PLAN TO INCREASE MARLAND'S RENEWABLE ENERGY PORTFOLIO BY 20% RPS BY 2022

Lead Agency: Maryland Energy Administration

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In 2004, Maryland was one of the first states to adopt a Renewable Portfolio Standard (RPS). An RPS is a requirement that Maryland's power providers buy or generate some of the electricity they supply or sell from renewable energy resources, guaranteeing a market for renewable energy. Maryland's RPS requires electricity suppliers to provide 20% of their total electricity from renewable resources, such as solar, wind, biomass (including poultry litter), landfill gas, and small hydroelectric power) by 2022. The Maryland RPS also requires 2.5% to come from additional renewables such as municipal solid waste until 2019, after which this additional renewable energy source will be no longer be included. Instead of generating renewable electricity themselves, the statute provides that suppliers may purchase Renewable Energy Certificates (RECs) from renewable projects located in the 14 state PJM regional grid.[1] To ensure that the RPS does not impose a significant cost on ratepayers, in the event that few RECs are available, electricity suppliers may choose an "alternative compliance payment" that acts as a ceiling on REC prices.

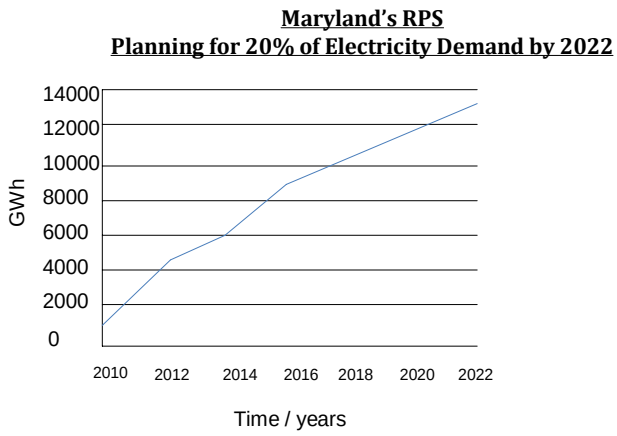
Electricity produced from a renewable energy source such as wind, solar, biomass, or geothermal is often referred to as "green power." Green power can be generated on-site at a customer's facility (also known as distributed generation) or can be produced remotely and then delivered over the transmission grid. Green power is typically more expensive than power produced from traditional sources, which is why government support is often needed to reach the goal of "grid parity." Green power products include: renewable electricity that is delivered to the consumer via the grid (i.e., through retail electric choice in competitive markets or through utility green pricing programs in regulated markets); and RECs that represent the positive attributes (environmental, solar, or other) of power generated by renewable resources. RECs are sold separately from electricity, and thus can be purchased in any market and in any location, even if a local utility or power marketer does not offer a green power product.

Renewable energy technologies, such as solar, wind and geothermal, are clean sources of new electricity generation that help reduce air pollution and greenhouse gas emissions. Promoting renewable electricity also augments Maryland's limited electricity supply, expands fuel diversity, and minimizes price volatility. In addition, renewable electricity typically is distributed throughout the electric grid, which helps reduce dependence on central generating stations, improves grid reliability, avoids the need for transmission, and enhances homeland security.

Goal: Increase Renewable Energy Portfolio by 20% RPS by 2022

As amended in 2008, the Maryland Renewable Energy Standard requires electricity suppliers to obtain 20% of total electricity generated from clean, renewable resources by 2022. Currently, the renewable energy could be generated anywhere in or adjacent to our 14 state regional PJM grid. Renewable energy produced in adjacent states will no longer qualify after December 31, 2010. The percentage of the state's electricity usage required to be generated from renewable sources increases over time as shown below.

[1] The PJM grid is a regional transmission organization (RTO) that coordinates the movement of wholesale electricity in all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and the District of Columbia. Acting as a neutral, independent party, PJM operates a competitive wholesale electricity market and manages the high-voltage electricity grid to ensure reliability for more than 51 million people.



Strategies to Accomplish the RPS Goal

Maryland has the choice of meeting its RPS obligation by either a) procuring RECs from other states or b) producing clean energy within its borders.

A: Procuring RECs from other states. This strategy supposes that other states have embarked on a long term strategy to generate sufficient energy that the associated credits would be available for sale to Maryland. The potential difficulties associated with this approach are that there is not a clear cost for the RECs and Maryland would miss the associated economic development benefits as well as environmental benefits. At this point, MEA is proposing this as a secondary rather than primary strategy.

