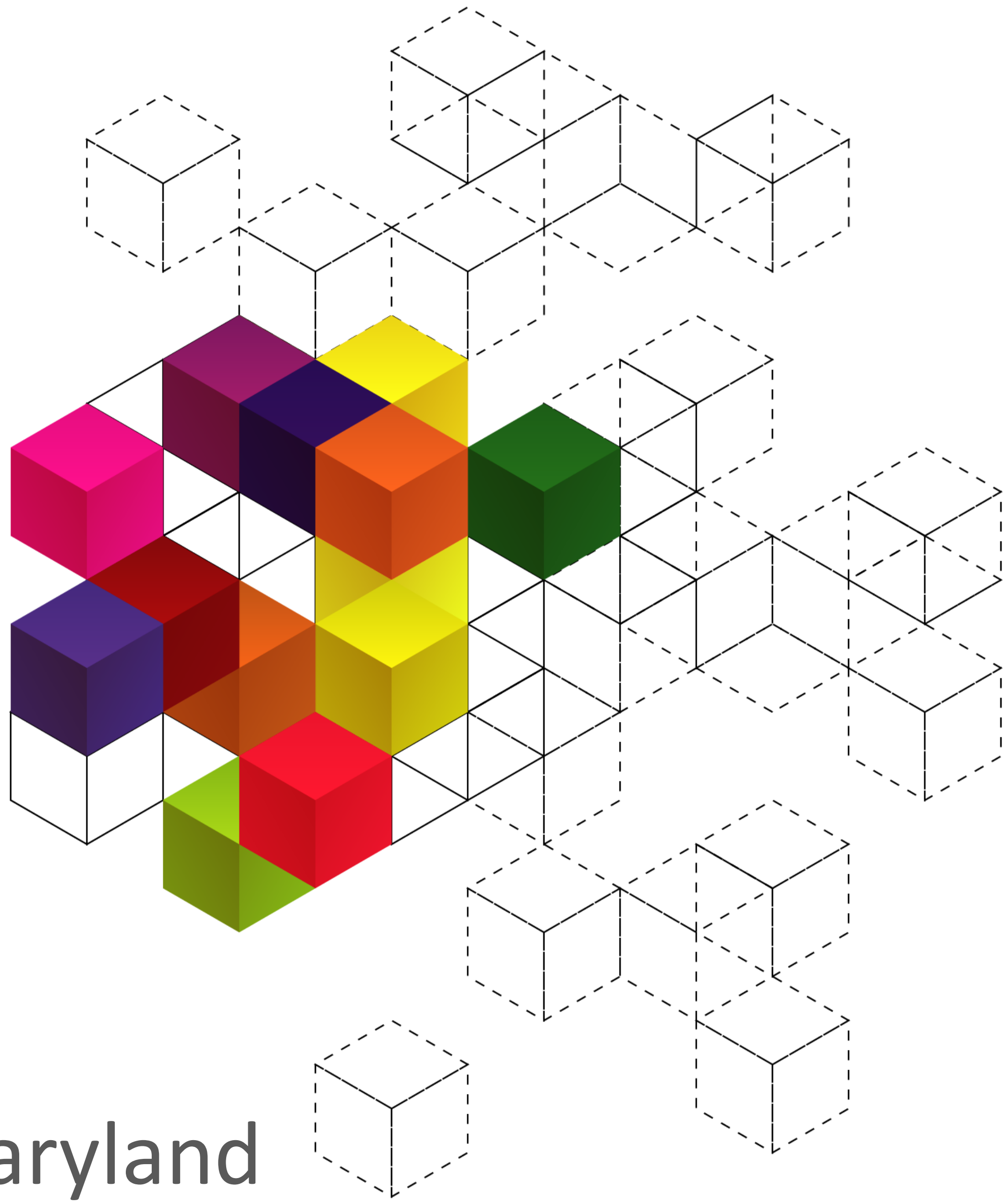

Maryland

RESILIENCY THROUGH MICROGRIDS TASK FORCE REPORT

EXECUTIVE SUMMARY

Recognizing the value that microgrids can offer to energy surety and resiliency, on February 25, 2014, Governor Martin O'Malley directed his Energy Advisor to lead a Resiliency Through Microgrids Task Force ("Task Force") to study the statutory, regulatory, financial, and technical barriers to the deployment of microgrids in Maryland. The Governor's charge required the Task Force to develop a "roadmap for action" to pave the way for private sector deployment of microgrids across the State.

As defined by the Task Force, a "microgrid" is a collection of interconnected loads, generation assets, and advanced control equipment installed across a defined geographic area that is capable of disconnecting from the macrogrid (the utility scale electric distribution system) and operating independently. Microgrids are currently being deployed across the State in numerous settings; one popular application is the "campus-style" microgrid that serves a single customer on a single parcel of property. These campus-style microgrids exist at various locations in Maryland today, though there are certainly many opportunities to improve the technology, financeability, and functionality of these types of systems.

There is another wave forming in the development of microgrids: those that serve multiple customers over multiple properties and cross public rights of way in the process. While these types of microgrids could certainly exist without any discrete public purpose, the Task Force chose to narrow its focus in this report to those serving the public good, termed "public purpose microgrids." As defined by this Task Force, public purpose microgrids serve *critical community assets* across multiple properties. Critical community assets include resources that provide important community functions, such as community centers, commercial hubs, and emergency service complexes. Facilities that contribute to quality of life during an extended power outage could also be included in a public purpose microgrid. A public purpose microgrid may be owned in whole or in part by either an electric distribution company or a third party entity, and must provide services to multiple customers across multiple property lines.

For the short term, the Task Force recommends the State focus on the deployment of utility-owned public purpose microgrids through advocacy and incentives. Current law likely provides the Maryland Public Service Commission with authority to allow or require Maryland utilities to own and operate public purpose microgrids. A critical first step in this process is completing a pilot project in the State that would serve as a model for future deployment. Additionally, the Task Force recommends that the Maryland Energy Administration conduct a holistic analysis of tariffs that help define the value of distributed generation to the macrogrid, as well as engage in a comprehensive review of siting, interconnection, and commissioning procedures.

For the long term, the Task Force recommends the State focus on reducing barriers to entry to third parties (non-utilities) wishing to offer public purpose microgrid services to multiple customers in Maryland, whether those services are offered in new developments or over existing electric distribution company assets. By authorizing competition for public purpose microgrid services, the Task Force believes the State can incent innovation, provide better reliability and resiliency to its citizens, and still allow traditional utilities to compete in this new business model.

The Task Force makes these recommendations understanding that this approach, while limited in its scope, represents a paradigm shift in the regulatory compact. Accordingly, this analysis and these suggestions are not made lightly. However, the Task Force is confident that Marylanders will continue to demand more resilient electric service, that innovation works best when competition is permitted, and that the appropriate structures and safeguards can be implemented to ensure that our utilities continue to thrive while also having the opportunity to benefit from these new product offerings.

