryland should consider expanding the tax credit program to residential buildings. It would be beneficial for the State to incent market transformation in both commercial and residential building sectors.

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61 New York State Department of Environmental Conservation, phone conversation October 19, 2009.
62 ACEEE, *The 2008 State Energy Efficiency Scorecard*, p. 24.
63 Senate Bill 625 (2009), http://mlis.state.md.us/2009rs/billfile/SB0625.htm.
64 Building Codes Assistance Project, *Building Codes & Efficiency: Maryland* Factsheet (February 2009), http://bcap-energy.org/files/Maryland_Fact_Sheet.pdf.
65 U.S. DOE, Building Technologies Program, http://www1.eere.energy.gov/buildings/goals.html.
66 Architecture 2030, http://www.architecture2030.org/2030_challenge/index.html.

What Are the Advantages and Disadvantages of Tax Credits for Zero Energy and Zero Energy-Ready Buildings?

Advantages include:

- Such tax credits encourage market transformation toward highly efficient buildings. If both residential and commercial buildings are included in the program, it would enhance market transformation in both sectors. (Current Maryland tax credits are not available for small residential buildings.)
- These tax credits focus on cutting-edge and innovative designs and technologies, instead of building solutions that may have already gained customer acceptance and significant market share.
- These tax credits focus on the buildings sector, which consumes more than 70% of electricity and 40% of total energy consumed in the U.S.[67]
- By capping the total tax credits available, the cost of this incentive program is known.

Disadvantages include:

- Additional State appropriations are needed to establish a tax credit program. Considering the State's current fiscal situation, this could be a major challenge.
- Establishing very stringent efficiency standards and renewable energy production requirements is likely to increase construction costs and require use of technologies that may not be cost-effective.
- If established standards are too stringent, few projects may apply for credits and funds may go unused.
- Since no similar standards exist in other states, additional resources will be needed to establish program standards and guidelines.

Recommendation

A tax credit program for zero energy and zero energy-ready buildings should be considered, even in these difficult fiscal times, as it would encourage immediate investment in zero energy building projects while the fiscal impacts are not felt until the buildings are complete several years from now.

Rationale: The building sector consumes more than 70% of electricity and 40% of total energy consumed in the U.S. California's long term commitment to energy efficient buildings is a key reason why Californians consume roughly 40% less electricity per capita than Marylanders. A highly targeted zero energy building tax credit would spur more energy efficient construction practices, help transform the building industry in Maryland, and set our course toward a more sustainable energy future.

Zero energy buildings are defined as buildings that have greatly reduced energy needs through efficiency gains, with the balance of energy needs supplied by renewable technologies. A zero energy ready building is constructed with the idea that on-site renewable energy generation can be easily incorporated into the building once it is cost effective. Similar to the success of Maryland's Commercial Green Building Tax Credit program, a zero energy building program can be launched

[67] ACEEE, *The 2008 State Energy Efficiency Scorecard*, p. 24.

even in these difficult fiscal times as it would encourage investment in zero energy building projects today, while the fiscal impact is not felt until the building is complete several years from now.

3.3.3 Combined Heat and Power (CHP) Initiatives

What Is Combined Heat and Power (CHP)?

Combined heat and power (CHP) applications are integrated systems that generate both electricity and thermal energy. Because CHP systems utilize the heat that is normally lost in electricity generation, these systems are significantly more efficient than separate systems for electricity and thermal energy generation. CHP systems utilize the recovered energy to serve an existing thermal load, such as facility's water heating needs or process heat at industrial facilities.

Maryland's 20 CHP facilities have a combined total capacity of 836 MW.[68] Natural gas is the primary fuel used for powering existing CHP facilities in the State, and the Department of Natural Resources (DNR) Power Plant Research Program (PPRP) expects natural gas-fired systems to dominate new CHP construction efforts in the future.[69]

CHP faces a number of barriers to more aggressive development, including regulatory hurdles, utility requirements, and the high cost of feasibility studies. High and volatile natural gas prices over the last few years[70] have been another significant factor limiting further CHP deployment. When natural gas prices rise, the economic viability of a CHP system diminishes. While the PSC and MEA are promoting CHP deployment in Maryland, additional initiatives could be taken to make CHP a more attractive option for businesses, public and private institutions, and utilities.

What Is Maryland's Experience with CHP?

Despite CHP's many potential energy efficiency benefits, the business case for installing CHP in Maryland has been less than compelling. High natural gas prices relative to historic electricity rates and air permitting policies that fail to credit displaced emissions in place of increased onsite emissions at CHP sites have historically been two main factors for the lack of CHP installations in the State.[71] Air permitting policies are controlled by federal law; therefore, changing this process is not fully within State control.

Maryland currently has some policies in place to encourage CHP, including a PSC-approved standard interconnection rule that includes all distributed generation (DG) systems up to 10 MW in size.[72] Baltimore Gas and Electric's (BGE) Schedule S and Allegheny Power's Schedule AGS both

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68 Energy and Environmental Analysis Inc. /ICF International, *Combined Heat and Power Installation Database*, last updated January 21, 2009, http://www.eea-inc.com/chpdata/States/MD.html.

69 Maryland Power Plant Research Program, *Inventory and Analysis of Combined Heat and Power Systems in Maryland* (April 2006), http://esm.versar.com/PPRP/bibliography/PPES_06_03/PPES_06_03.pdf.

70 EIA, *Natural Gas Prices*, http://tonto.eia.doe.gov/dnav/ng/ng_pri_sum_dcu_nus_m.htm.

71 American Council for an Energy-Efficient Economy, *Energy Efficiency, The First Fuel for a Clean Energy Future, Resources for Meeting Maryland's Electricity Needs* (February 2008), http://www.aceee.org/pubs/e082.htm.

72 American Council for an Energy-Efficient Economy, *Maryland Clean Distributed Generation* (August 2009), http://www.aceee.org/energy/state/maryland/md_dg.htm.

have standby rates that are considered neutral to CHP.[73] In addition, the PSC is currently considering proposals intended to remove certain utility DG rate and practice barriers and to provide incentives for CHP.

What Are Other States' Experiences with CHP?

An examination of other states' successful CHP policies provides perspective on where Maryland's policies rank, as well as input on policies that can be considered to further encourage CHP. ACEEE's *State Energy Efficiency Scorecard*, ranks states on a scale of 0 to 5 on CHP-related policies and programs, based on this order of importance:

- Standard interconnection rules
- Status of CHP-friendly standby rates
- Presence of CHP financial incentive programs
- Presence of output-based emissions regulations
- Inclusion of CHP/waste heat recovery in a state renewable portfolio standard (RPS) or energy efficiency resource standard (EERS)

With a total score of 3, Maryland ranks eighteenth among the 50 states and District of Columbia. Exhibit 3.1 illustrates selected top-ranked states and Maryland.[74]

Exhibit 3.1. State Scoring for CHP – Selected Top-Ranked States and Maryland (2009)

State	Interconnection	Standby Rates	Financial Incentives	Output-Based Emissions Regulations	RPS/EERS	Rank	Overall Score
OH	6	2	4	++	++	2	5
TX	6	3	0	+++	++	3	5
IL	6	3	0	+++		6	5
MD	6	3	0			18	3

Source: American Council for an Energy-Efficient Economy, *The 2009 State Energy Efficiency Scorecard* (October 2009), p. 36. Note on ACEEE scoring: Each policy is scored separately using differing scales. The overall score is a weighted average of the five policy scores, with 5 being the highest overall score.

Ohio

Ohio has several CHP-friendly policies in place, including exemplary interconnection standards, an Alternative Energy Resource Standard that includes CHP as a qualified alternative energy resource, and several financial incentives. In particular, Ohio's interconnection standard policy—which was established in 2007—is a good example for other states to follow. With three size tiers and systems up to 20 MW eligible for grid interconnection, Ohio's policy is particularly favorable to CHP since the tier system enables smaller CHP systems to have a faster (and often cheaper) path

[73] BGE charges the actual energy under the regular rate. Allegheny Power uses real-time pricing for moderate demand and energy charges. No ratchet exists for either of these rates. Source: American Council for an Energy-Efficient Economy, *Maryland Clean Distributed Generation* (August 2009), http://www.aceee.org/energy/state/maryland/md_dg.htm.

[74] American Council for an Energy-Efficient Economy, *The 2009 State Energy Efficiency Scorecard* (October 2009), p. 34-37, http://www.aceee.org/pubs/e097.htm.

to interconnection, and the higher interconnection limit of 20 MW is preferred by CHP developers.[75]

Texas

Texas has been a leader in establishing CHP-friendly policies. Texas's interconnection policy has been in place since 1999. Like Maryland's interconnection policy, the Texas policy applies to systems up to 10 MW. CHP is also included as a key component of Texas's Energy Efficiency Goal, and Texas's emissions regulations provide credit for thermal output for highly-efficient CHP systems. Texas also has CHP-friendly standby rates. Though Texas has few financial incentives for CHP, it has the most installed CHP capacity of any state.[76]

Illinois

Illinois has a tiered interconnection policy, established in 2008, for systems up to 10 MW of capacity, and currently has an open docket to explore rules for systems larger than 10 MW. In addition to establishing output-based emissions regulations, Illinois allows CHP to be eligible for energy-efficiency set-aside allowances.[77]

What CHP Initiatives Should Maryland Consider?

As Maryland business and industrial leaders investigate CHP opportunities at their facilities, they may encounter a number of barriers. As suggested in *Maryland's Energy Future-Energy Transition Report*, the MEA should focus on barrier-removing strategies specifically for CHP and use other states' experiences in removing them in Maryland.[78] To promote CHP development, financial incentives that require funding (e.g., loans, tax credits, grants, buy-downs, favorable fuel rates, and generation incentives) and/or regulatory or policy initiatives that do not require funding (e.g., standardized interconnection, inclusion of CHP in portfolio standards, and CHP-friendly standby rates) could be implemented.[79]

Specific potential CHP initiatives for Maryland include:

- Adoption of new regulations and policies friendly to clean distributed generation (DG) and CHP
- Exploration of large-scale CHP projects
- Establishment of financial incentives for CHP
- Aggressive CHP education and outreach

Adopt New Regulations and Policies

The MEA should collaborate with other Maryland agencies to adopt new regulations and policies that encourage the deployment of clean DG and CHP. Although Maryland already has an

[75] American Council for an Energy-Efficient Economy, *The 2009 State Energy Efficiency Scorecard* (October 2009), p. 37, http://www.aceee.org/pubs/e097.htm.
[76] ACEEE, *The 2009 State Energy Efficiency Scorecard*, p. 37, http://www.aceee.org/pubs/e097.htm.
[77] ACEEE, *The 2009 State Energy Efficiency Scorecard*, p. 37, http://www.aceee.org/pubs/e097.htm.
[78] Maryland Energy Transition Team, *Maryland's Energy Future – Energy Transition Report 2007* (February 2007), http://www.gov.state.md.us/documents/transition/Energy.pdf.
[79] Maryland PSC, Demand Response/Distributed Generation Working Group, EPA Maryland CHP Incentive, January 15, 2009, http://webapp.psc.state.md.us/Intranet/CaseNum/submit.cfm?DirPath=\\Coldfusion\EWorkingGroups\DRDG\\9149%20Distributed%20Generation%20Working%20Group&CaseN=Demand%20Response/Distributed%20Generation%20Working%20Group.

interconnection standard in place, the MEA should present a case to the Maryland PSC related to increasing the size range of generators that are covered by the interconnection rules. The MEA should also work with the Maryland Department of the Environment (MDE) to institute output-based regulations that will encourage clean DG technologies and CHP. Furthermore, the Governor and General Assembly could strive to revise Maryland's RPS to include CHP as an eligible technology.

Explore the Feasibility of Large-Scale CHP Projects

Maryland should explore the feasibility of large-scale projects that utilize waste heat in existing and future electricity generating facilities. District energy systems are one practical way utilities and other entities can increase overall fuel utilization efficiency. The University of Maryland at College Park utilizes CHP to provide heating, cooling and electricity for the campus. Baltimore has a district heating and cooling system in the central business district (with a new expansion to Inner Harbor East) with 60% of its steam provided by a waste-to-energy plant.[80] The feasibility of such systems in other locations or the expansion of the Baltimore system should be studied. The State may also want to consider if it is justified and reasonable to establish a requirement that all new fossil-fueled baseload generation facilities in Maryland utilize their waste heat.

Establish Financial Incentives

Maryland already has financial incentives for distributed renewable generation. The State should consider establishing new financial incentives specifically for CHP deployment. New Jersey's CHP grants could be used as a model[81] by providing a rebate for each kW of capacity installed in CHP facilities.

Advance CHP Education and Outreach

While many Marylanders are aware of the positive impacts of renewable energy, the benefits of CHP are not easily recognized. Advancing education and outreach on CHP across all sectors is an important initiative. The MEA should first focus on industrial/manufacturing facility managers. One approach is for Maryland to sponsor training seminars to educate these managers on CHP and the rationale for installing units at their facilities. Then, MEA can focus on the public sector through more aggressive public awareness campaigns, energy audits, and technical training at industrial, commercial, and institutional sites, utilizing college and university engineering students and other technically trained staff from the Mid-Atlantic Clean Energy Application Center, headquartered at Pennsylvania State University.

How Will CHP Initiatives Help Achieve Maryland Goals?

The inherent fuel efficiency of CHP systems makes them an important part of achieving the EmPOWER Maryland goals. CHP is efficient and most new CHP, if fueled by natural gas or biomass, also has the potential to reduce GHG emissions depending on the grid supply it displaces. In addition to energy efficiency benefits, the additional generating capacity provided by CHP systems can help utilities meet their load during times of peak demand.

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[80] Veolia Energy, http://www.veoliaenergyna.com/en/veolia-energy-north-america/locations/baltimore.htm.

[81] U.S. Environmental Protection Agency, Combined Heat and Power Partnership, *Funding Resources – NJ CHP Grants* (September 2009), http://www.epa.gov/chp/funding/funding/newnjchpgrants.html.

According to the Maryland DNR, approximately 3,700 sites in Maryland have the technical potential – potential maximum penetration rate without regard to economic feasibility – to utilize CHP. ACEEE estimates that the technical potential of CHP in Maryland is approximately 4,000 MW, of which ACEEE estimates the economic – or economically justifiable – potential to be 291 MW. ACEEE projects that, if implemented, the 291 MW CHP capacity could save 18.9 trillion Btu/year in fuel consumption, which equals 1.3% of all Maryland energy consumption in 2007. The same CHP capacity could produce approximately 2,000 GWh of electricity per year, an amount equal to 4.0% of all electric generation in Maryland in 2007.[82]

What are the Advantages and Disadvantages of CHP Initiatives?

Advantages include:

- The inherent fuel efficiency of CHP requires less fuel to produce a given energy output and the onsite location of CHP avoids transmission and distribution losses.
- CHP can play a large role in reducing the environmental impact of power generation. Because less fuel is burned to produce each unit of energy output, CHP reduces air pollution and GHG emissions. Most new CHP, if fueled by natural gas or particularly biofuels, has the potential to reduce GHG emissions depending on the grid supply displaced.
- CHP can be designed to provide high-quality electricity and thermal energy to a site regardless of what might occur on the grid. This decreases the impact of outages and improves power quality.

Disadvantages include:

- Additional State appropriations are needed to establish financial incentives for CHP. Given the State's fiscal situation, this could be a major challenge.
- Larger CHP projects, such as district energy systems, require a long-term commitment that does not often fit with a focus on short-term return on investment.
- Projected relatively high natural gas prices over the next two decades,[83] and price volatility, can make CHP an economically unattractive option despite strong incentives.

Recommendation

MEA, in conjunction with other relevant State agencies, should consider presenting a case to the PSC regarding further regulatory actions to enhance the economic viability of combined heat and power (CHP) systems. However, MEA does not believe that devoting significant financial resources to support such installations, such as grants or other financial assistance, is justifiable at this time.

Rationale: CHP applications are integrated systems that generate both electricity and thermal energy. These systems are significantly more efficient than separate systems for electricity and thermal energy generation and promise significant benefits in the form of energy efficiency and lower GHG emissions.

The State's regulatory agencies should pursue further actions to remove barriers for CHP technology implementation. Potential options include increasing the size range of generators that

[82] ACEEE, *Energy Efficiency: The First Fuel for a Clean Energy Future*, p. 32.
[83] EIA, Annual Energy Outlook 2009, *Natural Gas Demand*, http://www.eia.doe.gov/oiaf/aeo/gas.html.

are covered by existing interconnection rules and instituting output-based emissions regulations to encourage clean distributed generation technologies. However, the economic viability of CHP projects is mainly dictated by the relative cost of natural gas and electricity. As a result, MEA does not believe that devoting significant resources in support of such installations in the form of grants or other financial assistance is justifiable at this time.

3.3.4 New Appliance Efficiency Standards

What Are Appliance Efficiency Standards?

Appliance efficiency standards set minimum energy efficiency levels for all products in specific appliance categories. Appliance standards address the energy consumption of many common household and small commercial appliances such as bottle-type water dispensers, televisions, portable light fixtures, compact audio equipment, and DVD players and recorders. In effect, efficiency standards remove the most inefficient products from the market. Even though energy savings per individual appliance may seem low, the collective effects of appliance standards are significant as they affect all products purchased in the marketplace.

State appliance efficiency standards have been an important driver to guide the development of federal standards. Prompted by state standards, the federal government has established efficiency standards for a large number of energy consuming products. The Obama Administration has issued a new expedited rulemaking schedule calling for 26 new appliance standards to be completed by January 2013. Nevertheless, many states continue to adopt efficiency standards for appliances not covered by the federal standards.

What Is Maryland's Experience with New Appliance Efficiency Standards?

According to the Appliance Standards Awareness Project (ASAP), Maryland is one of 12 states that have current appliance standards in effect that are not pre-empted by the federal standards. Over the years, Maryland has adopted efficiency standards for a variety of appliances. Currently, efficiency standards for the following three product categories are not covered by federal standards and are thus enforced by the State of Maryland: bottle-type water dispensers, commercial hot food holding cabinets, and residential natural gas furnaces.[84]

Under the *Maryland Energy Efficiency Standards Act of 2007*, the MEA was tasked with proposing legislative improvements to current standards and additional appliances that should be covered by state standards every two years. Any new state standards need to be cost effective on a life-cycle basis and technologically feasible. In 2009, House Bill 1238 was introduced to set efficiency standards on televisions, but it was not enacted into law.

What Are Other States' Experiences with New Appliance Efficiency Standards?

Maryland has not been alone in using state appliance efficiency standards as a means to push for the development of federal standards. The Northeast Energy Efficiency Partnership (NEEP) and the Appliance Standards Awareness Project (ASAP) are promoting the adoption of new appliance efficiency standards in other Northeast and Mid-Atlantic states, including Massachusetts, New York, Pennsylvania and New Jersey.

[84] Appliance Standards Awareness Project, *State Standard,* http://www.standardsasap.org/state/index.htm

California

California – a long-time leader in this policy area – has the most state-level appliance standards in effect, with a total of nine such standards.[85] While a number of Northeast states have adopted standards for similar products, only California has established a standard on the active mode for televisions.[86]

The California television standard is a technology-neutral, performance-based specification that sets a limit on a television's active mode electricity use using a formula directly proportional to the television's screen size (i.e., larger sets are allowed more electricity use as a function of their size).[87] This standard only applies to televisions 1,400 square inches and smaller (58 diagonal inches). The regulations will not affect existing televisions that consumers already own or the televisions currently on retail store shelves. Stores will not be prohibited from selling existing stock of older televisions after the standard goes into effect.

As can be seen in Exhibit 3.2, the California standard takes effect in two tiers, effective in 2011 and 2013. Since the current market share of Tier 1 qualified televisions is already around 82%,[88] significant savings result from implementation of the Tier 2 standard. The Tier 2 standard is the same as the ENERGY STAR V4 requirement, which becomes effective on a voluntary basis in May 2010. Manufacturers are currently promoting Tier 2 compliant products, such as their "Eco" or "Green" products. Of the nearly 1,200 television models currently available on the market, over 300 already meet the Tier 2 specification (~25%). This new appliance standard will ensure that all new televisions sold in California meet a greatly improved level of energy efficiency.

While the Consumer Electronics Association (CEA) has opposed this standard in California (as it appears they have for every proposed standard on any electronic product), other manufacturers and trade associations support the standard. Leading television manufacturer Vizio, component supplier 3M, and the LCD TV Association each submitted formal comments stating that this standard can easily be met with existing technologies and, most importantly, can be met using technologies that will not increase prices.

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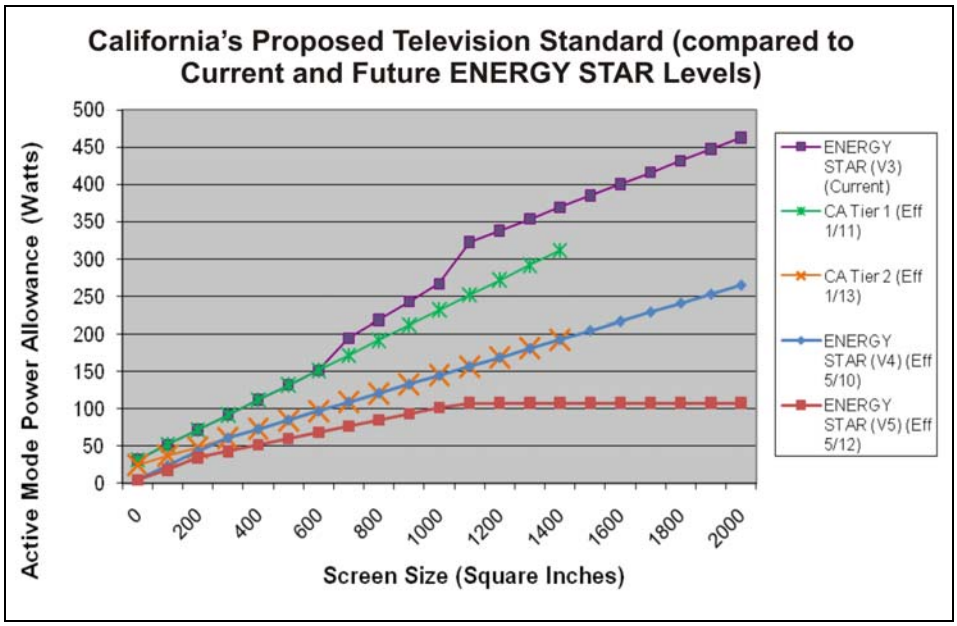
85 Ibid.

86 Included in the *New York Appliance and Equipment Energy Efficiency Standards Act of 2005* were provisions for New York (the New York Secretary of State in consultation with the president of the New York State Energy Research and Development Authority (NYSERDA)) to develop standards for "consumer audio and video products" which include televisions. This process is ongoing and an exact date for completion and implementation is unknown.

87 The standard affects "active mode" energy use, i.e. when the television is on. California also has an existing standard covering "standby" energy use, which limits consumption when off to 3 watts. Very few, if any, televisions currently on the market use more than 1 watt when in standby mode, therefore, the big energy savings opportunity lies in reducing "active mode" energy use. (Active mode accounts for approximately 95% of annual energy use.)

88 California Energy Commission, December 2009.

Exhibit 3.2. California's Proposed Television Standard



Source: Northeast Energy Efficiency Partnerships and Appliance Standards Awareness Project (12/2/09)

Massachusetts

Activity is currently underway in Massachusetts to adopt a package of standards similar to the ones established in California. Working with input from Environment Massachusetts, ASAP and NEEP, Sen. Robert O'Leary and Rep. Frank Smizik introduced a bill in January 2009, which was heard before the legislature's Joint Committee on Telecommunications, Utilities, and Energy on October 7, 2009.

How Will a New Appliance Efficiency Standard Help Achieve Maryland Goals?

The U.S. Energy Information Administration (EIA) estimates that energy consumed through television use – approximately 5.3% of residential electricity use in 2006 – will grow to nearly 7.2% by 2030, making this appliance the most energy consuming, unregulated product in the home. With peripherals, such as set top boxes, television-related energy use increases to around 10%. This increase is due to three factors: annual increase in average hours of operation; increased size of the average television screen; and the fact that high-definition digital televisions use more energy than their analog predecessors. In fact, some large flat screen televisions draw as much power as a common refrigerator.[89]

Enacting a standard for televisions offers Maryland a cost-effective strategy for reducing energy use and GHG emissions while saving consumers and businesses money on their electricity bills. Based on preliminary estimates from NEEP and ASAP, Maryland's adoption of the recommended new appliance efficiency standard for televisions would result in annual savings of 167 kWh per unit. By

[89] Northeast Energy Efficiency Partnerships and Appliance Standards Awareness Project, December 2, 2009.

2015, this would result in annual State efficiency savings of approximately 102 GWh, or total consumer cost savings of approximately $15.3 million.[90]

Adoption of New Regulations and Policies

The manufacturing community is split in its public position regarding minimum standards. While one industry trade association opposed this standard in California, another set of manufacturers and trade associations support the standard. A leading manufacturer, component supplier, and a trade association have all submitted formal comments stating this standard can easily be met with existing technologies and, very importantly, can be met using technologies that will not increase prices. One trade association's arguments have centered on the changing nature of the industry and its preference for voluntary initiatives over standards. The standard takes advantage of the fast changing nature of electronic products to capture very large energy savings because Tier 2 standards encourage manufacturers to focus part of their innovative capability on actually delivering televisions to consumers with the efficient performance they have already shown to be possible. Voluntary initiatives such as ENERGY STAR and utility incentive programs already are effective complements to minimum standards for dozens of other products. Standards raise the "floor" for energy efficiency performance while voluntary efforts create incentives to reach for even further improvements.

The U.S. DOE recently repealed an outmoded federal energy test method for televisions, in order to clear the path for states and the federal government to adopt test methods that work for digital televisions. In repealing the old federal test method, DOE said it would begin a proceeding to set federal minimum standards for televisions "soon." However, no firm schedule has been indicated. Typically, it takes three years for DOE to develop a new standard and DOE typically provides three years between final standard publication and implementation. Thus, the very soonest that federal standards might take effect is sometime in 2016.