B: Producing the Clean Energy within the State. MEA has focused on four technology sectors to accomplish Maryland's RPS goal: (1) Solar, (2) Biomass, (3) Onshore Wind, and (4) Offshore Wind. MEA has designed strategies for each sector to spur market transformation that will increase the installation of renewable energy within the State.

1) MEA's Solar Strategy - Plan for Achieving Renewable Portfolio Standard Goals

Maryland's RPS, as amended in 2007, requires that a percentage of the renewable portfolio standard must originate from in-state solar generated electricity. This percentage gradually ramps up to 2% by 2022. To show the benefits of just one of the renewable energy options available to our State, the chart below highlights the contribution to the RPS from just the solar energy sector.

Distributed solar or on-site generation produces electricity from many small energy sources. A wide deployment of distributed solar throughout the state will reduce peak energy demand from centralized power plants and lower transmission congestion. Solar may provide the added benefit of reducing peak energy prices, which will benefit all of Maryland's citizens.

Solar is usually installed close to the demand source. By having supply and demand at the same location this eliminates and reduces the need for additional generation, transmission, and distribution infrastructure. Additionally, solar energy production is highest on hot sunny days coinciding with the highest level of cooling demands from air conditioners.

Solar is a source of clean energy, producing zero greenhouse gas emissions. Solar equipment contains no moving parts and even after 20 years of service can produce power at 80% of rated capacity or higher. As a result, operating and

maintenance costs remain very low throughout the life of a system. Solar energy provides a hedge against rising energy costs from fuel based power plants and stability to customers.

1.1 Creating Market Incentives for Solar (S-RECs)

The first part of Maryland's solar strategy has been to create a self-sustaining, market based mechanism to incentivize solar generation. As noted above, Maryland's RPS includes a specific percentage of solar energy that is required to be produced in Maryland. The solar energy produced counts towards the completion of yearly generation of Solar Renewable Energy Credits (S-RECs). These S-RECs are counted toward the RPS goal. They also have a currency value which provides a strong incentive for those interested in developing solar projects. S-RECs can provide a valuable income stream to owners of solar energy facilities, small and large, and can contribute to off-setting investment costs. Considerable importance has been given to launching the S-REC market, starting with the residential market. It is anticipated that future, larger scale installations that will be financed from the sale and future value of the S-RECs.

1.2 Residential Incentives

To complement the emerging S-REC market, MEA has created specific programs geared at incentivizing solar for different market segments. For example, residential and small commercial customers are eligible for a state solar grant for systems 20 kilowatt (kW) or smaller. Due to soaring demand, MEA has reduced the size of the grant per kilowatt twice during this calendar year to stretch the funds, expand the number of Maryland families that receive awards, and increase the amount of kilowatts generated per dollar spent. In July 2008, Maryland's residential solar incentives provided home owners with $2,500 per kW installed with the ceiling of $10,000 per household. The program was so popular that the funding became rapidly exhausted and a waitlist was created. At the present time, the grant program has been restructured to provide $1,250/kw for the first two kW, $750/kW for the 3rd through to the 8th and $250 /kW for the 9th through to the 20th. The federal government recently expanded federal tax credits, bringing solar energy into reach of more Marylanders. Encouraging homeowners, such as the Pasadena, Maryland family pictured above, and businesses to generate their own power enables individual Marylanders to take control of their energy future, minimize their dependence on the utility grid, enhance their property values, and increase public awareness in every community where a solar panel is installed.

MEA offers grants for residential and small business solar water heating and geothermal systems. Grants awarded for solar water heating systems are for 30% of system cost with a maximum grant amount of $2000. Grants awarded by MEA for geothermal systems are $500 per ton of cooling capacity, with maximum grant amounts of $3,000 for residential systems, and $10,000 for commercial systems.

1.3 Mid Size Renewable Projects

MEA is starting a similar incentive program for businesses and other institutions interested in installing mid-size solar arrays up to 100 kW. The grants helps defray the up-front installation costsand are structured in the following way:

- $500/ kW for the first 20 kilowatts
- $250/ kW for kilowatts 21 – 50
- $150/ kW for kilowatts 51 – 100

Systems must be between 20 and 100 kilowatts to be eligible and the maximum grant amount is $25,000.