Additionally, the Task Force believes that these recommendations, if implemented, will speed the adoption of public purpose microgrids in Maryland, thereby providing real world examples to better understand the operational and financial characteristics of third party ownership or service over electric distribution company assets. Further, it would allow all stakeholders to work together to explore seam issues between electric distribution company and third party operation in a more controlled environment. The Task Force believes that the knowledge and experience to be gained in understanding how third parties would manage these assets would be invaluable prior to any broader rollout. New business models could be explored, operational challenges identified and resolved, and potential innovation introduced in a way that might not be possible with a utility-owned public purpose microgrid.

SUMMARY OF KEY CONCLUSIONS AND RECOMMENDATIONS

TECHNICAL AND FINANCIAL

1. Public purpose microgrids have the potential to offer important societal benefits during periods when the macrogrid is down, while allowing for the economic and innovative integration of distributed generation and energy storage systems during normal operations (page7).
2. Electric distribution companies should incorporate public purpose microgrids, with accompanying distributed generation and energy storage systems, into their existing grid upgrade planning processes. Local governments and emergency planners should coordinate with public purpose microgrid operators to determine how such systems will be utilized during emergencies (page 21).
3. The State should develop incentives that support the deployment of public purpose microgrids, advanced controls, and energy storage systems as part of a new Grid Transformation Program (page 21).
4. The State's microgrid deployment efforts must utilize existing EmPOWER Maryland energy efficiency incentives as a means to reduce the distributed generation required to meet local load (page 24).
5. The continued deployment of distributed generation will have significant impacts on the grid. The State should analyze and reform the current energy paradigm to allow for the successful integration of microgrids and distributed generation while maximizing social benefits (page 17).
6. The Maryland Energy Administration, in consultation with the Public Service Commission, should conduct the following three studies:
    a. A review of interconnection procedures for distributed generation and microgrids, with the goal of ensuring safe interconnection with the macrogrid while enabling island and smart control technologies, reducing soft costs, and expediting adoption (page 17);
    b. A tariff study examining a methodology to value distributed generation and microgrids to the macrogrid and society (page 18); and
    c. A plan outlining an appropriate process for electric distribution companies to provide project developers with information identifying the most valuable locations for distributed generation and public purpose microgrid deployment (page 19).

SUMMARY OF KEY CONCLUSIONS AND RECOMMENDATIONS

LEGAL AND REGULATORY

1. *Short Term*: Utility-Owned, Multiple Customer Public Purpose Microgrids Across Multiple Properties
    a. It is in the policy interest of the State to pursue utility-owned public purpose microgrids that serve multiple customers over multiple properties. The State should focus on the deployment of these microgrids in the short term (page 26).
    b. Current law authorizes the PSC to require or allow electric distribution companies to construct, own, and operate microgrids subject to appropriate cost recovery (page 29).
    c. Under current Maryland law:
        i. The Public Service Commission is authorized to require to allow electric distribution companies to construct and operate distributed generation facilities to meet long-term, anticipated demand in the State for electricity supply (page 30);
        ii. Electric distribution companies can own and operate energy storage systems (page 32);
        iii. Electric distribution companies are not prohibited from selling services from distributed generation facilities and energy storage systems into PJM wholesale markets (page 32);
        iv. After Public Service Commission approval, electric distribution companies can sell services from distributed generation facilities and energy storage systems to microgrid retail customers (page 34);
        v. After Public Service Commission approval, electric distribution companies can assess a "Microgrid Service Charge" through a PSC-approved rider on microgrid customers (page 34); and
        vi. Electric distribution companies can make a legitimate argument to include a portion of public purpose microgrid costs in the rate base (page 35).
    d. Electric distribution companies should facilitate the deployment of public purpose microgrids by filing applications for project preapproval with the Public Service Commission (page 36).
2. *Long Term*: Third Party-Owned, Multiple Customer Public Purpose Microgrids Across Multiple Properties

SUMMARY OF KEY CONCLUSIONS AND RECOMMENDATIONS

a. If done through an appropriate legal framework, authorizing competition for the provision of public purpose microgrid services to multiple customers across multiple properties has the potential to enhance grid resiliency and spur innovation. The State should take a long run approach to the authorization of these systems, with broad public debate (page 27).
b. Third party owned and operated microgrids are not feasible under current Maryland law (page 43).
c. *New Asset Microgrids ("NAMs")* – Public Purpose Microgrids Utilizing New, Non-Utility Distribution Assets.
    i. In order to allow for increased resiliency and enhanced economic opportunities, the State may consider authorizing public purpose NAMs that utilize entirely new, non-electric distribution company distribution assets (page 51).
    ii. The Task Force believes the following sample legal framework is an appropriate starting point for future public discussion and debate:
        1. The Public Service Commission should have authority to grant limited authorization to NAMs to serve specific customers in predefined boundaries within existing EDC franchise areas (page 45).
        2. The Public Service Commission should be authorized to establish a NAM tariff that incorporates the value of the EDC distribution grid, while creating a process to factor in the value a NAM may provide to the electric distribution company's distribution system (page 51).
        3. All NAMs should satisfy a statutory definition of "public purpose microgrid" that includes a requirement to serve critical community assets, the ability to island, and a cap on maximum load served (page 52).
        4. NAMs with small loads should be exempt from Public Service Commission rate regulation, regardless of system ownership or control (page 52).
        5. All NAMs up to the maximum load cap that are owned by the State or local governments should be exempt from Public Service Commission rate regulation (page 53).

6. All other NAMs above the small load exemption and up to the maximum load cap should only be exempt from Public Service Commission rate regulation upon a determination by the Public Service Commission prior to project construction that the NAM does not present a substantial likelihood of operating against the interests of any particular customer class (page 53).
7. Customers of all NAMs, as well as the Office of People's Counsel, on behalf of such customers, should have the right to petition the Public Service Commission to investigate whether a NAM is operating in the interest of its customers (page 55).

d. *Local Microgrid Operators ("LMOs")* – Microgrids Operated by Third Parties Utilizing Existing Electric Distribution Company Distribution Assets.
   i. Recognizing the majority of potential microgrid customers are served by existing electric distribution company assets, the State may consider authorizing LMOs that provide microgrid services on top of – and not in place of – existing electric distribution company assets (page 56).
   ii. The Task Force believes the following sample legal framework is an appropriate starting point for future public discussion and debate:
      1. Under this model, a LMO would not own distribution assets (i.e., the wires) and the electric distribution company would remain eligible to recover all applicable costs from ratepayers who are also served by the LMO (page 56).
      2. LMOs should be authorized to own and/or contract for generation, storage, and control systems, and could operate as the electricity supplier for microgrid customers (page 56).
      3. LMOs should have the ability to assess a Microgrid Service Charge from microgrid customers through existing utility billing systems, similar to competitive suppliers (page 57).
      4. LMO developers should be required to seek project approval from the Public Service Commission through a mechanism similar to the existing Certificate of Public Convenience and Necessity process (page 58).
      5. LMOs should meet licensing and consumer protection requirements similar to those applicable to competitive electricity suppliers (page 59).