What Are the Advantages and Disadvantages of a New Appliance Efficiency Standard for Televisions?

Advantages include:

- Estimated results from implementation of an efficiency standard for televisions include reduced annual electricity use by approximately 102 GWh by 2015 and approximate savings of $15.3 million for Maryland consumers.
- California has set a precedent to address the energy consumption of televisions and has other Northeast states considering similar action.
- Tier 1 television standards are already met by 82% and Tier 2 by 25% of televisions in the market, lending credence to the belief that the California television standard can be met with existing technologies and without increasing prices.
- The California regulation will not affect existing televisions that consumers already own or televisions currently on retail store shelves. Stores will not be prohibited from selling existing television stock after the standard goes into effect.
- No federal standards exist for these products, eliminating any issues of preemption.

[90] Northeast Energy Efficiency Partnerships and Appliance Standards Awareness Project (12/2/09); consumer cost savings are based on delivered cost of 15 cents per kWh.

- Maryland will be in a position to help consumers purchase energy efficient televisions without additional cost restrictions.

Disadvantages include:

- The Consumer Electronics Association opposes energy efficiency standards for consumer electronics.
- The standard does not address televisions purchased outside the state and brought or shipped into the state. The California standard does not address televisions greater than 58 diagonal inches due to the concern over possible cost increases for these products.

Recommendation

MEA recommends implementation of a standard modeled after the California Tier 2 standard for televisions sold in Maryland.

Rationale: Nationally, televisions consumed about 5.3% of residential electricity use in 2006, and are estimated to consume nearly 7.2% by 2030,[91] making them the most energy consumptive, unregulated product in the home. Some large flat screen televisions draw as much power as a common refrigerator.

MEA recommends adopting the California Tier 2 television standard, effective January 2013. This standard, which 25% of televisions sold today already meet, is the same as the ENERGY STAR V4 requirement, which becomes effective on a voluntary basis in May 2010. Requiring mandatory compliance in 2013 allows manufacturers time to update their remaining product line to meet the new standard and for retailers to sell off their existing stock. Based on testimony from a leading television manufacturer, a supplier, and the LCD TV trade association, this new standard can be met without additional cost increases.

Estimated results from implementation of an efficiency standard for televisions include reduced electricity use of approximately 102 GWh by 2015 and approximate savings of $15.3 million to Maryland consumers.

[91] Calculated using 2005 Televisions/Set Top Box energy breakdown and projecting those proportions on 2006 energy usage and the estimate for 2030. US Energy Information Agency; *An Updated Annual Energy Outlook 2009 Reference Case Reflecting Provisions of the American Recovery and Reinvestment Act and Recent Changes in the Economic Outlook,* http://www.eia.doe.gov/oiaf/servicerpt/stimulus/aeostim.html and Miscellaneous electricity services in the Building Sector http://www.eia.doe.gov/oiaf/aeo/otheranalysis/mesbs.html.

4.0 Options to Advance Renewables to Meet Maryland's Renewable Portfolio Standard (RPS)

Maryland is blessed with rich renewable resources and a business climate that is poised to advance solar, wind, biofuels, and waste-to-energy opportunities that will contribute to the State's clean, reliable, and affordable energy economy. This chapter explores policy and program options to promote renewable energy resources and achieve Maryland's Renewable Portfolio Standard (RPS) goal of 20% renewables by 2022.

4.1 What Is Maryland Currently Doing?

The State of Maryland currently offers incentives for private citizens, businesses, and industries to take advantage of solar, wind, biomass, landfill methane, geothermal, ocean, fuel cell, and hydropower resources. They include:

- Clean energy production tax credits for wind, geothermal, solar, hydropower, small irrigation, and municipal solid waste projects
- Sales tax waiver for renewable energy equipment
- Property tax exemption for solar and wind energy systems
- Wind energy grants up to $20,000 and a free wind anemometer loan program
- Solar energy grants for residential and small commercial photovoltaic (PV) systems of up to $10,000, residential and small commercial solar water heating systems of up to $3,000, and commercial mid-size solar arrays of up to $25,000
- Geothermal heat pump grants of up to $3,000

These incentives have been designed to help achieve the Maryland Renewable Portfolio Standard (RPS). In 2008, the Maryland General Assembly strengthened the State's RPS to provide a market-based incentive for new renewable generation. The Maryland RPS requires Maryland electric suppliers to provide their customers with a gradually increasing portion of their electricity from renewable energy. This obligation is met through retirement of Tier 1 and Tier 2 Renewable Energy Credits, or RECs,[92] or through alternative compliance payments (ACPs) credited into the Maryland's Strategic Energy Investment Fund (SEIF) to support renewable energy projects in Maryland.

[92] One renewable energy credits (REC) is equal to the renewable attribute associated with one megawatt-hour (MWh) of electricity from an accredited renewable source.

Tier 1 resources include: solar, wind, qualifying biomass, landfill methane, geothermal, ocean, certain fuel cells, energy derived from poultry litter, and small hydropower stations. Tier 2 resources include: hydroelectric plants (larger than 30 MW) and waste-to-energy plants, but are only eligible to meet the resource requirement through 2018. Exhibit 4.1 provides details on the timing of the Tier 1 requirements, including a "solar carve-out," which begins at 0.005% in 2008 and ramps up to 2% in 2022, and the sunset of the Tier 2 requirement after 2018.

Exhibit 4.1. RPS Tier Requirements

Year	RPS Goals		
	Tier 1 (%)	Tier 1 Solar (%)	Tier 2 (%)
2007	1	N/A	2.5
2008	2.005	0.005	2.5
2009	2.01	0.01	2.5
2010	3.025	0.025	2.5
2011	5.0	0.04	2.5
2012	6.5	0.06	2.5
2013	8.2	0.10	2.5
2014	10.3	0.15	2.5
2015	11.5	0.25	2.5
2016	12.7	0.35	2.5
2017	13.1	0.55	2.5
2018	15.8	0.90	2.5
2019	17.4	1.20	0
2020	18.0	1.50	0
2021	18.7	1.85	0
2022	20.0	2.00	0

Source: Maryland PSC, *Renewable Energy Portfolio Standard Report of 2009, With Data for Compliance Year 2007* (February 2009), p. 11

Clean Energy Production Tax Credits

The Clean Energy Incentive Tax Credit, enacted in 2006, offers a State income tax credit of 0.85 cents per kWh for electricity generated from qualified renewable sources, including wind, geothermal energy, solar energy, hydropower, small irrigation power, and municipal solid waste.

Tax Exemptions

Maryland waives its sales tax on solar, wind, and geothermal heat pump systems. Maryland also provides a 100% property tax exemption for residential solar and wind energy systems.

Renewable Energy Grants

The Maryland Strategic Energy Investment Fund (SEIF)[93] offers a number of grants to support renewable energy development. Grants are offered for residential solar water heating and photovoltaic (PV) systems, up to $3,000 and $10,000, respectively, to both residential and commercial customers. MEA is also offering businesses grants of up to $25,000 for larger solar arrays.

MEA administers the Windswept grant program, which supports the deployment of wind energy systems for small commercial and residential customers. Private and federal funds are leveraged with grants up to $20,000 in value to offset between 10% and 30% of installation costs. Grant values depend on turbine size and performance. In addition, MEA, in conjunction with the Maryland Environmental Service, loans wind measurement anemometers to Maryland landowners.

Geothermal heat pump grants of up to $3,000 are also provided to Maryland citizens.

Local Government Support

MEA works with Maryland counties to promote renewable energy. Many counties offer their own financial incentives, including Anne Arundel, Harford, Howard, Montgomery, and Prince

[93] MEA, Regional Greenhouse Gas Initiative (RGGI), http://www.energy.state.md.us/rggi.asp.

George's.[94] In particular, MEA supports county officials and community wind energy entrepreneurs in the development of community-scale projects, both through the State's regulatory processes for permitting new generation and through local planning and zoning procedures for small wind energy systems.

Renewable Energy Analysis and Advancement

MEA, the State of Maryland Department of General Services, and the University of Maryland have collectively launched the Generating Clean Horizons initiative to make a larger impact on the amount of installed clean energy in Maryland. An RFP was issued to attract companies interested in providing clean energy generation under a power purchase agreement with the State. In December 2009 the State announced that it would enter into power purchase agreements with four renewable energy projects, including two large-scale solar projects, one land-based wind project, and one offshore wind project.[95] This initiative supports the efforts of the Maryland Public Service Commission, which is considering new in-state generation from both renewable and conventional sources.

In an effort to advance biomass development, several Maryland entities–MEA, Maryland Environmental Services, and Salisbury State University–are conducting a cellulosic feedstock study to assess biomass source locations and the potential costs of moving feedstocks to sites around the State.[96] Scientists Ken Staver and Russell Brinsfield of the University of Maryland are looking for ways to improve water quality from agricultural runoff while at the same time reducing our dependency on fossil fuels,[97] thus improving the health of the Chesapeake Bay and offsetting GHG emissions. Their studies are finding that native grasses, especially switchgrass, could play a role in achieving this objective.[98]

The State of Maryland provides technical support to both developers and other State agencies in planning and pre-construction analysis for renewable energy projects. Earlier this year, the State of Maryland released a Request for Expressions of Interest and Information from wind energy developers interested in constructing wind energy generation facilities in ocean areas adjacent to Maryland's coast. MEA is also completing a Memorandum of Understanding (MOU) with the Department of Natural Resources (DNR) on marine spatial planning.

In addition, through a contract with the DNR, the Nature Conservancy is compiling a detailed report on the characteristics of Maryland's coastal waters and adjacent federal Outer Continental Shelf areas and creating a decision support tool to help facilitate project and policy evaluations. MEA is also developing a strategy for incorporating additional data layers into the Coastal Atlas program (e.g., wind speed, PJM interconnection options, and radar and Federal Aviation

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94 For additional information on state incentives for renewable energy in Maryland, see www.energy.state.md.us.
95 Office of the Governor, Press Release December 8, 2009, http://www.governor.maryland.gov/pressreleases/091208.asp.
96 State of Maryland, Governor's Delivery Unit, *GDU X: Increase Renewable Energy Portfolio by 20% RPS by 2022* (October 2009), p. 6.
97 Native grasses can be used as a renewable energy source similar to woody biomass.
98 Economic value must be incentivized in order for exploration of the efficacy of using native grasses as a renewable energy source to be carried out on a more realistic scale. The State should consider adopting a policy to provide incentives for the development of Tier 1 biomass renewable energy projects. Assembling a group of experts in the field to identify solutions to the current barriers to making this concept economically feasible is one action that could be taken.

Administration restrictions.) Finally, MEA is working collaboratively with the neighboring states of Delaware and Virginia to determine best practices and resources related to offshore wind.[99]

4.2 What Are the Results So Far?

As described in Chapter 2, Maryland is just beginning to show progress in fulfilling the State's RPS mandate. This is primarily due to the 2008 legislative changes in Maryland's RPS requirement, which do not become effective until 2011. Nevertheless, Maryland's RPS obligations through 2007 (latest data available) have been satisfied through submission of the appropriate level of Tier 1 and Tier 2 RECs, or through alternative compliance payments (ACPs). In 2008, ACPs generated over $1 million, mostly to comply with the solar carve-out provisions.

Maryland's Clean Energy Production Tax Credit offers up to $25 million in incentives for projects that begin producing energy by December 31, 2010. To date, MEA has certified approximately $5.1 million out of the $25 million.[100] However, several of these projects have been delayed due to the economic downturn, among other factors, making it unclear whether they will be able to meet the required qualifications.

The response to other MEA-administered financial incentives has been remarkable. The Solar Energy Grant Program reports that grants for PV installations increased from 80 in FY2008 to 208 in FY2009 to over 550 projected in FY2010. Solar water heating grants also increased from 98 to 140 during the same period, with over 225 projected in FY2010.

Installed renewable energy capacity as a result of MEA's Renewable Energy Grant Program is shown in Exhibit 4.2. The number of households served by the program is provided in Exhibit 4.3.

Exhibit 4.2. MEA Renewable Energy Grant Program Installed Capacity (kW)

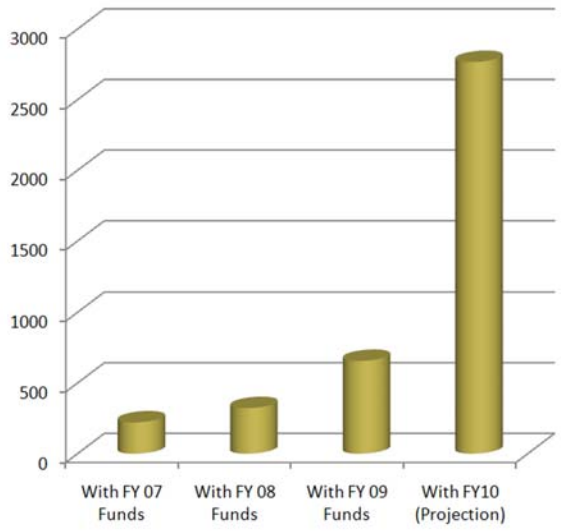
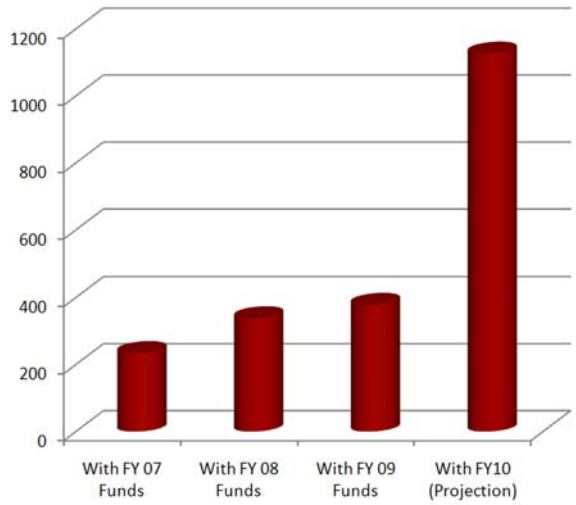


Exhibit 4.3. Number of Households Served by the MEA Renewable Energy Grant Program



[99] Office of Governor O'Malley, Press Release on November 10, 2009, http://www.gov.state.md.us/pressreleases/091110.asp.
[100] MEA.

Due to soaring demand, MEA has modified its grant program and award sizes in an effort to stretch the funds, expand the number of Maryland families receiving awards, and increase the amount of kilowatts generated per dollar spent.

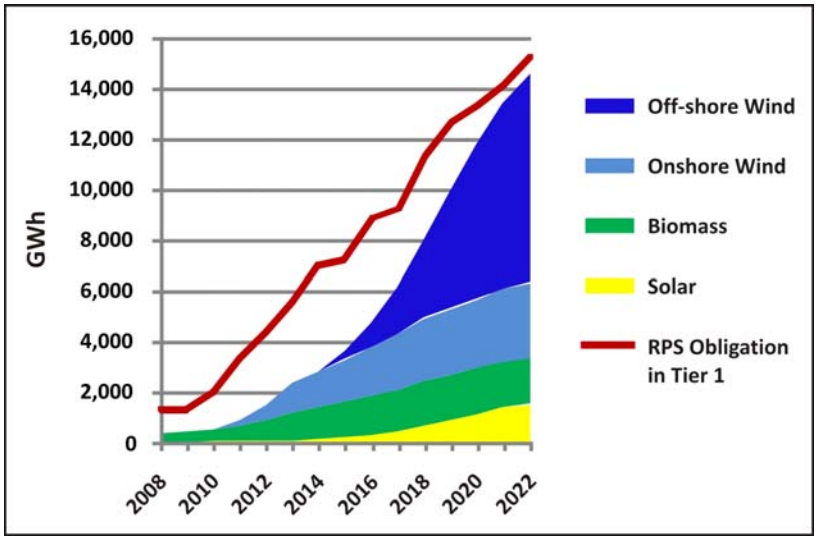
The MEA-administered Windswept grant program has resulted in 224 kW of deployed capacity in FY2009. In FY2010, MEA intends to increase deployment to 400 kW. As for community-scale projects, approximately 30 MW (name-plate) are in the early stages of development.[101]

There are 230 MW of commercial in-state wind projects in the PJM queue that are in various stages of approval by the Maryland PSC. These projects range in size from 40 to 70 MW and are located in western counties in the State. Several projects have been granted Certifications of Public Convenience and Necessity (CPCN) exemptions and are proceeding toward construction.[102] With the recent purchase of the Clipper Wind Project by Constellation Energy, Maryland will have two wind projects that have secured long-term (20 year) purchase power agreements that should enable them to secure construction financing for project completion.[103]

4.3 What More Can We Do?

While progress has been made to meet the RPS requirements, additional actions can be taken today to help Maryland fulfill its important mandate by 2022 and beyond. To meet a significant portion of its RPS goals through in-state renewable generation, new renewable sources such as land-based and offshore wind must be developed in Maryland. Exhibit 4.4 shows that a large portion of the RPS requirement can be met through in-state generation, reflecting changing market conditions as well as our increased understanding of what is working in other states. Implementing a strategy with a supportive policy framework will enable appropriate technologies and levels of deployment to meet the RPS schedule.

Exhibit 4.4. Potential Scenario for Fulfilling Maryland RPS Tier 1 Requirement



Sources: Maryland PSC, *Load Projection - Net DSM*; Governor's Delivery Unit, *GDU X*; PPRP, *The Potential for Biomass Co-firing in Maryland*

101 MEA.

102 Maryland PSC, *Annual Report on the Status of Wind-Powered Generating Stations in the State of Maryland* (February 2009), and updates on individual cases.

103 Clipper Wind Project has a 20 year agreement with Old Dominion Electric Cooperative and Synergics has a 20 year agreement with Delmarva Power.

Stabilizing financial incentives for renewable resources would provide the much-needed assurance required to sustain investment and growth in this industry in the State. Maryland could also learn from other states' experiences with renewable energy financial incentives. To further support the development of in-state renewable energy resources, policies and incentives could be modified to be more attractive to both in-state and out-of-state developers.

There are many additional policies or policy modifications that Maryland could pursue to encourage renewable energy development. In the process of preparing the Maryland Energy Outlook, numerous such options were considered and discussed with State agencies and renewable energy developers, including: adjusting the RPS implementation schedule; designating specific technology obligations or "carve-outs" in the RPS; adjusting the Alternative Compliance Payment penalty; changing the structure of current incentive programs; and implementing new tax incentives and grant programs.

Based on policies and programs that already exist and best practices in other states, the following options were selected for further analysis. These options are:

- Modify the RPS solar requirement
  - Accelerate phase-in of solar RPS requirement
  - Adjust Alternative Compliance Payment penalty to encourage new solar installations
- Extend the waste-to-energy RPS requirement
- Establish a carve-out for ocean energy in the RPS
- Extend and expand Maryland's Renewable Energy Production Tax Credit program

4.3.1 Modify the RPS Solar Requirement

Refinements to Maryland's RPS solar requirement could be made to ensure that the implementation schedule is balanced and reasonable over its lifetime and that it is more effective in promoting installation of solar energy systems, as follows:

- Currently, solar installation requirements are relatively modest in the early years, compared to later years. The solar requirement schedule could be accelerated in those early years. This would make the phase-in of the requirement more evenly distributed over the RPS lifetime and reiterate the importance of solar technology and its environmental and employment benefits. This modification would also provide more long-term support for Maryland's growing solar industry.
- The Alternative Compliance Payment (ACP), which is a fee that must be paid if an electricity provider fails to meet the solar component of Maryland's RPS, could be adjusted. Currently, the ACP is set to decrease substantially over the next dozen years. The ACP's decreasing value has the immediate impact of discounting the long-term value of solar renewable energy credits (S-RECs), which may undermine the financial incentive to invest in solar today. The ACP could be modified to a higher level, thereby encouraging utilities to pursue the development of actual solar installations rather than choosing to pay the ACP.

What Is Maryland's Experience with the RPS Solar Requirement?

Maryland's RPS requires that a specific percentage of electricity sold in the State must come from solar energy. The solar requirement starts with 0.005% in 2008 and increases each year, peaking at 2% in 2022 and remaining at 2% for each year thereafter. Solar electricity generating facilities must be sited in Maryland beginning on January 1, 2012, to meet the solar requirement. Exhibit 4.5 shows the solar set-aside requirements of the Maryland RPS and an estimate of solar PV capacity that would be required to achieve these targets.

As of August 2009, installed PV capacity in Maryland is approximately 2.9 MW.[104] An additional 1.1 MW of operational PV capacity is scheduled for PSC approval in December 2009, which will bring the total to 4 MW.[105] This is well short of the 5.5 MW installed capacity needed to meet the solar RPS requirement of 0.01% for 2009. In order to meet Maryland's 0.9% solar goal by 2018, installed capacity would need to be approximately 548 MW.

The most significant reasons for the shortfall in meeting the 2009 solar RPS requirements are the economic recession, tight credit markets, and the relative immaturity of the S-REC market. Increasing awareness and acceptance of solar technology, along with improving economic conditions and more accessible credit markets, should bring a strong rebound in solar demand.

MEA is aware of well over 50 MW of new commercial scale solar projects currently in various stages of development. While many of these projects may not ultimately come online, the level of interest in large-scale solar projects is at an all-time high. Since Maryland's RPS only requires 22.5 MW of S-RECs in 2011, an argument can be made that the slow ramp up may inadvertently serve as a ceiling, inhibiting faster growth in the commercial solar market.

[104] 2.9 MW figure based on PSC and MEA data on behind-the-meter installations.
[105] The 1.1 MW figure is based on PSC and MEA data on behind-the-meter installations.

Exhibit 4.5. Progress in Meeting the Solar RPS Goal

Year	MD Retail Sales		Solar RPS		MW/Year Installed		
	Solar %	GWh*	Estimated MWh	Needed MW	Needed Solar Addition	Actual Solar Added**	Actual Solar Cum**
Prior						0.036	0.036
2006						0.033	0.069
2007						0.116	0.185
2008	0.005%	64701	3235	2.7	2.7	1.436	1.621
2009	0.010%	65116	6512	5.5	2.8	1.279	2.900
2010	0.025%	65631	16408	13.9	8.4		
2011	0.040%	66360	26544	22.5	8.6		
2012	0.060%	67233	40340	34.1	11.7		
2013	0.100%	67694	67694	57.3	23.1		
2014	0.150%	68221	102332	86.6	29.3		
2015	0.250%	68872	172180	145.7	59.1		
2016	0.350%	69936	244776	207.1	61.4		
2017	0.550%	70925	390088	330.0	122.9		
2018	0.900%	71982	647838	548.1	218.1		
2019	1.200%	73076	876912	741.9	193.8		
2020	1.500%	74211	1113165	941.8	199.9		
2021	1.850%	75249	1392107	1177.8	236.0		
2022	2.000%	76394	1527880	1292.6	114.9		

* Maryland PSC, PSC Sales Projection - Net DSM, February 2009.

** Source: Maryland PSC, *Renewable Energy Portfolio Standard Report of 2009*; 2009 solar addition estimate based on extrapolation of MEA mid-year data.

The compliance fee schedule for the solar RPS was $450/MWh in 2008 and adjusted to $400 in 2009, and will decrease $50 every 2 years until it levels out at $50 by 2022.[106] The decreasing ACP schedule limits the financial return from the sale of S-RECs to investors in the utility scale systems. In addition, an increased S-REC value potentially provides additional revenue for Maryland's residents who have installed solar systems and can supplement the grants that are currently being offered.

As described above, Maryland provides a wide array of incentives to encourage solar energy development, including grants for residential and commercial projects, production tax credits for commercial installations, and a State sales tax exemption for renewable energy equipment. Additionally, Maryland offers a property tax exemption for solar systems, and some counties provide property tax credits for solar installations. During 2008-2009, MEA awarded $8.4 million in grants for solar systems; of these grants, 288 were for solar PV. The Maryland Solar Grants Program incentive levels are tiered to favor smaller residential installations, and program eligibility is limited to systems under 20 kW. Maryland solar project developers can receive supplementary federal incentives as well.[107]

[106] PSC Article §7-704.

[107] MEA, http://energy.maryland.gov/incentives/residential/solargrants/index.asp.

Maryland has both the solar resources and the infrastructure to significantly build its solar industry. We are fortunate to be home to a number of solar component manufacturers, equipment installers, and servicing and design firms. Among the leaders is BP Solar, located in Frederick, which not only manufactures PV panels, but works with utility companies to develop large-scale solar systems. One of the most prominent solar project developers and financiers in the nation, SunEdison, is headquartered in Beltsville. The regional Solar Energy Industry Association (SEIA) lists over 80 professional and corporate members in Maryland, many of whom provide necessary support to residential, commercial, industrial, and institutional solar installations. We have the capability to meet the full solar supply chain; the Maryland RPS and our existing State incentives are critically important to success in this endeavor.

What Are Other States' Experiences Regarding RPS Solar Requirements?

As of October 2009, 15 states have a solar carve-out as part of their RPS. Among them, New Mexico has the highest solar target, 4% of electricity sales by 2020. Other states with high solar targets are New Jersey (2.12% by 2021), Delaware (2.005% by 2019), and Maryland (2% by 2022). Solar RPS allocations in Maryland and selected nearby states are summarized in Exhibit 4.6.