MEA is also offering grants for mid-size solar hot water arrays. The basis of such grants is:

- 15% of the installed cost up to $25,000 maximum grant.
- Systems must be larger than 100 sq ft to be eligible

For commercial scale solar development, MEA is teaming up with the University of Maryland and the Department of General Services on an initiative called 'Generating Clean Horizons' to make a larger impact on the amount of clean energy installed. The University System of Maryland's Board of Regents and the Department of General Services

approved the award of four renewable energy projects, totaling 130MW of capacity, which will produce over 20 percent of the institutions and state agencies annual electric needs. The contracts will also further the State's commitment to reducing its carbon footprint 25 percent by 2020. The awards have been granted to three utility-scale wind projects, including one offshore wind project, and one utility-scale solar project. The state has selected Constellation Energy Group to install a 16MW photovoltaic system, which is expected to provide over 21,000 MWh of electricity per year. The system is expected to be completed by December of 2012.

1.4 Leading by Example

MEA is partnering with other governmental agencies to 'lead by example' in an effort to add solar and other renewable technologies on as many public buildings as possible. Further, MEA is working with public schools and local governments, as well as with the Department of Housing and Community Development to add solar panels to public housing where appropriate. These larger projects can take advantage of economies of scale in purchasing and project development costs to provide competitive electricity rates to these buildings, lowering taxpayer supported costs. As these projects are completed and favorable economics are demonstrated, they will pave the way for commercial entities to follow, leading to widespread adoption of solar on commercial rooftops.

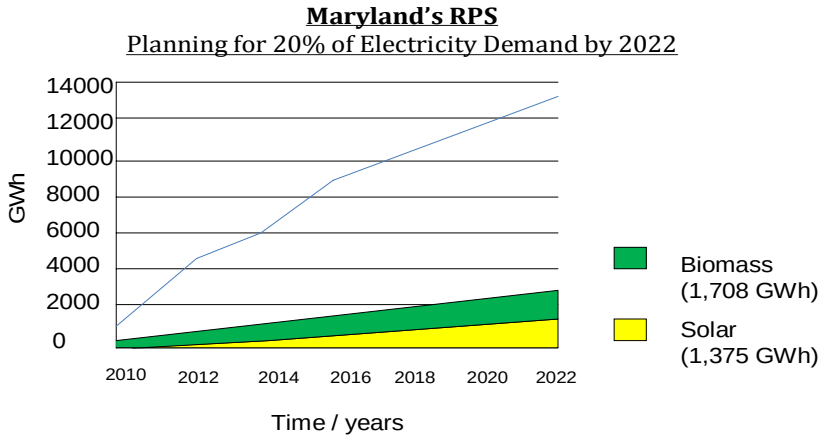
MEA actively engages with the local solar industry; including manufacturing, project development, and installation companies on policy issues and workforce training. MEA created the Clean Energy Economic Development Initiatives in partnership with Maryland Clean Energy Center and the Department of Business and Economic Development. MEA is working to attract emerging clean energy companies, such as thin-film solar manufacturers and other component manufacturers, which could cluster and grow Maryland's solar expertise through economic development loans and grants. The development of a robust solar energy market of manufacturers and installations would allow Maryland to capitalize on the maximum benefits of a diverse solar energy portfolio.

2) MEA Biomass Strategy for Achieving Renewable Portfolio Standard Goals

MEA continues to work with a wide variety of groups to promote biomass production. The state currently has 133 megawatts (MW) of municipal solid waste incineration on-line, as well as one woody biomass to electricity facility and several smaller biomass to heat projects. Additionally, there are about 20 MW of landfill gas online in Maryland and that number is expected to grow over the next few years.

Maryland has a variety of second generation biomass feed stocks including: wood biomass from forestry waste, other organic materials such as agricultural crops and residues, special grasses, poultry manure as well as household and industrial refuse for waste-to-energy processes. The different feedstock can be used with a variety of technologies and can be converted into a number of different energy types including: heat, steam, biofuels, and electricity. Some technologies provide both in the form of combined heat and power (CHP). Maryland is also beginning to witness the development of third generation biomass feed-stocks in the form of algae. There is also considerable interest in developing an energy project in Maryland that uses poultry litter as a feed stock.