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INTRODUCTION

Recognizing the value that microgrids can offer to energy surety and resilience, on February 25, 2014, Governor Martin O'Malley directed his Energy Advisor to lead a Resiliency Through Microgrids Task Force ("Task Force") to study the statutory, regulatory, financial, and technical barriers to the deployment of microgrids in Maryland. The Governor's charge required the Task Force to develop a "roadmap for action" to pave the way for private sector deployment of microgrids across the State.

In response to this direction, the Task Force, comprised of representatives from the Maryland Energy Administration, the Power Plant Research Program, and the Maryland Emergency Management Agency, held four roundtable discussions over a two month period. The Task Force engaged experts from across the country to participate in the discussions and provide their input for this report. Experts included representatives from sister states, project developers, utilities, and non-profit think tanks, as well as ratepayer advocates, regulatory lawyers, and university and law school professors. While the Task Force considered all input, this report is the product and opinion solely of the Task Force members.

A critical first step was defining the scope of the Task Force's effort, as opinions vary about the attributes of a microgrid. For purposes of this report, a "microgrid" is a collection of interconnected loads, generation assets, and advanced control equipment, installed across a defined geographic area, that is capable of disconnecting from the macrogrid (the utility scale electric distribution system) and operating independently. Utilizing this definition, microgrids can be deployed in a variety of different settings, each of which implicates different challenges. Campus-style microgrids, i.e., those that serve single customers on single parcels of property, are feasible today in Maryland and have, in fact, been in operation for several years on military installations, universities, and other private and federal facilities. Significant opportunities remain for additional improvements in both the economics and the technology associated with these types of projects. However, recognizing that the microgrid marketplace is moving towards different models, the Task Force narrowed its focus to "public purpose microgrids." Such microgrids serve *critical community assets* across multiple properties. Critical community assets include resources that provide important community functions, such as community centers, commercial hubs, and emergency service complexes. A public purpose microgrid may be owned in whole or in part by either an electric distribution company or a third party entity, and must provide services to multiple customers.

As these public purpose microgrids go beyond single customers and single parcels of property, they face significant legal and regulatory uncertainty. The Task Force believes the State can address these barriers. Doing so will enable greater energy resiliency and security for Maryland citizens and business, and will encourage market innovation and competition for the relevant services and products required to create these types of microgrids. Further, focusing on the complex issue of public purpose microgrids enables the State to identify key barriers and opportunities that are applicable to all styles of microgrids.

This report is organized into two sections. The first section, entitled "Resiliency and Microgrids in Maryland," provides an introduction to the concept of a microgrid, as well as the specialized public purpose microgrids addressed in this report. This section discusses the benefits of microgrids from an economic and technical standpoint, and makes recommendations concerning incentives available from the State and EmPOWER Maryland energy efficiency programs. It also makes recommendations concerning interconnection procedures and distributed energy valuation. The second section, entitled "Legal and Regulatory Framework," analyzes the ownership of public purpose microgrids by electric distribution companies ("EDCs") from a legal perspective, before outlining a sample regulatory framework for public purpose microgrids owned and/or operated by entities other than EDCs.[1] Recommendations are incorporated into the body of this document. For a summary of all recommendations, please see the "Summary of Key Conclusions and Recommendations" section in the prefix to this report.

[1] This report uses the term "electric distribution company" or "EDC" to refer to entities that provide retail electric service to multiple customers across multiple properties. This definition is distinguishable from the term "electric company" as it is defined Md. Public Utilities Article § 1-101(h). The statutory definition of "electric company" applies to all entities that transmit or distribute electric service to retail customers, but also provides detailed exemptions for certain cases of on-site generation. This report references the term "electric company" in instances where that statutory definition is relevant to the analysis of the Task Force.

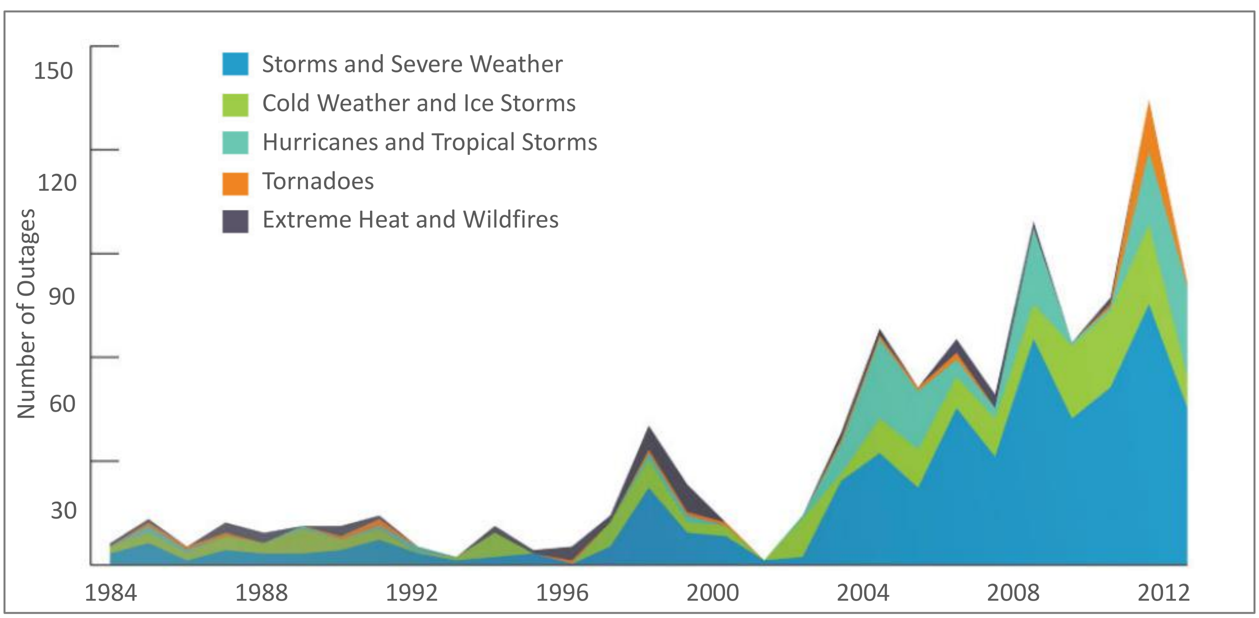
Resiliency and Microgrids in Maryland

AN INTRODUCTION TO PUBLIC PURPOSE MICROGRIDS

1. Have major weather events increased in frequency, severity, and economic impact? Is this why there a focus on improving the resiliency of Maryland's electric distribution system and ensuring long term energy supply to Maryland's citizens?

Major weather events are becoming more common and are increasing in severity. Data from the National Oceanic and Atmospheric Administration ("NOAA") shows that severe weather events that can damage the electric system are on the rise. Between 1975 and 1994, the Atlantic produced an average of 5.3 named storms per year, while 1995 to 2012 saw the average number of named storms increase 67% to 8.9 storms per year. Even more telling, the average annual number of events considered the most extreme, classified as "Severe Hurricanes," has more than doubled in the same time, jumping from an average of 1.6 major events per year to 3.9 events. Hurricanes and other severe events pose the most significant threats to our energy system and present the most significant challenges to grid operators. As shown below, Climate Central, a nonprofit organization focusing on the impacts of climate change, has charted a tenfold increase in power outages related to extreme weather affecting more than 50,000 customers from the mid-1980s to 2012.

