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An Opportunity for Maryland to Get Solar Siting Right

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Executive Summary

In 2019, with the passage of the Clean Energy Jobs Act, Maryland set a goal of achieving 50% of its electric needs from renewable energy by 2030 and committed to examine ways to achieve 100% clean power by 2040. Specifically, this law sets a new requirement for solar arrays to produce 14.5% of electric power by 2030, up from the current goal of 2.5% by 2020.

Until recently, most of Maryland's solar energy was produced on rooftops with a small number of solar panels. Although these projects reduce residential and small business utility bills while contributing to Maryland's renewable energy future, they are limited in scope and unlikely to enable the state to reach its new renewable energy goals set out in the 2019 legislation. Maryland urgently needs more and better options for generating solar energy.

After reviewing the projected needs for solar energy, the report explores existing options and the role the state and counties can play. It finds:

- Keeping the state's best agriculture lands for farming is an important state goal and is critical to increasing the state's local food sustainability and reducing the carbon footprint of foods. The future of Maryland's renewable energy should include strategies that maintain the best land for growing food, minimize collateral damage, and protect the agricultural community.
- Contaminated lands, such as brownfields and landfills, can play a key role in producing green energy for Maryland. Siting solar on these contaminated sites, however, is more complicated and more expensive than on a farm field. For Maryland to maximize contaminated land for energy generation requires an assessment of all the potential sites to determine how many could actually be used to power Maryland and a creative approach to incentives that would make the numbers work.
- Rooftop solar arrays are terrific job generators and offer access for households and communities, but they are slow and expensive to install. Maryland could follow California's lead and require solar on all new buildings with large rooftops, such as warehouses, big box stores, industrial buildings, and shopping centers.
- Sprawling parking lots that surround active and closed shopping centers and other development can generate income again with the installation of solar arrays that put these vast expanses of impervious surface back to work.

- Local governments can and should play a critical role in the renewable energy process. Each county in Maryland has the authority to plan and regulate its own land use and development, but they need to provide clarity as to where these solar projects can and cannot be sited. Counties can minimize the possibility that the Public Service Commission will override local plans by ensuring that these plans permit viable solar sites, have clear criteria, and seek input from stakeholders.

To effectively meet its higher renewable energy goals, Maryland must address land use conflicts that resulted in a moratorium, legal battles, and lengthy uncertain processes, and reduce the regulatory hurdles that exist when it comes to solar siting.

Fundamentally, this report recommends Maryland develop a plan for solar siting. To accomplish this vital and urgent goal, the state, along with the counties, should address the following:

1. Determine annually the amount of net new solar production needed under different future scenarios and make this publicly available.

2. Complete a detailed analysis of the opportunities for solar development on rooftops, parking lots, disturbed land, and less productive farmland, and map preferred land for solar siting to enable the state to achieve renewable energy targets. The New Jersey Solar Siting Analysis serves as a model screening tool.

3. Articulate policy to ensure that renewable energy benefits are shared between residential, commercial/community, and utility scale and for all income levels. Deliberate action at both the state and local levels is required to safeguard against certain communities bearing the brunt of renewable energy generation. The state should create a formula to determine the appropriate minimum amount of solar generation for each county, recognizing local opportunities and limits.

4. Improve citizen participation in local siting decisions, especially for large-scale solar projects. Engage organizations and individuals at the earliest possible stage—ideally throughout the planning and zoning phases—so that everyone is clear about where these large projects can go.

5. Clear regulatory hurdles to make developing on disturbed lands faster and less expensive. Maryland and its counties should create a list of lands ready for solar development, change zoning and other regulations to allow solar, and list specific issues per site.

6. Identify energy grid infrastructure limits, especially in urban areas, that cap the amount of solar production. Adding capacity in these areas should be prioritized over rural grid expansion.

7. Utilize Maryland Solar Renewable Energy Credits as a policy tool to incentivize use for projects on already developed sites and limit use for projects on sensitive lands. The state should also identify any additional incentives that make solar projects on already-developed or disturbed land cost-effective. These can include: favorable lease rates, tax incentives, or other financial tools.

8. Require new large commercial buildings to include solar systems, and large new energy users—shopping centers, warehouses, and commercial building—to generate a significant portion of energy needs from onsite renewable energy.

9. Improve the DG+ power plant siting tool (see page 14) by adding additional data layers that include more preserved land and designated “priority preservation areas.” The goal should be to easily see the potential of landfills, brownfields, large parking lots, and other such sites.

10. Improve data access and transparency to more easily—and more accurately—track renewable energy generation from different sources. The state should make clear publicly available data on where the energy is being generated and in what segments (i.e., residential, commercial, utility).

Introduction

Maryland's transition to clean renewable energy has begun. In 2017, the Maryland General Assembly increased the state's renewable energy goal from 20% of electrical power sales to 25% by 2020. In 2019, with the passage of the Clean Energy Jobs Act, the state set a higher goal of achieving 50% of its electric needs from renewable energy by 2030 and committed to examine ways to achieve 100% clean power by 2040.[1] Specifically, this law sets a new requirement for solar arrays to produce 14.5% of electric power by 2030, up from the current goal of 2.5% by 2020. With growing concerns about global climate change due to energy-sector greenhouse gas production, along with the other environmental and public health threats posed by fossil fuel production and use, the time for careful consideration of responsible solar siting is now.

This once-in-a-generation opportunity to greatly expand Maryland's solar energy generation has the potential to benefit everyone, from homeowners to small businesses, governments to large energy users. Moving to a renewable energy future reduces air and water pollution, saves consumers money, and generates new jobs in the growing renewable energy industry.

But with opportunity comes challenge. Until recently, most of Maryland's solar energy was produced on rooftops with a small number of solar panels. Although these projects reduce residential and small business utility bills while contributing to Maryland's renewable energy future, they are limited in scope and unlikely to enable the state to reach its new renewable energy goals set out in the 2019 legislation.