Exhibit 4.6. Solar Carve-Outs in Maryland and Selected Nearby States

State	Carve-Out	Target Date	Phase-In Schedule	Alternative Compliance Payments	Grid connected capacity 2008 (kW_{dc})
DE	2.005%	2019	2010: 0.018% 2012: 0.099% 2015: 0.559% 2018: 1.547%	Begins at $250/MWh and increases to $300 if the electricity supplier has opted for the ACP in any previous year; increases to $350 with subsequent uses.	1,824 kW_{dc}
D.C.	0.4%	2020	2010: 0.028% 2012: 0.070% 2015: 0.170% 2018: 0.30%	$500/MWh	661kW_{dc}
MD	2%	2022	2010: 0.025% 2012: 0.060% 2015: 0.250% 2018: 0.900%	Starts at $450/MWh in 2008 and decreases $50 every two years until 2023; $50/ MWh 2023 and thereafter.	3,129 kW_{dc}
NJ	2.12%	2021	2010: 0.221% 2012: 0.394% 2015: 0.765% 2018: 1.333%	2008-2009: $711/MWh; 2009-2010: $693; 2010-2011: $675; 2011-2012: $658; 2012-2013: $641; 2013-2014: $625; 2014-2015: $609; and 2015-2016: $594	70,236 kW_{dc}
NC	0.2%	2018	2010: 0.02% 2012: 0.07% 2015: 0.14% 2018: 0.20%	No penalties for noncompliance.	4,697 kW_{dc}
OH	0.5%	2024	2010: 0.01% 2012: 0.06% 2015: 0.15% 2018: 0.26%	$450/MWh in 2009, reduced to $400/MWh in 2010 and 2011, and will be reduced by $50 every two years thereafter to $50/MWh in 2024.	1,356 kW_{dc}
PA	0.5%	2020	2010: 0.0120% 2012: 0.0325% 2015: 0.1440% 2018: 0.3400%	Set at "200% of average market value" of the solar credits sold during the reporting period.	3,938 kW_{dc}

Sources: DSIRE, http://www.dsireusa.org/; National Renewable Energy Laboratory (NREL), *State of the States 2009: Renewable Energy Development and the Role of Policy* (October 2009). NREL estimate of Maryland solar capacity differs from Maryland PSC figures provided in Exhibit 4.3.

When comparing the phase-in schedules of the three states in the region with the most aggressive solar goals–New Jersey, Delaware, and Maryland–it is apparent that Maryland's requirement is the most "back-loaded." Compared to New Jersey and Delaware, Maryland's solar requirement increases more slowly in the early years of the RPS, and then increases more rapidly in the last few years. In 2015 the solar requirement in Maryland is only 0.25% of electricity sales, while it is 0.765% in New Jersey and 0.559% in Delaware.

In the early years of the allocation requirement, even some states with much lower overall solar targets, such as the District of Columbia, North Carolina and Ohio, have interim targets that are equal to or exceed those in Maryland. Maryland's back-loaded RPS schedule imposes very high annual installation requirements during the latter years of the RPS. These significant allocations may be difficult to achieve.

Maryland's alternative compliance payments (ACPs) differ markedly from those in New Jersey and Delaware. New Jersey has the highest compliance payments in the region, starting at $711 per MWh in 2009 and declining to $594 by 2016. Delaware's compliance payment of $250 per MWh does not decline over time, but higher payments are required of utilities that choose to pay compliance payments in two or more consecutive years. The District of Columbia also has a constant, and higher ($500/MWh), compliance payment. In Pennsylvania, compliance payments are set at twice the value of S-RECs during the compliance period.

It is clear that aggressive solar requirements and high ACPs, combined with federal and state incentives, have contributed to robust growth in solar installations in New Jersey. At the end of 2008, installed solar capacity in New Jersey was 70.2 MW, second only to California.[108] This growth is expected to continue, as evidenced by a July 2009 announcement by a large utility based in the state that it plans to add 80 MW of solar capacity in its territory by the end of 2013, through installation of 200,000 small PV panels on existing power poles.[109]

How Will Modifying the Solar RPS Help Achieve Maryland Goals?

Maryland's current RPS policy establishes an aggressive, but achievable, solar energy target. By modifying the phase-in schedule of the solar RPS and adjusting ACP levels, it is more likely that the goals of the solar carve-out will be achieved and that the number of actual solar installations will grow in Maryland. In turn, more solar installations will help achieve **all four** of Maryland's energy goals:

- **EmPOWER Maryland:** Because electricity produced by solar PV coincides with peak cooling loads from air conditioning, it provides an effective peak load reduction technology and contributes to decreasing peak electricity prices.
- **Maryland RPS:** Solar energy installations increase the amount of renewable energy production.
- **GHG Reduction:** Solar energy reduces GHG emissions by displacing fossil-fueled power generation.

[108] National Renewable Energy Laboratory (NREL), *State of the States 2009: Renewable Energy Development and the Role of Policy* (October 2009), p. 35.
[109] PSEG Press Release, July 29, 2009, http://www.pseg.com/media_center/pressreleases/articles/2009/2009-07-29.jsp#.

- **Green Jobs:** Maryland is home to two major solar companies, BP Solar and Sun Edison, and dozens of installers and service firms. Growth in solar installations is likely to lead to increased business for these and other local businesses, creating new jobs in Maryland.

What Are the Advantages and Disadvantages of Modifying the RPS Solar Requirement?

Advantages include:

- More effective incentives will result in increased solar development, following the pattern seen in New Jersey. More development adds much needed electricity onto Maryland's grid and helps diversify the State's energy portfolio.
- Photovoltaic (PV) electricity is a form of distributed generation. Distributed generation decreases demand on the grid, which in turn enhances reliability. As a distributed generation resource, solar energy capacity can be increased through a number of smaller installations that are easier to bring on line than large-scale plants.
- Increasing Alternative Compliance Payments is a relatively minor change in existing policy.
- A more evenly distributed compliance schedule will result in more achievable solar goals during the later years of the RPS requirement.
- All customers receive the environmental benefits of reduced GHGs from solar energy.
- Growth in solar installations is likely to lead to increased market opportunities for existing and new Maryland-based solar energy companies, benefiting the State's economy.
- General benefits from greater use of solar include:
  - Coincides with peak cooling loads, providing an effective peak load reduction strategy
  - Provides electricity at point of use, reducing transmission losses
  - Provides long-term power price stability

Disadvantages include:

- Increasing the solar ACP may lead to higher electricity prices. However, the solar requirement is only a small portion of all utility sales, significantly dampening the potential price impact on the utilities and thereby sheltering consumers.
- Rapid growth in solar system demand may create supply chain constraints, including shortage of trained installation professionals.
- Despite generous State and federal incentives, high upfront cost of solar systems continues to make them uncompetitive for many consumers.

Recommendation

MEA recommends modifying Maryland's 2% RPS solar carve-out by: 1) accelerating the phase-in; and 2) leveling the Alternative Compliance Payment (ACP) for S-RECs to encourage electricity suppliers to pursue the development of actual solar installations rather than choosing to pay the declining ACP.

Rationale: Maryland's solar RPS requirement starts with 0.005% in 2008 and increases each year, reaching 2% in 2022. Compared to other states with similar aggressive solar targets, Maryland's phase-in schedule of the requirement is "back-loaded." There are several large-scale solar projects under development in Maryland, well in excess of the current solar RPS requirement schedule. The

slow ramp-up of the solar requirement may inadvertently serve as a ceiling, inhibiting faster growth in the commercial solar market. Accelerating the phase-in of the solar requirement would make it more evenly distributed over the RPS lifetime.

The compliance fee for the solar RPS was $450/MWh in 2008 and adjusted to $400 in 2009, and will decrease $50 every 2 years until it levels out at $50 by 2022. In most other states, compliance payments have been set at a higher price point with longer-term consistency, which encourages the development of actual solar system installations. If the compliance fee is too low, electricity suppliers will more likely choose to pay the ACP rather than pursue solar system installations. In addition, the declining value of the ACP effectively reduces the long term value of S-RECs.

In-state development of solar capacity adds much needed electricity capacity onto Maryland's grid, helps diversify the State's energy portfolio, and serves as a hedge against future fossil fuel price increases. Growth in solar installations is likely to lead to increased market opportunities for existing and new Maryland-based solar energy companies, benefiting the State's economy.

4.3.2 Extend the Waste-to-Energy RPS Requirement

What Are the Suggested Modifications to the Waste-to-Energy Requirement in the RPS?

Technologies in Tier 2 of the RPS include waste-to-energy (WTE) and certain hydroelectric facilities. Currently, the 2.5% Tier 2 requirement drops to 0% in 2019 and beyond. The State should consider amending the RPS statute in a manner that extends the WTE requirement beyond 2018. This could be achieved by making the Tier 2 requirement permanent, or by defining waste-to-energy technologies as a Tier 1 resource.

What Is Maryland's Experience with the Waste-to-Energy Requirement in the RPS?

Five jurisdictions in Maryland representing over 3.1 million people and more than 55% of the State's population are served by WTE, or so-called municipal solid waste (MSW), plants. These jurisdictions are Anne Arundel, Baltimore, Harford, and Montgomery Counties, as well as Baltimore City. As is typical nationwide, the steam produced by combusting solid waste at Maryland facilities is used to drive a turbine that generates electricity.[110] Total MSW plant capacity in Maryland increased from 138 MW in 2008 to 267.2 MW in 2009[111] at three facilities in Baltimore and in northeast Maryland. These plants produced 293 GWh of electricity, or approximately 17% of total renewable energy generation in Maryland in 2007.[112] The three currently certified Tier 2 MSW facilities are estimated to produce approximately 1,400 GWh annually.[113]

Two more WTE plants are under development awaiting approval. Frederick and Carroll Counties have approved a new 45 MW facility with a design capacity of 547,500 tons of waste per year that is expected to be online in 2015. A privately owned 120 MW WTE project in Baltimore is being

110 EPA, Waste-To-Energy, http://www.wte.org/environment/.
111 PSC, *Renewable Energy Portfolio Standard Report of 2009, with data for Compliance Year 2007,* February 2009, and yet to be published supplemental data in September 2009.
112 PSC *Ten-Year Plan (2008-2017) of Electric Companies in Maryland*, Table A-9, February 2009.
113 Ibid.; assumed 59% MSW plant capacity factor based on 60 MW Baltimore plant generation from PSC, Table A-9.

planned as part of an eco-industrial park.[114] Military installations in the State are also considering construction of WTE facilities.

WTE facilities provide a potentially attractive local energy resource for Maryland. Technology assessments and cost-benefit analyses could be pursued to determine how best to harness the inherent value of waste products. At the same time, air quality issues and opposition to WTE energy facilities in local communities may overshadow their positive attributes. While WTE is a lower-carbon solid waste alternative to landfills, technology assessments and cost-benefit analyses that include an assessment of the overall air quality impacts of WTE facilities should be performed to address concerns frequently raised by local communities about the permitting of new and expanded WTE facilities.

What Are Other States' Experiences with RPS Waste-to-Energy Requirements?

Thirty-one state-level RPS policies have binding targets, fourteen of which include WTE, or MSW, as an eligible resource. In the other seventeen states, MSW cannot be used to meet the RPS requirements.[115]

Of the states that include MSW in their RPS, seven, including Maryland, limit WTE to a portion of the total RPS requirement. In Maine, existing MSW facilities are eligible for the RPS, but new facilities are not. In Minnesota, a large carve-out for wind energy leaves only a relatively small portion, or 5%, for other technologies, including MSW. Five states, including Connecticut, the District of Columbia, Maryland, Massachusetts, and New Jersey, categorize renewable technologies into "tiers" or "classes" and set separate targets for the different tiers. Details about these five state tiers that contain MSW are included in Exhibit 4.7.

Exhibit 4.7. States with RPS Tiers/Classes that Contain WTE/MSW

State	Tier/Class Technologies	Percentage	Tier Permanency
Connecticut	Waste-to-energy, certain biomass, certain hydro	3%	Permanent
District of Columbia	MSW, hydro	2.5% (2007-2015)	Phased out to 0% by 2020
Maryland	**Waste-to-energy, hydro**	**2.5% (2006-2018)**	**Phase out to 0% in 2019**
Massachusetts	MSW	3.5%	Permanent
New Jersey	Waste-to-energy, certain hydro	2.5%	Permanent

Source: DSIRE, http://www.dsireusa.org/

[114] PSC Case 9199, Application filed along with requests for a waiver of the two-year notice requirement and expedited review of its Application, May 22, 2009.

[115] Based on analysis of RPS policy descriptions included on DSIRE website, http://www.dsireusa.org/, accessed October 20, 2009.

Based on a review of the information contained in the DSIRE database, the Maryland and Washington D.C. tiers containing MSW are the only renewable energy resources or tiers in all the states with RPSs that are phased out over time. In all other states, resource requirements are permanent and do not decrease over time.[116]

Will Extending the Waste-to-Energy Requirement in the RPS Help Achieve Maryland's Goals?

As the Maryland RPS statute currently stands, the 2.5% Tier 2 requirement, which includes WTE and large (larger than 30 MW) hydropower facilities, drops to 0% in 2019 and beyond. If Maryland decides to support continued development of WTE facilities, the RPS requirements that include WTE could be extended beyond ten years and allow newly constructed WTE facilities to be part of the RPS. Extending the WTE requirement in Maryland's RPS would help the State achieve some of its long-term energy goals:

- **Maryland RPS:** WTE facilities provide in-state renewable electricity generation that satisfies RPS requirements.
- **GHG Reduction:** WTE technologies can contribute to GHG mitigation while generating significant ancillary benefits related to sustainable waste management. WTE facilities help mitigate methane (CH_4), which is released when some types of waste decompose. Waste minimization and recycling diverts waste from landfills, thereby reducing emissions released in combustion, transport, and decomposition. WTE facilities do not generate methane and also may displace higher carbon emitting electricity generated predominately in Maryland by coal-fired power plants. WTE facilities also recover ferrous metals for recycling, thereby saving energy needed to produce the same amount of virgin steel.
- **Green Jobs:** Extending the WTE requirement would provide a stable, long-term business environment that is favorable for green jobs.

What Are the Advantages and Disadvantages of Extending the Waste-to-Energy RPS?

Advantages include:

- Extending the WTE RPS would secure a long-term revenue stream for such projects, which would increase their financial viability and ability to provide a valuable energy source in urban areas.
- WTE employs an established technology that is widely used and accepted.
- WTE reduces waste volume.
- WTE produces GHG reduction benefits by reducing methane emissions.
- Waste is a local resource, thus creating jobs and economic activity in Maryland.

Disadvantages include:

- It is difficult to add new WTE capacity in an EPA non-attainment region.
- Community concerns persist regarding waste incinerators.
- There is disagreement among policy-makers on the value of WTE as a renewable energy resource.

[116] DSIRE, http://www.dsireusa.org/, accessed October 20, 2009.

- Environmental considerations associated with MSW, including emissions of greenhouse gases and hazardous criteria pollutants, require State regulatory attention.

Recommendation

MEA, in conjunction with MDE and other relevant State agencies, should evaluate and report to the Governor and the General Assembly on: 1) the potential of waste-to-energy projects in Maryland to contribute to satisfying Maryland's RPS; 2) the environmental impact of waste-to-energy facilities; and 3) the effectiveness of RECs in incentivizing waste-to-energy and large hydroelectric resources.

Rationale: Maryland's RPS requirement includes a 2.5% requirement for Tier 2 renewable resources. These Tier 2 resources include waste-to-energy (WTE) and certain hydroelectric facilities. As the law currently stands, the Tier 2 requirement is set to drop to 0% in 2019 and beyond. WTE facilities provide in-state renewable electricity generation that satisfies RPS requirements and contribute to GHG mitigation while generating significant ancillary benefits related to sustainable waste management. In light of these attributes, studying the efficacy of extending and/or enhancing the WTE RPS requirement is recommended.

4.3.3 Establish a Carve-Out for Ocean Energy In the RPS

What Is an RPS Carve-Out for Ocean Energy?

A specific RPS obligation for ocean energy – an ocean carve-out – encourages and incentivizes the development of ocean energy resources, such as offshore wind, energy from waves, energy derived from harnessing tidal flow, currents, and other renewable marine resources. Like the solar carve-out, an ocean energy carve-out would establish a set percentage of electricity sales in Maryland that needs to be satisfied through electricity generation from ocean energy resources.

As with other RPS carve-outs, policy makers would need to make other important policy decisions besides setting carve-out percentages and schedules. For example, can an ocean carve-out be satisfied with projects outside of Maryland, perhaps in the PJM Interconnection, or can it only be satisfied with projects located in Maryland waters? An ocean carve-out would also need to be backed by Alternative Compliance Payments (ACPs) that are set at a level high enough to ensure that actual projects are developed to meet the RPS requirement.

What Has Been Maryland's Experience Regarding Ocean Energy?

The State has not yet benefited from ocean or offshore wind energy projects. That may change, however, as a recently issued Request for Information and Interest (RFI) asking that project developers and others with an interest in such projects come forward. The RFI is "seeking to explore offshore wind energy resources to capture economic development, air quality, public health, GHG reduction and environmental benefits of domestic generation."[117]

Simultaneously, the State is conducting a study to evaluate opportunities for offshore wind energy on Maryland's Atlantic coast and Outer Continental Shelf. This study will assess the viability of offshore wind energy generation and build on important marine spatial planning work currently

[117] MEA, *Request for Expressions of Interest and Information Maryland's Offshore Wind Energy Deployment Strategy* http://energy.maryland.gov/documents/OffShoreREoI91509.pdf.

underway at DNR and The Nature Conservancy. The results of this study will give the State and potential wind energy partners significant guidance on the physical characteristics of Maryland's offshore resources.

In conjunction with these efforts, MEA is working with community leaders across the State to obtain early feedback on the potential for an offshore wind energy project. Maryland is considering multiple deployment strategies, including development of an initial technical evaluation staging ground as well as advanced large-capacity turbines and new methods of deep-water development. The State plans to draw on a broad range of capabilities and skills to evaluate opportunities for manufacturing and supply chain development, transmission management, and continued stakeholder outreach.

Besides wind, other ocean energy technology industries are becoming attracted to Maryland due to its long-standing scientific and business expertise in the marine field. Wavebob Ltd. is in the initial stages of exploring wave power technology in the U.S., and has recently opened an office in Annapolis. In addition, Underwater Electric Kite (UEK) Systems, a Maryland company also located in Annapolis, is exploring the potential for hydrokinetic energy.

What Are Other States' Experiences Regarding Ocean Energy?

Although no offshore wind projects have been built in the United States, several are in various stages of planning. In addition, kinetic hydro devices are being developed to exploit large potential energy resources in river and tidal currents. According to the DSIRE database, no state currently includes a carve-out for ocean energy or offshore wind in its RPS.[118] However, in March 2009, New Jersey's Office of Clean Energy released a strawman proposal to establish an offshore wind carve-out within New Jersey's Renewable Portfolio Standard; this proposal is currently under review.[119]

Carve-outs for other renewable energy resources are a common element in state RPS policies. Typically states create carve-outs when good renewable energy potential meets a robust developing industry. Of 31 states with a binding RPS, 15 have a carve-out for solar energy. In addition, 14 states have included other types of carve-outs or set-asides in their RPS covering a wide range of different technologies and types of installations. Exhibit 4.8 presents a summary of carve-outs included in state RPS policies.

[118] DSIRE, http://www.dsireusa.org/, accessed October 20, 2009.

[119] New Jersey Board of Public Utilities *REVISED Straw Proposal: New Jersey's Offshore Wind Renewable Energy Certificate (OREC),* March 10, 2009, http://www.njcleanenergy.com/files/file/Renewable_Programs/Wind/REVISED%20OREC%20Straw%20Proposal%20031009%20fnl.pdf.

Exhibit 4.8. Summary of Carve-Outs in State RPS Policies

Description of Carve-Out	States
Solar	Colorado, Delaware, District of Columbia, Illinois, Maryland, Missouri, Nevada, New Hampshire, New Jersey, New Mexico, North Carolina, Ohio, Oregon, Pennsylvania, Rhode Island
Wind	Illinois, Minnesota
Other resource-specific carve-outs	New Mexico, North Carolina
Customer-sited, distributed generation, or "community projects"	Arizona, Massachusetts, Montana, New Mexico, New York
For different priority tiers and classes (primarily to limit contribution from less preferred or existing resources)	Connecticut, Maryland, Massachusetts, New Hampshire, New Jersey

Source: DSIRE, http://www.dsireusa.org/

Because most state RPS policies are relatively new, sufficient information is not available to thoroughly evaluate their impact on renewable energy development. However, according to a study by Lawrence Berkeley National Laboratory (LBNL), RPS policies are widely considered to be among the most important policies leading to increased renewable energy capacity.[120] This conclusion is supported by the fact that among states with the highest percentage of total electricity generated by non-hydroelectric renewables, nine out of ten states have adopted mandatory RPS policies.[121]

It is also too early to conclusively evaluate the effectiveness of technology-specific carve-outs. However, ranked by the total number of distributed solar installations in 2008, three of the top four states have an RPS solar carve-out policy in place.[122] California is the only state among the top four without a specific solar carve-out, but it has aggressively supported solar development through other policies and incentives.

Nearby States' Current Activities

While no states include a carve-out for ocean energy or offshore wind in their RPS, several states along the Mid-Atlantic coastline are supporting related activities. Offshore wind efforts in New Jersey, Delaware, Virginia, and North Carolina are described below.

New Jersey

New Jersey has developed a very ambitious offshore wind program.[123] New Jersey's Energy Master Plan calls for a minimum of 1,000 MW of offshore wind capacity to be developed by 2013,

[120] Lawrence Berkeley National Laboratory, *Renewable Portfolio Standards in the United States: A Status Report with Data through 2007* (April 2008), http://eetd.lbl.gov/ea/ems/reports/lbnl-154e.pdf.

[121] National Renewable Energy Laboratory (NREL), *State of the States 2009: Renewable Energy Development and the Role of Policy* (October 2009), p. 16, http://www.nrel.gov/docs/fy10osti/46667.pdf.

[122] Top four states: California, New Jersey, Colorado, Nevada. Source: NREL, *State of the States 2009: Renewable Energy Development and the Role of Policy* (October 2009), p. 35.

[123] Miller, L., Chief of Policy and Planning, New Jersey Board of Public Utilities, *Wind: Nearby Resource*, presented at United States Capitol for Environmental and Energy Study Institute, July 17, 2009, http://www.eesi.org/071709_offshore.

and a minimum of 3,000 MW of offshore wind capacity by 2020.[124] A strawman proposal to establish an offshore wind carve-out within New Jersey's RPS is currently under consideration;[125] the proposed schedule and requirements are shown in Exhibit 4.9.

Exhibit 4.9. New Jersey Strawman Proposal for an Offshore Wind Carve-Out – Proposed Schedule and Requirements

Year	Offshore Carve-Out by Capacity (MW)	Offshore Carve-Out by Production at 34% Capacity Factor (MWh)
2013	Total of 1,000 MW	2,978,400
2017	At least 2,000 MW	5,956,800
2021	Total of 3,000 MW	8,935,200

Source: New Jersey Board of Public Utilities, *REVISED Strawman Proposal: New Jersey's Offshore Wind Renewable Energy Certificate (OREC),* March 10, 2009, p. 4, http://www.njcleanenergy.com/files/file/Renewable_Programs/Wind/REVISED%20OREC%20Straw%20Proposal%20031009%20fnl.pdf.

As shown in this exhibit, the proposed New Jersey offshore wind carve-out is established as a production requirement expressed in MWhs versus a percentage of total load served. A 34% capacity factor is used as an example; the New Jersey Board of Public Utilities (NJBPU) would determine the appropriate capacity factor to be used for determination of the carve-out. The increments are designed to stimulate project development while allowing flexibility consistent with the scale and pace of offshore wind project development.

In June 2009, the NJBPU awarded $12 million in rebates to three offshore wind developers ($4 million to each developer), following award of a $4 million grant to a developer of the first offshore project in the State. These funds are being used to conduct studies and to prepare permit applications; the remainder will be paid based upon production of electricity.

Delaware

Delaware has long supported offshore wind energy and ocean acidification research.[126] In 2009, a grant of $1.4 million was approved to cost-share the construction and testing of a 2 MW turbine at a shoreline site in Delaware.[127] In October 2009, the University of Delaware and Gamesa Corporación Tecnológica finalized an agreement to install a utility-scale wind turbine at the university's Hugh R. Sharp Campus in Lewes, Delaware, in 2010. This turbine will be used in a 200 MW pilot project planned by Bluewater Wind, LLC, which will generate power for Delmarva

[124] State of New Jersey, Office of the Governor Press Release, *Governor Corzine Lauds Release of Windpower Leases*, June 23, 2009, http://www.state.nj.us/governor/news/news/2009/approved/20090623a.html.

[125] New Jersey Board of Public Utilities, Docket No. EXO8100930.

[126] Kempton, W., Director, Center for Carbon-free Power Integration; Professor, College of Earth, Ocean, and Environment, University of Delaware, *Transmission and Wind*, Presented at United States Capitol for Environmental and Energy Study Institute, July 17, 2009, http://www.eesi.org/071709_offshore.

[127] FY 2009 U.S. DOE Budget Appropriations Earmark, Senate Report 110-416 – Energy and Water Development Appropriations Bill, 2009, with additional cost-shared funding from the University of Delaware and turbine manufacturer, Gamesa.

Electric as an initial segment of a possible 600 MW offshore plant. The Delaware Public Service Commission has approved a power purchase agreement at a price of $117.10 per MWh and has granted a 350% REC credit for offshore wind facilities sited on or before May 31, 2017.[128]

Virginia

In 2007, the Virginia General Assembly authorized formation of the Virginia Coastal Energy Research Consortium (VCERC), a university, government, and industry consortium established with initial funding from the Commonwealth with a total budget of $1.5 million. VCERC provides research and development funding for commercialization and implementation of wind, wave, and algal biomass energy.[129] Recent wind energy studies are focused on an offshore project site 12 nautical miles east of Virginia Beach that has total potential for 3,680 MW of wind energy capacity.

Will Establishing a Carve-Out for Ocean Energy Help Achieve Maryland's Goals?