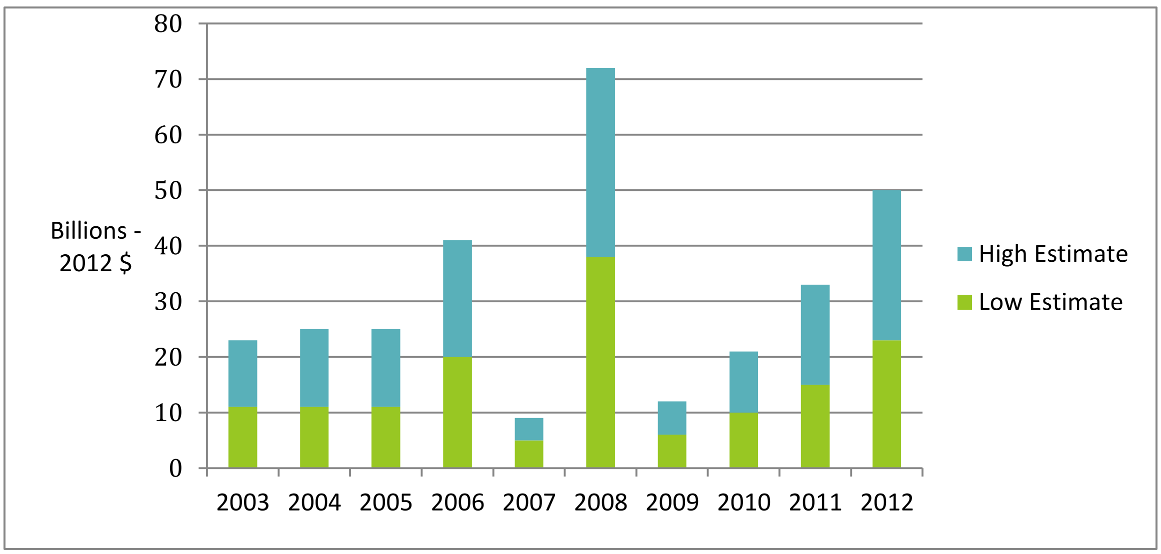
Outages of More than 50,000 Customers Caused by Extreme Weather



RESILIENCY AND MICROGRIDS IN MARYLAND

The economic impact of severe weather events continues to grow with their increased frequency and scale, as well as society's significant – and growing – reliance on electricity. According to the President's Council of Economic Advisers and the United States Department of Energy, severe weather-related electricity outages cost the US economy over $336 billion dollars between 2003 and 2012. Most businesses are not able to operate without reliable electricity, and their lost time and sales comprise a significant portion of these monetary losses. Medium to large scale commercial and industrial customers incur an average cost of $21,312 from a one-hour interruption on a summer weekday and $98,278 per hour from outages lasting eight hours.[2]

Estimated Cost of US Weather Related Outages (Billions – 2012 $)



This increasingly severe weather, combined with our growing dependence on electricity to fuel our economy, has renewed focus on the need to ensure a reliable and resilient electric distribution system. Additionally, as the economy recovers and population grows, the demand for electricity increases as well. Current forecasts show increases in peak demand even after incorporating policies such as EmPOWER Maryland and implementing stricter building codes. While the State continues to advance and enhance its existing policies, rising electricity

[2] Sullivan et. al. "Estimated Value of Service reliability for Electric Utility Customers in the United States" Ernest Orlando Lawrence Berkeley National Laboratory, Table ES-3, June 2009, available at http://certs.lbl.gov/pdf/lbnl-2132e.pdf.

demand will need to be met through a variety of means in the future to ensure the continued reliability of the electric system.

2. What has Maryland done to date to improve the resiliency of its electric distribution system?

Maryland has taken significant actions in recent years to increase the resiliency of its electric distribution system in the face of major storms. Reducing the barriers to microgrid deployment is a rational and positive next step in this process.

Maryland began taking these actions after a series of extreme weather events battered the State in 2010 and early 2011. During the 2011 Maryland General Assembly Session, the General Assembly passed legislation, co-sponsored by Governor O'Malley, requiring the Maryland Public Service Commission ("PSC") to adopt stricter regulations regarding EDC performance by July 1, 2012. As a result of this legislation, the PSC adopted regulations through a proceeding – deemed Rule Making 43 ("RM43") – that established minimum service quality and reliability standards for Maryland's electric companies.[3]

The RM43 regulations set minimum reliability metrics for each EDC based on past performance, established a mandatory annual performance reporting system, set up a customer communication survey, and mandated vegetation management and periodic inspections. In addition, the RM43 regulations required utilities to submit major outage event reports within three weeks of major outages, as well as restoration plans detailing their responses to each major event. The PSC retains the right to enact civil penalties and disallow cost recovery should a EDC fail to comply with the regulations.

Before these regulations had time to make a significant impact, however, Maryland experienced the June 2012 Derecho: the fastest moving and most severe thunderstorm on record in Maryland. In the midst of intense summer heat and humidity – and over a holiday weekend – over a million electric customers in Maryland were without electric service for up

[3] The revisions to COMAR pertaining to RM43 may be found online here: http://webapp.psc.State.md.us/intranet/AdminDocket/CaseAction_new.cfm?CaseNumber=RM43

to a week.[4] Estimated economic damages totaled nearly $593.5 million for Maryland ratepayers across all utilities.[5]

Soon after this disruptive event, Governor O'Malley signed an Executive Order directing his Energy Advisor, in consultation with identified agencies, to solicit input and recommendations from experts on how to improve the resiliency and reliability of the Maryland electric distribution system. After an extensive 60-day stakeholder process, the Grid Resiliency Task Force ("GRTF") issued *Weathering the Storm: Report of the Grid Resiliency Task Force* on September 24, 2012.

The GRTF considered technological solutions, infrastructure investments, regulatory reforms, and process improvements, and remained always cognizant of and focused on cost. It sought information on how much it would cost to make Maryland's system more resilient and insight on how to most appropriately allocate these costs. The report's most significant recommendations included:

- Strengthening Maryland's RM43 EDC reliability requirements to address major storms and provide simplified major outage reports to the public.
- Accelerating RM43's four years' worth of reliability improvements into two years.
- Facilitating information sharing between State emergency officials and utilities, and increasing citizen participation in a State-wide list of special needs customers.
- Tracker cost recovery for investments that are accelerated and incremental to those mandated under existing requirements.
- Development of performance based ratemaking standards that align EDC profits with resilient and reliable service, as well as other policy goals.

Additionally, the GRTF explained that "[m]icrogrids are a welcome and appropriate solution for customers whose need for consistent and reliable electricity is paramount."[6] However, the Task Force noted that regulatory barriers complicate and even prohibit the deployment of such microgrids in many instances.[7]

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[4] Pepco defends its response to Derecho storm, Washington Post (July 30, 2012), available at http://articles.washingtonpost.com/2012-07-30/local/35487619_1_pepco-derecho-storm-outages

[5] "Weathering the Storm: Report of the Grid Resiliency Task Force" (September 2012).