In an effort to increase solar production over the last few years, there has been a surge in large-scale solar projects. Projects of this size are commonly referred to as "utility scale" and generate over 2 MW of energy per site. These projects—sometimes called "solar farms"—consist of hundreds of solar arrays and must be connected directly to the high-voltage power line.

However, this sudden growth of large-scale solar projects took many Marylanders by surprise. In 2013, large-scale solar production began its surge, and by 2017, large-scale solar was producing about 50% of solar energy in the state.[2] Large solar panel arrays suddenly sprouted up on rural lands many times with little community notice or input, often resulting in public backlash.

Solar Project Size and Cost Breakdown

	Project size	Roof Top	Cost
Residential	3 – 10 KW	Yes	$2.80/watt
Commercial/Community	10 KW – 2.0 MW	Mixed	$1.85/watt
Utility	2 MW and greater	No	$1.03 - $1.11/watt

U.S. Solar Photovoltaic System Cost Benchmark: Q1 2017; National Renewable Energy Laboratory

The scale of the solar project impacts the costs. Small projects on rooftops are the most expensive way to generate renewable energy while large-scale utility projects are the least expensive. But residential solar is a jobs growth market and reduces the utility bill of homeowners and small businesses. Utility solar can bring renewable energy online for far less money per watt but can have significant impact on land use.

The process became so contentious that a number of counties declared moratoriums on building new large projects to allow time to create appropriate local policies to address where to build these projects and what processes should be followed. Public opposition to large solar arrays and land use conflicts from locating large-scale solar projects on farmland have also resulted in long, expensive legal processes for developers, communities, and local governments.

Throughout the 2018 and 2019 Maryland General Assembly sessions, dozens of bills were introduced, attempting to deal with a plethora of issues relating to the state's renewable energy goals, from the siting of solar and zoning issues, to restrictions on transmission lines, and more. These issues will remain top of mind in future sessions.

While large-scale solar development is necessary in meeting the state's clean energy goals, the path forward requires thoughtful analyses that weigh the need for development against the potential negative impact an expanded solar infrastructure can have on the state's precious resources. Changing Maryland's current process and bringing more renewable energy on quickly requires a plan that maximizes benefits while minimizing collateral damages and time-consuming, costly legal fights. As the state moves toward reaching higher renewable energy goals, it will need to balance the benefits of the opportunity with the obstacles to achieving these renewable energy targets. This report focuses both on the challenges and the opportunities of locating enough solar energy to meet Maryland's new renewable energy goals.

How much solar power is needed in Maryland?

The first step in achieving the state's newly articulated renewable energy goals is to determine how much solar energy must be generated under current and potential future renewable energy goals.

Until 2019, Maryland's goal was to have 25% of its electric needs met through renewable energy, with 2.5% (or 1,028 MW) of this coming from solar. The rest was to be generated from wind, incinerator/trash burning, and other sources. Currently, the state is exceeding that goal. According to estimates by the Maryland Energy Administration (MEA), about 1,125 MW of solar energy is derived from 63,207 projects throughout the state, with most being on rooftops or small arrays on land.[3]

How much solar do we need under current and future scenarios?

	Estimated 2020	Percentage	2035 Goals	
% Renewable Goal	**25%**		**50%**	**100%**
Electric Use	58,041 MW		60,492 MW	60,492 MW
Total RPS goal (Total Electric Use / % Renewable Goal)	14,740 MW		30,246 MW	60,492 MW
% Solar Goal	2.50%		14.50%	29.00%
Total Solar Needed	1,474 MW		8,771 MW	17,543 MW
Residential	442 MW	30%	2,631 MW	5,262 MW
Community/Commercial	147 MW	10%	877 MW	1,754.3 MW
Utility	884 MW	60%	5,262 MW	10,526 MW
Total acres needed - Utility scale	**7,075 acres**		**42,096 acres**	**84,192 acres**

Note: 1 MW requires 8 acres minimum

To increase renewable energy to 50%—or 100% as the state has committed to study—requires that more solar come on line much faster than the current rate of adoption. Assuming the split between residential, commercial, and utility scale remains roughly the same, Maryland will need to find 42,096 acres of land to develop the capacity to generate 5,262 MW more utility scale solar energy to meet the 50% goal. To meet a goal of 100%, these figures would increase to 84,206 total acres of land to generate 10,526 MW of solar energy at the utility scale.

The solar field is rapidly changing and becoming more efficient with new products always being developed. These estimates, therefore, can change significantly with improvements in technology that increase the efficiency and yield of solar production or that bring new products, such as solar roads and other innovations, to life.

Don't Give Away the Farm

Farms are a critical economic engine for the state. Keeping the state's best agriculture lands for farming is an important state goal and is critical to increasing the state's local food sustainability and reducing the carbon footprint of foods. According to the USDA National Agricultural Statistic Service, the 2017 market value of agricultural products in Maryland was $2.47 billion. Beyond crops, fiber, and wood products, farms also support feed stores, mechanics, harvesters, and other agriculture and forestry-related jobs. The total impact of agriculture, forestry, and agricultural services on Maryland's economy is almost $8.25 billion in total output and nearly $3 billion in value added.[4]

But throughout history, Maryland's farmland has been targeted for development projects. It is this very development that poses a significant threat to the agricultural community. Solar industry developers—just like other developers—see open farmland as the easiest and cheapest place to locate their solar projects. Indeed, the biggest threat to continued farm production is the fragmentation of land through commercial and residential development. Between 2010 and 2040, The Harry R. Hughes Center for Agro-Ecology projects that Maryland will lose 346,000 acres of farmland and forest, an 8% decrease between 2010 and 2040.[5] These predictions were calculated before utility scale solar became such a significant factor.