Maryland's coastal waters and adjacent Outer Continental Shelf enjoy wind resources characterized as "outstanding" by the U.S. Department of Energy.[130] Offshore wind is a stronger and more consistent resource than on-shore wind. Maryland's offshore wind resources are located less than 100 km from high voltage transmission lines and major load centers.[131] Recent data compiled by the Atmospheric Physics Department at the University of Maryland, Baltimore, also indicate powerful winds in low level jets (LLJs) over the Bays in late afternoon and evenings during summer months, possibly increasing wind energy capacity value.[132]

The economic potential of offshore wind and other renewable technologies was evaluated by Levitan Associates, Inc. for the Maryland PSC in 2008. The Levitan analysis notes positive economic value for land-based wind projects, but negative value for offshore wind. Despite the negative economics of offshore wind presented in this report, it concedes offshore wind's benefit as a higher capacity resource compared to land-based wind, due to higher wind speeds and less intermittency, as well as local opposition to land-based wind projects.[133] Wind research and project development efforts continue in the U.S. and in Europe, demonstrating that fast paced changes are taking place in this sector. These developments are positively impacting economic viability for potential future projects, both here and abroad.

Measurements on towers 80 to 120 m tall located along the Chesapeake Bay shorelines in Maryland and Virginia are underway to assess wind speeds at greater heights than are reflected in current models.[134] Newer offshore wind turbine towers are often deployed at greater hub heights than those

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128 Delaware PSC, Purchased Power Agreement executed between Bluewater Wind LLC and Delmarva Power Light Company, in PSC Docket No. 07-20, Order Number 7440 on September 3, 2008.

129 Hagerman, George, Director of Virginia Coastal Energy Research Consortium (VCERC) and Research Associate Virginia Tech Advanced Research Institute, *Green Power Superhighways or Offshore Wind or Both?,* Presented at United States Capitol for Environmental and Energy Study Institute, July 17, 2009 http://www.eesi.org/071709_offshore.

130 NREL, *U.S. Wind Map*, http://www.windpoweringamerica.gov/pdfs/wind_maps/us_windmap.pdf.

131 NREL, *Maryland 50 Meter (height) Wind Resource Map 1.1.2* (January 2003), http://www.windpoweringamerica.gov/maps_template.asp?stateab=md.

132 Sparling, Lynn, M. Weldegaber, *Tall Tower Wind Data*, UMBC in cooperation with Maryland DNR, NREL, and PERI, beginning in fall 2009.

133 Levitan, *Analysis of Resources and Policy Options for Maryland's Energy Future* (December 2008),, p. 148-155.

134 Ibid.

installed in past years; these studies are expected to provide data that could affect the potential economic value of this resource.

The development of Maryland's most abundant renewable energy resource, ocean energy, would help Maryland achieve several of its energy goals:

- **Maryland RPS:** Ocean energy installations could significantly increase the amount of renewable energy production. If Maryland is to fulfill a large portion of its RPS through in-state generation, offshore wind energy and other ocean energy resources should be considered.
- **GHG Reductions:** Utilization of ocean energy resources reduces GHG emissions by displacing fossil-fueled power generation.
- **Green Jobs:** Growth in ocean energy will lead to increased business for Maryland's marine industry.

What Are the Advantages and Disadvantages of Establishing a Carve-Out for Ocean Energy?

Advantages include:

- Ocean energy development taps a resource that could potentially supply a large portion of Maryland's electricity needs.
- Offshore wind speeds are higher and steadier than land-based wind, since there are no obstacles to block the wind and cause turbulence.
- Maryland's coastal waters and adjacent federal Outer Continental Shelf areas represent energy resources which are close to major load centers.
- The RPS requirement is a budget-neutral option for the State (unlike financial incentives).
- Offshore projects support marine industries.
- Large-scale utilization of ocean energy could significantly reduce GHG and other emissions from fossil fuel generation.
- Ocean energy research and development is garnering federal support and could benefit Maryland's research institutions.
- Ocean/wind energy development decreases nitrogen levels in the Chesapeake Bay from coal plant emissions, reducing algae blooms.
- Ocean energy provides an opportunity for regional cooperation with other Mid-Atlantic states.
- Ocean energy provides Maryland with significant economic development opportunities in wind turbine component manufacturing and assembly work.

Disadvantages include:

- The need to combat harsh ocean environments and deploy new transmission increases installed costs for offshore wind compared to land-based wind energy. This makes offshore wind development more expensive than many conventional generation options, which may put upward pressure on electricity prices.
- While offshore wind development has taken place in other parts of the world, no major projects have been constructed in the U.S. Due to lack of experience, offshore wind is considered an unproven technology by some utilities and other energy developers.
- Besides offshore wind energy, no other large-scale ocean energy technologies are expected to be commercially viable in the near future.

- Environmental impacts, such as possible effects on birds, fish and other wildlife, need to be researched and compared to other power generating options.
- Environmental and aesthetic concerns may impact public acceptance for ocean energy.
- Since ocean waters are governed by numerous federal and state statutes, and provide critical environments for marine life, finding suitable sites for ocean energy projects can be challenging.
- If the carve-out is not geographically limited to Maryland, the set-aside may incent project development in other states.

Recommendation

MEA does not recommend the adoption of an ocean energy RPS carve-out at this time. However, the State should continue its efforts to remove barriers to the commercial development of Maryland's vast offshore wind energy resources by considering wind measurement studies, pilot turbine demonstrations, compatible use studies, economic analyses, and environmental issue/benefit assessments.

Rationale: Offshore wind is typically a stronger and more consistent resource than on-shore wind, and Maryland's coastal waters and adjacent Outer Continental Shelf enjoy wind resources characterized as "outstanding" by the U.S. Department of Energy. Like the solar carve-out, an ocean energy carve-out would establish a set percentage of electricity sales in Maryland that needs to be satisfied through electricity generation from ocean energy resources.

Despite great offshore wind resource potential in Maryland, MEA does not recommend the establishment of an ocean energy carve-out at this time. This is primarily because of current uncertainty regarding cost, resource effectiveness, and potential sites. However, as the State further explores offshore energy potential and costs, this policy option may be considered in the future. Maryland should concentrate on continuing to cooperate with our neighboring states to further ocean energy analysis and ways in which regional efforts can reduce cost constraints.

4.3.4 Extend and Expand Maryland's Renewable Energy Production Tax Credit Program

What Is an Extension and Modification of Maryland's Renewable Energy Production Tax Credit?

Maryland's Clean Energy Incentive Tax Credit, enacted in 2006, offers Marylanders an income tax credit for electricity generated by qualified resources of 0.85 cents per kWh, and 0.50 cents per kWh for electricity generated from co-firing a qualified resource with coal. These credits, also known as Clean Energy Production Tax Credits (PTC), can be claimed over a period of five years. However, under current law, credits will only be available for facilities that commence operation before January 1, 2011.

The following modifications to the tax credit program could be considered to make it a more effective policy tool to incent the construction of new renewable energy facilities in Maryland:

- Extend the tax credit program until 2022, to correspond with the State's RPS policy.
- Increase the per kWh incentive.

- Extend the payment period to ten years.
- Allow the tax credits to be transferable to other entities or make them refundable, to enable those with insufficient or no tax liability to utilize the incentive.
- Establish a minimum limit for tax credit payments, or minimum size for eligible projects, to reduce administrative costs.
- Instead of providing a tax credit over a number of years, restructure the incentive with an option for an upfront payment similar to the federal program. This would provide critically needed upfront capital for project developers.
- Depending on the extent of implemented program changes, appropriate adjustments to the cap on total available credits and per project payment limits should be considered.

What Actions Have We Taken Already Regarding Renewable Energy Production Tax Credits?

Under the *Maryland Clean Energy Incentive Act*, tax credits are available to individuals and corporations that build renewable energy facilities and generate electricity from them on or after January 1, 2006, and before January 1, 2011. Renewable energy facilities for electricity production include solar, wind, open and closed loop biomass, geothermal, small irrigation power, municipal solid waste, and hydropower.[135] Annual tax credits cannot exceed one fifth of the initial credit certificate issued by MEA.

In order to receive these credits, eligible participants apply for an Initial Credit Certificate from MEA, which issues them on a first-come, first-served basis. Under current law, the total number of Initial Credit Certificates may not exceed $25 million by 2010, with each Initial Credit Certificate limited to $2.5 million to any eligible taxpayer. Tax credits may be claimed over a 5-year period.[136] The statute does not currently specify a minimum floor for tax credit payments. The smallest tax credit certified to date is for $133 over a 5-year period, or $26.60 per year.[137]

As of September 2009, MEA had received 13 applications for Tax Credit Certificates for a total of $5.1 million. In part due to the economic downturn, some applicants do not have a sufficient tax liability to use their certificates. In addition, project delays are impacting the ability of companies to meet production deadlines and MEA may have to cancel the certificates. These companies may resubmit their applications or request extensions.[138]

What Are Other States' Experiences Regarding Renewable Energy Production Tax Credits?

Ten states offer renewable energy production tax credits similar to the Maryland incentive program. However, several of these tax credit programs are new programs with no existing track record, pilot projects, or are limited to smaller installations. Iowa, Minnesota, New Mexico, and Oklahoma have programs comparable to the Maryland Clean Energy Production Tax Credit.[139] The successful production tax credit programs in Iowa and Oklahoma are described in further detail below.

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135 COMAR 14.2606.00, http://www.dsd.state.md.us/comar/SubtitleSearch.aspx?search=14.26.06.*.
136 MEA, http://www.energy.state.md.us/incentives/allprograms/cep_taxcredit.asp.
137 Ibid.
138 Ibid.
139 DSIRE, http://www.dsireusa.org/, accessed October 20, 2009.

Iowa

In 2005, Iowa enacted legislation creating two production tax credit programs under which renewable energy facilities may qualify for one of the two credits. The tax credits are available for a 10-year period, may be carried forward for a maximum of seven years, and are transferable.

Under the first program, a production tax credit of 1.5 cents per kWh is available for energy generated and sold by wind energy generators and other renewable energy facilities. The maximum total amount of wind generating capacity eligible for this credit is 330 MW. The maximum total eligibility for other renewable technologies is 20 MW. The intent of the tax credit program has been to support small, locally-owned projects by setting a per facility size limit of 2.5 MW and establishing other ownership qualifications. As of October 2009, active applications filed with the Iowa Utilities Board exceed the 20 MW maximum for other renewable technologies and the 330 MW maximum for wind.[140]

Under the second program, a production tax credit of 1.0 cent per kWh is available for electricity generated by eligible wind energy facilities. While there are no specific ownership criteria for individual projects, facilities must have a minimum nameplate capacity of at least 2 MW and a maximum capacity of 30 MW. Applications from schools, colleges, universities, and hospitals must have a minimum nameplate capacity of 750 kW. The maximum total amount of generating capacity eligible for the second program is 150 MW. As of October 2009, credits for 124.5 MW of capacity were available for this program.[141]

Iowa's total installed wind capacity of 3,053 MW (as of June 2009) ranks second among all states.[142] According to the Iowa Office of Energy Independence, these state-level production tax credits have been of vital importance in ensuring the construction of many locally-owned, small wind farm projects. In addition, the federal PTC has generally been enough to ensure the economic viability of most large-scale wind farms in the State. However, even with the federal PTC and Farm Bill renewable energy grants, many of the smaller farmer-owned wind energy projects needed the additional State PTC incentive to be economically viable.[143]

Oklahoma

Since 2003, Oklahoma has offered a Zero-Emissions Facilities Production Tax Credit, a state income tax credit for producers of electric power using renewable energy resources from a zero-emission facility located in-state. The zero-emission facility must have a rated production capacity of 1 MW or greater and electricity must be sold to an unrelated party. The amount of the credit varies between 0.25 and 0.75 cents per kWh, depending on when a facility is put in service and when the electricity is generated. The credit may be claimed for a 10-year period following the date the facility is placed in operation. Eligible renewable energy resources include wind, hydroelectric, solar, and geothermal energy. The tax credit is freely transferable at any time during the ten years following the qualified year. This includes transfers or sales from non-taxable entities to taxable entities and transfers or sales from one taxable entity to another.[144]

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140 Iowa Utilities Board, http://www.state.ia.us/government/com/util/energy/renewable_tax_credits.html.
141 Ibid.
142 American Wind Energy Association (AWEA), http://www.awea.org/projects/.
143 Lee Vannoy of Iowa Office of Energy Independence and Tom Wind of Wind Utility Consulting, several discussions 2006-2009.
144 DSIRE, http://www.dsireusa.org/, accessed October 20, 2009.

As of June 2009, Oklahoma had installed approximately 865 MW of wind energy capacity.[145] Between 2001 and 2007, growth in renewable energy generation in Oklahoma was fifth fastest among all states. Among states with no RPS policy in place, renewable energy generation growth was faster in Oklahoma than in any other state.[146] The State's excellent wind energy resource is a major factor in that growth. According to the Oklahoma Department of Commerce (ODC), besides a five-year property tax abatement, the Zero-Emissions Facilities Production Tax Credit has been the primary policy tool supporting the State's rapid wind energy deployment. While no detailed data on the Zero-Emissions Facilities Production Tax Credit allocations and expenditures are available, it is believed that all major wind projects in the State utilize the credit. No other major renewable energy development, other than wind, is underway in Oklahoma.[147]

Will Extending and Modifying Renewable Energy Production Tax Credits Help Achieve Maryland's Goals?

An extended and modified PTC program would enhance the development of renewable energy generation in Maryland and help the State achieve several of its energy goals:

- **Maryland RPS:** A PTC supports the development of all renewable energy resources and larger renewable energy projects in particular. Maryland currently offers a wide array of financial incentives for smaller residential-scale renewable energy systems, but not as many incentives for larger utility-scale installations.
- **GHG Reductions:** Greater utilization of renewable energy resources reduces GHG emissions by displacing fossil-fueled power generation.
- **Green Jobs:** Development of in-state renewable energy projects will lead to increased business activity and more jobs in Maryland.

What Are the Advantages and Disadvantages of Extending the Renewable Energy Production Tax Credits?

Advantages include:

- The Renewable Energy Production Tax Credits support development of all renewable resources.
- The tax credit encourages both small and large scale projects.
- The tax credit supports projects based on the actual amount of electricity produced.
- Extending the tax credit can be implemented with relatively minor administrative actions building on an existing program.
- Extending the renewable Energy Product Tax Credit does not require expenditure of State funds.
- Program expenditure caps limit the State's exposure to tax revenue losses.

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145 AWEA, http://www.awea.org/projects/.

146 National Renewable Energy Laboratory (NREL), *State of the States 2009: Renewable Energy Development and the Role of Policy* (October 2009), p. 21.

147 Oklahoma Department of Commerce, Kylah McNabb, phone conversation October 22, 2009.

Disadvantages include:

- Tax credits reduce future tax revenue.
- It is unclear what incentive level is needed to encourage the construction of new renewable energy facilities.
- Different technologies may require different levels of tax credits for projects to be economically viable.
- Increasing PTC per kWh payments and extending the payment period to 10 years may create pressure to increase program expenditure limits, which may be difficult to do under current fiscal constraints.

Recommendation

The Maryland Renewable Energy Production Tax Credit program should be extended until 2022, to coincide with the State's RPS schedule, and a minimum project size for the credits should be established. The State should also consider other modifications to the program, such as increasing the payment level or extending the payment period beyond 5 years, which could make it a more effective policy tool to incentivize in-state renewable energy production.

Rationale: Maryland's Clean Energy Production Tax Credit program offers Marylanders an income tax credit of 0.85 cents per kWh for electricity generated by qualified resources. These credits can be claimed over a period of five years. Under current law, credits will only be available for facilities that commence operation before January 1, 2011. To date, the tax credit program has been underutilized; approximately $5.1 million of the authorized $25 million in tax credits have been allocated.

To make the tax credit a more effective tool for incentivizing renewable energy production in Maryland, several program modifications could be considered including: extending the tax credit program, adjusting the per kWh incentive level, extending the payment period, making the credits transferable or refundable, providing an option to receive an upfront payment instead of credits spread out over several years, and establishing minimum size for eligible projects.

At this time, MEA recommends that the tax credit program be extended to 2022 to coincide with the State's RPS requirement, and that a minimum project size be set. Further analysis is needed to determine if other modifications to the program could make it a more effective policy tool to incentivize in-state renewable energy production. Well-structured and targeted production tax credit programs in other states appear to have been successful.

5.0 Options for Advancing Clean Energy Economic Development and Green Jobs in Maryland

This chapter explores policy and program options to promote clean energy economic development and green jobs in Maryland.

5.1 What Is Maryland Currently Doing?

Governor O'Malley has positioned Maryland as one of the most progressive clean energy states in the nation. In 2008, the General Assembly enacted three legislative initiatives: the *EmPOWER Maryland Energy Efficiency Act of 2008*, which sets energy conservation and peak demand goals by 2015; a revision to the Renewable Portfolio Standard that sets a 20% goal for renewable energy by 2022; and the *Greenhouse Gas Emissions Reduction Act*, which requires the Maryland Department of the Environment to have a plan in place to reduce GHG emissions by 25% by 2020. These initiatives create significant demand for clean energy technologies in Maryland and serve as a foundation upon which to build the Administration's *Smart, Green and Growing Maryland* program. A strategic plan to take advantage of the opportunities presented by these initiatives is needed to benefit Maryland's workforce and citizens.

The Governor's Workforce Investment Board (GWIB) defines Maryland's green economy as "…the system of production, exchange, distribution and consumption of goods and services produced by any business or entity directly engaged in the research, development, manufacture, sale, distribution, installation, or application of products and/or services that promote energy generation, efficiency and conservation, renewable and alternative energy production, waste management and/or organizations that are focused on environmental stewardship."[148] In this Maryland Energy Outlook, economic activities related to renewable energy and energy efficiency are considered to be the primary elements of the clean energy sector.

On February 6, 2009, Governor O'Malley explained that the State of Maryland is "working on a number of different fronts to promote research, generation, and advancement of alternative energy in Maryland – which is helping to create jobs in the present and very importantly laying the groundwork for future job creation as these technologies progress." The Governor additionally pledged to create "at least 100,000 (more) green jobs by 2015..." and noted that "we are working across our State government – along with partners in organized labor, and in the private, academic, and non-profit sectors – to implement twenty action items which are designed to create new jobs and advance eco-friendly technologies…"[149] These statements, made at the *Good Jobs, Green Jobs* National Conference, highlights Maryland's commitment to accelerating the transition to a green-collar economy.

In support of this effort, Governor O'Malley and the General Assembly created the Maryland Clean Energy Center (MCEC), which was launched in January 2009 with the intention of helping facilitate clean energy economic development in Maryland. The purpose of the Center is to encourage

[148] Governor's Workforce Investment Board, *Maryland's Energy Industry Workforce Report: Preparing Today's Workers for Tomorrow's Opportunities* (September 2009), http://www.mdworkforce.com/pub/pdf/energyworkforce.pdf.
[149] Office of Governor Martin O'Malley, February 2009, http://www.governor.maryland.gov/speeches/090206.asp.

deployment of clean energy technologies across Maryland; support emerging technologies through pilot projects; collect, analyze and disseminate industry data; and provide outreach and technical support to further the clean energy industry in Maryland. The Center is structured as a not-for-profit, quasi-governmental corporation with the support of many State government agencies, including the Office of the Governor and the MEA. It has not, however, been provided with any General Funds for start-up or operating expenses, and its effectiveness is limited by the need to raise its own funds.

MEA is also leading a Clean Energy Economic Development Initiative (CEEDI) program, in partnership with the Maryland Clean Energy Center and the Department of Business and Economic Development, using federal stimulus funding, to establish funding for clean energy businesses and organizations. Funding opportunities through the CEEDI program are expected to come in the form of loans and grants.

Maryland is further encouraging a clean energy economy and development of green jobs through implementation of the *Maryland Climate Action Plan* and the *Greenhouse Gas Emissions Reduction Act of 2009* (GGRA). Several of the 42 GHG mitigation policies in the plan have been specifically identified as benefitting a green economy in Maryland. For example, under the cap-and-trade policy (ES-3), studies by the University of Maryland's Center for Integrative and Environmental Research have identified that participation in the RGGI program would result in several thousand new Maryland jobs, many of them considered green jobs, along with a boost in the State's domestic gross product. Other policies in the *Climate Action Plan* will result in additional green jobs, particularly in the design and construction of green buildings; retrofit of older buildings with energy efficient appliances and technologies; maintenance and expansion of public transit systems; design, construction, and operation of wind turbines, biomass generators and solar collectors; and research and development in a wide array of new practices and technologies. In addition, the plan includes a specific mitigation policy (CC-9) for promoting economic development opportunities associated with reducing GHG emissions in Maryland. The Department of Budget and Management is the lead agency for achieving this policy's goals. The GGRA also includes new employment opportunities for Maryland related to energy conservation, alternative energy supply, and GHG emission reduction technologies.

To attract more green firms to Maryland, the State has begun to build its workforce by tailoring education and training programs specifically for relevant industries. Formal educational opportunities for renewable energy and energy efficiency training are in place to expand overall green job employment. For example, MEA and the Department of Housing and Community Development (DHCD) have launched home weatherization and home energy auditor training programs at 16 community colleges, and Maryland has already trained hundreds of weatherization technicians.

Similarly, Frostburg State University now offers a program on design, installation, and maintenance of residential PV and wind generation systems. The program includes an eight-week online course supported by a three-day instructional and hands-on training program. This program prepares students for entry-level certification tests given by the North American Board of

Certified Energy Practitioners, Inc. (NABCEP).[150] In addition, the University of Maryland at College Park houses the University of Maryland Energy Research Center (UMERC). The UMERC is a multi-disciplinary initiative run by the School of Engineering that focuses on energy science and technology, with a special focus on alternative energy generation and storage.[151]

Maryland community colleges and universities offer numerous programs and degrees in manufacturing and construction that provide students with the skills that are needed by firms involved in clean energy technology fields. The newly created Maryland Center for Construction Education and Innovation at Towson University serves as a repository of information on training programs and resources for prospective workers in the construction industry.[152]

Maryland's ability to attract clean energy companies benefits from several other attributes. First, it has a highly educated workforce. With more than 2.9 million workers, Maryland leads the nation in the percentage of its workforce, 25 years of age and older, with a bachelor's degree or higher (37%) and in the percentage of its workforce employed in professional and technical fields (25%).[153] In addition, the State has a sophisticated infrastructure network, including seaports, airports, rail systems and interstate highways that are attractive to energy manufacturing and professional service firms. Finally, Maryland is geographically close to Washington, D.C., with its many federal agencies and other organizations that support clean energy development.

5.2 What Are the Results So Far?

The number of jobs in America's emerging clean energy economy grew nearly two and a half times faster than overall jobs between 1998 and 2007, according to a recent report by The Pew Charitable Trust.[154] This report states that jobs in the clean energy economy grew at a national rate of 9.1%, while traditional jobs grew by only 3.7% between 1998 and 2007.

In Maryland, the Governor's Workforce Investment Board (GWIB) estimates that Maryland's green economy includes about 22,000 businesses, directly employing nearly 250,000 people and generating total wages of $14.6 billion.[155] The Pew report ranks Maryland as sixth in the nation in attracting venture capital for clean energy investments, raising $324 million during the years 2006-2008.

Maryland appears poised for a significant expansion of clean energy jobs in the coming decade. In addition to expected growth in the solar, wind, and home energy retrofit sectors, Constellation Energy Group is moving forward with plans for a new nuclear power reactor at Calvert Cliffs. This project is expected to create 4,000 construction jobs and 400 skilled permanent positions once completed.

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150 Interstate Renewable Energy Council, *Renewable Energy Training Catalog* (August 2009), http://www.irecusa.org/trainingCatalog/providerListing.php?id=109.

151 University of Maryland Energy Research Center, *About the UM Energy Research Center*, http://www.umerc.umd.edu/about/index.html.

152 Governor's Workforce Investment Board, *Maryland's Construction Industry Workforce Report* (September 2009), www.mdworkforce.com/news/constenforum/constructionlayout.doc.

153 Higher Education Transition Work Group, *Higher Education's Role in One Maryland* (January 2007), http://www.governor.maryland.gov/documents/transition/HigherEducation.pdf.

154 Pew Charitable Trusts, *The Clean Energy Economy: Repowering Jobs, Businesses and Investments Across America* (June 2009), http://www.pewcenteronthestates.org/uploadedFiles/Clean_Economy_Report_Web.pdf.

155 Maryland Governor's Workforce Investment Board, *Maryland's Energy Industry Workforce Report: Preparing Today's Workers for Tomorrow's Opportunities* (September 2009), p. 5-6, http://www.mdworkforce.com/pub/pdf/energyworkforce.pdf.

5.3 What More Can We Do?

To further strengthen and grow the clean energy sector and create green jobs in Maryland, the State should consider establishing a comprehensive clean energy economic development strategy and supporting initiatives to meet the goals of the GWIB and the Maryland Clean Energy Center.

5.3.1 Develop a Clean Energy Economic Development Strategy

Maryland lacks a comprehensive strategy for growing its clean energy sector. While the State has undertaken many initiatives that support businesses in the clean energy sector and are creating green jobs, a strategic approach is needed to maximize the effectiveness of its efforts.

To guide Maryland's efforts to foster growth in clean energy, the State should assess which clean energy sectors hold the greatest economic development and job creation opportunities for Maryland. To begin this prioritization process, the State needs to identify technology areas where it has a natural advantage over other states due to existing industries, research facilities, and other resources. Key among these resources is Maryland's indigenous renewable energy sources, including solar, wind, and ocean technologies.

A clean energy economic development strategy should be bolstered by specific policies and programs. Such programs and policies could include, but not be limited to, the following:

- An economic development fund focused on supporting the growth of companies currently existing in Maryland as well as attracting new clean energy companies to the State
- A suite of tax incentives to encourage the emerging clean energy industry
- Creation of clean energy enterprise zones
- Commitment to in-state implementation of clean energy resources

Economic development fund. Several states have established targeted economic development funds to support clean energy industrial development. As discussed below, these funds provide grants, low-interest loans, loan guarantees, and other financial incentives to attract new clean technology facilities or to support the expansion of existing businesses. Many funds also support research and development and early commercialization efforts. Many clean economic development funds receive their funding from a state public benefit fund or a similar systems charge on utility customers' bills.