[6] *Id.* at 52.

[7] *Id.*

RESILIENCY AND MICROGRIDS IN MARYLAND

As the GRTF finalized its report, the PSC commenced a simultaneous proceeding to examine the response of Maryland's electric distribution companies ("EDCs") to the Derecho. On February 27, 2013, the PSC issued an order which adopted numerous recommendations of the Task Force. Among other improvements, the order required the utilities to file both short term and long term plans to increase the resiliency of their systems to major storms. Importantly, the PSC found that long term plans should include "[g]eneration solutions that might be applied to distribution, *e.g.*, microgrids with generators."[8]

3. What are microgrids and what benefits do they offer in the face of severe weather events and demand for long term, anticipated electricity supply?

A "microgrid" is a collection of interconnected loads, generation assets, and advanced control equipment, installed across a defined geographic area, that is capable of disconnecting from the macrogrid (the utility scale electric distribution system) and operating independently. A microgrid operates within a clearly defined electrical boundary that can act as a single controllable entity with respect to the grid and can connect and disconnect from the grid to enable it to operate in both grid-connected or island mode.[9] A microgrid should combine clean and/or renewable distributed generation with advanced control and communication technologies. This enables microgrids to satisfy anticipated demand for electricity supply in Maryland, while enabling portions of the electric grid to remain online even if the wider grid, or macrogrid, is down.

Distributed generation systems are key components of microgrids. Distributed generation systems are a range of small- to medium-scale and modular devices designed to provide electricity, and sometimes thermal energy, in locations close to consumers. They include fossil and renewable technologies and combined heat and power ("CHP") systems. These systems are smaller than utility-scale generating assets and are located closer to the loads that they serve. Due to this proximity, this structure reduces line losses associated with transmitting electricity over long distances and minimizes the chance of an outage due to failures in the distribution grid.

A "campus-style" microgrid serves a single customer on a single parcel of property. Campus-style microgrids exist at various locations in Maryland today and are demonstrably feasible

[8] PSC Order 85385, Case 9298, 19 (2013).

[9] http://energy.gov/sites/prod/files/EAC%20Presentation%20%20OE%20Microgrid%20R%26D%20Initiative%202011%20-%20Smith.pdf

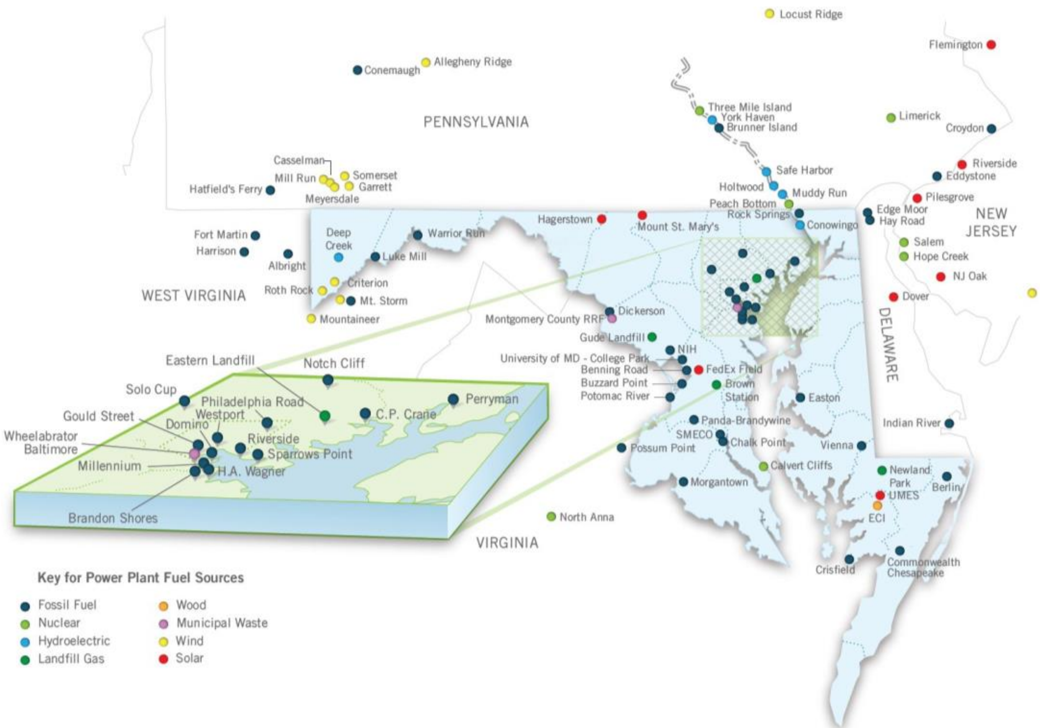
from a technical and legal standpoint, though opportunities for improvement certainly exist. This report, however, focuses on microgrids that go beyond single customers and single parcels of property. It also addresses an added complexity: the difference between public purpose microgrids operated by existing utilities and those operated by third parties.

Microgrids can reduce the frequency of outages by locating electricity generation closer to where it is ultimately consumed. Instead of transporting electricity long distances from centralized power plants to population centers, microgrids allow communities to leverage local, distributed generation. While microgrids can remain connected to the macrogrid during blue sky days – helping to meet long term, anticipated demand for electricity supply in Maryland – they also have the ability to disconnect from the macrogrid when necessary to continue operations. With generation located close to where it is consumed, and integrated with existing systems through smart control technologies that allow for islanding, it becomes less likely that severe weather will disrupt power lines before they can carry electricity to consumers.

4. But why are we focusing on microgrids right now? Haven't they have been around for a long time?

Microgrids predate the current national electric grid and have existed in some form or another since the 1880's. In fact, the Edison Illuminating Company pioneered the first microgrid in Manhattan by installing the very first commercial power-plant and electric distribution system. The system illuminated 59 homes with Edison Bulbs and the necessary local electric distribution infrastructure: wires, controls, voltage regulators, and fixtures. However, as electric transmission capabilities improved and society became increasingly concerned about the environmental and health impacts of industrialization, power generation began to move further away from the cities where the electric load existed. At the same time, states began to grant utilities exclusive franchises in specific service areas, preventing microgrid service providers from operating in areas served by existing utilities.

Power Plants In and Around Maryland



In recent years, microgrids have enjoyed a resurgence as certain entities began to place an emphasis on continuous or near-continuous power supply that proved difficult to achieve solely with the traditional centralized generation/distribution network structure. The need for electric reliability drove owners of buildings and campuses that required uninterruptable power to invest in generators and CHP systems. Furthermore, the increasing commercial viability of clean, distributed generation made it possible to place generation close to load without significant environmental and health concerns. Wholesale solar photovoltaic ("PV") panels today cost less than one third of what they did in 2008, while wholesale natural gas prices are below $5/MMBtu compared to their 2008 peak above $13/MMBtu.