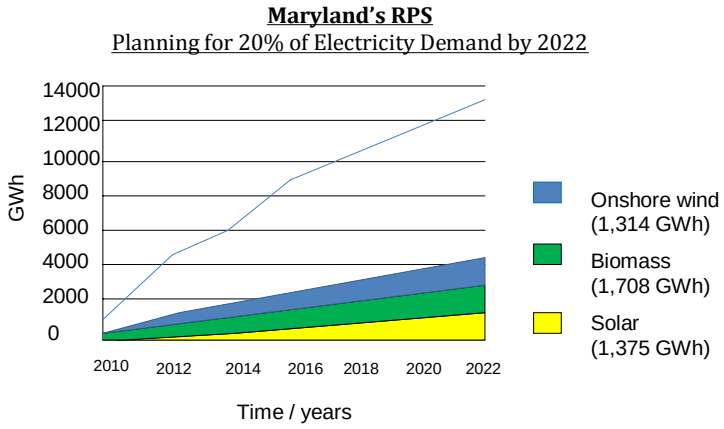
Maryland has the potential by some estimates to produce in excess of a million dry tons of biomass per year (excluding municipal solid waste). This supply, combined with the state's demand for renewable energy, reinforces MEAs belief that biomass can make a significant contribution to meeting the state's RPS goals, as indicated in the below forecast. However, because of the high investment cost for each biomass facility and the high dependency on the price consistency and availability of the feedstock, it is unlikely that MD will witness the construction of more than one plant every two to three years



To enhance Maryland's appeal for the biomass sector, MEA, Maryland Environmental Services and Salisbury State University currently are conducting a project called the "Cellulosic Ethanol Feedstock and value added by-product" study to assess in more detail the locations for different biomass sources, which will then provide information about costs in handling and moving the feed-stocks to different potential sites throughout the state. The nature of the biomass sector requires labor intensive handling of the bio feed-stocks, which translates into a significant opportunity for green job creation.

3) On-Shore Wind Energy Strategy for Achieving Renewable Portfolio Standard Goals

Onshore wind can make a significant contribution to achieving Maryland's RPS goals. Projections of the availability of onshore wind resource in the western counties of the state, as well as the Eastern Shore, combined with the cumulative capacity of small and residential wind energy systems, indicate that by the target year 2022, onshore wind could supply between 600 and 1000 megawatts (MW), as illustrated below:



MEA's efforts to expand onshore wind energy production have focused on three sectors: i) small and residential scale, ii) community scale, and iii) utility scale located in the mountains within the state's western counties.

3.1 Residential

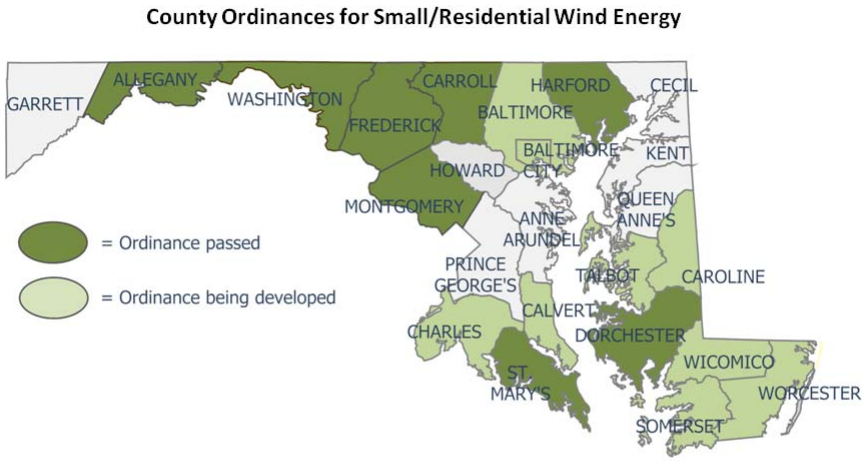
MEA administers the *Windswept* grant program, which supports the deployment of small and residential wind energy systems. This program typically supports between 10% and 30% of the total cost of installation, leveraging private and federal funds to expand small and residential wind energy. In FY09, the *Windswept* program resulted in 46.8kW of deployed capacity. In FY10, MEA will work to increase deployment to 250kW of additional capacity.

3.2 Other Onshore Wind Projects

MEA works with local officials, county governments and community-scale wind energy entrepreneurs to facilitate development of community-scale wind projects. Community-scale projects can be effective in supplying energy to municipal or community facilities, such as wastewater treatment plants and military installations or can be designed to supply energy to individual cities or communities. They often employ utility-scale turbines but in smaller numbers, and typically are designed to provide a community benefit. Currently, approximately 30 MW (name-plate) of community-scale projects are in early stages of development.