For landowners with an eye on the bottom line, solar development can turn a cow pasture into a cash cow. In many instances, the landowner and the farmer are not the same. In fact, a large number of Maryland farmers lease the land they work, often from a number of landowners. Typically, farmers lease crop or pasture land from anywhere between $25.50 per acre and $175 per acre, depending on location, soil quality, and type of farmland. Not surprisingly, the lease rates offered by solar companies are far higher than lease rates considered affordable by the farmer, as solar leases can run $800 to $1,200 an acre. [6]

Often, solar companies argue that the land can return to agriculture after the lease lapses (lease periods are generally 25-30 years); however, the impact of this time period on both the agricultural community and the farmer can be significant. Further, it is arguably unlikely that a landowner will forgo the much higher lease payments to return the land to farming; it is also not likely that the solar utility will give up valuable acres at the end of a lease.

Finding the Middle Ground

Although it would be unrealistic to suggest that Maryland could achieve its renewable energy goals and leave all existing farmland intact, it is possible to forge a path forward that expands the state's solar capacity while minimizing collateral damage to the agricultural community. Maryland should, therefore, explore ways to better combine solar with agriculture.

For example, solar developers can be reluctant to allow access to a solar site for

liability reasons. But when Maryland's farmland is used for energy production, there are ways to permit grazing or shade-tolerant plants.[7] On a smaller scale, Maryland farms should be encouraged to use more solar for on-farm needs. Solar on untilled land, chicken houses, and barns can help to reduce a farm's utility bills.

But perhaps the biggest obstacle to striking a balance between maintaining prime land for agriculture and developing plots to achieve renewable energy targets is that there is no statewide mapping of "preferred" land. To clear this hurdle, Maryland should look to New Jersey. Its Solar Siting Analysis—released by the New Jersey Department of Environmental Protection (NJDEP) as a result of the 2012 Solar Act and updated in December 2017—explicitly classifies land into three categories: preferred (largely characterized as having existing impervious surfaces), not preferred (forests, wetlands, agricultural lands, and open space), or indeterminate (areas where additional information is necessary). Although the Siting Analysis is not formal policy or a regulatory determination, it serves as an initial screening tool to help users evaluate sites.

The future of Maryland's renewable energy should include strategies that maintain the best land for growing food and devote the less-fertile acres for growing energy. By identifying land that has few other beneficial uses, Maryland can earmark those acres as solar priority locations before converting the state's best land to energy production.

Rethinking Solar Energy Incentives

A renewable energy credit is a market-based incentive for verifying, tracking, and trading renewable electricity generation. These credits are equivalent to one megawatt-hour (MWh) of electricity generated and delivered to the electricity grid from a renewable energy resource. Solar Renewable Energy Credits (SRECs) are those generated specifically from solar and are offered as an incentive in Maryland. The 2019 increase in the solar carve-out to 14.5% will result in an increase in the availability of credits in Maryland. Utilities use these to "purchase" renewable energy production to meet state goals; developers can generate income through the sale of SRECs; and homeowners can similarly sell their excess power for every 1,000 kWh produced, in the form of SRECs.

Solar developer Energy Sage offers this example: The average Maryland homeowner buying a 9 kW system typically generates about 10 MWh of solar electricity per year, equivalent to 10 SRECs.[8] In some states, SRECs are valued at $300. In Maryland, the price fluctuates but remains low—at less than $20 through the latter half of last year. However, with the new law, SRECs are expected to increase both in number and value. There is real concern that large solar installations are in a position to dominate solar production at the expense of small projects that directly benefit businesses and homeowners because large solar projects utilize large allocations of SRECs.

New Jersey's aggressive renewable portfolio standard was amended in 2012 to limit eligibility for solar renewable energy credit for projects sited on land "actively devoted to agricultural or horticultural use."[9] The 2012 amendments also incentivized grid-supply projects on brownfields and landfills[10] and discouraged grid-supply projects that would "significantly impact the preservation of open space."[11] (For more information about New Jersey's policy regarding renewable energy, see sidebar titled, "What's Happening in Other States?")

Although it would be unrealistic to suggest that Maryland could achieve its renewable energy goals and leave all existing farmland intact, it is possible to forge a path forward that expands the state's solar capacity while minimizing collateral damage to the agricultural community.

Landfills and Brownfields

One avenue to explore is the role that contaminated lands can play in producing green energy for Maryland. These sites are potential locations to host solar energy projects, generating both energy and income. Siting solar on these contaminated sites, however, is more complicated and more expensive than on a farm field.

For Maryland to maximize contaminated land for energy generation requires an assessment of all the potential sites to determine how many could actually be used. However, the more that these already disturbed lands can be put back to work, the greater the reduction in pressure to build on rural lands. These currently "useless" lands are potential resources to generate income and lower utility bills as they produce renewable energy.

To date, there are numerous success stories:

In Washington County, a landfill was leased for the purpose of producing green energy. Julie Pippel, director of the Division of Environmental Management, summed up the benefits of this deal: "We had all of this land, we're owning it and maintaining it. It wasn't drawing in a tax base and we weren't getting anything from it." Now, this landfill generates $375,000 annually in rent revenue from the companies using the site for solar energy and will create net savings and revenue of $475,000 for Washington County.[12]

Anne Arundel County opened the largest "landfill to solar" project in the country in late 2018 on the closed Annapolis landfill. It has 50,000 solar panels on 80 acres, producing 18 MW of electricity for Annapolis and Anne Arundel County facilities.[13]

According to Paul Curran, BQ Energy's project manager, this project is an example of how the concept of landfill to solar should work. After issuing an RFP to solar developers, Anne Arundel County worked with the selected firm, BQ Energy, to ensure that the 80-acre solar project was designed to protect the integrity of the cap on the landfill, and it coordinated with the Maryland Department of the Environment. The local government went one important step further and helped to identify users of the newly produced green energy.

Howard County is also using a closed landfill to save money and generate green energy. This site provides 90% of the electric needs for Worthington Elementary School.

In Frederick County, a newly sited 14-acre solar array at an area landfill will produce enough power for seven county facilities, including Winchester Hall; the libraries in Frederick, Urbana, and Emmitsburg; the Frederick Senior Center; the landfill scale house; and the charging stations for the all-electric Transit Services of Frederick County buses.