Additionally, today's microgrids have an important component differentiating them from earlier microgrids: a "brain." The modern microgrid has the ability to communicate with grid operators and react to signals from the electricity marketplace. This "intelligence" allows microgrids to provide energy services to the larger distribution system by connecting or disconnecting from the macrogrid, and also enables the microgrid to sell energy into the grid in order to meet long term, anticipated demand in the State for electricity supply. Microgrids enable many stakeholders to benefit from reliable distributed generation and allow system owners to productively interact with the macrogrid and wider electricity markets.

These changes in economics and technology create new opportunities for businesses, residents, and governments to invest in their own energy future – so long as our policy goals and legal and regulatory structures are aligned for these opportunities to flourish.

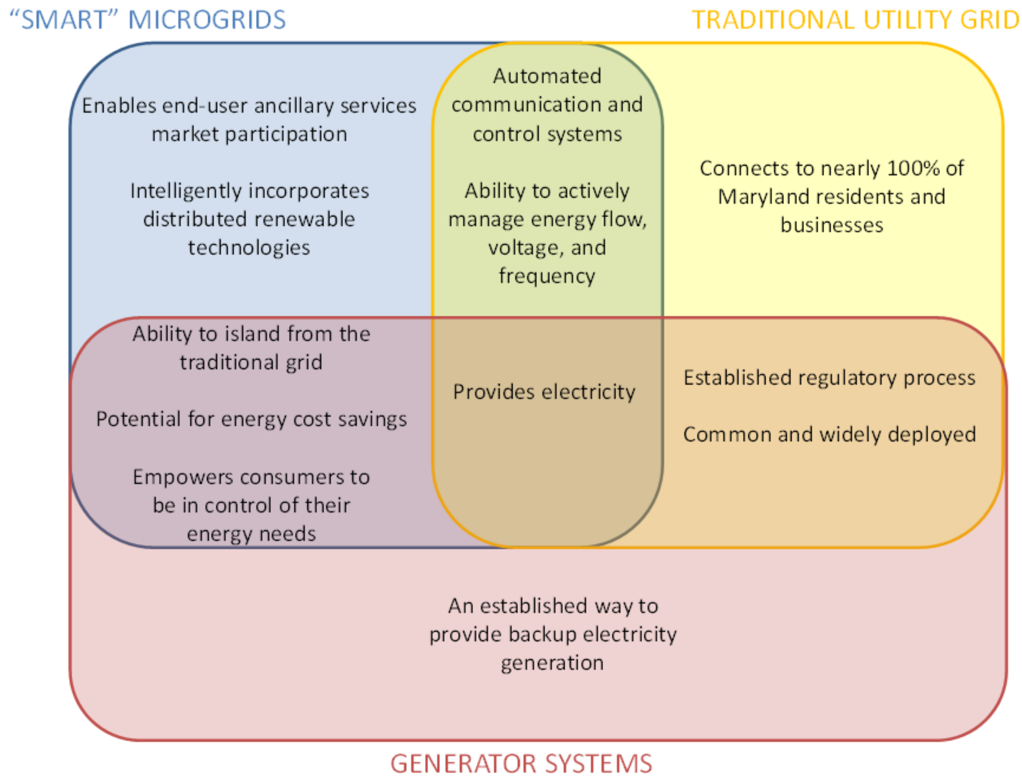
5. What makes a microgrid “smart”?

“Smart” microgrids are primarily distinguished by sensors, switches, computer algorithms, and other system components that help the system automatically disconnect from or connect to the macrogrid and sell energy to the macrogrid when it is economic to do so. Communications and control technology can evaluate the optimal combination of islanding, buying, and/or selling energy to the grid to maximize value to retail microgrid and macrogrid customers.

Today’s “smart” microgrids can incorporate various types of distributed generation systems like PV and CHP along with energy storage systems to provide additional power and energy services to the microgrid. These systems are a valuable a tool to manage peak demand, which in turn improves the quality of power, can reduce the need for costly upgrades to distribution lines, and could lower cost to all ratepayers.

Conversely, while traditional, non-smart microgrids were sometimes able to “island”, or disconnect from the EDC distribution grid at times of instability to supply their own electricity, they were markedly less sophisticated. Traditional microgrids were unable to interact and communicate with the macrogrid in a manner that also allowed for economic islanding.

Comparing "Smart" Microgrids to Generator Systems and the Traditional Utility Grid



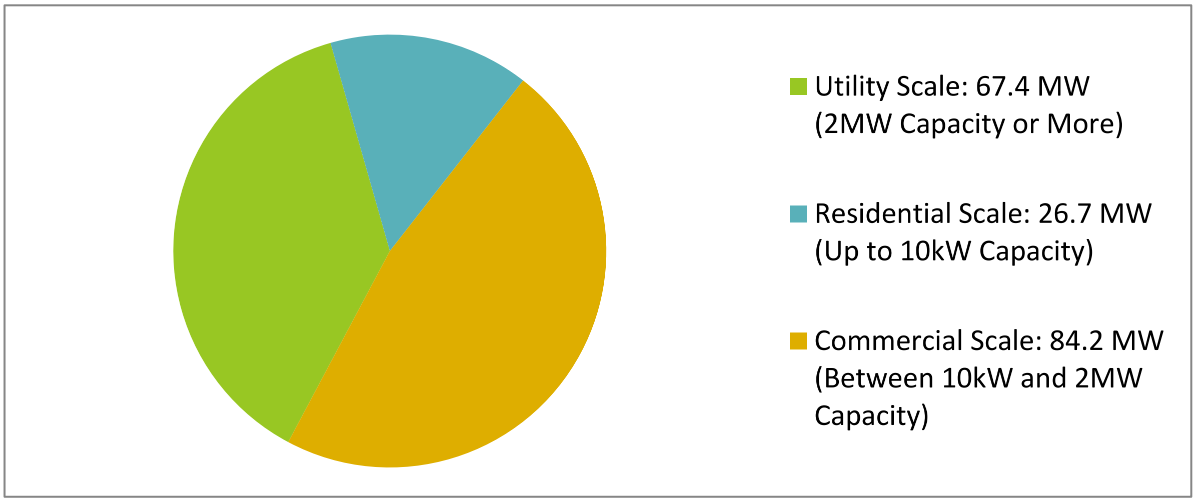
6. What is the growth trajectory for distributed generation in Maryland and why is that relevant to microgrid deployment in Maryland?

As mentioned above, distributed generation is a critical component of any microgrid. The distributed generation marketplace is expected to grow exponentially, both nationally and in Maryland, as innovation and market forces continue to drive down prices. For example, solar PV module prices have declined 99% since 1976 and 80% since 2008.[10] As recently as 2007, Maryland had deployed less than 0.1 megawatt of solar capacity. Today, more than 178 megawatts of solar PV generating capacity is deployed throughout the State, 61% of which is comprised of distributed commercial or residential scale systems. Similarly, CHP systems

[10] Bloomberg New Energy Finance, Sustainable Energy in America 2014 Factbook, 3, *available at* http://bnef.com/InsightDownload/9271/pdf/.

currently comprise 8% of the United States' generating capacity, with 870 megawatts of capacity installed in 2012 alone.[11]

Installed Solar Capacity in Maryland (May 2014)



While just 1% of domestic energy sales currently come from solar PV, Bloomberg New Energy Finance defines the market potential as "gigantic."[12] Market trends like cost decreases in generation technology, accompanied by policies designed to deploy renewable energy, are expected to significantly increase adoption. In a recent survey of electric utility executives, more than half of respondents stated they believe that distributed generation will grow from current levels.[13] Confirming this perception, the Energy Information Administration projects that growth of distributed generation in the commercial sector alone will account for more than 18 GW of capacity between 2011 and 2040.[14] 10 GW of this growth is expected to come from solar PV. This represents a transformational shift in the way that energy is generated, delivered, and used. These trends are expected to continue with federal regulation of CO_2 emissions under Sections 111(b) and (d) of the Clean Air Act.