At the utility scale, MEA is supporting developers as they go through the Certificate for Public Convenience or Necessity (CPCN) or CPCN exemption process. MEA staff participates in public hearings by advocating for greater renewable energy deployment in the state. Currently, 179 MW of capacity is at some stage of the CPCN or CPCN exemption processes.

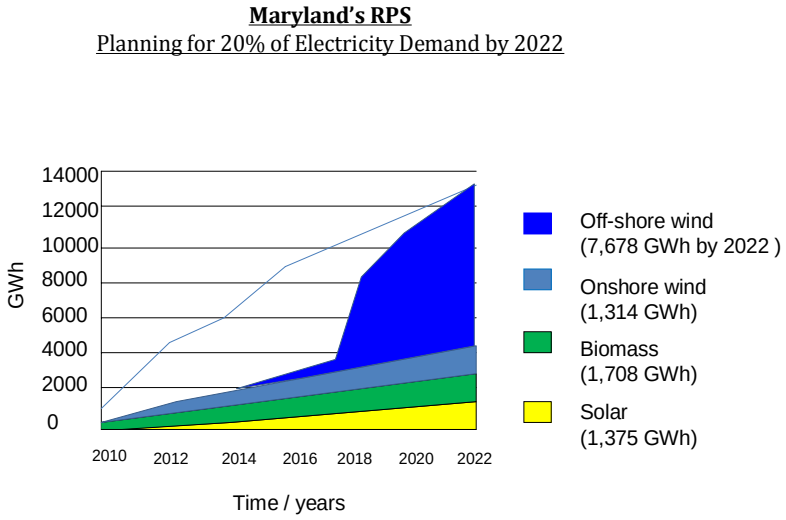
One of the main barriers to deployment of small and residential wind energy systems has been the lack of ordinances and permitting standards for such systems. However, in 2009, counties have made significant progress on passing such ordinances. MEA staff have worked closely with Planning and Zoning officials and participated in a number of county and municipal hearings on small and residential wind energy systems, advocating for their enactment. Currently, 9 counties have enacted such ordinances, and 7 more are in some phase of development.



Most Maryland counties have developed or are in the process of developing ordinances permitting small and residential wind energy systems.

4) Off-Shore Wind Energy Strategy for Achieving Renewable Portfolio Standard Goals

Despite considerable new generation of solar, biomass and on-shore wind energy, the only present day clean energy technology that can produce the quantities of renewable energy to meet the state's RPS goal is from the off-shore wind resources that are so prominent off the Atlantic coast. Deployment is not immediate but the potential is enormous and should be considered at this time as Maryland's most significant contribution to meeting the State's RPS, as illustrated below



Offshore wind is a critical component of MEA's strategy to achieve the RPS goals of 20 percent renewable content by 2022. Maryland has demonstrated its commitment to offshore wind energy by awarding the Delaware Bluewater Wind project with a power purchase agreement for 55 MW of power under the *Generating Clean Horizons* program described above. Although this represents only a portion of the output of this project, such power procurements greatly are critical to moving the Delaware project forward.

Developing wind energy generation off of Maryland's coast continues to be a major priority for the State. Meteorological models and projections from the U.S. Department of Energy indicate that Maryland is well situated to take advantage of these tremendous resources. With enough investment and effort, Maryland could satisfy the entire projected REC shortfall in 2022 from in-state renewable electricity generation from offshore wind energy. MEA is committed to developing this resource in a broad stakeholder-driven process and is seeking to engage with the business community, science and technical experts, and local communities to find common strategies for deployment. MEA issued a Request for Expressions of Interest and Information to seek concepts and input from offshore wind energy developers, including new technologies and deployment techniques that could be brought to bear in Maryland's coastal waters and Outer Continental Shelf, and MEA will continue to work with respondents to determine the next steps for this effort.

MEA completed a Memorandum of Understanding with the Department of Natural Resources (DNR) related to marine spatial planning. DNR has contracted with The Nature Conservancy to learn about the physical, geotechnical, and bathymetric characteristics of Maryland's coastal waters, including benthic habitat, fisheries data and conflicting uses. This will result in a report as well as data layers that will be incorporated in the Maryland Chesapeake and Coastal Program (MCCP) Coastal Atlas program on iMap. This will create a decision support tool that will facilitate project or policy evaluations that may impact marine habitat and resources. MEA is simultaneously working to develop a strategy

for incorporating additional data layers such as wind speed, PJM interconnection options, and radar and FAA restrictions into the Coastal Atlas program.