Carroll County recently completed a solar installation on 18 acres at Hoods Mill Landfill, which is expected to save residents $4.1 million over the next 20 years. This follows a 3-acre project at Carroll Community College and a 6 1/2-acre project at the Hampstead Wastewater Treatment Plant.

The EPA's database RE-Powering America's Land suggests that over 15,000 MW could be generated from contaminated lands in Maryland. While that number is exciting, a close look at the data shows the possibilities for energy generation will actually be far less. For example,

the national database uses such criteria as sites located within 20 miles of a high-voltage power line. In densely developed Maryland, the power line source needs to be closer than 2 miles.

The Utility Scale Solar Energy Coalition of Maryland completed a detailed analysis of hundreds of contaminated sites in Maryland. This study concluded that there are 370 sites that are actually viable for solar projects and could produce between 214 and 427 MW of renewable energy. The report noted that other sites could be viable if specific issues are resolved, such as improving connections to the grid; increasing the prescreening process and removing bureaucratic hurdles; making zoning for solar "by right" at these sites; and offering incentive packages to increase financial viability.

In May 2018, Edward Dexter, the administrator of the Maryland Department of the Environment Solid Waste Administration, noted that landfill to solar is occurring across the state. There are at least seven landfills approved for solar and at least six more that have started the process. However, Maryland has not yet developed a Superfund or brownfield site into a renewable energy project.

Rooftops

Anyone flying out of Thurgood Marshall Airport can look down on a sea of flat rooftops and quickly realize that Maryland has an opportunity to put those spaces to work and increase the state's renewable energy generation. According to a National Renewable Energy Laboratory report, "Rooftop Solar Photovoltaic Technical Potential in the United States: A Detailed Assessment," Maryland could achieve—in theory—over 21% of 2016 electric sales from rooftops, or about 10.9GW of power. This is significantly more energy than solar is currently required to produce, and even more than the requirements in proposed legislation to take Maryland to a 50% renewable rate.

But rooftops, while terrific job generators, are a slow and expensive way forward. How can Maryland make the path to more rooftop solar faster and less expensive? What can Maryland do to ensure future roofs are part of the renewable equation?

Specifically, the National Renewable Energy Laboratory report indicates that Baltimore City has the potential to generate 2 GW of energy from rooftop solar projects. A more detailed look at rooftop potential in Baltimore by Clean Tech Methods determined that the 201 largest rooftops in the city could generate more than 275,432 MWh. Installing a 1.4 MW solar project on just one shopping center, for example, could save that business over $194,000 every year in electric bills.

Rooftop solar projects are significant not only to achieve the state's renewable goals but also to ensure that households and small businesses share in the benefits of Maryland's renewable energy future. According to Arjun Makhijani, Ph.D., at the Institute for Energy and Environmental Research, "Tens of thousands of low-income households cannot afford their heating and electricity bills, and energy burden often runs 10-20% of income. Reducing these costs through individual projects or community solar ensures that all communities benefit from this energy future."[14] Although small solar projects are the most expensive way to produce renewable energy per kilowatt, these projects generate the most jobs—another benefit worth noting.

Putting solar on rooftops during the design and construction phase is more cost-effective than renovating an existing structure. So as Maryland moves forward, it must consider whether to follow California's lead and require all new homes to have solar panels.[15] This recommendation is currently before the Maryland Climate Commission.

Rather than a blanket requirement, however, Maryland could begin by requiring solar on all new buildings with large rooftops, such as warehouses, big box stores, industrial buildings, and shopping centers. In 2013, the

IKEA distribution center in Perryville installed "Maryland's largest solar roof." The company has committed to reducing climate change with a goal to produce as much renewable energy as it consumes in its operations by 2020. Since 2009, IKEA has installed approximately 750,000 solar panels on its buildings worldwide.

Parking Lots

Like rooftops, parking lots are another location for renewable energy generation. Often, sprawling parking lots that surround closed shopping centers and other abandoned development sit empty. But they can generate income again with the installation of solar arrays that put these vast expanses of impervious surface back to work.

Active facilities can contribute as well, with the installation of solar parking lot covers, which also provide shade for cars and reduce the heat islands created from these lots. Chesapeake College, located in Wye Mills, looked to an expansive campus parking lot to generate a significant portion of its on-site energy needs. Since 2016, the 6-acre solar project has produced enough power in one year to offset approximately 45% of the college's energy demand. "In the first year, the array produced 2.25 million kilowatts of electricity at a cost of $106,000," stated Dr. Stuart Bounds, interim president at Chesapeake College. "This represents a savings of $85,000 of off-grid prices. We anticipate similar savings on utility bills over the next 19 years, which doesn't include any additional solar installations constructed."

But not all parking canopy projects go smoothly. Charles County Government encountered problems just days before construction of its highly publicized parking lot solar canopy at the county office complex. Suddenly, permits were canceled by the town of La Plata, where the county seat is located. Nearby residents were concerned that the project would interfere with the weekly farmers' market, and they objected because they felt they did not have enough opportunity for input.[16]

Community Solar

Not all rooftops are solar compatible: Some face north, are shaded, not able to support the solar systems, or simply too small. For many homeowners, cost may be prohibitive. Renters of course don't have the option of installation. In these instances, community solar may offer a solution.

Under a statewide pilot program extended by law to 2022, community solar grants access to the benefits of solar energy without placing the array on a personal roof. Rather, the solar project is at commercial scale (larger than individual but smaller than utility) and built off-site. Customers subscribe to the solar project and receive an energy usage offset on their monthly bill based on the amount of solar power generated. State law requires that a portion of the energy and subscriptions be reserved for low- and moderate-income residents.

However, siting can also be an issue for community solar. In Baltimore County, most community solar projects have been proposed for rural agricultural areas that have been protected from development for decades. No community solar projects have been proposed on disturbed land or rooftops.

Interestingly, the smaller footprint of these projects makes them better suited for previously developed sites like abandoned parking lots, contaminated lands, and industrial lands. Some large rooftops can also host up to 2 MW of solar energy.