Tax incentives. At least 11 states have adopted various tax incentives to encourage clean energy industrial development. Most of these incentives are in the form of business tax credits or exemptions for clean energy manufacturers and technology developers.[156]

Enterprise zones. Clean energy enterprise zones are a time-tested strategy used by multiple jurisdictions to encourage economic development in pre-determined locations. Projects locating in these zones may be eligible for any number and type of incentives based on the enabling acts that create the zones. Maryland has successfully used the "One Maryland" designation in the past to

[156] DSIRE, http://www.dsireusa.org/, accessed September 17, 2009.

drive economic development to areas of the state where jobs are most needed. This concept could be revisited in a novel way to encourage clean energy generation, manufacturing, and service companies to bring projects to the State. Local jurisdictions would be able to identify such areas as part of their planning and zoning process and work with appropriate State agencies to implement the program and track the resulting impacts.

In-state implementation of clean energy resources. Maryland's economic development efforts will be more successful if they are focused on technologies that are actively being developed in the State. The correlation between actual wind energy installations and wind energy manufacturing facilities is an example of this relationship. It is not coincidental that the two states with the most wind energy capacity – Texas and Iowa[157] – are also the only two states that manufacture all major components of wind turbines.[158]

What Have Other States Done?

New Jersey

Through the Edison Innovation Clean Energy Manufacturing Fund (CEMF), supported by the New Jersey Economic Development Authority (EDA), New Jersey manufacturers of renewable energy or energy efficiency technologies, products, or systems, are eligible to apply for up to $3.3 million in grants and interest-free loans. The grant portion of the assistance (up to $300,000) can be used for manufacturing site identification and procurement, design, and permits. The interest-free loan portion of the assistance (up to $3 million) can finance site improvements, equipment purchases, and facility construction completion. The CEMF is funded by a system benefits charge. It is anticipated that $12 million will be available annually for this program through 2012.[159]

Thus far, two businesses have received awards through the CEMF – Noveda Technologies, Inc. (October 2009) and Petra Solar, Inc. (July 2009). Noveda Technologies expects that the $3.3 million it received through the CEMF will yield more than $6.6 million in public/private investment and create 83 jobs in the company by 2013.[160] Petra Solar expects that its $3.3 million in funding will result in more than $7.6 million in public/private investment and create 164 jobs over the next two years.[161] Already, Petra Solar has tripled in size and has acquired a $200 million contract to produce 200,000 smart solar systems to be installed on utility and street light poles.[162]

Iowa

The Iowa Power Fund was created in 2007 to promote energy independence. The Fund provides financial assistance in the form of grants and loan guarantees to Iowa organizations involved in

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157 American Wind Energy Association, http://www.awea.org/projects/.

158 Iowa Department of Economic Development, http://www.iowalifechanging.com/Business/wind_energy.aspx.

159 New Jersey Economic Development Authority, *Financing Programs - Edison Innovation Clean Energy Manufacturing Fund (CEMF)*, http://www.njeda.com/web/Aspx_pg/Templates/Npic_Text.aspx?Doc_Id=1085menuid=1359topid=722levelid=6midid=1357.

160 New Jersey Board of Public Utilities, *Noveda Technologies Awarded Funding under New Jersey's Clean Energy Manufacturing Fund*, October 28, 2009, http://www.state.nj.us/bpu/newsroom/news/pdf/20091028b.pdf.

161 New Jersey Economic Development Authority, *Petra Solar is First Business Awarded Funding under New Jersey's Clean Energy Manufacturing Fund*, July 8, 2009, http://www.njeda.com/web/Aspx_pg/Templates/Press_Rls.aspx?topid=721Doc_Id=1095ParentDocID=163.

162 The State of New Jersey, *Clean Energy in New Jersey*, New Jersey's Clean Energy Success Stories, p. 7, http://www.njeda.com/web/pdf/CleanEnergySolution/NewJerseyCleanEnergyBrochure.pdf.

research and development and early commercialization of renewable energy and energy efficiency technologies. The Fund was set up to provide a total of $100 million in funding over a four-year time period.[163] In addition to the Power Fund, the Iowa Department of Economic Development (IDED) has established two renewable energy sectors – biofuels and wind energy – among primary target industries for its general economic development programs and funds.[164]

Iowa's focus on growing renewable energy industries has proved very effective. The State's 39 ethanol and 15 biodiesel plants[165] make it the largest producer of both fuels in the nation.[166] In addition, the State is one of only two states that manufacturers all major components of wind turbines. It is estimated that 2,000 Iowans are employed by wind manufacturing companies.[167]

Michigan

Businesses engaged in alternative energy research, development, and manufacturing may claim a nonrefundable credit from the Michigan business tax. In 2006, Michigan enacted legislation allowing for the creation of Renewable Energy Renaissance Zones (RERZ). The Renaissance Zones offer significant tax benefits to facilities located within their boundaries. Facilities within a RERZ do not pay the Michigan business tax, personal and real property taxes, or local income taxes. These taxes may be abated for up to 15 years. Fifteen RERZs can be created in the State. Renaissance zone designations are approved based on local economic impacts, job creation, project viability, and other relevant criteria. Renaissance zones must be one distinct, continuous geographic area and must be supported by a tax abatement resolution from the city, village, or township in which the zone is located.[168]

Michigan has made great strides in supporting the development of green jobs. It is estimated that there are approximately 110,000 green jobs in the State, or 3.4% of the total employment of 3.2 million in Michigan. Of these green jobs, 41% are in clean transportation and fuels, 23% in energy efficiency, and 9% in renewable energy production. The remaining 26% are in natural resources conservation and pollution prevention, and environmental clean-up.[169]

How Will a Strategy for Clean Energy Economic Development Help Achieve Maryland Goals?

Aggressive clean energy economic development will help Maryland achieve Governor O'Malley's goal of creating 100,000 green jobs by 2015.

Energy efficiency offers the potential for significant growth in green-collar jobs. A 2008 report on energy efficiency in Maryland written by the American Council for an Energy Efficient Economy (ACEEE) states that "…investments in efficiency have an additional benefit of creating new, high-

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163 Iowa Office of Energy Independence, http://www.energy.iowa.gov/Power_Fund/index.html.

164 For example, Business Sphere, Vol. 20, No. 1, http://www.iowalifechanging.com/business/downloads/bs0308.pdf, and Manufacturing.net, *Iowa Governor Woos Wind Turbine Manufacturers*, http://www.manufacturing.net/Iowa-Gov-Woos-Wind-Turbines.aspx?menuid=270.

165 Iowa Renewable Fuels Association, http://www.iowarfa.org/.

166 Iowa Office of Energy Independence, *Energy Information Report* (December 2008), p. 34, http://www.energy.iowa.gov/OEI/docs/EnergyInformationReport2008.pdf.

167 Office of Energy Independence, *Energy Information Report* (December 2008), p. 35.

168 Database of State Incentives for Renewables and Efficiency, http://www.dsireusa.org/.

169 Michigan Department of Energy, Labor Economic Growth, *Michigan Green Jobs Report 2009* (May 2009), p. 14-15, http://www.michigan.gov/documents/nwlb/GJC_GreenReport_Print_277833_7.pdf.

quality 'green-collar' jobs for the state."[170] The report further notes that if Maryland were to reduce electricity demand by 22,000 GWh, over 8,000 jobs could be created and nearly $500 million in increased wages could result. Finally, the report states that investments made in energy efficiency are likely to be spent locally as compared to investments in conventional electricity generation, which are primarily spent outside Maryland. The White House Council of Economic Advisers estimates that $92,136 of government spending creates one job-year.[171] Using this formula, the $52.3 million allocation of ARRA funds for Maryland through the Energy Efficiency and Conservation Block Grant program can be expected to generate approximately 570 job-years.[172]

Renewable energy development in Maryland can play an important part in providing additional green jobs. The National Renewable Energy Laboratory (NREL) reports that Maryland has wind resources consistent with utility-scale production. Several areas of the State are estimated to have good-to-excellent wind resources, including the barrier islands along the Atlantic coast, the southeastern shore of Chesapeake Bay, and ridge crests in the western part of the State.[173] On-shore and offshore wind development would require a trained and competent workforce. According to an analysis conducted by Navigant Consulting, the construction of a typical 100 MW wind farm in Texas creates approximately 500 direct jobs and 574 indirect and induced jobs. Once operational, such a wind farm employs 27 people directly and creates 22 indirect and induced jobs.[174] At the national level, the U.S. Department of Energy (DOE) estimates the potential job impact of a concerted effort to produce 20% of U.S. electricity from wind. DOE estimates that such wind energy development would support an average of 258,000 jobs annually (including direct, indirect and induced jobs). The DOE report also projects that 5,000-10,000 additional manufacturing jobs could result in Maryland from such a national effort.[175]

Green jobs are not limited to the wind energy sector. One Maryland-based company has cited that for each 50MW woody biomass plant installed, 400 new green jobs are created. Further, Maryland has an abundance of solar energy available for both direct use and electricity generation. Maryland has made a significant commitment to developing in-state solar energy resources by setting a goal to generate 2.0% its electricity from solar by 2022.[176] To achieve this goal would require the installation of approximately 1,500 MW of solar PV in the State.[177] This level of solar PV development could result in significant economic activity in Maryland from solar panel sales and installation services.

What Are the Advantages and Disadvantages of Developing a Clean Energy Economic Development Strategy?

Advantages include:

- Marylanders could benefit from greater employment opportunities through an economy focused on clean energy. A recent study suggests that the renewable energy and energy

170 ACEEE, *Energy Efficiency: The First Fuel for a Clean Energy Future* (February 2008).
171 Executive Office of the President, Council of Economic Advisers, *Estimates of Job Creation from the American Recovery and Reinvestment Act of 2009* (May 2009), http://www.whitehouse.gov/assets/documents/Job-Years_Revised5-8.pdf.
172 MEA, March 27, 2009 press release, http://energy.maryland.gov/documents/blockgrantpresser032709FINAL.pdf.
173 U.S Department of Energy, *Maryland Wind Resource Map*, http://www.windpoweringamerica.gov/maps_template.asp?stateab=md.
174 Navigant Consulting, http://www.seref.us/pdf/2009SolarJobsStudy-2-08.pdf.
175 U.S. DOE, *20% Wind Energy by 2030* (July 2008), p. 204-211, http://www1.eere.energy.gov/windandhydro/pdfs/41869.pdf.
176 DSIRE, http://www.dsireusa.org/.
177 Ibid.

efficiency sectors generate more than 2.5 times as many jobs per dollar of revenues as do the oil and natural gas sectors.[178]

- A more strategic and comprehensive approach to clean energy economic development would lead to more efficient and effective utilization of current economic development resources.
- The clean energy sector is expected to be a growth engine in the coming decades in the United States and worldwide. Strong early positioning in this high-growth sector will provide Maryland with long-term economic benefits.
- More aggressive clean energy economic development efforts will enable Maryland to compete with neighboring states that have established clean energy funds and other incentive mechanisms for their clean energy industrial growth.

Disadvantages include:

- Many clean energy economic development programs and tools require a financial commitment from the State. This could be a major challenge, considering Maryland's current fiscal situation.

Recommendation

Maryland should develop a comprehensive strategy for clean energy economic development, which relies on both government support and private sector investment, to guide the State's efforts to foster clean energy business growth.

Rationale: The clean energy sector is expected to grow rapidly in the 21st century. Maryland has positioned itself as one of the most progressive clean energy states in the nation by establishing three aggressive clean energy targets: the EmPOWER Maryland energy reduction goals, the State's Renewable Portfolio Standard policy, and a GHG emissions reduction goal.

To foster clean energy economic development, Maryland has already taken significant steps, including creation of the Maryland Clean Energy Center, launch of the ARRA-funded Clean Energy Economic Development Initiative (CEEDI), and development of an aggressive agenda to build a trained workforce for a robust clean energy industry through the Governor's Workforce Investment Board.

To compete with other, larger states for clean energy investment capital and green collar jobs, Maryland should develop a comprehensive, strategic plan that includes financial incentives, institutional and policy initiatives, and technologies that match our indigenous resources. Not only should State government support this strategy, but private sector organizations and institutions should be encouraged to invest in it. Venture capital funding should be identified and targeted toward clean energy economic development opportunities in Maryland.

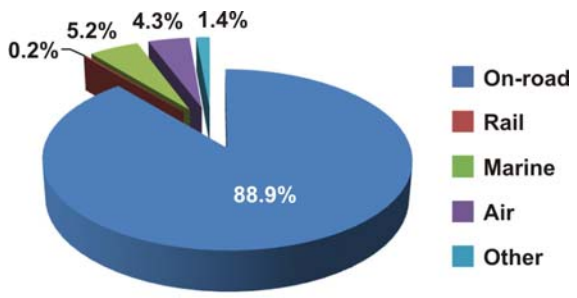
[178] American Solar Energy Society, *Green Collar Jobs in the U.S. and Colorado* (January 2009), http://www.ases.org/images/stories/ASES/pdfs/CO_Jobs_Rpt_Jan2009_summary.pdf.

6.0 Options to Increase Transportation Energy Independence

Maryland's transportation sector uses approximately 31% of all energy consumed in the State, most of it imported from outside the State. The impact of this on consumers is great, both in terms of price paid at the pump and vulnerability to political and supply interruptions. The purpose of this chapter is to explore policy and program options to reduce transportation fuel demand and petroleum use in Maryland, thereby supporting future steps toward independence from imported energy.

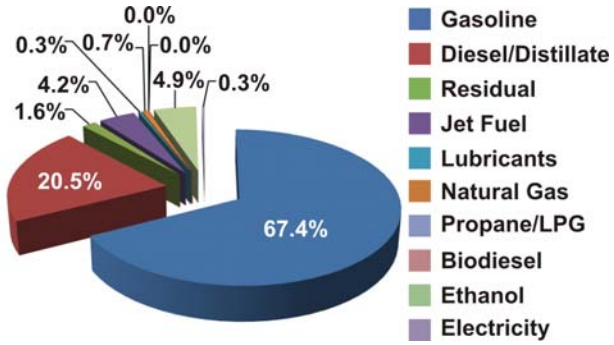
The exhibits below illustrate Maryland's energy use in the transportation sector. Total fuel used for transportation in Maryland is approximately 4.1 billion gallons, or 476 trillion Btu of energy. As shown in Exhibit 6.1, on-road transportation accounts for nearly 90% of all transportation sector energy used in Maryland. Exhibit 6.2 shows that gasoline and diesel account for 88.2% of fuel demand on an energy basis. Ethanol accounts for 4.9% of total fuel energy used, primarily due to its use in E10 gasoline blends. All other fuels play a minor role.

Exhibit 6.1. Energy Use by Transportation Sector



Source: EIA State Energy Profile, FHWA Highway Statistics, Maryland Department of the Environment, Maryland Clean Cities Coalition

Exhibit 6.2. Transportation Sector Energy Use by Fuel (Energy Basis)

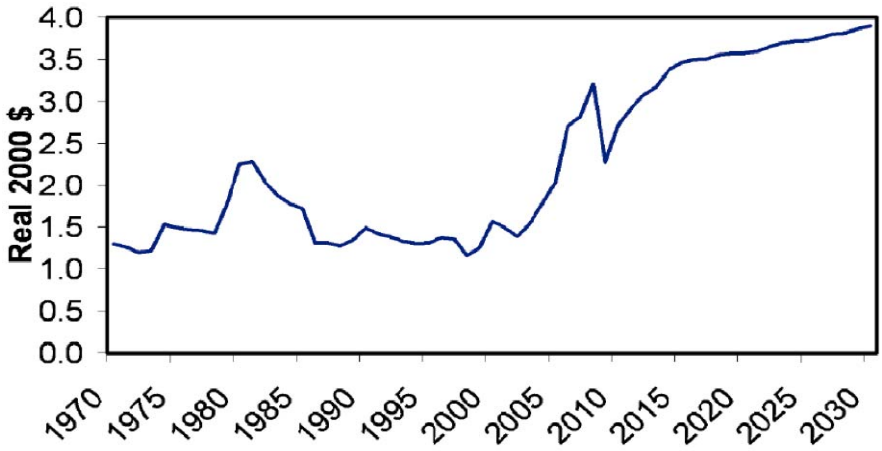


Source: EIA State Energy Profile, FHWA Highway Statistics, Maryland Department of the Environment, Maryland Clean Cities Coalition

Several drivers currently affect the State's transportation fuel mix and demand picture:

- Energy security concerns in Maryland and at the national level
- GHG emissions
- Fuel price volatility
- Federal and State legislative requirements, including Corporate Average Fuel Economy (CAFE), the *Maryland Clean Cars Act of 2007*, *Energy Independence and Security Act of 2007* (EISA) and the potential for a low carbon fuel standard
- Smart Growth/efficient land use policies that impact transportation planning and public services

Exhibit 6.3. Projected Gasoline Fuel Prices



Source: EIA, Annual Energy Outlook 2009

Perhaps the most compelling issue affecting transportation energy independence is the price and price volatility of petroleum fuel. According to the Energy Information Administration's (EIA) *Annual Energy Outlook 2009* (AEO 2009), petroleum prices are expected to increase rapidly over the next ten years. Exhibit 6.3 illustrates projected gasoline fuel costs between 1970 and 2030.[179,180] Gasoline prices in 2018 are projected to be $3.50 per gallon in 2000 dollars (or roughly $4.38 in 2009 dollars).[181]

6.1 What Is Maryland Currently Doing?

Maryland currently has a number of policies and programs in place to reduce transportation energy demand and to promote alternative fuel vehicles (AFV) and fuels, electrically-powered transportation, and smart growth practices.

Although not a State policy, most of the gasoline used in Maryland contains 10% ethanol (E10), according to the Maryland Department of the Environment (MDE).[182] The primary reason for its use is as a fuel oxygenate to improve combustion and to reduce vehicle exhaust emissions; however, a secondary effect is to reduce petroleum-based fuel demand by roughly 10%.

The Maryland Clean Cities Coalition (MCCC), operated by the Maryland Energy Administration, is one of the 80-plus nationwide coalitions in the U.S. Department of Energy's Clean Cities program. The Clean Cities program is focused on petroleum reduction through the use of alternative fuels, hybrid-electric vehicles (HEV), battery-electric vehicles (BEV), idle-reduction, and other fuel reduction measures.[183] MCCC works with State and private fleets, fuel providers, and others to facilitate the availability and use of alternative fuels and vehicles in Maryland. In the past, MCCC

179 EIA, *Annual Energy Outlook 2009: With Projections to 2030* (March 2009), http://www.eia.doe.gov/oiaf/aeo/.

180 White, Thomas, U.S. DOE, *The Impact of Changing Fuel Prices and GDP Projections on VMT and Oil Use and National Highway Speed Limits Impacts*, presented at the 2009 Society of Automotive Engineers Government and Industry Meeting (February 2009).

181 United States Department of Labor, Bureau of Labor Statistics, Consumer Price Index Calculator Online Tool, http://www.bls.gov/data/inflation_calculator.htm.

182 Maryland Department of the Environment, Alternative Fuels and Alternative Fuel Stations Webpage, http://www.mde.maryland.gov/Programs/AirPrograms/Mobile_Sources/afv/fuels.asp.

183 U.S. DOE, Clean Cities Program, *Mission and Background*, http://www1.eere.energy.gov/cleancities/mission.html.

has provided grant incentives for the installation of alternative fueling stations and alternative fuel blending capacity at fuel terminals. These grants have enabled several new stations to open, offering E85 (a blend of 85% ethanol and 15% gasoline) and the construction of biodiesel blending terminals in the past several years.

The State fleet currently contains a large number of alternative fuel vehicles, of which 1,419 are flexible-fuel vehicles (FFV) capable of using E85. E85 use in State FFVs is low, however, due to fuel availability and price, and no State mandate on its use. Maryland also requires that 50% of the State's diesel vehicles use a 5% blend of biodiesel (B5). In reality, B5 use is closer to 100%.

There are currently only seventeen E85 stations (ten private and seven public) in Maryland. Several E85 stations have been installed at State fleet locations to increase the use of E85. There are currently only ten stations (five private and five public) selling biodiesel blends in Maryland.

The MEA, the Maryland Clean Cities Coalition, and several project partners, have recently been awarded nearly $6 million in federal stimulus funds to provide incremental funding for the purchase of 150 heavy-duty hybrid-electric trucks.[184] Heavy-duty vehicles use a much larger amount of fuel annually due to their weight and use patterns, so they are ideal applications for hybridization.

Ethanol used in Maryland is typically imported from the Midwest in rail cars. The State offers a production credit of up to 20 cents per gallon for ethanol produced from "small grains" like wheat and barley.[185] All available ethanol credits under the current statute have been awarded to a planned barley ethanol facility.

Maryland has joined ten other states in the Northeast in working toward the adoption of a low carbon fuel standard (LCFS) for transportation vehicles. The LCFS is a performance-based regulation; that is, it sets a target for lowering the carbon intensity of fuels and allows the market to determine the most cost-effective mix of fuels and strategies for achieving that target. This program will incentivize the production and use of low carbon fuels while discouraging the use of high carbon intensive fuels. The LCFS requires lifecycle accounting for fuel, production, storage, transport, delivery, combustion, and emissions.

The Commuter Connections program has been providing Maryland residents with information about alternative commuting options, such as teleworking, mass transit use, rideshare/carpool/ vanpool, the Guaranteed Ride Home program, alternative work schedules (e.g., four ten-hour days instead of five eight-hour days), biking and walking to work, etc. since 1974.

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184 MEA press release on August 26, 2009, *Maryland Receives Nearly $6 Million in Clean Cities Grant Funding to Support Hybrid Electric Vehicles*.

185 Ethanol production credits are as follows: a) $0.20 per gallon of ethanol produced from small grains such as wheat, rye, triticale, oats, and hulled or hull-less barley; and b) $0.05 per gallon of ethanol produced from other agricultural products. The Board may not certify ethanol production credits for more than a total of 15 million gallons per calendar year, of which at least 10 million gallons must be produced from small grains. Source: Maryland Statutes, Agriculture Code 10-1501 through 10-1507, http://mlis.state.md.us.

6.2 What Are the Results So Far?

Maryland has made significant strides in reducing statewide petroleum use, but still has a long way to go. Approximately 305 million gallons of ethanol are consumed in Maryland each year as a result of E10 use. E85 use in all registered vehicles in Maryland is not tracked well, but is considered to consist of several hundred thousand gallons per year. The number of stations offering E85 was stagnant for a long time, but has grown by a few public and private stations in the past several years. Accurate figures for biodiesel use are not available, but the fuel is estimated to be increasing at a rate of about 150,000 gallons per year. Approximately one million gallons of pure biodiesel (B100) are now estimated to be used in Maryland vehicles each year. Maryland is required to purchase alternative fueled vehicles (AFV) for at least 75% of its new light-duty vehicle fleet. According to the Maryland Department of General Services, the State fleet includes 9,045 vehicles, including 1,419 E85-capable flexible fuel vehicles (FFV) and 144 compressed natural gas (CNG) vehicles. An additional 200 FFVs will be added to the State vehicle inventory in each of the next two years. The State fleet also includes 63 hybrid-electric vehicles, and there are plans to purchase an additional 30 vehicles in each of the next two years.

Statewide, there are approximately 150,000 FFVs in use. The number of hybrid-electric vehicles in Maryland is not known, but the market penetration of hybrids is approximately 2 to 3% of new light-duty vehicles.

Electric-drive vehicles in the form of hybrid-electric vehicles are a common sight in Maryland, with increasing sales each year. The number of fully electric vehicles, such as plug-in hybrid-electric vehicles, in the State is not known, but is very low. The majority of electric-drive vehicles are likely low-speed nonroad vehicles used on large private properties and campuses.

The Commuter Connections program has developed a comprehensive set of metrics to track the effectiveness of the program. The methodology is one of the most comprehensive in the country and has been adopted by other large cities with commuting problems such as Atlanta and Los Angeles.[186] The Commuter Connections program has increased its effectiveness each year, but according to the program staff has struggled to keep up with population growth and demand for its services.

6.3 What More Can We Do?

Maryland can make significant progress in reducing petroleum use and increasing petroleum independence by focusing on several near-term options. The key is to address vehicle and fuel technology areas with near-term potential for petroleum reduction that will also enable Maryland to meet federal renewable fuel use requirements.

During the Maryland Energy Outlook development process, several policy options to decrease transportation sector fuel consumption and to increase use of alternative fuels were considered. Among those options were financial incentives for biofuels production and use; support and development of alternative fuels other than biofuels; lead-by-example activities; idle reduction strategies; and promotion of mass transit. Based on policies and programs that already exist and

[186] Personal communication with Nicholas Ramfos, Director, Commuter Connections Program, in June 2009.

potential efficiency improvements, the most promising options were selected for further analysis. Although CNG was not selected as one of these options, the State should consider financial incentives such as tax and grant incentives for vehicle purchases and refueling infrastructure as more shale gas, such as the Marcellus formation, comes on line and combines with the prospect of a low carbon fuel standard.

These options include:

- Increase the availability and use of high-level ethanol blends
- Increase the availability and use of biodiesel blends
- Promote electric-drive vehicles
- Lead-by-example to "green" the State fleet
- Increase support for the Commuter Connections program

6.3.1 Increase the Availability and Use of High-Level Ethanol Blends

What are Ethanol Blended Fuels?

According to the U.S. Environmental Protection Agency, low-level gasoline/ethanol blends can contain up to 10% ethanol (E10). E10 can be used in all gasoline vehicles without modification. Low-level ethanol blends in gasoline have been used in many states, including Maryland, as an oxygenate to improve fuel combustion and reduce emissions.