Ultimately, Maryland will likely need to develop an incentive mechanism such that developers will find deployment off Maryland's coastal waters to be a financially sustainable option. Currently, no purchasing mechanism or offshore requirement is in place to create market certainty and developers are unlikely to participate as merchant generators.

Finally, MEA is seeking to engage different supply chain enterprises as well as wind turbine manufacturers and to introduce them to DBED and the MCEC as part of a strategy that could ultimately help rebuild Maryland's port infrastructure and in turn transform the surrounding industrial assets into a large commissioning and deployment technology hub.

MEA is building an alliance with both Delaware and Virginia to capitalize on the mid-Atlantic region's offshore wind resources. By working collaboratively, leveraging resources, and learning from each other's best practices, we intend to brand the mid-Atlantic as a major destination in the offshore wind industry.

There is demand for excess of 7000 gigawatt hours (GWh) of off-shore wind. If this is met for off-shore wind generation, it equates to approximately 1000 standard size (2.5 MW) turbines or 500 of the newly deployed large deep water 5MW turbines. Such quantities in demand would necessitate 'local' manufacturing rather than importing them from the current facilities in Europe. The large volume of demand in this sector is key to attracting foreign investors which would provide a critical economic development boost to the State's goal for increased green jobs.

Measures

It is important for Maryland to monitor and support all sectors that help meet the State's renewable portfolio standard. This will translate into increased capacity each year leading to the 2022 goals of:

- 1375 GWh of solar
- 1708 GWh of biomass
- 1314 GWh of on-shore wind
- 7678 GWh of off-shore wind or a combination of off-shore wind and additional capacity from the other sector types.

These are admittedly ambitious targets, which is why the RPS explicitly allows Maryland electricity generators to purchase non-solar RECs generated elsewhere on the PJM grid. Nevertheless, every kilowatt generated in Maryland helps create local, green collar jobs, expands availability of electricity in our part of the grid to reduce prices and provide greater energy security, and reduces asthma, heart attacks and other effects of local air pollution. As such, MEA is committed to generating as much renewable power in Maryland as possible.

Cross Cutting Efforts

Cross Cutting strategies are initiatives that influence some or all of the other above mentioned strategies.

Clean Horizons:

MEA has assisted in launching an initiative that is cross cutting and applicable to all renewable energy technology types. The first is called Generating Clean Horizons. Under this initiative, MEA worked with the University System of Maryland and the Department of General Services to issue an RFP for clean energy producers of all technology types to provide clean energy under a set term power purchase agreement(s). The advantage to the developer is for a contract with a guaranteed cash flow which can be used to help raise the necessary financing. Maryland approved the award of four renewable energy projects which will produce over 20 percent of the UMS institutions' and state agencies' annual electric needs.

Tax Credit Program:

MEA also administers the Clean Energy Tax Credit which helps to incentivize biomass and other renewable electricity sources (wind, geothermal energy, solar energy, hydropower, small irrigation power, and municipal solid waste), Maryland offers a production tax credit equal to 0.85 cents per kilowatt hour for electricity generated by solid waste and biomass sources. Eligible biomass resources include anaerobic digestion, landfill gas, wastewater-treatment gas, and cellulosic material derived from forest-related resources (excluding old-growth timber and mill residues consisting of sawdust or wood shavings)*, from waste pallets and crates, or from agricultural sources. To qualify, a facility must generate electricity by December 31, 2010. The maximum amount of credit is based on estimated annual energy production during a five-year period, or $2.5 million.

Outcomes

Maryland's Renewable Portfolio Standard is accelerating the State's transition from brown power to green power, bringing all the associated environmental and heath benefits to its citizens. Specifically, the 20% goal by 2022 will generate over 12,000 GWh. This equates to:

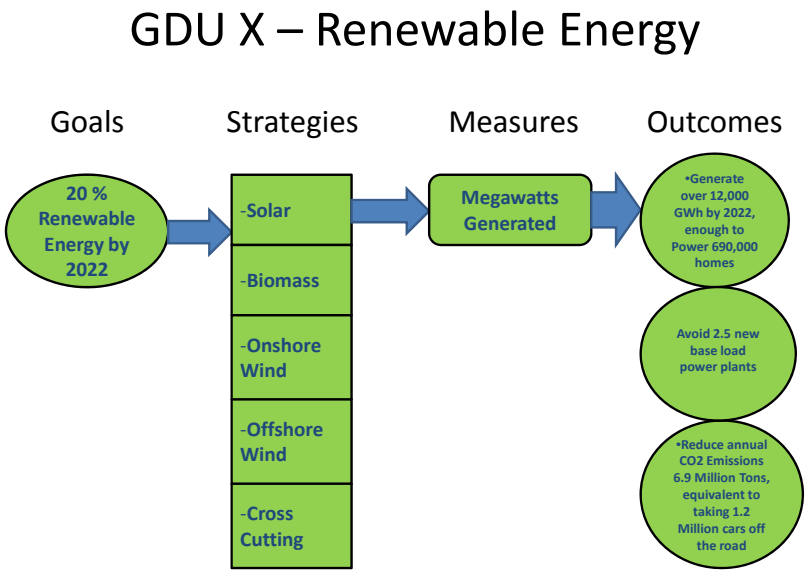
A) Sufficient green electricity to power 690,000 homes

B) Avoiding 2.5 new base load power plants*

* assumes 600MW power plant operating at 90% efficiency

C) Reducing annual carbon dioxide emissions by 6.9 million tons, which is equivalent to taking 1.2 million cars off the road.

Maryland is one of the nation's most progressive states in establishing the important goal of achieving 20% renewable energy by 2022. Further the state has resources to use most of the present day proven technologies as mentioned above and represented in the diagram below. Each clean energy technology type will provide a significant number of clean energy (Megawatts) thereby avoiding traditional fossil fuel electricity plants. In order to best understand the process forward regarding our State's commitment to clean energy generation, the following diagram has been provided.

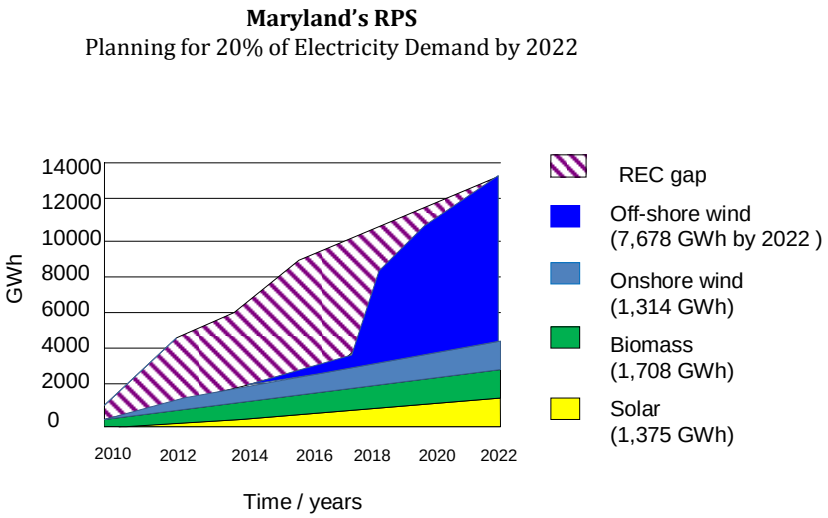


Maryland's goal of 20% renewable energy by 2022 will be met by incorporating a series of clean energy technologies into our State's energy portfolio. Solar, biomass, on shore wind, off shore wind, and combinations there of, will all continue to be explored and developed with the ultimate consumer benefits and environmental preservation in mind. Through clean energy megawatts generated, it is estimated that over 690,000 homes in Maryland will be powered without additional

strain on our existing grid. We will also avoid the need for 25 new base-load power plants and reduce our CO2 emissions by 6.9 million tons, which is equal to taking 1.2 million cars off of our roads. As previously noted, increased production of renewable energy also provides numerous additional qualitative benefits, such as local, green collar jobs, reduced electricity price pressure, expanded fuel diversity, greater energy security, and improved public health.

Challenges and Outlook

The overarching challenge will be to meet the potential gap of the expected RPS in the early years until the off-shore wind sector becomes established. This is illustrated below:



Supporting development of utility scale on-shore wind and biomass plants will be the most important growth sectors to alleviate this gap. Further, much focus will be given to the solar sector as utility installations can be built relatively more quickly than some of the other clean energy technologies. However, too heavy a dependency on the solar sector runs the risk of exceeding its 2% carve out which would provide an abundance of S-RECs and thereby diminish their value. For this reason, MEA is providing close stewardship over all the clean energy technology types.