The county hoped its project would generate 1.8 MW of electricity, which was estimated to reduce annual electricity expenditures by around 20%, or more than $85,000 per year.[17] This situation reiterates the need for clear, updated zoning and permits so that projects can move forward quickly. Earlier citizen participation on this project could have also helped to resolve issues.

Another consideration is cost. Solar parking canopies can be 40% more expensive than development on a farm because systems require additional engineering and safety requirements. But with the added benefit of providing shade and directly reducing energy bills at the site, this option is worth considering, especially if incentives can be offered to solar developers to offset the difference.

According to a community solar group: "Research is needed to understand the additional cost required to develop on Maryland's contaminated sites and parking canopies, and to identify potential funding sources to bridge the cost gap between greenfield and brownfield development. This work should also include recommendations for incentives and funding sources to make solar projects on disturbed land, parking canopies, and other potential sites more cost-effective. These can include tax incentives, a streamlined permitting process, and development of legislative incentives."

The Role of Local Governments

Local governments can and should play a critical role in the renewable energy process, especially considering that local governments can financially benefit from converting farmland to large-scale solar. Property taxes, for example, are considerably higher on solar projects, netting local governments new additional revenues.

Each county in Maryland has the authority to plan and regulate its own land use and development. Comprehensive development plans outline where all forms of development can go as well as designate areas that are to be protected for agriculture use, as sensitive environmental areas, or for historic resource value. Most county plans and local zoning regulations, however, are silent when it comes to large-scale solar and other renewable energy projects.

To address the flood of large-scale solar projects hitting the desks of local government permitting offices over the past few years, many counties instituted temporary moratoriums to allow their policies to catch up with this new form of development. While these delays gave local governments time to create new processes for solar development, they have also caused a slowdown in solar production.

Other Siting Opportunities

In addition to landfills, there is the potential to site large arrays at other state- and county-owned facilities, such as correctional facilities, wastewater treatment plants, and airports. In a particularly insightful 2011 report by Colorado-based Western Resource Advocates, the authors encourage and challenge local governments to maximize planning for clean energy by co-locating with other infrastructure projects. Another possibility includes borrowing a strategy from the Netherlands and Australia and incorporating solar panels into highway noise barriers.[18]

"We want to make sure that we foster this new technology, we do it right and .... we do it in a way that best meets the needs of Frederick County."

– Frederick County Executive Jan Gardener

Frederick County Executive Jan Gardener explained her rationale for the temporary moratorium citing the "size and scope and impact of these projects." She told the News-Post: "We want to make sure that we foster this new technology, we do it right and .... we do it in a way that best meets the needs of Frederick County."[19]

The resulting county policies vary widely, with Kent County being the only one with a comprehensive plan for renewable energy. Kent County—along with Carroll, Montgomery, Anne Arundel, and Harford counties—does not permit large-scale solar in rural areas.

Frederick County protects prime agricultural soils from commercial solar, and Montgomery County only allows solar to be accessory, not commercial, use. Howard County allows solar on agricultural land and on land with county easements. Caroline County identified 2,000 acres of agricultural land for solar projects.

Here is a closer look at three counties in particular:

Kent County

Eight years ago, the Kent County Commissioners set up the Renewable Energy Task Force to "address the opportunities and challenges presented by the development and use of clean renewable energy sources (such as solar, wind, geothermal, methane, and biomass), to study the potential uses of renewable energy in the county and recommend appropriate policies and ordinance amendments." Specifically, the task force was charged with the following:

1. To objectively evaluate the application of each type of renewable energy technology at the residential, commercial, and utility scale for their benefits to the county and potential effects on the community and the environment;
2. To identify infrastructure requirements including those needed for transmission and the conversion from energy to electricity;
3. To advise the County Commissioners on the applicability of each type of technology to Kent County and recommend potential alternative energy technology that may be applicable to reduce county building or other structures energy use;
4. To propose appropriate policy changes and ordinance amendments; and
5. To review current technology incentives.

As a result, the county's comprehensive development plan identifies locations zoned for large-scale solar projects. Their size, suitability, and location near the electrical grid meet the specific needs of solar projects. These siting requirements also respect other important issues for Kent County such as keeping the historic and agricultural areas free from energy development.

Despite this, the Mills Branch Solar project targeted 300 acres in the middle of the county's agriculture zone and a historically important area—clearly outside the designated renewable energy zones—for a

solar project. The Mills project faced years of challenges and the developer ultimately withdrew, but only after concerned citizens, the county government, and the developer spent huge amounts of time and money. Meanwhile, other major solar projects in Kent County that located in the designated zones were quickly built and are currently operating.

Baltimore County

In 2017, local legislation in Baltimore County limited large-scale solar to commercial projects under 2 MW and allocated up to 10 projects per councilmanic district, but it was silent on other restrictions, resulting in increased confusion and land use conflicts.

To date, all projects have attempted to locate in protected rural areas of the county. Of the 14 submitted projects, 12 fall within "agriculture priority preservation and resource preservation area[s]" and two fall within "rural residential area[s]."[20] All are being contested and will likely be dragged through the Board of Appeals and court process, potentially for years.

In July 2018, the Planning Commission drafted suggested changes to the 2017 legislation, including recommending that large-scale solar not be located on prime agriculture lands but be steered to more commercial and manufacturing zones. No action has been taken on these recommendations to date.