Ethanol fuel is currently produced using corn as a feedstock, which has long-term sustainability limitations. Cellulosic ethanol is the next generation of ethanol fuel. Cellulosic ethanol can be produced from a wide variety of biomass feedstocks, including fast growing grasses such as switchgrass and other forest and agricultural wastes that do not impact the food supply. Industry leaders and experts have advised that cellulosic ethanol production technology is under development, but is not expected to produce the large quantities required to meet the State and national ethanol demands for roughly ten years. The infrastructure developed for, and experience gained by, individuals and fleets, using current ethanol will allow cellulosic ethanol a smoother transition when commercially available in large quantities. A strong move toward replacing gasoline with current corn ethanol fuel will help ensure a strong market infrastructure and demand for later years when it is needed.

E85 (85% ethanol, 15% gasoline) is the only currently allowable higher-level blend. It can only be used in flexible fuel vehicles (FFV); it cannot be used in conventional gasoline engine vehicles. FFVs are essentially gasoline vehicles that have several components upgraded for compatibility with alcohol fuels. Unlike other alternative fuel vehicles that suffer from low vehicle availability or high purchase costs, FFVs are common since many domestic car manufacturers have been selling them for many years with no price premium. The number of FFVs will grow in the coming years because most domestic manufacturers have plans to produce an even larger percentage of their vehicles as FFVs.

What Can Maryland Do to Increase the Availability and Use of High-Level Ethanol Blends?

The *Energy Independence and Security Act of 2007* mandates a rapid increase in ethanol use over the next decade, from roughly 6.45% (volume basis) in 2009 to 13.26% in 2018. Technically, the Renewable Fuel Standard (RFS) compliance burden is placed on petroleum refiners and fuel blenders, not on States or individual consumers. Ideally biofuels would be used in the most cost-effective manner, such as higher use in the Midwest where the crops and fuel are produced. It is likely that these areas will see higher biofuels use due to lower fuel prices caused by proximity to biofuel production facilities. However, it is not realistic to assume that significantly higher biofuels use will only occur in Midwestern states. 52 % of the U.S. population lives in 19 east and west coast states. A base case assumption (equal percentage usage) in each state has been assumed for the MEO.

In reality Maryland's biofuels consumption will be somewhat less than the averages shown above, which is counter to Maryland's goal of leading reductions in petroleum use and curbs in GHG emissions. Currently E10 use is sufficient to meet the RFS requirement through 2013. For 2014 and beyond, additional ethanol use will be required if no changes to the RFS are made and Maryland is assumed to meet the State ethanol consumption average discussed earlier. Based on analysis earlier in this Maryland Energy Outlook, an additional 96.6 million gallons of ethanol per year will need to be used in Maryland by 2018 to meet EISA and the RFS.

To meet this additional volume, the following options could be considered:

- Use higher level ethanol blends (i.e., greater than E10) in the gasoline motor fuel pool for current and future conventional gasoline engines
- Allow ethanol blending in conventional gasoline and not just reformulated gasoline (RFG)
- Increase the use of E85 in flexible fuel vehicles (FFV)

The first option is appealing because even a small increase in ethanol percentage would lead to a significant volumetric increase. However, at this time, gasoline is legally able to include only up to 10% ethanol. Higher level intermediate ethanol blends (e.g., E15 and E20) are being studied by the U.S. Department of Energy (DOE) and the U.S. Environmental Protection Agency (EPA) to determine whether their use is feasible without causing engine and fuel system damage or operability issues with existing and new gasoline vehicles and equipment.[187] Additionally, using intermediate ethanol blends could result in an increase in evaporative emissions for the region; before the State were to move forward, this issue would have to be fully investigated and addressed. The second option would only result in a small increase in ethanol use since most gasoline in Maryland already includes 10% ethanol.

Therefore, until a final determination has been made whether to approve the use of intermediate level ethanol blends, the significant additional ethanol consumption required must come from higher use of E85 in FFVs. The progress of the EPA/DOE evaluation and determination made on intermediate level blends should be tracked since an approval of any blend higher than 10% will decrease the need to use more E85.

[187] Oak Ridge National Laboratory and National Renewable Energy Laboratory, *Effects of Intermediate Ethanol Blends on Legacy Vehicles and Small Non-Road Engines, Report 1*, ORNL/TM-2008/117, NREL/TP-540-43543, October 2008.

E85, like other alternative fuels, suffers from a "chicken and egg" problem. E85 use is typically very low, so few stations are willing to invest in the necessary capital equipment to sell the fuel. Because throughput is low, the stations that are selling the fuel must buy it in small quantities at prices higher than those that can be achieved by buying in bulk. The stations then must sell the fuel at a higher cost to make up this difference and to pay for the dedicated fueling infrastructure at the station. The higher price is one factor that has caused individual consumers and commercial fleet managers to avoid using E85. Additionally, ethanol has less energy per unit of volume than gasoline. E85 has roughly 30% less energy per volume than gasoline, so the fuel must be priced accordingly to compete on a $/Btu or $/mile basis.

In order to be able to meet the EISA RFS goals and to begin a meaningful shift away from petroleum-based transportation fuels, a self-sustaining market for higher level ethanol blend fuel must be established that builds on the current and growing FFV population in the State. The solution requires four actions to be effective:

- Ample number of FFVs
- Convenient and widespread publicly available fueling stations
- Competitive fuel price (on an energy basis)
- FFV driver education programs on E85

Only when all of these are implemented will fuel use be high enough and consistent enough to allow for lower-cost bulk fuel purchases and to persuade consumers to change their fuel choice. The first point is being addressed by vehicle manufacturers producing high numbers of FFV vehicles, which will result in significantly more FFVs on the road in the coming years. The remaining three actions are addressed below.

Increase E85 Refueling Station Infrastructure

Several fuel dispensing locations for E85 have been installed in Maryland in the past several years. To increase the use of E85, the State should work with retailers and other stakeholders to increase the availability of E85, with a focus on publicly-accessible stations. Public stations can service both private and government fleets as well as individual customers, so they can have a much larger potential fuel throughput. The State should conduct a statewide analysis of alternative fuel vehicle locations based on registration data versus available fueling locations. This would help determine areas with high FFV populations and identify locations where new E85 fuel dispensing locations could be used. The MEA Biofuels Grant Program, which provided eight fueling stations with $12,500 to install E85 fuel dispensing equipment, has been successful in providing funding for fuel distribution companies to install new alternative fuel dispensing infrastructure. The program should be continued to maintain momentum as more drivers decide to switch to alternative fuels. Another option to achieve the same goal is to provide tax credits for installing E85 refueling dispensers at public refueling stations.

E85 Fuel Price Assistance

E85 sales will not increase unless the fuel is priced lower than gasoline on an energy basis. E85 currently costs 30% more than gasoline on an energy basis. Experience has shown that one-time, or short-term, discounts and rebates will change consumer behavior only while they are in effect, and behavior will revert once the incentives expire. A long-term E85 fuel price buydown is needed to

maintain the price below gasoline on an energy basis to create consistent demand that will drive additional fueling station installations and lower price bulk fuel sales. For example, a fuel tax exemption or tax credits could be used to provide this price assistance.

Education Campaign

Ethanol has been discussed in the media for several years and several domestic manufacturers have made FFV equipment standard on many of their common models. However, it is important to heighten the messaging: ethanol as a useful and important fuel; vehicles that use the fuel; performance differences between gasoline and E85; and fuel purchasing locations. Consumer education is a key component of the strategy to increase E85 use in Maryland. State, county, and local governments in Maryland have fleets with a high number of FFVs due to federal purchasing requirements. These fleets should be initially targeted to give the education initiative a jump start. A public education program should follow, highlighting State and county successes.

What Is Maryland's Experience with High-Level Ethanol Blends?

Use of E85 is not tracked well in Maryland, but is estimated to have been several hundred thousand gallons per year for several years. According to the DOE Alternative Fuels Data Center, Maryland has seventeen stations offering E85. Ten of the stations are public-access; the rest are limited to fleet use only.[188] For comparison, there are approximately 1,700 gasoline stations in the State.[189] There were over 150,000 E85 compatible FFVs registered in Maryland in 2008. The numbers will increase in the coming years as manufacturers produce more FFV models.

Gasoline in the Central Atlantic region cost an average of $2.54/gallon in July 2009 while E85 cost an average of $2.35/gallon (7% lower).[190] The E85 cost equates to an energy adjusted cost of $3.32/gasoline gallon equivalent (30% higher than regular gasoline).

What Are Other States' Experiences with High-Level Ethanol Blends?

Several initiatives have been undertaken across the country to increase the use of E85. The Twin Cities Clean Cities Coalition in Minneapolis-St. Paul, Minnesota, partnered with fuel station company Holiday Station Stores to install a large number of E85 fueling stations. Forty-eight are currently in operation in Minnesota, with an additional four in Wisconsin, and one in South Dakota.[191] Holiday priced the fuel competitively so that users would break even or save money compared to gasoline. A public awareness campaign, including advertisements on radio and television, mirror hang tags for new cars in showrooms, $0.85/gallon promotions, and other strategies were used to promote the fuel and increase its use. E85 use in the upper Midwest is the highest in the country, and the region accounts for 700 of the 1,500 E85 stations nationwide. These efforts have been enhanced by the fact that the feedstock is locally grown and the fuel is locally produced, minimizing transportation costs.

In addition, Minnesota has actively promoted the use of ethanol by providing incentives for ethanol producers and establishing an ethanol blending mandate. Minnesota's sixteen ethanol plants have a

188 U.S. DOE, *Alternative Fuels and Advanced Vehicles Data Center, Alternative Fueling Station Locator*, http://www.afdc.energy.gov/afdc/locator/stations/state, accessed on August 27, 2009.
189 U.S. Census Bureau 2002 Statistics, http://www.census.gov/econ/census02/data/industry/E4471.HTM, accessed on August 27, 2009.
190 U.S. DOE, *Clean Cities Alternative Fuel Price Report* (July 2009), http://www.afdc.energy.gov/afdc/pdfs/afpr_jul_09.pdf.
191 Holiday Stationstores website, http://www.holidaystationstores.com/petroleum/petroleum.html.

capacity of over 600 million gallons, and approximately 20% of the Minnesota corn crop is made into ethanol. The State has over 300 commercial E85 stations.[192]

Tennessee has also conducted aggressive development efforts for biofuel refueling stations. $1.5 million was provided to the Tennessee Department of Transportation to develop a Biofuel Green Island Corridor network along State highways. An additional $480,000 from the State Congestion Mitigation and Air Quality (CMAQ) fund was provided to locate biofuels infrastructure in areas of nonattainment or maintenance for air quality standards. This program has led to construction of 26 E85 stations in Tennessee.[193]

A similar initiative was undertaken under the auspices of the U.S. Department of Energy to develop biofuels infrastructure along the I-65 corridor between Gary, Indiana, and Mobile, Alabama. The project allows FFV drivers to travel along this entire Interstate corridor using E85. A total of 31 E85 refueling stations have been constructed in four states: Indiana, Kentucky, Tennessee, and Alabama. The DOE Clean Cities Program, the individual Clean Cities Coalitions along the route, and the Indiana Office of Energy Development have all been involved in the project.[194]

How Will Increasing Use and Availability of High-Level Ethanol Blends Help Achieve Maryland's Goals?

- **GHG Reduction:** Increasing the use of higher-level ethanol blends within the State through infrastructure development and education has the potential to decrease the total consumption of petroleum for transportation use in the short-term (through 2012) by 160 million gallons and reduce GHG emissions in the state by 0.3 million tons.
- **RFS:** Increased use of high-level ethanol blends will also enable Maryland to meet the RFS biofuels consumption requirements through 2018.

What Are the Advantages and Disadvantages of Increasing the Availability and Use of High-Level Ethanol Blends?

Advantages include:

- The State has a large population of FFVs. The number of FFVs is expected to increase since more models will be sold by domestic car makers in the coming years.
- Increasing the availability and use of high-level ethanol blends helps develop a self-sustaining market for E85.
- Increasing the availability and use of high-level ethanol blends supports Maryland's biofuels consumption level so that it is on par with federal RFS requirements.
- High-level ethanol blends improve air quality.
- High-level ethanol blends improve State and national energy security.

Disadvantages include:

- State funding will be required to incentivize installation of E85 infrastructure.

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192 Minnesota Department of Agriculture, *About the Ethanol Program*, http://www.mda.state.mn.us/renewable/ethanol/about.htm.
193 Tennessee Department of Transportation, Biofuel Green Island Corridor Grant Project, http://www.tdot.state.tn.us/biofuel/application.htm.
194 Indiana Office of Energy Development, *I-65: America's Biofuels Corridor* website, http://www.in.gov/oed/2396.htm.

- State funding will be required, at least in the near-term, for buying down the price of E85 fuel to maintain a lower price than gasoline.
- The lower energy content of E85 decreases fuel economy, making the fuel less attractive to consumers.
- Modest GHG benefits of first-generation ethanol and other environmental concerns regarding ethanol production lessen consumer acceptance and may threaten future economic viability of the fuel.
- A high-level ethanol program could result in an increase of evaporative emissions in the form of volatile organic compounds (VOCs) that lead to an increase in ground-level ozone.

Recommendation

The State should focus on State government lead-by-example initiatives to promote the use of ethanol and continue supporting key private industry ethanol infrastructure development in anticipation of more widespread use of higher ethanol blends in the future and potential in-state production of cellulosic ethanol.

Rationale: Most gasoline sold in Maryland is already blended with 10% ethanol (E10), so the State has hit the "blend wall," the maximum allowable amount blended in gasoline. Until the federal government makes a final determination whether to approve the use of intermediate level ethanol blends (e.g., 15%, 20%, or other ethanol blends), the only viable method for Maryland to significantly increase ethanol use is greater use of E85 (85% ethanol blend) in flexible fuel vehicles (FFVs). To increase E85 use, three strategies should be deployed together to:

- Further develop E85 refueling infrastructure to make the fuel the more commonly and conveniently available to private individuals and fleets
- Provide price assistance for E85 to keep the fuel cost-competitive with conventional gasoline on an energy basis
- Deploy a consumer education campaign on E85, its availability, and benefits.

The *Energy Independence and Security Act of 2007* mandates a rapid increase in ethanol use over the next decade that cannot be met with current E10 use. Technically, the burden of compliance is placed on petroleum refiners and fuel blenders. It would be advisable for the State, which owns a significant number of FFVs, to make sure its own fleet uses E85. In addition, Maryland should continue supporting key private industry ethanol infrastructure development in anticipation of more widespread use of higher ethanol blends in the future and potential in-state production of cellulosic ethanol.

6.3.2 Increase the Availability and Use of Biodiesel Blends

What Are Biodiesel and Alternate Distillate Blended Fuels?

Alternate distillate fuels are distillate fuels derived from plant and animal fats that can be used in diesel engines. Biodiesel, produced from the transesterification of plant and animal fats, is the most commonly known and currently available alternate distillate fuel. Renewable diesel (produced from biological materials through a thermal depolymerization process) and co-processed renewable diesel

(small amounts of plant and animal fats co-processed with petroleum) are also alternate distillate fuels.[195] All alternate distillate fuels in this report are referred to as biodiesel.

Biodiesel is typically blended with diesel fuel in different proportions. Diesel engines can technically operate on 100% biodiesel (B100), but blends from 2% (B2) to 20% (B20) are more common. A B5 blend, and lower blends, can safely be used by all diesel vehicles.[196] Biodiesel blends are used for various reasons, including: improving combustion efficiency and exhaust emissions; increasing the renewable portion of the fuel; and improving vehicle GHG emissions.

What Can Maryland Do to Increase the Availability and Use of Biodiesel Blends?

The *Energy Independence and Security Act (EISA) of 2007* requires an increase in biodiesel use over the next decade. The percentage of biodiesel in the diesel fuel pool will rise from roughly 1.4% (on a volume basis) in 2009 to 3.96% in 2018. Technically, the Renewable Fuel Standard (RFS) burden of compliance is placed on petroleum refiners and fuel blenders, not on States or other end-users. Ideally, biofuels would be used in the most cost-effective manner, including higher use in the Midwestern states where crops and fuel are produced. It is likely that consumers in these states will use a higher percentage of biofuels due to lower fuel prices (caused by proximity to biofuels production facilities); however it is not realistic to assume that significantly increased biofuels consumption will be centered only in these states. 52 % of the U.S. population lives in 19 eastern states and the west coast. In this report, all states are assumed to use biodiesel blends at an equal level. In reality, the use of biofuels in Maryland will be somewhat less than the average.

Biodiesel use in Maryland is roughly 10% of the amount required to meet the RFS requirement for 2009, so additional transportation use of biodiesel is required for 2009 and beyond. Options for increasing biodiesel use include:

- Mandate use of low-level biodiesel blends
- Increase use of higher-level biodiesel blends in diesel vehicles

Increasing the use of higher-level blends will be more expensive and more slowly deployed because higher-level blends are seen as alternative fuels, which have limited appeal to end-users. Meeting the RFS requirement requires near-term solution, so mandating use of low-level blends is the only realistic option. Promoting higher-level blends is important and should be reconsidered once use of low-level blends has become more widespread.

Maryland should also consider providing tax incentives to companies that install biodiesel blending technology, because the blending capacity of the fuel distribution system needs to be improved in anticipation of higher consumer demand.

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195 National Biodiesel Board, *Biodiesel, Renewable Diesel, Co-Processed Renewable Diesel*, http://www.biodiesel.org/pdf_files/fuelfactsheets/Co-Processing%20One%20Pager.pdf.

196 ASTM International, *New Biodiesel Specifications Published by ASTM International*, Release #8079 (October 2008), http://astmnewsroom.org/default.aspx?pageid=1515.

Mandate the Use of Low-Level Biodiesel Blends

Maryland should consider mandating the use of low-level biodiesel blends. Mandating blends up to 5% would be relatively straightforward, since the diesel fuel specification allows for up to 5% biodiesel. Enacting this option would ensure that the RFS requirements would be met through 2018. The mandate could be introduced in steps, slowly increasing the biodiesel blending percentage up to the 3.96% required to meet the RFS requirements in 2018. Existing diesel storage and dispensing infrastructure would be used, eliminating significant additional infrastructure-related costs. As discussed below, this approach has already been adopted by several states which provide valuable lessons as to how such a program could be structured.

Increase Use of Higher-Level Biodiesel Blends

The second option is to expand the use of higher-level biodiesel blends (above B5). This option is limited because most diesel engine manufacturers have not endorsed higher level biodiesel blends. Higher-level blends require additional separate storage and dispensing infrastructure, which poses a significant limitation to the overall effectiveness of this option. The potential market for use of higher level blends is limited and not expected to result in biodiesel use sufficient to meet the RFS requirements.

Increase Biodiesel Blending Capacity

Pure biodiesel (B100) cannot be transported through the fuel pipelines, so it must be blended with diesel fuel at petroleum distribution terminals. A key aspect of providing reliable fuel blends at competitive prices is the ability to produce the blends at fuel distribution terminals. This allows fuel blenders to alter the percentage of biodiesel in the fuel to react to seasonal changes, differences in fuel prices, and customer demands. Increased biodiesel use from a biodiesel mandate or increased use of higher-level blends would require additional terminal blending infrastructure. The State should consider providing tax incentives to petroleum distributors to help offset the costs of installing additional biodiesel blending capacity.

What Is Maryland's Experience with Biodiesel?

Retail purchase of biodiesel is limited in Maryland. According to the DOE Alternative Fuels Data Center, Maryland has ten stations offering biodiesel blends (up to 20% biodiesel); five of these stations are public-access and the rest are limited to fleet use.[197] Accurate figures for biodiesel use are not available, but estimates suggest that biodiesel use has increased by about 150,000 gallons per year to a level of approximately one million gallons of pure biodiesel (B100).[198]

Diesel fuel in the Mid-Atlantic region costs an average of $2.62/gallon while biodiesel blends from B10 to B100 range from $2.49/gallon to $2.71/gallon. The energy content difference between biodiesel and diesel is small.

The MEA Terminal Infrastructure Grant Program has been successful in the past in incentivizing fuel distribution companies to install biodiesel blending capacity at fueling terminals, and the U.S.

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197 U.S. DOE, *Alternative Fuels and Advanced Vehicles Data Center: Alternative Fueling Station Locator*, http://www.afdc.energy.gov/afdc/locator/stations/state, accessed on August 27, 2009.

198 Historical biodiesel usage in Maryland developed by New West Technologies, LLC for the Maryland Clean Cities Coalition.

Department of Energy, Clean Cities Program also has provided funding in 2009 for installation of additional biodiesel terminal blending equipment.

What Are Other States' Experiences with Biodiesel?

Several states, including Minnesota, Pennsylvania, and Missouri, have instituted low-level (2 to 5%) biodiesel blend mandates. In Minnesota, a 2% blend has been required since 2005. Minnesota will begin increasing the required percentage of biodiesel to its ultimate level of 20% by 2015.[199] In Pennsylvania, the required biodiesel blend depends on in-state biodiesel production, increasing from 2% when production reaches 40 million gallons per year (MMgy) to 20% when in-state production reaches 400 MMgy.[200] In-state production in Pennsylvania has passed the 40 MMgy threshold, so within one year all diesel fuel in the State will contain 2% biodiesel. In Missouri, all diesel fuel distributors will be required to provide consumers with a blend of at least 5% biodiesel by June 1, 2010.[201] However, if the price of biodiesel-blended fuel is higher than regular diesel, distributors will not be required to sell it.

Several states, including Illinois and Iowa, provide tax incentives for biodiesel blends. In Illinois, the sales tax is reduced by 20% on biodiesel blends up to B10 and a full exemption from the State sales tax (6.25%) is provided for B11 and above.[202] Iowa provides a three cent per gallon tax credit to retailers whose biodiesel blend (B2 or higher) sales account for 50% or more of all diesel sales.[203]

How Will Increasing Use and Availability of Biodiesel Help Achieve Maryland's Goals?

- **GHG Reduction:** Implementation of programs to increase the use of biodiesel blends within the State could potentially decrease total consumption of petroleum for transportation use in the short-term (through 2012) by 150 million gallons and reduce GHG emissions in the state by 1.2 million tons.
- **RFS:** Mandating low-level biodiesel blends would enable use in Maryland to be on par with the RFS requirements through 2018.
- **Green Jobs:** If both regular diesel and biodiesel are produced out of state, it is unclear whether implementing a biodiesel mandate will create green jobs since increased biodiesel consumption will come from decreased petroleum use. Additional green jobs could be created by farming feedstock crops and producing the fuel in state.

199 "Minnesota Passes Statewide B20 Mandate", National Biodiesel Board press release on May 12, 2008, http://www.biodiesel.org/resources/pressreleases/gen/20080512_mnb20.pdf.

200 Pennsylvania House Bill 1202 (2007), P.N. 4184, *Providing for the Study and Mandated Content of Biofuels*, http://www.legis.state.pa.us/CFDOCS/Legis/PN/Public/btCheck.cfm?txtType=HTMsessYr=2007sessInd=0billBody=HbillTyp=BbillNbr=1202pn=4184.

201 "Missouri Senate Passes B5 Mandate", *Biodiesel Magazine*, April 3, 2008, http://www.biodieselmagazine.com/article.jsp?article_id=2247.

202 Domestic Fuel Website, *Illinois Ups Biodiesel Mandate by 5%*, September 2, 2009, http://domesticfuel.com/2009/09/02/illinois-ups-biodiesel-mandate-to-5-percent/.

203 U.S. DOE, Alternative Fuels Data Center, *Iowa Biodiesel Laws and Incentives*, http://www.afdc.energy.gov/afdc/progs/ind_state_laws.php/IA/BIOD.

What Are the Advantages and Disadvantages of Increasing the Availability and Use of Biodiesel?

Advantages include:

- Low-level biodiesel blends (B5 and below) are included in diesel fuel specifications (ASTM D975) and can be immediately implemented in all diesel vehicles.
- Low-level biodiesel blends can potentially decrease petroleum consumption in the transportation sector in the short-term (through 2012) by 150 million gallons and reduce GHG emissions in the state by 1.2 million tons.
- Implementing a low-level biodiesel mandate for a percentage equal to or above the RFS requirement will ensure that Maryland's biodiesel consumption is on par with the regulation through 2018.
- Low-level biodiesel blends will have a small price impact.
- Offsetting some of the State's diesel fuel demand with biodiesel will improve our energy security and air quality.
- Jobs will be created on farms, fuel production, and fuel distribution.

Disadvantages include:

- Biodiesel fuel and diesel fuel prices track differently, so the price difference will vary depending on many factors, such as the price of petroleum, feedstock and biodiesel fuel, weather impacts on crops, production facilities, and so forth.

Recommendation

Maryland should require the use of low-level biodiesel blends based on volume. If the blending level mandate were to increase gradually and be in line with the federal Renewable Fuel Standard requirements, this would help boost local Maryland biodiesel production and could be achieved with existing infrastructure.

Rationale: Current biodiesel consumption levels in Maryland fall well short of those required by the federal Renewable Fuel Standard (RFS). While the federal RFS does not set state-level requirements for biodiesel use, it does not appear unreasonable or unrealistic for Maryland to match the relatively modest biodiesel consumption requirements of the RFS. Since Maryland has biodiesel production facilities in place with the potential to increase production, higher biodiesel use would likely result in increased economic activity and employment.

To increase biodiesel consumption, the State should work to increase use of high-level biodiesel blends or mandate the use of low-level blends. Increasing the use of high-level blends will be more expensive and occur more slowly, since high-level blends are perceived as alternative fuels which have limited appeal to users. Mandating blends up to 5% would be relatively straightforward, since the diesel fuel specification allows for up to 5% biodiesel. The mandate could be introduced in steps, slowly increasing the biodiesel blending percentage up to the 3.96% required by the RFS in 2018. To achieve this, existing diesel storage and dispensing infrastructure could be used, eliminating significant additional infrastructure-related costs. Low-level biodiesel mandates have already been adopted by several states, which provide valuable lessons as to how such a program could be structured.

6.3.3 Promote Electric-Drive Vehicles

What Are Electric-Drive Vehicles?