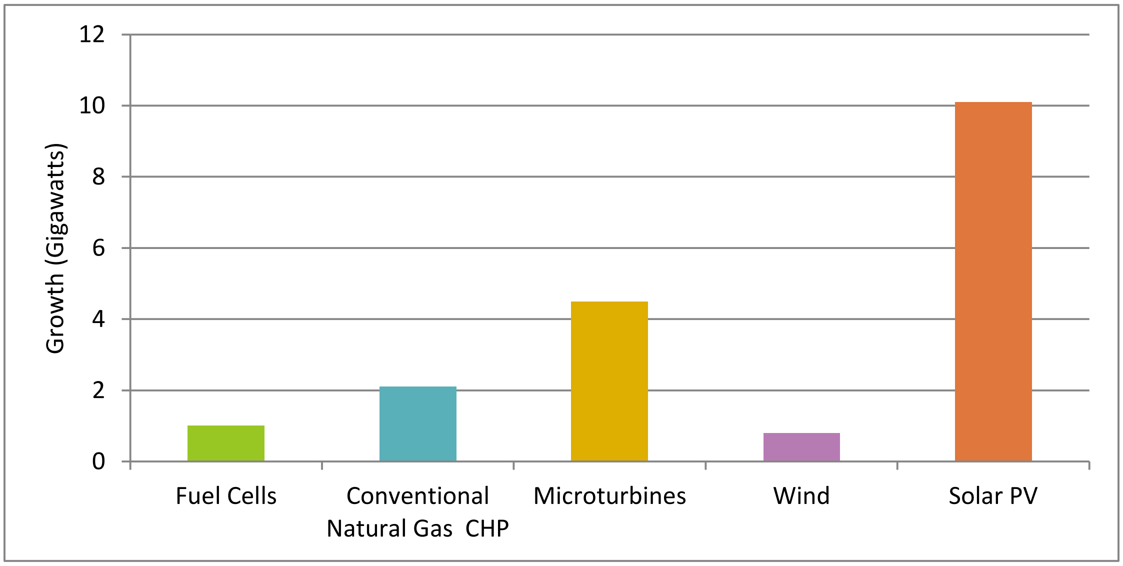
[11] *Id.* at 4.

[12] *Id.*

[13] Black and Veatch, 2014 Utility Automation & Integration Report, *available at* http://bv.com/reports/2013-electric-utility-report/power-generation/renewable-energy/distributed-generation.

[14] Energy Information Administration, Market Trends: Commercial Section Deployment, *available at* http://www.eia.gov/forecasts/aeo/MT_commercialdemand.cfm

Commercial Sector Additions to Distributed Generation Capacity (2011 – 2040)



Source: http://www.eia.gov/forecasts/aeo/MT_commercialdemand.cfm

The decreasing cost of distributed generation has the potential to lead to widespread microgrid deployment in Maryland, so long as the State's policy goals and regulatory structures are aligned to enable a broader rollout. The Task Force anticipates that microgrids will become an important tool to allow such generation to intelligently meet demand for electricity in Maryland, while providing important islanding capabilities in the face of severe weather and/or market signals. Looking to these trends, Navigant Research projects that revenue from the deployment of microgrids will increase approximately $40 billion annually by 2020 under average conditions.[15]

7. In addition to meeting demand for electricity supply in Maryland, what are the additional technical benefits of microgrids?

Despite the increasing adoption of distributed generation systems like solar PV and CHP, these installations are, in many instances, unable to provide backup power services when the macrogrid is non-operational. This is largely due to safety concerns; charged wires can pose a safety threat to emergency response personnel, and the standard practice of PV system installation requires the panels automatically disconnect when the macrogrid experiences a

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[15] Navigant Research, Market Data: Microgrids, *available at* http://www.navigantresearch.com/research/market-data-microgrids.

power outage. As a result, the presence of a distributed generation system does not inherently enable a user to island and continue using the energy generated by the system. Therefore, creating a smart microgrid as described above, rather than simply installing a distributed generation system, offers greater benefits in terms of ensuring energy demand, increasing energy resiliency, and accruing grid benefits.

In addition to the obvious benefits that microgrids can provide to those connected to them when islanded, microgrids can provide benefits to the macrogrid when the macrogrid is operational. Microgrids can help balance the larger electricity grid and provide demand response services into PJM, the regional electricity market in which Maryland participates. When demand is high, PJM can send a signal to the microgrid, requesting that the distributed generation serving the microgrid make its power available to the macrogrid through the energy markets. This helps maintain system stability as well as to lower electricity prices in the market.

Battery systems and some CHP technologies are able to quickly increase, decrease, stop, and start energy flow to fill demand as needed by the macrogrid. This capability allows distributed generation to serve peak demand at the installation site as well as help counter unexpected fluctuations in aggregate supply and demand on the larger bulk power grid. Large distributed generators can also participate in the PJM energy markets and be called on to feed electricity into the grid when it is economic to do so. Certain types of distributed generation resources may be able to compete economically with conventional centralized peak generation assets to offer more affordable and reliable electricity during peak times.

Similarly, in times of extremely high demand, PJM can call upon the microgrid for additional demand response services, which could further reduce load on the macrogrid. In those cases, the microgrid would go into island mode, creating the electricity it needs for its own use with its distributed generation, removing its demand from the macrogrid, and exporting any excess generation to help maintain grid stability.

Microgrids can also provide direct benefits to EDC distribution systems. By placing generation close to load, microgrids allow EDCs to defer or avoid distribution system upgrades, which thereby reduces the strain on the system during times of peak demand. It is important to note that it will be critical for microgrids to meet rigorous performance standards during development to ensure that they can be relied upon over decades of service.

Finally, microgrids can help mitigate line losses that occur when transporting electricity from centralized power plants to load. The electrical resistance of transmission and distribution lines that deliver our power results in some energy being "lost" to heat. Line losses increase as demand on the system approaches the limits of the distribution lines. At peak times, line losses are approximately 50% higher than the overall average value, and can approach 8-10% of the power sent through the lines.[16] A reduction of load through active microgrid management at times of peak demand will produce greater savings and enhance reliability more than a less timely decrease in demand. This results in lower line losses, higher system efficiency, and lower costs for all parties.