Anne Arundel County

On December 3, 2017, Anne Arundel County announced an eight-month moratorium on solar facilities. "We need to ensure the impact of heavy industrial activity like solar energy operations has been fully vetted by officials within the Department of Planning and Zoning," said County Executive Steve Schuh. "We must make certain these activities will not negatively affect the quality of life for residents in areas like South County and the Lake Shore Peninsula."[21]

The Dispersed Energy Committee was formed to research the issues. Its key recommendations included:

1. Make it easier and faster to install accessory solar use on rooftops and for use on the property by permitting in all zoning districts and in any land use regulation.
2. Recommend a "hierarchy" for large-scale ground-mounted solar systems, with the order of preferred locations being industrial zones, brownfields, and reclamation areas. Agriculture and rural areas are a last resort. Large-scale rooftop and parking lot canopies should be located in industrial and heavy commercial areas.
3. Allow solar as a permitted use to the greatest extent possible.
4. Recognize brownfields and other reclaimed land as a positive attribute if zoning requires a special exemption.
5. Do not locate utility scale projects in the County's Priority Preservation or Rural Legacy areas.
6. Include allowances for wildlife corridors for any site larger than 15 acres.
7. Relax access road requirements to make for more efficient siting for solar projects.
8. Require property owners to record an agreement that land returns to prior use (before project was built) at the end of the lease.
9. Require view-shed analyses for sites near scenic roads or historic properties.

The county executive and county council ultimately passed legislation based on these recommendations in November 2018.[22] The ordinance allows utility-scale projects under special exception or conditional use, based on whether the project is ground-mounted or rooftop. Projects must be located at least 10

Adding energy projects to counties' comprehensive development plans is critical because, done well, these plans can reduce potential land use conflicts and open the door for the state to meet its renewable energy goals.

miles from another solar project for community solar and at least 20 miles for utility-scale projects.

These three examples demonstrate that local land use plans can make the difference in directing energy development in the areas that benefit the community and minimize harmful impacts. Moving forward, Maryland counties must determine where and how much development will occur within their boundaries. Clearly, adding energy projects to their comprehensive development plans is critical because, done well, these plans can reduce potential land use conflicts and open the door for the state to meet its renewable energy goals.

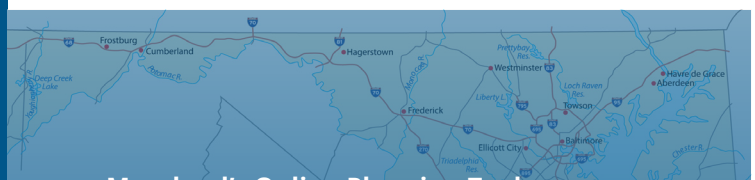
Although the Maryland Public Service Commission (PSC) has the authority to override local decisions for the location of major power generation projects, including solar projects, recent legislation offers guidance that enables county governments to maintain a voice in the process.[23]

Granting authority to the PSC was implemented during the 1970s to ensure that Maryland could build new large fossil- and nuclear-fueled plants to meet the state's needs and overcome the tremendous challenges of siting these large plants in or near communities. All new power sources over 2 MW were required to apply to the PSC for a Certificate of Public Convenience and Necessity (CPCN). Today, the more dispersed and numerous large solar projects (over 2 MW) go through this same process.

In 2017, concerns over limited public input and lack of consideration for local land use planning in PSC decisions led to the passage of HB1350 by the General Assembly. The Maryland Association of Counties (MACo) took the lead and developed an approach that still gives the PSC oversight but now includes more local input. Counties can minimize the possibility that the PSC will override local plans by ensuring that these plans permit viable solar sites, have clear criteria and regulatory process, and seek input from all stakeholders.

To ensure success in meeting renewable energy goals, MACo recommended that each county in Maryland should:

1. Provide clarity as to where these solar projects can and cannot be sited.
2. Update zoning and other regulations to speed up the permitting process.
3. Delineate the number of acres required to significantly contribute to the state's renewable energy goals.
4. Prioritize building large-scale solar on already disturbed lands such as closed landfills and Superfund sites and clear any bureaucratic hurdles.
5. Limit the use of the most valuable agriculture lands including land designated as prime farmlands, Priority Preservation Areas, and Rural Legacy Areas.
6. Incorporate energy siting into the Comprehensive Development Plan.
7. Include robust and meaningful citizen participation in the design of the siting criteria and review of proposed projects.
8. Include solar on existing county buildings, parking lots, and other areas, as feasible, and require all new county buildings to include solar energy.
9. Require new large buildings to be energy-efficient and include solar, as feasible.



Maryland's Online Planning Tool

SmartDG+, developed by the Maryland Energy Administration and the Department of Natural Resources Power Plant Research Program (PPRP), is an online planning tool intended to help developers and officials identify promising locations for energy projects. According to the SmartDG+ website, "PPRP evaluated electrical lines throughout Maryland, gathered publicly available data on barriers to project construction, and met with county and utility officials to discuss local priorities and policies of relevance. Combining this information is intended to help everyone save time and make better decisions about where to focus further research."

"The linchpin of SmartDG+ is a statewide map of 1- to 4-mile wide corridors surrounding electrical distribution and transmission lines that appear strong enough to absorb projects greater than 2 MW. Within these corridors, the tool shows areas that remain promising after various standard screens—involving resource availability, land use, protected areas, and more—have been applied."

While this effort helps screen sites for potential development, it does not show the lower-voltage electricity lines to which many distributed generation projects interconnect. In addition, due to national security concerns, utilities will not disclose the location of substations or share their remaining capacity to host distributed generation projects and where future upgrades are planned. Site-specific feasibility reviews by the utilities are still needed to successfully site a large project. These evaluations take months and are dependent on the status of other proposed projects nearby. This mapping effort, therefore, is only the start of a long process by the solar developer.

Recommendations and Conclusion

To effectively meet its higher renewable energy goals, Maryland must address land use conflicts that resulted in a moratorium, legal battles, and lengthy uncertain processes, and reduce the regulatory hurdles that exist when it comes to solar siting. The state must not only calculate the amount of energy that can be generated, but it must also determine how best to distribute it across various sites and identify the opportunities, benefits, and consequences of solar projects on rooftops, parking lots, contaminated lands, and farmlands.

The following recommendations will help Maryland address these challenges.