Most hybrid-electric vehicles, like the Toyota Prius, can operate for only a few miles solely on battery power. The next evolutionary step toward fully electric vehicles is the plug-in hybrid-electric vehicle (PHEV). PHEVs have a large battery pack with more stored energy to significantly increase the vehicle's driving range on electric power. The auto industry is also working to develop a fully electric vehicle using only energy stored in a battery pack for power. These all-electric vehicles are commonly referred to as electric-vehicles (EVs) or battery-electric vehicles (BEVs). PHEVs have a significant driving range since energy is provided both by a battery pack and an internal combustion engine. BEVs have limited range that varies by vehicle, but initially they will operate for roughly 100 miles.

PHEVs are being designed by several automobile manufacturers. The Chevy Volt is expected to be released in 2011 with a purchase price of approximately $40,000.[204] In comparison, the base price of a Toyota Prius is approximately $22,500. Toyota is also developing a PHEV Prius, with a 2012 production date goal. Ford has also shown a PHEV version of the Escape, which is expected to be available in 2012. Others, such as the four-passenger, $88,000 Fisker Karma, scheduled for a mid-2010 release, are aimed at luxury buyers. Fisker is also developing a $40,000 PHEV for a price point significantly below the Karma.[205] PHEVs available directly from automobile manufacturers are currently eligible for up to a $2,500 federal tax credit.[206]

Battery technology suitable for storing energy in PHEVs and BEVs has advanced significantly over the past ten years and is now suitable for use in commercially available vehicles. The Electric Power Research Institute (EPRI) estimates that since half the vehicles on the road are driven 25 miles a day or less, a PHEV with even a 20-mile range battery system could reduce petroleum usage by about 60%.[207] The U.S. Department of Transportation, Bureau of Transportation Statistics, estimates that 78% of vehicles travel 40 miles or less per day; thus, replacing these vehicles with a BEV or PHEV with a 40 mile electric-only range would reduce petroleum use by roughly the same percentage.[208]

PHEV and BEV batteries are very expensive, so the battery capacity is a compromise between driving range and cost. As a result, PHEVs and BEVs are significantly more expensive than conventional vehicles. Exact prices are not known at this time because commercial versions of these vehicles have not yet been released.

Electric vehicles provide efficient transportation, especially when combined with regenerative braking features that can recover some of the vehicle's braking energy as current hybrid-electric vehicles do. It is critical that fuel use, criteria and carbon emissions, and the well-to-tank efficiency

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204 CNN Money Website, *Chevy Volt: A Lot of Unanswered Questions*, http://money.cnn.com/2009/10/15/autos/volt_problems.fortune.

205 Fisker Automotive Website News, *Fisker Automotive Awarded $528M from U.S. Department of Energy,* http://karma.fiskerautomotive.com/news_items.

206 U.S. Department of the Treasury, Internal Revenue Service, *Vehicle Credits* Website, http://www.irs.gov/formspubs/article/0,,id=210607,00.html, accessed October 20, 2009.

207 Electric Power Research Institute, *Driving the Solution the Plug-in Hybrid Vehicle* (2005).

208 U.S. Department of Transportation, Bureau of Transportation Statistics, *Figure 2 - On a Typical Day, How Many Miles One-Way Do You Travel from Home to Work?*, http://www.bts.gov/publications/omnistats/volume_03_issue_04/html/figure_02.html.

of the processes used to produce the electricity are taken into account to ensure that net emissions per vehicle are an improvement over conventional gasoline vehicles.

Even with several PHEV and BEV models expected to be available in the coming years and high consumer interest, the total number of vehicles available nationwide will be low, on the order of 100,000 per year for several years. HEVs were introduced in the U.S. in 2000 and are just now reaching a market penetration of between 2-3% of new vehicle sales. PHEVs and BEVs are a step beyond HEVs in both technology and cost, so the rate of market share capture is expected to be slower than HEVs. Therefore, PHEVs/BEVs are not expected to represent a large portion of near-term new vehicle sales. Thus, they are not expected to represent much of the overall vehicle fleet in Maryland (estimated to be 4.77 million in 2009).

As long as the number of electric vehicles remains small, their impact on total electricity consumption in Maryland will be limited. However, if electric vehicles increase their market share in the future and appropriate recharging infrastructure is developed, the impact on average household electricity consumption and total electricity demand in the State could be significant.

What Can Be Done to Promote Electric-Drive Vehicles?

Even though widespread PHEV/BEV use is years away, there are several things Maryland could do to promote PHEVs/BEVs:

- Mandate that the State purchase PHEVs and BEVs and/or participate in an EV leasing program
- Establish a vehicle sales tax exemption program for the purchase of PHEVs and BEVs
- Establish HOV, parking, and vehicle registration incentives for PHEVs and BEVs
- Establish a zero-emission vehicle partnership with leading electric vehicle manufacturers and other Stakeholders

Mandate that the State Purchase PHEVs and BEVs

Maryland should consider mandating that State fleet organizations purchase BEVs or PHEVs for a portion of new vehicle acquisitions. This option is discussed in more detail in the "lead-by-example" section of this report. A conservative goal (e.g., 1 or 2%) should be set initially to limit the additional cost these vehicles will add to the budget. This could start with a small demonstration fleet to provide more information on cost, utility, and maintenance differences between conventional and electric-drive vehicles, and charging infrastructure permitting and installation requirements. Another option would be for the State to actively participate in an electric vehicle car sharing program. Such efforts would also showcase these vehicles for residents, companies, and local governments.

Establish a Sales Tax Exemption Program for the Purchase of PHEVs, BEVs and Re-Charging Infrastructure

The State should consider establishing a time-limited sales tax exemption for the purchase of PHEVs and BEVs. The program would help decrease the vehicle purchase cost, which along with other tax credits (e.g., IRS vehicle credit) would enable more individuals, businesses, and government entities to purchase PHEVs/EVs. The State should also consider establishing a tax credit program for the installation of re-charging infrastructure. Since only a relatively small number

of vehicles are anticipated to be sold in Maryland in the next several years, these options should not result in a large fiscal impact.

Establish HOV, Parking, and Vehicle Registration Incentives for PHEVs and BEVs

The State should consider an HOV exemption for PHEVs/BEVs as a method to incentivize the purchase and use of these vehicles in Maryland. Similar State programs were effective for hybrid-electric vehicles when they were in the early commercialization stage to help increase use. Since there are few areas in Maryland with HOV lanes,[209] providing drivers with preferential and free parking at State operated parking lots and parking meters could also be implemented as an additional incentive. Vehicle registration fees could also be waived for PHEVs and BEVs for a limited time period.

Establish a Zero-Emission Vehicle Partnership with Leading Electric Vehicle Manufacturers

The State should consider forming partnerships with leading electric vehicle manufacturers, such as the Renault-Nissan Alliance (Nissan in the U.S.). The State would work with manufacturers or vehicle/infrastructure companies to develop plans and policies to promote a charging infrastructure for EVs, as well as to deploy, operate, and maintain a charging network for the vehicles. These partnerships support vehicle fleets, as well as experience and support of top tier vehicle manufacturers.

For example, Nissan has been involved in developing batteries for electric and hybrid-electric vehicles for over 20 years, even though most of these vehicles were prototypes or limited production models. Several cities and states have formed partnerships with Renault-Nissan.[210, 211] Another option would be to partner with a company such as Better Place[212] or ECOtality[213] that works with EV manufacturers and develops and installs the charging infrastructure.

Maryland should also consider "lead by example" infrastructure development projects. For example, electrification of the State's truck stops could be implemented with the needs of PHEVs and BEVs in mind.

What Has Been Maryland's Experience with Respect to Electric Vehicles?

The number of full-speed EVs and PHEVs in use in Maryland is estimated to be low. The use of BEVs in Maryland and elsewhere in the country has been primarily limited to low-speed EVs. AltCar.org began operation of the country's first EV car sharing program (similar to ZipCar) in Baltimore using the Electrovava-built Maya 300 low-speed vehicle.[214] The company will also offer the vehicle for sale to individuals, companies, and government entities. The Baltimore City Police Department uses low-speed electric vehicles at the Inner Harbor. Low-speed non-road electric vehicles are common at universities, military bases, and other large, self-contained campuses where

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209 Maryland Department of Transportation website, *High Occupancy Vehicle (HOV) Lanes Frequently Asked Questions*, http://www.sha.maryland.gov/index.aspx?Pageid=249, accessed August 30, 2009.

210 Nissan Leaf Electric Car website, http://www.nissanusa.com/leaf-electric-car/, accessed August 30, 2009.

211 Nissan partners include Tennessee; Oregon; Sonoma County, California; Raleigh, North Carolina; San Diego, California; Phoenix, Arizona; Tucson, Arizona, and Seattle, Washington. Nissan Zero Emission website, http://www.nissan-zeroemission.com/EN/index.html.

212 Better Place, http://www.betterplace.com/.

213 ECOtality, http://www.ecotality.com/ and http://www.theevproject.com/.

214 Altcar.org website, http://www.altcar.org/, accessed August 20, 2009.

the vehicles are not operated on public roads. It is difficult to determine the number of such low-speed vehicles since they are not required to be licensed.

The Maryland Science Center successfully demonstrated advanced lithium-ion battery technology in a low speed electric vehicle, the "AltCar," sponsored by Exxon Mobile in 2009. This interactive demonstration provided valuable performance data and driver feedback from the general public. As a result, the electric vehicle demonstration attracted the attention of several manufacturers interested in State of Maryland as an "EV Showcase."

What Are Other States' Experiences with Electric-Drive Vehicles?

Several California cities, air quality management districts, universities, utilities, and national labs have been testing PHEVs in fleet evaluations since 2004.

The State of New York began a two-phase program in 2006 to purchase a demonstration fleet of converted PHEV vehicles (Toyota Prius and Ford Escape).[215, 216] The State has been evaluating the initial five vehicles. The ultimate goal of the project is to retrofit 600 State-owned HEVs as PHEVs.

California and Hawaii have signed agreements with Better Place to support deployment of EVs by developing the necessary charging infrastructure. Several countries have signed agreements with Better Place as well, including Israel, Denmark, and Australia. The Province of Ontario, Canada has also signed a similar agreement. The Japanese government is providing funding for Tokyo's largest taxi operator to use EV taxis with swappable battery packs to enable continual operation.

Several cities and states, including Tennessee, Oregon, Sonoma County (CA), Raleigh (NC), San Diego (CA), Phoenix (AZ), Tucson (AZ), and Seattle (WA), have formed partnerships with Renault-Nissan to participate in the Nissan EV vehicle and infrastructure program.

In Northern California, the mayors of San Francisco, San Jose, and Oakland have developed policies to develop and expand the EV infrastructure, including expediting permit and installation processes for charging outlets; providing incentives for employers and other organizations who install charging infrastructure at the workplace and other parking facilities; developing standard regulations governing EV infrastructure across the region; and establishing programs to purchase EVs for use by city and state employees. The mayors will work with other cities in the Bay Area as well as regional government organizations and private sector partners.[217]

Georgia offers tax credits for both zero-emission vehicles (battery-electric vehicles or hydrogen fuel cell vehicles) and for EV chargers. The ZEV credit is for up to 20% of the cost of the vehicle, up to $5,000, and the charger credit is for 10% of the charger cost, up to $2,500.[218]

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215 Calcars.org website, *NYS Governor Announces Winners of PHEV Conversions*, December 21, 2006, http://www.calcars.org/calcars-news/620.html.

216 New York State Energy and Research Development Authority website, *Transportation Example – Plug-In Hybrid Electric Vehicles*, http://www.nyserda.org/programs/transportation/hybrid.asp.

217 City and County of San Francisco press release, *Mayors Aim to Make San Francisco Bay Area the Electric Vehicle Capital of the U.S.,* November 20, 2008,, http://www.sfgov.org/site/mayor_index.asp?id=93399.

218 U.S. DOE, *Georgia Electric Laws and Incentives*, http://www.afdc.energy.gov/afdc/progs/ind_state_laws.php/GA/ELEC, accessed October 22, 2009.

How Will Promoting Electric-Drive Vehicles Help Achieve Maryland's Goals?

- **Energy Efficiency:** Electric drive vehicles will increase electricity consumption, but will decrease overall transportation energy demand. Electric drive vehicles also provide energy source flexibility so the State's transportation energy demand is not linked to one fuel source.
- **GHG Reduction:** This option is not expected to result in large measureable reductions in either petroleum or energy use in the next ten years. Rather, it will result in real-world information on the use, maintenance, and charging of PHEVs/BEVs that will be valuable for adopting EVs state-wide. This, in turn, could have a significant impact on GHG emissions in the State. For example, if PHEVs were able to achieve 10% market penetration over the next decade, the total tailpipe GHG emissions from automobiles in Maryland in 2018 would decrease by 2.97 million tons, assuming baseline fuel use growth.
- **Green Jobs:** Maryland could work to persuade electric vehicle manufacturers and component suppliers to locate their facilities in the State to create jobs.

The GHG reduction estimate above assumes that these vehicles are charged with non-polluting renewable power such as solar, wind, hydro, or nuclear. It is critical that fuel use, criteria, carbon, and GHG emissions, and the well-to-tank efficiency of the processes used to produce the electricity are taken into account to ensure that the net effective emissions per vehicle are an improvement over the conventional gasoline vehicle being replaced. Studies have shown that the net per vehicle emissions for electrically-driven vehicles in areas that have a high percentage of electricity produced by coal, such as Maryland, are similar to, or show only a small improvement in GHG emissions. The ideal solution for eliminating the connection between transportation and carbon emissions is to power electrically-driven transportation using clean, renewable power generation.

What Are the Advantages and Disadvantages of Promoting Electric-Drive Vehicles?

Advantages include:

- Maryland would evaluate new technology with great potential benefit for reducing petroleum use, curbing GHG emissions, and increasing energy independence in Maryland as well as the U.S. The geopolitical ramifications of dramatically reducing oil imports from unstable foreign regimes could be significant.
- Valuable lessons learned from these experiences would help legislators, technology developers, electric utilities, electric contractors, and the general public better understand all aspects of vehicle technology, use, operations and maintenance costs, and charging infrastructure installation, operation, and cost.
- Promoting EVs would not have a significant fiscal impact since the adoption of PHEVs/BEVs is expected to be slow.

Disadvantages include:

- Per vehicle cost will be high compared to a conventional gasoline vehicle, FFV, or HEV, even when production volumes reach mass market levels.
- The driving range of EVs is limited compared to a conventional vehicle, which will have to be considered when selecting a vehicle.
- Limited numbers of vehicles will be available.

- Battery costs are very high, on the order of $1,000 per kWh for lithium-ion batteries, which can account for $10,000 to $50,000 per vehicle depending on the battery capacity.
- EVs have limited driving range compared to conventional vehicles (e.g., 100 miles per charge versus 400 miles per tank).
- Battery recharging times are long, between 4 hours and 12 hours depending on the electricity service (i.e., 110VAC versus 208/220VAC).

Recommendation

The purchase and use of electric-drive vehicles and the required re-charging infrastructure should be supported when they become available through the use of State tax incentives, local parking benefits, and use of HOV lanes.

Rationale: Many experts believe that the next evolutionary step toward fully electric vehicles is the plug-in hybrid-electric vehicle (PHEV). For many, the long-term goal is a fully electric vehicle using only energy stored in a battery pack to propel the vehicle, commonly referred to as electric-vehicles (EV) or battery-electric vehicles (BEV). Even with several PHEV and BEV models expected to be available in the coming years, the total number of vehicles available nationwide will be low, on the order of 100,000 per year for several years.

The State should consider establishing a time-limited sales tax exemption or other tax benefit for the purchase of PHEVs, BEVs and re-charging infrastructure. Such an incentive would help decrease the vehicle purchase cost, which along with other tax credits (e.g., federal tax credit) would enable more individuals, businesses, and government entities to purchase PHEVs/EVs. Since only a relatively small number of vehicles are anticipated to be sold in Maryland in the next several years, this option should not result in a large fiscal impact. The State should also consider other incentives, such as an HOV exemption for PHEVs/BEVs and local parking benefits. Vehicle registration fees could also be waived for BEVs and PHEVs for a limited time period. Similar state programs were effective for increasing use of hybrid-electric vehicles when they were in the early commercialization stage.

6.3.4 Lead-by-Example to "Green" the State Fleet

The State fleet includes a total of 9,045 vehicles: 4,046 sedans, 1,923 pickup trucks, 2,833 vans/SUVs, and 243 other vehicles such as dump trucks.[219] The State fleet represents a very small percentage (less than 0.2%) of the total number of vehicles in the state (4.77 million in 2008).[220] Even though this is the case, the State's fleet operation provides an example to residents, business, and local governments on how best to fuel and use vehicles. Beyond showing leadership, the experience and lessons learned from the State's programs can be shared with others to speed decisions for new vehicles and fuels.

[219] Email communication from Larry Williams, Maryland Department of Budget and Management, August 31, 2009.
[220] Maryland Department of Transportation, *2009 Annual Attainment Report on Transportation System Performance*.

What Can Maryland Do to Green the State Fleet?

The State is already active in several areas of green transportation. However, additional steps can be taken to better understand fleet operation, minimize overall fuel use, and maximize the amount of alternative fuel used.

Baseline Fleet Assessment

The first step is to perform a baseline fleet analysis to determine vehicle population, fuel use, emissions profile, use patterns, and geographic vehicle distribution. Following this, a structured implementation plan for fleet improvements should be developed, proposing use pattern modifications, available replacement models, and fueling infrastructure.

The U.S. DOE's regulations require that at least 75% of light-duty vehicles acquired be alternative fuel vehicles (AFV). Fuels considered as alternative fuels by the U.S. DOE include: ethanol, methanol, biodiesel, electricity, natural gas, liquefied petroleum gas (i.e., propane), and hydrogen.[221] Hybrid-electric vehicle (HEV) acquisitions, unfortunately do not currently count toward the 75% requirement, although changes to this requirement are under review by DOE. The 75% requirement ensures a high percentage of the State fleet vehicles are AFVs, but the program does not require that alternative fuel is used in these vehicles. Many of the vehicles are FFVs, but they are refueled by regular gasoline most of the time. The result of the AFV purchase requirement is that other, more efficient gasoline vehicles cannot be purchased that could reduce the State's fuel use. These vehicles, including HEVs, can be purchased as part of the remaining 25% light-duty vehicle acquisitions.

State Fleet Vehicle Selection and Use Analysis

A cost-effective method for reducing fuel use is to replace larger passenger vehicles with smaller passenger vehicles where possible. It is likely that most larger passenger vehicles could be replaced by vehicles that are one or two class sizes smaller than the current vehicle. Choosing hybrid-electric vehicles and efficient clean diesel vehicles could also lessen fuel consumption. In addition, the State should continually strive to increase the fuel economy of its heavy duty fleet and replace petroleum with more alternative fuels.

In parallel, current State fleet vehicle use could be optimized through improved fleet management practices, such as combining trips and maximizing the number of passengers in all vehicles. For example, scheduled van service between key employee destinations like Baltimore and Annapolis could be established.

Maximize Alternative Fuel Use for State Fleet Vehicles

Simply purchasing alternative fuel vehicles and making fueling available does not impact the State's petroleum use and GHG emissions. The State should consider developing an enforceable policy or regulation to ensure that the State's alternative fuel vehicles are operated on alternative fuels whenever possible. State staff should be trained about the vehicles and fuels to understand the importance of using alternative fuels in the vehicles and the importance of showing leadership to Maryland consumers. The State should also track E85 use in each State vehicle to determine which E85-capable vehicles are actually using ethanol.

[221] U.S. DOE, Alternative Fuels Advanced Vehicles Data Center, http://www.afdc.energy.gov/afdc/fuels/index.html.

Begin Pilot Integration of Plug-In Hybrid-Electric and Battery-Electric Vehicles into the State Fleet

In order to better understand the technology and start transitioning to electric drive vehicles, the State should purchase a test and evaluation fleet of PHEVs and BEVs as they become available from vehicle manufacturers. The demonstration program could be used to evaluate the vehicles' petroleum reduction performance, GHG reduction performance, exhaust emission reduction performance, and their ability to meet the needs of the State fleet.

In parallel, the State should install the necessary charging infrastructure for its electric vehicle fleet. The charging infrastructure development will provide the State with valuable lessons on implementation experiences and its effect on Maryland consumers and utilities.

As with AFVs, electric vehicles will show the public that the State is proactive in learning about and implementing available technologies. The State could use these vehicles as an outreach tool through public workshops or ride-and-drive opportunities for the State's residents to learn about and experience these vehicles firsthand. The momentum for electrically-driven vehicles is gaining public support, and this type of outreach would enable a cost-effective grassroots method for disseminating information and gauging public opinion.

What Is Maryland's Experience with Greening the State Fleet?

As of 2009 the State fleet includes 1,563 light-duty alternative fuel vehicles (1,419 FFVs, 144 compressed natural gas vehicles) and 63 light-duty hybrid-electric vehicles. Two hundred FFVs and 30 hybrid-electric vehicles are projected to be added to the fleet in 2010 and in 2011. E85 and biodiesel blends are the most heavily supported alternative fuels in terms of vehicle availability, fuel availability, and public and government support. Maryland has set a goal of using B5 for 50% of the State fleet, diesel vehicle fuel use. In addition, the Maryland Transit Administration operates 10 diesel hybrid-electric buses that reduce fuel use by approximately 23% compared to conventional buses. The entire fleet will be transitioned to hybrid-electric buses over the next decade. The fleet also uses a 5% biodiesel blend (B5) to further reduce petroleum use.[222]

The State, along with private parties, is developing petroleum reduction goals. The goals are being considered not only to stabilize costs, but also to decrease energy dependence on neighboring states and foreign countries. The State's actions should be documented and portrayed as a model for local governments, communities, and individuals to follow.

What Are Other States' Experiences with Greening Their Fleets?

A number of state fleets across the nation have large alternative fuel vehicle programs that are very visible to their communities. New York State began a two-phase program in 2006 to purchase a demonstration fleet of converted PHEV vehicles (Toyota Prius and Ford Escape).[223, 224] The State has been evaluating the initial five vehicles. The ultimate goal of the project is to retrofit 600 State-owned HEVs as PHEVs.

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222 Maryland Transit Administration, *MTA Green Facts* website, http://www.mtagogreen.com/mtagreen.html.

223 Calcars.org website, *NYS Governor Announces Winners of PHEV Conversions*, December 21, 2006, http://www.calcars.org/calcars-news/620.html.

224 New York State Energy and Research Development Authority Website, *Transportation Example – Plug-In Hybrid Electric Vehicles*, http://www.nyserda.org/programs/transportation/hybrid.asp.

New York City is conducting a BEV test program including 10 BMW Group Mini-E BEVs that will be used by inspectors from the Mayor's Office of Operations to drive every city street once per month and report conditions that negatively impact quality of life.[225]

In 2003 California conducted an assessment of the State fleet to determine the baseline fuel use and to evaluate and determine options for reducing the fuel use by 10%.[226] The main recommendation was to use alternative fuels in existing alternative fuel vehicles. In this case the vehicles were dual-fuel natural gas and propane vehicles, but were being operated primarily on gasoline. It was also suggested that either hybrid-electric vehicles or the most fuel efficient vehicles in a given class be required for new fleet purchases. This option is limited because federal regulations regarding State fleet purchases of AFVs exclude hybrid-electric vehicles. Other very effective measures suggested were fleet management practices that more effectively use vehicles by combining trips, making fewer trips, and maximizing the number of passengers in all vehicles. The combined estimated fuel savings for these programs was between 10 and 14%.

In Washington State, effective June 1, 2015, all state and local government agencies will be required to use 100% biofuels or electricity to operate all publicly owned vehicles.[227] To phase in this requirement, all state agencies must achieve 40% biofuel or electricity use by June 1, 2013.

How Will Greening the State Fleet Help Achieve Maryland's Goals?

- **GHG Reduction:** This option will not necessarily have a significant measurable short-term effect on total petroleum consumption or GHG emissions in Maryland. It can, however, provide necessary support for refueling stations to reduce fuel costs and build markets for the fuels, and can provide an example to State residents for using alternative fuels. Valuable lessons on both advanced alternative fuel and electric vehicle technology and refueling/charging infrastructure installation and operation can be learned by being an early adopter of these technologies.

What Are the Advantages and Disadvantages of Leading by Example to Green the State Fleet?

Advantages include:

- Maryland has the opportunity to evaluate new technology with great potential for reducing petroleum use and GHG emissions, and increasing the State's energy independence.
- The State can learn valuable lessons on vehicle technology, as well as charging infrastructure installation and operation.
- Greening the State fleet helps bolster commercial station throughput of biofuels to ensure that stations are viable and profitable.

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225 City of New York press release, *Mayor Bloomberg Announces Progress in City's Efforts to Reduce Emissions through use of Electric Cars and Other Alternative Fuel Vehicles,* August 24, 2009, http://www.nyc.gov/portal/site/nycgov/menuitem.c0935b9a57bb4ef3daf2f1c701c789a0/index.jsp?pageID=mayor_press_releasecatID=1194doc_name=http%3A%2F%2Fwww.nyc.gov%2Fhtml%2Fom%2Fhtml%2F2009b%2Fpr385-09.htmlcc=unused1978rc=1194ndi=1.

226 TIAX, LLC, *California State Vehicle Fleet Fuel Efficiency Report: Volume II*, Report # 600-03-004 (April 2003), http://www.energy.ca.gov/reports/2003-05-12_600-03-004-VOL2.PDF.

227 Washington State House Bill 1481, 2009, and Revised Code of Washington 43.19.647 and 43.19.648, *Washington State Fleet Alternative Fuel Use Requirement*, http://www.leg.wa.gov/legislature/Pages/visitingthelegislature.aspx and http://apps.leg.wa.gov/rcw/.

- A State fleet can support the expansion of E85 fueling infrastructure and raise fuel volumes that in turn reduce fuel cost.