1. Determine annually the amount of net new solar production needed under different future scenarios and make this publicly available.
2. Complete a detailed analysis of the opportunities for solar development on rooftops, parking lots, disturbed land, and less productive farmland. Knowing this capacity will help identify the incentives and regulatory policies needed to ensure that these locations are used for solar energy.
3. Articulate policy to ensure that renewable energy benefits are shared between residential, commercial/community, and utility scale and for all income levels. Deliberate action at both the state and local levels is required to safeguard against certain communities bearing the brunt of renewable energy generation. The state should create a formula to determine the appropriate minimum amount of solar generation for each county, recognizing local opportunities and limits.
4. Improve citizen participation in local siting decisions, especially for large-scale solar projects. Engage organizations and individuals at the earliest possible stage—ideally throughout the planning and zoning phases—so that everyone is clear about where these large projects can go.

Armed with a more informed analysis, Maryland can determine how to make the best use of its assets to produce green energy without unnecessary detrimental impacts on rural lands.

5. Clear regulatory hurdles to make developing on disturbed lands faster and less expensive. Maryland and its counties should create a list of lands ready for solar development, change zoning and other regulations to allow solar, and list specific issues per site.

6. Identify energy grid infrastructure limits, especially in urban areas, that cap the amount of solar production. Adding capacity in these areas should be prioritized over rural grid expansion.

7. Utilize Maryland Solar Renewable Energy Credits as a policy tool to incentivize use for projects on already developed sites and limit use for projects on sensitive lands. The state should also identify any additional incentives that make solar projects on already-developed or disturbed land cost-effective. These can include: favorable lease rates, tax incentives, or other financial tools.

8. Require new large commercial buildings to include solar systems, and large new energy users—shopping centers, warehouses, and commercial building—to generate a significant portion of energy needs from onsite renewable energy.

9. Improve the DG+ siting tool (see sidebar titled, "Maryland's Online Planning Tool") by adding additional data layers that include more preserved land and designated "priority preservation areas." The goal should be to easily see the potential of landfills, brownfields, large parking lots, and other such sites.

10. Improve data access and transparency to more easily—and more accurately—track renewable energy generation from different sources. The state should monitor and share publicly where the energy is being generated and in what segments (i.e., residential, commercial, utility).

Recently, Governor Hogan signed an executive order establishing a task force to examine renewable energy development and siting.[24] This group will produce an interim report by December 2019 and a final report by August 2020. By working together, Maryland, like other states, can protect its invaluable resources and farmlands while still achieving its robust renewable energy goals. To do this requires making the regulatory process easier and faster—and developing at the most preferred locations, such as contaminated and disturbed lands, parking lots, and commercial and industrial areas.

This use of contaminated and other disturbed lands must begin with a rigorous assessment of the potential for solar power. These data will help determine whether—and to what extent—other locations are needed to meet the state's goal. Armed with a more informed analysis, Maryland can determine how to make the best use of its assets to produce green energy without unnecessary detrimental impacts on rural lands, ensuring that the renewable energy future provides economic benefits and protects the health of all communities.

What's happening in other states?

Other states have been grappling with similar issues relating to renewable energy goals and have instituted policies and compiled resources worth exploring. After review of the landscape in North Carolina, New Jersey, New York, Massachusetts, and Vermont, a number of common issues emerged: All five states specifically recognize that a strong renewable future depends on increased participation at the residential, commercial, and utility scale, and that the burden and the benefits of renewable energy are to be shared among stakeholders. The absence of some form of common plan or policies results in unpredictability and can impede solar development. These states all recognize that the largest projects require the most oversight and the most limits on location and siting. As a result, they all limit, in some form, the amount of large scale solar in rural areas, especially on prime agricultural land, and urge the use of disturbed land like landfills. They also recognize the need for solar decommissioning plans—and guaranteed funding—for each large-scale project.

Although North Carolina, New Jersey, New York, Massachusetts, and Vermont have all taken different approaches to reach their renewable energy goals, they have all done so in a way that makes project siting more predictable with fewer negative outcomes. Maryland can look to each of these five states as it continues to develop a plan for solar siting.

NORTH CAROLINA

Amount of solar installed: 5,467 MW
National ranking in installed solar: 2nd

In 2013, North Carolina convened a broad group of stakeholders—solar developers, law firms, advocacy organizations, local governments, utilities, academic institutions, conservation groups, and agricultural groups—that developed the state's first "Template Solar Energy Development Ordinance." Used voluntarily by local governments, the template serves as a model and starting point for developing or updating their solar energy development regulations. Its language clearly identifies the need and interest to balance renewable goals with environmental and land use goals: "The purpose of this ordinance is to facilitate the construction, installation, and operation of Solar Energy Systems (SESs) ... in a manner that promotes economic development and ensures the protection of health, safety, and welfare while also avoiding adverse impacts to important areas such as agricultural lands, endangered species habitats, conservation lands, and other sensitive lands."

The template defines three levels of solar energy systems. Level one includes all rooftop, parking lot, and certain small ground-mounted and building integrated systems. Level two includes midsize ground-mounted systems (defined by the amount of acreage covered by the solar system rather than the capacity of the system on a variety of different land-use types). Level three includes all other projects. For each level, the template outlines recommendations for types of permits required based on zoning district, and provides language for siting issues, such as parcel line setbacks, height limitations, buffers, and decommissioning (as applicable).

Key takeaways:

- Broad stakeholder engagement is essential to developing a resource that is both comprehensive and useful for local governments.
- This type of resource will need to be updated over time (preferably multiple times) as additional experience is gained.

NEW JERSEY

Amount of solar installed: 2,828 MW
National ranking in installed solar: 7th

New Jersey's success can be attributed mostly to its aggressive renewable portfolio standard (RPS), which was originally enacted in 1999 and was amended five times between 2004 and 2018. A key goal of the 2012 amendments was to limit solar renewable energy credit (SREC) eligibility for projects sited on qualified land "actively devoted to agricultural or horticultural use."[25] The 2012 amendments also incentivized grid-supply projects on brownfields and landfills[26] and discouraged grid-supply projects that would "significantly impact the preservation of open space." [27] As a result, not only did SREC prices stabilize, but also grid-supply development outside of brownfields and landfills abruptly stopped.

Further, the state's Solar Siting Analysis (SSA), released by the New Jersey Department of Environmental Protection (NJDEP) as a result of the 2012 Solar Act, was updated in December 2017. Land was classified into three categories: preferred (largely characterized as having existing impervious surfaces), not preferred (forests, wetlands, agricultural lands, and open space), or indeterminate (areas where additional information is necessary). The 2017 SSA classified 63% of New Jersey's land as "not preferred," 29% as "preferred," and 8% as "indeterminate." Although the SSA is not formal policy or a regulatory determination, it serves as an initial screening tool to help users evaluate sites.

Interestingly, a 2017 analysis found that to meet the 4.1% state solar goal by 2028 less than a quarter percent New Jersey's total land area was needed for solar development. A 100% solar requirement could be met on just over 4% of the state land area and, importantly, on just 14.3% of land designated as "preferred" for solar development.[28]

Finally, in 2018, New Jersey passed legislation that significantly overhauled the state's solar policy, including a directive to transition the solar market away from SRECs.[29] The Board of Public Utilities is now required to procure up to 100 MWs of grid-supply projects by 2020 and to develop a community solar pilot program. It is unknown whether specific siting criteria or preferences will be included in the application process for these projects; however, reasonable solar siting parameters have been incorporated into the community solar draft rules (e.g., disallowing projects on preserved farmland).

Key takeaways:

- Analytical tools can inform broader state policy decisions as well as support decisions at the local level, and they should be developed, supported, refined over time, and utilized.

NEW YORK

Amount of solar installed: 1,717 MW
National ranking in installed solar: 9th

New York is bullish on clean energy, especially with its Reforming Energy Vision process working to create a cleaner, more resilient and affordable energy system. Similar to Maryland's new law, New York's Clean Energy Standard requires that 50% of the state's electricity must come from renewable energy by 2030. The NY-Sun $1 billion initiative aims to support 3 GW of solar by 2023.

The New York State Energy Research and Development Authority (NYSERDA), which was originally established in the 1970s, offers numerous initiatives and programs and provides analysis and technical support to achieve the state's broader goals. For instance, the New York State Solar Guidebook,[30] which was originally produced in 2016 and was updated in August 2018, provides objective information and analysis that not only is invaluable to local communities and developers, but also leads to better, more consistent local laws and regulation—and more predictable solar development. Examples of chapters most relevant to large-scale systems include: "State Environmental Quality Review for Solar," which provides background information as well as instructions for municipal boards on the process for large-scale ground-mount PV systems, and "Land Use Tools for Siting Solar While Protecting Farmland," which explains how municipalities can use special-use permits and site plan regulations to balance solar and farmland uses. A "Model Solar Energy Local Law" is included to help municipalities draft local laws and ordinances.

In addition to information and technical assistance, NYSERDA's NY-Sun solar program has recently been updated to include a $0.10/W incentive for eligible projects sited on brownfields or landfills.[31]

Key takeaways:

- When establishing multiple supportive renewable energy policies, states should empower and fund their state agencies to become technical and professional resources capable of detailed analysis and able to facilitate information and expertise to help ensure complementary results.

MASSACHUSETTS

Amount of solar installed: 2,534 MW
National ranking in installed solar: 8th

In November 2018, the state launched its Solar Massachusetts Renewable Target (SMART) program to support an additional 1,600 MW of solar power.[32] In an effort to balance multiple policy goals, a quantitative analysis will be conducted to help establish appropriate incentive values and an effective approach for various project types and sizes. The program design incorporates "adders" to incentivize siting of projects on brownfields/landfills and to encourage floating solar facilities. Greenfield "subtractors" are included to help steer development to specific types of land use categories without mandating broad prohibitions or being overly prescriptive.

Generally, the regulations disallow projects sited in the state's protected spaces (i.e., protected open space, wetland resource areas, properties in the State Register).[33] They also incorporate performance standards for certain project types, such as prohibiting removal of all field soils and maintaining vegetative cover to prevent soil erosion, among other requirements. Massachusetts has also developed tools and resources specifically for local governments that include both policy guidance and model zoning regulations. The goal of these documents is to provide clarity and offer a level of consistency in solar development that is important to achieving the state's energy goals. There is also the Green Community Designation and Grant Program, which provides resources (i.e., technical, informational, and financial) to municipalities that pledge to cut their own municipal energy use.

Key takeaways:

- An extensive stakeholder process was essential to arriving at the ultimate program design, which while complex, seeks to balance multiple policy goals.
- The state provides important resources and guidance to local communities to help them successfully contribute to clean energy goals.

VERMONT

Amount of solar installed: 295 MW
National ranking in installed solar: 25th

In 2016, Vermont passed legislation addressing the siting of energy projects,[34] after heated disagreements relating to wind turbines located on the scenic ridge lines and a year after enacting the mandatory Renewable Energy Standard, which requires that 75% of annual retail electricity sales come from renewables by 2032.[35]

As a result of Act 174, the Department of Public Service (DPS) has developed detailed, robust standards by which to evaluate enhanced energy plans and to determine whether they should be entitled to "substantial deference."[36] In addition, the Department has developed multiple recommendations and guidance documents to help local governments develop their plans. Local energy plans must also identify potential areas for renewable energy development and label areas that are unsuitable for such development. Preferred locations include rooftops (and other structures), parking lots, previously developed sites, brownfields, gravel pits, quarries, and Superfund sites. Possible constraint areas include agricultural soils and protected lands.

Although local governments do not have to update existing plans and are not required to meet the new standards, those that meet the new standards receive "substantial deference."

Key takeaways:

- To meet ambitious renewable energy goals, detailed standards and multiple guidance documents help ensure all stakeholders are on the same path to success.

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by Dru Schmidt-Perkins

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The Abell Foundation is dedicated to the enhancement of the quality of life in Maryland, with a particular focus on Baltimore. The Foundation places a strong emphasis on opening the doors of opportunity to the disenfranchised, believing that no community can thrive if those who live on the margins of it are not included.

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