Disadvantages include:

- Limited refueling infrastructure may make it impractical for many State employees to purchase E85 for FFVs.
- If the cost of E85 is not low enough, cost per mile traveled will be higher than for conventional gasoline.
- The per-vehicle-cost of electric vehicles will be high, especially when compared to conventional gasoline vehicles.
- Driving range of EVs is limited compared to a conventional vehicle, which will have to be considered when selecting a vehicle.

Recommendation

The State should consider implementing policies and initiatives to ensure that vehicle selection and use of its own vehicle fleet, both on the light and heavy duty side, is optimized (e.g., vehicle size, engine power rating, etc.) and that alternative fuel use is maximized. The State should also initiate a pilot demonstration and evaluation program to integrate plug-in hybrid-electric vehicles and battery-electric vehicles into the State fleet.

Rationale: The State fleet includes over 9,000 vehicles. This represents a very small percentage of the total number of vehicles in the state, but the State's fleet operation provides an example to consumers, business, and local governments on how best to fuel and use vehicles. Beyond showing leadership, the experience and lessons learned from the State's programs should be shared with the public to help speed decisions for adopting new vehicle technologies and fuels.

6.3.5 Increase Support for Commuter Connections Program

What Is the Commuter Connections Program?

The Metropolitan Washington Council of Governments (MWCOG), the Baltimore Metropolitan Council (BMC), and the Maryland Department of Transportation operate commuting programs under the Commuter Connections program. These programs are designed to educate both employers and employees on various ways to decrease the number of vehicles on the road, and thus decrease fuel use and exhaust emissions. The MWCOG Commuter Connections[228] and BMC programs cover different geographic areas in Maryland, and in some cases overlap. The combined coverage area includes 86% of the State population and an even larger percentage of congestion. Maryland currently provides $2.45 million to the Commuter Connections program (roughly 47% of total program funding); Virginia and the District of Columbia also contribute funds to the program.

Providing transportation alternatives and promoting innovative land-use patterns for Maryland consumers and businesses is critically important. Addressing these issues could significantly decrease fuel demand, time spent in traffic, air quality concerns from vehicle exhaust emissions,

[228] Commuter Connections program, http://www.commuterconnections.com and http://www.commuterconnections.org/.

climate change issues caused by vehicular GHG emissions, and vehicular traffic congestion associated with commuting.

The Commuter Connections program advocates numerous commuting options including: teleworking; mass transit use; rideshare/carpool/vanpool programs; alternative work schedules (e.g., four ten-hour days instead of five eight-hour days); bicycling and walking to work; etc. Eliminating or decreasing the number of vehicle trips, and increasing the number of passengers per vehicle can have a meaningful impact on fuel demand and traffic congestion. In addition, these program options lower fuel and vehicle maintenance costs.

What Can Be Done to Further Promote the Commuter Connections Program?

The Commuter Connections program offers a complete portfolio of commuting information options and outreach tools for individuals and businesses. Program outreach is accomplished through in-person workshops, the Commuter Connections website, call center, information booths at community events, and advertising (online, radio, and television). Because program funding is limited, Maryland should consider providing additional support to the Commuter Connections program to expand its reach, engaging more individuals and companies, and should consider expanding the "Guaranteed Ride Home" program to the Baltimore metropolitan region.

What Has Been Maryland's Experience with the Commuter Connections Program?

MWCOG does extensive tracking of program effectiveness, a model that has been studied and replicated in other major metropolitan areas around the country. As a result of the portfolio nature of the program, the cost-effectiveness of each sub-program cannot be accurately evaluated. Cumulative program benefits can be used as a surrogate for detailed information on the sub-programs. MWCOG claims an overall cost-effectiveness of $0.01/vehicle mile travelled (VMT), $0.25/gasoline gallons equivalent saved (assuming $2.50 per gallon of gasoline), and $15/ton of GHG reduced. Thus, the program has good cost-effectiveness and petroleum savings. However, due to the magnitude of gasoline use in the state (roughly 3 billion gallons per year), the savings on an overall percentage basis are small.

What Are Other States' Experiences with Commuting Programs?

The Association for Commuter Transportation and the Transportation Demand Management Institute (TDMI) operate a Commuter Choice[229] service with funding from the U.S. Environmental Protection Agency, U.S. Department of Transportation, and TDMI. The organization works with employers in most of the country's major cities (New York City, Los Angeles, Washington D.C., Atlanta, Boston) and connects with local organizations to distribute information on commuting options for their employees.

Several other commuter programs, similar to Commuter Connections operate in major U.S. metropolitan areas. Selected programs from across the country and highlights of unique services provided include:

[229] Commuter Choice, http://www.commuterchoice.com/index.php.

- **MetroPool NuRide (greater New York City region including New York and Connecticut)** – MetroPool is an incentive-based ride network that gives riders NuRide Miles Reward Points that can be redeemed for rewards.[230]
- **Metro STAR Ride Matching (greater Houston-Galveston area)** – Metro STAR is a free online database that helps riders find existing car/vanpools or start new ones (both STAR and privately operated).[231]
- **511 My 511 Traffic Page (San Francisco Bay area)** – 511 allows online users to create custom traffic pages tailored to their commute. Among other features, users can receive customized alerts and access their page from the Web or cell phones.[232]
- **RideSmart SchoolPool (greater Atlanta area)** – RideSmart SchoolPool is a pilot program providing carpooling services to parents driving their children to a common school.[233]
- **CommuteSmart (Southern California)** – CommuteSmart provides information and training workshops for employers who are interested in setting up programs in their companies.[234]

How Will Increasing Support for Commuter Connections Program Services Help Achieve Maryland's Goals?

- **GHG Reduction:** Traffic congestion, vehicle miles travelled, fuel use, and GHG emissions will not improve until the number of vehicles on roadways is reduced. Commuting practices are affected by economics, convenience, and personal preference, and cannot be mandated. Recent high fuel prices have shown that there is a tipping point at which personal behavior is impacted. However, increasing fuel prices or fuel taxes to remain above the tipping point are not popular. Therefore, education programs such as those provided by Commuter Connections, increase knowledge and offer adoption of commuting alternatives.

What Are the Advantages and Disadvantages of Providing Additional Support for the Commuter Connections Program?

Advantages include:

- The Commuter Connections program has shown continual improvement as additional programs have been added and as commuters have become more interested in finding alternatives.
- The program is a cost-effective measure for reducing VMT and GHG emissions.
- Funding levels are relatively low compared to the problem. Increased funding will not significantly increase the annual State budget.
- Increased worker productivity leads to improved profit margins.

Disadvantages include:

- Program results have been able to just keep up with population increases.
- Total VMT and GHG reduction results are relatively small.

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230 MetroPool Website, http://www.metropool.com/index.shtml.
231 Metropolitan Transit Authority of Harris County, Houston, Texas, http://www.ridemetro.org/Services/StarVanPool.aspx.
232 511.org website, http://www.511.org.
233 Ride Smart website, https://www.myridesmart.com/html/index.htm.
234 CommuteSmart website, http://www.commutesmart.info.

Recommendation

Maryland should consider increasing its support for the Commuter Connections program. As the State's population, vehicle miles travelled, traffic congestion and fuel use from commuting grow, this type of program is more important than ever. The State should provide additional funding, subject to revenue projections for the coming years.

Rationale: The Metropolitan Washington Council of Governments (MWCOG), the Baltimore Metropolitan Council (BMC), and the Maryland Department of Transportation operate commuting programs under the Commuter Connections program. These programs are designed to educate the public on various ways to decrease the number of vehicles on the road, and thus decrease fuel use and exhaust emissions. Information on transportation alternatives and innovative land-use patterns for Maryland residents and businesses is critically needed. Addressing commuting and land-use development could significantly decrease fuel demand, time spent in traffic, air quality concerns from vehicle exhaust emissions, climate change issues caused by vehicular GHG emissions, and traffic congestion associated with commuting.

7.0 Conclusions and Recommendations

The Maryland Energy Outlook (MEO) has been prepared to create and sustain a better energy landscape for Maryland. This report reflects an extensive stakeholder review process provided by the Maryland Energy Outlook Advisory Committee and others. Based on this input, the Maryland Energy Administration (MEA) recommends that the following policy options be considered for implementation:

Recommendations to Decrease Energy Demand

- Time-of-Sale Disclosure of Energy Performance for Residential and Commercial Buildings

MEA recommends that energy consumption for all residential and commercial buildings over a certain size be disclosed at the time of listing for sale. This mandatory disclosure of prior year energy consumption should be modeled after the time-of-sale disclosure requirement currently in force in Montgomery County.

Rationale: While consumers are more aware than ever about the importance of a building's energy performance, such information is not readily available in the marketplace. Requiring disclosure of energy consumption at the time of listing will encourage residential and commercial property owners to invest in energy efficiency, which will increase the value of their buildings. Such disclosure also helps consumers make more informed purchases since the energy efficiency of a home or business makes a major impact on affordability, comfort, and quality of life. Requiring disclosure of the prior year's annual consumption at the time-of-sale imposes no added costs on consumers, yet provides critical information to them and encourages greater adoption of energy efficiency technologies in the buildings market.

- Tax Credits for Zero Energy and Zero Energy-Ready Buildings

A tax credit program for zero energy and zero energy-ready buildings should be considered, even in these difficult fiscal times. Such a program would encourage immediate investment in zero energy building projects. Fiscal impacts would not be felt until the buildings are complete several years from now.

Rationale: The building sector consumes more than 70% of electricity and 40% of total energy consumed in the U.S. Zero energy buildings are designed to address this consumption. Such buildings have greatly reduced energy needs as a result of efficiency gains, with the balance of energy needs supplied by renewable technologies. A zero energy-ready building is constructed so that on-site renewable energy generation can be easily incorporated into the building once it is cost-effective. Other states have successfully addressed energy consumption in buildings. In particular, Californians consume roughly 40% less electricity per capita than Marylanders, in part due to the state's aggressive commitment to energy efficient buildings.

A highly targeted zero energy building tax credit for zero energy and zero energy-ready buildings would spur more energy efficient construction practices, help transform the building industry in Maryland, and set out a course toward a more sustainable future. The success of Maryland's Commercial Green Building Tax Credit program illustrates the State's ability to initiate and implement a similar effort for residential buildings.

- Combined Heat and Power (CHP) Initiatives

The MEA, in conjunction with other State agencies, should propose regulatory actions that would enhance the viability of combined heat and power (CHP) systems. However, MEA does not believe that proposing significant financial assistance, such as grants or loans, to support such installations is justifiable at this time.

Rationale: CHP applications are integrated systems that generate both electricity and thermal energy. These systems are significantly more efficient than separate systems for electricity and thermal energy generation and promise significant benefits, including energy efficiency and lower GHG emissions.

The State's regulatory agencies should pursue actions to remove barriers to CHP technology implementation. Such actions include increasing the size range of generators that are covered by existing interconnection rules and instituting output-based emissions regulations to encourage clean distributed generation technologies. However, the economic viability of CHP projects is mainly dictated by relative prices for natural gas and electricity. As a result, MEA does not believe that proposing significant financial assistance, such as grants or loans, to support installation of CHP, is justifiable at this time.

- New Appliance Efficiency Standard

MEA recommends establishing a new appliance efficiency standard for televisions sold in Maryland, modeled after the California Tier 2 standard for televisions.

Rationale: Nationally, televisions consumed about 5.3% of all residential electricity use in 2006, a figure that is estimated to grow to nearly 7.2% by 2030.[235] Televisions are thus the most energy consumptive, unregulated product in the home. Some large flat screen televisions draw as much power as a common refrigerator.

MEA recommends adopting the California Tier 2 television standard, effective January 2013. This standard, which 25% of televisions sold today already meet, is the same as the EnergyStar Version 4 requirement, which becomes effective on a voluntary basis in May 2010. Requiring mandatory compliance in 2013 allows manufacturers time to update their remaining product line to meet the new standard and for retailers to sell off their existing stock. Based on testimony from leading television manufacturers, suppliers and the LCD TV trade association, these new standards can be met without additional cost increases.

Estimated results from implementation of an efficiency standard for televisions include reduced electricity use of approximately 102 GWh by 2015 and an approximate savings of $15.3 million for Maryland consumers.

[235] Calculated using 2005 Televisions/Set Top Box energy breakdown and projecting those proportions on 2006 energy usage and the estimate for 2030. US Energy Information Agency; *An Updated Annual Energy Outlook 2009 Reference Case Reflecting Provisions of the American Recovery and Reinvestment Act and Recent Changes in the Economic Outlook,* http://www.eia.doe.gov/oiaf/servicerpt/stimulus/aeostim.html and Miscellaneous electricity services in the Building Sector, http://www.eia.doe.gov/oiaf/aeo/otheranalysis/mesbs.html.

Recommendations to Advance Renewables to Meet Maryland's Renewable Portfolio Standard (RPS)

- Modify the RPS Solar Requirement

MEA recommends modifying Maryland's 2% RPS solar carve-out by: 1) accelerating the phase-in; and 2) leveling the Alternative Compliance Payment (ACP) for solar Renewable Energy Credits (S-RECs) to encourage electricity suppliers to pursue development of solar installations rather than choosing to pay the declining ACP.

Rationale: Maryland's solar RPS requirement starts with 0.005% in 2008 and increases each year, reaching 2% in 2022. Compared with other states that have similar aggressive solar targets, Maryland's phase-in schedule is "back-loaded." There are several large-scale solar projects under development in Maryland, well in excess of the current solar RPS requirement schedule. The slow ramp-up of the solar requirement may inadvertently serve as a ceiling, inhibiting faster growth in the commercial solar market. Accelerating the phase-in of the solar requirement would make it more evenly distributed over the RPS lifetime.

The compliance fee for the solar RPS was $450/MWh in 2008, adjusted to $400 in 2009, and will decrease $50 every 2 years until it levels out at $50/MWh by 2022. In most other states, compliance payments have been set at a higher price point over a longer-term, which encourages the development of actual solar system installations. If the compliance fee is too low, electricity suppliers will more likely choose to pay the ACP rather than pursue solar system installations. In addition, the declining value of the ACP effectively reduces the long term value of S-RECs.

In-state development of solar capacity adds much needed electricity capacity onto Maryland's grid, helps diversify the State's energy portfolio, and serves as a hedge against future fossil fuel price increases. Growth in solar installations is likely to lead to increased market opportunities for existing and new Maryland-based solar energy companies, benefiting the State's economy.

- Evaluate the Waste-to-Energy RPS Requirement

MEA, in conjunction with the Maryland Department of the Environment (MDE) and other appropriate State agencies, should evaluate and report to the Governor and the General Assembly on: 1) the potential for waste-to-energy projects in Maryland to contribute to satisfying Maryland's RPS; 2) the environmental impact of waste-to-energy facilities; and 3) the effectiveness of RECs in incentivizing waste-to-energy and large hydroelectric resources.

Rationale: Maryland's RPS requirement includes a 2.5% requirement for Tier 2 renewable resources. These Tier 2 resources include waste-to-energy (WTE) and certain hydroelectric facilities. The Tier 2 requirement is set to drop to 0% in 2019 and beyond. WTE facilities provide in-state renewable electricity generation that satisfies the RPS requirements and contributes to GHG mitigation, while generating significant ancillary benefits related to sustainable waste management. In light of these attributes, studying the efficacy of extending and/or enhancing the WTE RPS requirement is recommended.

- RPS Carve-Out for Ocean Energy

MEA does not recommend the adoption of an ocean energy RPS carve-out at this time. However, the State should continue its efforts to remove barriers to the commercial development of Maryland's vast offshore wind energy resources by considering wind measurement studies, pilot turbine demonstrations, compatible use studies, economic analyses, and environmental issue/benefit assessments.

Rationale: Offshore wind is typically a stronger and more consistent resource than on-shore wind, and Maryland's coastal waters and adjacent Outer Continental Shelf enjoy wind resources characterized as "outstanding" by the U.S. Department of Energy. Like the solar carve-out, an ocean energy carve-out would establish a set percentage of electricity sales in Maryland that must be satisfied through electricity generation from ocean energy resources.

Despite great offshore wind resource potential in Maryland, MEA does not recommend the establishment of an ocean energy carve-out at this time. This is primarily because of current uncertainty regarding cost, resource effectiveness, and potential sites. However, as the State further explores offshore energy potential and costs, this policy option may be considered in the future. At this stage, the State should continue to cooperate with our neighboring states to further ocean energy analysis and ways in which regional efforts can reduce the cost of implementation.

- Maryland's Renewable Energy Production Tax Credit Program

The Maryland Renewable Energy Production Tax Credit program should be extended until 2022, to coincide with the State's RPS schedule, and a minimum project size for the credits should be established. The State should also consider other modifications to the program, such as increasing the payment level or extending the payment period beyond 5 years, which could make it a more effective policy tool to incentivize in-state renewable energy production.

Rationale: Maryland's Clean Energy Production Tax Credit program offers Marylanders an income tax credit of 0.85 cents per kWh for electricity generated by qualified resources. These credits may be claimed over a period of five years. Under current law, credits will only be available for facilities that commence operation before January 1, 2011. To date, the tax credit program has been underutilized. Only $5.1 million of the authorized $25 million in tax credits have been allocated.

To make the tax credit a more effective tool for incentivizing renewable energy production in Maryland, several program modifications could be considered, including: extending the tax credit program; adjusting the per kWh incentive level; extending the payment period; making the credits transferable or refundable; providing an option to receive an upfront payment instead of credits spread out over several years; and establishing a minimum size for eligible projects.

At this time, MEA recommends that the tax credit program be extended to 2022 to coincide with the State's RPS requirement, and that a minimum project size be set. Further analysis is needed to determine if other modifications to the program could make it more effective in encouraging in-state renewable energy production. Well-structured and targeted production tax credit programs in other states appear to have been successful.

Recommendations to Advance Clean Energy Economic Development and Green Jobs

- Clean Energy Economic Development Strategy

Maryland should develop a comprehensive strategy for clean energy economic development, which relies on both government support and private sector investment, to guide the State's clean energy business growth.

Rationale: The clean energy sector is expected to grow rapidly in the 21st century. Maryland has positioned itself as one of the most progressive clean energy states in the nation by establishing three aggressive clean energy targets: the EmPOWER Maryland energy reduction goals, the State's Renewable Portfolio Standard policy, and a GHG emissions reduction goal.

To foster clean energy economic development, Maryland has already taken significant steps, including creation of the Maryland Clean Energy Center (MCEC), launch of the ARRA funded Clean Energy Economic Development Initiative (CEEDI), and development of an aggressive agenda through the Governor's Workforce Investment Board (GWIB) to build a trained workforce for a future robust clean energy industry.

To compete with other, larger states in attracting clean energy investment capital and creating green collar jobs, Maryland should develop a comprehensive, strategic plan that includes financial incentives, institutional and policy initiatives, and support for technology research, development, and deployment that matches our indigenous resources. Not only should state government support this strategy, but private sector organizations and institutions should be encouraged to invest in it. Venture capital funding should be identified and targeted toward clean energy economic development opportunities in Maryland.

Recommendations to Increase Transportation Energy Independence

- Increase the Availability and Use of High-Level Ethanol Blends

The State should focus on State government "lead-by-example" initiatives to promote the use of ethanol and continue supporting key private industry ethanol infrastructure development in anticipation of more widespread use of higher ethanol blends in the future and potential in-state production of cellulosic ethanol.

Rationale: Most gasoline sold in Maryland is already blended with 10% ethanol (E10), so it has hit the "blend wall," the maximum allowable amount blended in gasoline. Until the federal government makes a final determination whether to approve the use of intermediate level ethanol blends (e.g., 15% 20%, or other ethanol blends), the only viable method for Maryland to significantly increase ethanol consumption is higher use of E85 (85% ethanol blend) in flexible fuel vehicles (FFVs). To increase E85 consumption, three strategies should be considered together. These strategies are: 1) further develop E85 refueling infrastructure to make the fuel the more commonly and conveniently available to private individuals and fleets; 2) provide fuel price assistance for E85 to keep the fuel cost competitive with conventional gasoline on an energy basis; and 3) support a consumer education campaign about E85, its availability, and benefits. Each element of this strategy would require State financial support.

The *Energy Independence and Security Act of 2007* (EISA) mandates a rapid increase in ethanol use over the next decade that cannot be met solely with E10 fuel. Technically, the compliance burden of EISA is placed on petroleum refiners and fuel blenders. It would be appropriate for Maryland to use E85 in its own fleet of vehicles, which includes a significant number of flexible fueled vehicles (FFVs). In addition, the State should continue supporting key private industry ethanol infrastructure development in anticipation of more widespread use of higher ethanol blends in the future and potential in-state production of cellulosic ethanol.

- Increase the Availability and Use of Biodiesel Blends

Maryland should require the use of low-level biodiesel and other alternative distillate blends. If the blending level mandate were to increase gradually, be based on volume, and be in line with the federal Renewable Fuel Standard requirements, this would help boost local Maryland biodiesel production and could be achieved with existing infrastructure.

Rationale: Current biodiesel consumption levels in Maryland fall well short of the required consumption levels found under the federal Renewable Fuel Standard (RFS). While the federal RFS does not set any state-level requirements for biodiesel use, it does not appear unreasonable or unrealistic for Maryland to match the relatively modest biodiesel consumption requirements of the RFS. Since Maryland has existing biodiesel production facilities and potential to increase production, higher biodiesel consumption would likely result in increased economic activity and employment.

To increase biodiesel consumption, the State can work to increase use of high-level biodiesel blends or mandate the use of low-level blends. Increasing the use of high-level blends will be a more expensive and slower expansion since high-level blends are seen as alternative fuels which will have limited appeal to users. Mandating blends up to 5% would be relatively straightforward, since the diesel fuel specification allows for up to 5% biodiesel. The mandate could be introduced in steps, slowly increasing the biodiesel blending percentage up to the 3.96% required by the RFS requirements in 2018. To achieve this, the existing diesel storage and dispensing infrastructure would be used, eliminating significant additional infrastructure related costs. Low-level biodiesel mandates have already been adopted by several states, which provide valuable lessons as to how such a program can be structured.

- Promote Electric-Drive Vehicles

The purchase and use of electric-drive vehicles and re-charging infrastructure, when they become available in the marketplace, should be supported through the use of State tax benefits and other policies, such as offering local parking benefits and use of HOV lanes. The State should also promote the development of electric transportation by providing financial incentives such as tax credits for the installation of re-charging and idle reduction infrastructure.

Rationale: Many experts believe that the next evolutionary step toward fully electric vehicles is the plug-in hybrid-electric vehicle (PHEV). For many, the long-term goal is a fully electric vehicle using only energy stored in a battery pack to propel the vehicle, commonly referred to as electric-vehicles (EV) or battery-electric vehicles (BEV). Even with several PHEV and BEV models expected to be available in the coming years, the total number of vehicles available nationwide will be low, on the order of 100,000 per year for several years.

The State should consider establishing a time-limited sales tax exemption, or other tax benefits, for the purchase of PHEVs and BEVs. The program would help decrease the vehicle purchase cost, which along with other tax credits (e.g., IRS vehicle credit) would enable more individuals, businesses, and government entities to purchase PHEVs/EVs. Since only a relatively small number of vehicles are anticipated to be sold in Maryland in the next several years, this option should not result in a large fiscal impact. The State should also consider other incentives, such as an HOV exemption for BEVs/PHEVs and local parking benefits. Similar State programs were effective for hybrid-electric vehicles when they were in the early commercialization stage to help increase use. Vehicle registration fees could also be waived for BEVs and PHEVs for a limited time period.

- Lead-by-Example to "Green" the State Fleet

The State should consider implementing policies and initiatives to "green" its own fleet. Both in terms of light and heavy duty vehicle selection and use, State vehicles should be as energy efficient as possible, sized properly for the job, and with the most efficient engine power ratings as possible. Those vehicles that can use alternative fuels, should do so. Maryland should initiate a pilot demonstration program to integrate and evaluate the use of plug-in hybrid-electric vehicles and battery-electric vehicles into the State fleet.

Rationale: The State fleet includes over 9,000 vehicles. While this represents a very small percentage of the total number of vehicles in use in Maryland, the State fleet offers an opportunity to show leadership on fueling and using vehicles in an energy efficient manner. Beyond leadership, the experience and "lessons learned" from State "leading by example" efforts could support consumer, business, and local government decision-making on new vehicle technologies and fuels.

- Increase Support for Commuter Connections Program

The State should consider increasing its support of the Commuter Connections program. As Maryland's population grows and as vehicle miles traveled between home and work increase, traffic congestion will increase, resulting in higher fuel use and emissions from commuting vehicles. The Commuter Connections programs, and others like it, are more important than ever in improving Maryland's traffic situation. Supporting these programs will require increased State funding, subject to the State's revenue projections for the coming years.

Rationale: The Metropolitan Washington Council of Governments (MWCOG), the Baltimore Metropolitan Council (BMC), and the Maryland Department of Transportation (MDOT) have operated commuting programs for a number of years, under the auspices of the Commuter Connections program. This program is designed to educate the public about alternative transportation options, methods for decreasing the number of vehicles on the road, limiting fuel use, and reducing exhaust emissions. The program also encourages residents and business owners to understand the relationship between innovative land-use planning and transportation requirements. Addressing these issues could significantly decrease fuel demand, time spent in traffic, vehicle exhaust emissions, and traffic congestion associated with commuting. As climate change issues become more critical, programs offered by Commuter Connections and similar organizations will become even more important.

The Commuter Connections program advocates for, and distributes information about numerous commuting options, including: teleworking; mass transit; commuter buses; ridesharing, carpools, and

vanpools; alternative work schedules; bicycling and walking to work; and any other activities that decrease or eliminate vehicle trips, or increase the number of passengers per vehicle. All of these options result in reducing fuel demand and traffic congestion. Program outreach is accomplished through in-person workshops, the Commuter Connections website and call center, information booths at community events, and advertising. Because program efforts are limited due to funding constraints, Maryland should consider providing additional funding to the Commuter Connections program to expand its reach to more individuals and companies.

Appendix A. Maryland Energy Outlook Advisory Committee

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Bob Smith	Maryland General Assembly, Economic Matters Committee
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