8. What is the difference between a microgrid and a *public purpose* microgrid?

The Task Force quickly ascertained that campus-style microgrids, as described above, already exist in several locations throughout Maryland. While there is always opportunity for greater efficiency and technical improvement in those applications, the Task Force chose to focus instead on solving for the technical, financial, statutory, and regulatory barriers to what it termed "public purpose microgrids." These types of microgrids go a step further than campus-style microgrids by serving *critical community assets* across multiple customers and multiple properties. Critical community assets include resources that provide important community functions, such as community centers, commercial hubs, and emergency service complexes. A public purpose microgrid may be owned in whole or in part by either an EDC or a third party entity, and must provide services to multiple customers.

For example, a public purpose microgrid may include a town center, commercial center, and emergency service complex. In this case, the system would provide multiple services to the public, improving the quality of life for a broad spectrum of citizens during an outage. By focusing on ways that Maryland can deploy public purpose microgrids across a variety of geographies and service territories, the State can promote the systems that provide the most public benefits to the most people. The recommendations contained in this report focus primarily on public purpose microgrids.

The Task Force anticipates that by focusing on this complex venue of microgrid deployment, it will, in effect, flesh out and solve many of the technical, financial, regulatory, and statutory barriers to simpler microgrid configurations.

[16] "Avoided Energy Costs in Maryland" Exeter Associates, April 2014.

9. What benefits do public purpose microgrids offer to Marylanders not connected to the microgrid?

Public purpose microgrids can benefit consumers that are not directly connected to the microgrid by enabling important community resources, such as grocery stores, gas stations and pharmacies, to stay up and running when the macrogrid is experiencing an outage. A customer who is not directly connected to a public purpose microgrid can still benefit from its existence by being able to purchase groceries, fuel, or supplies from the businesses and services that are able to stay open. Public purpose microgrids can also provide uninterrupted power to critical government facilities such as police and fire stations, first responder communications and command systems, and medical and hospital facilities. Public purpose microgrids can also provide non-critical "quality of life" services such as hosting charging stations for cell phones and other electronic devices that can make prolonged outages more manageable for citizens.

Furthermore, public purpose microgrids also benefit all consumers by helping the State meet long term, anticipated demand for electricity supply and by providing technical services to the macrogrid. These services, discussed later in this report, can benefit ratepayers through reduced costs and increased in-State generation capacity. The existence of these public benefits will likely be an important component of potential cost recovery.

10. What are some ways to make microgrid and distributed generation projects more cost effective? What role can the State of Maryland play to help bring down these costs?

Today, microgrids of any model are expensive undertakings that are likely cost prohibitive for most potential host sites. The exception is facilities such as military bases, hospitals and research facilities in which constant, reliable, and high quality power is so critical to the fundamental function of the institution that it has value in and of itself. For example, avoiding a devastating loss to the experiments and data that would occur from an outage at Federal Drug Administration's research facilities in White Oak, Maryland justified the incremental cost of a microgrid.

Many commercial businesses, local government entities, and citizens also value an uninterruptable power supply, but without a monetized value of reliability, the cost to attain that capability currently exceeds the market benefits it provides. In order to reduce the costs of public purpose microgrids and help create a distribution system that is more resilient, efficient, and sustainable, the Task Force recommends that Maryland pursue two related efforts. First, the State should seek to lower the cost of deploying public purpose microgrids by updating the interconnection process and examining the appropriate tariff structure. Second, the State, in collaboration with the utilities, should guide public purpose microgrid developers towards projects that can offer "stackable benefits." More specifics on each recommendation follow below.

11. What are the Task Force's recommendations to update interconnection standards and tariff designs to more readily accommodate public purpose microgrids, energy storage, and wide-scale deployment of distributed generation?

The State's interconnection and tariff standards must adapt to a new reality of wide-scale distributed generation deployment and microgrids as relevant technologies continue to decrease in price and Maryland encourages deployment through policy and incentives. PEPCO Holdings, Inc., a key participant at the Resiliency Through Microgrids Task Force meetings, noted this, expressing its support of microgrid deployment while cautioning that "increased adoption of microgrids and distributed generation resources require interconnection rules, communications technologies and standards, advanced distribution and reliability technologies, integration with macrogrid planning, and enabling policies and regulations."[17]

To unlock the full potential of distributed generation, bring down soft-costs related to interconnection, and safely integrate public purpose microgrids into the macrogrid, the Task Force recommends that MEA, in consultation with the PSC, conduct the following detailed analyses, which will inform the changes necessary:

- *A review of next-generation interconnection procedures for distributed generation systems and energy storage systems, with a view towards a microgrid-based, high penetration distributed generation future* – Maryland engaged in a comprehensive review of interconnection procedures for systems of 10 MW and less with the passage of SB 595 in 2007. While this study resulted in new rules in 2008 that standardized some interconnection processes, Maryland currently does not have standardized interconnection procedures for energy storage systems and microgrids, and the current IEEE 1547 standards do not encourage, or even allow, smart inverter deployment and islandable distributed energy systems.[18] Accordingly, this review should investigate islanding standards and mandatory procedures related to interconnection of high penetration renewables and energy storage systems on the

[17] PHI Written Submission to Resiliency Through Microgrids Task Force.

[18] Maryland's current small generator interconnection standards can be found at COMAR 20.50.09.01, *et seq*.

distribution network, with a focus on smart inverters, advanced communications technologies, and islanding capabilities. The process will lead to specific recommendations for submission to the PSC related to interconnection standards necessary in an era of microgrids, energy storage, and wide-scale distributed generation deployment.

- *A tariff study examining how to value distributed generation systems and microgrids to the macrogrid and society* – This analysis should investigate how to determine the value of distributed generation systems and public purpose microgrids to the macrogrid and society, as well as the costs imposed on the macrogrid by such systems. This analysis should also investigate how to allow customer-generators to intelligently choose between self-consumption and sales to the grid. This will allow the State to better value distributed energy resources and assess the value microgrids provide to the wider distribution system. This could also serve as a starting point for the PSC to develop a tariff for microgrids, as discussed in the legal and regulatory section below. Ideally, tariffs will value system output utilizing smart inverter and other communications technology adopted in accordance with the interconnection study.

12. What are the Task Force's recommendations related to siting public purpose microgrids and distributed generation?

As discussed above, microgrids in any context are frequently not cost-effective for average customers, who nonetheless value reliable energy. One way to reduce the cost of the microgrid is by increasing the ways in which the services that the microgrid provides can be monetized. Specifically, overall cost can be driven down by maximizing stackable benefits, i.e., utilizing the assets of a public purpose microgrid in as many markets as possible to maximize revenues that flow to a project. Current microgrid technology can be programmed to automatically manage generation, battery charge/discharge and connection to the macrogrid in a way that enables these projects to be paid for the services provided.

For example, imagine a public purpose microgrid owner that has invested in a hybrid system using both natural gas-fired combined heat and power ("CHP") and solar PV with battery storage. In the morning hours, the system could automatically call on the CHP to generate electricity for use within the microgrid, thereby reducing the total amount of energy it needs to purchase from the macrogrid, which reduces the total load on the grid. This helps to reduce congestion on the grid and prevents suppliers from having to purchase expensive power from peaker plants during winter mornings.

Throughout the day, the energy system controls charge the battery for use that evening during the second peak in demand, while also absorbing and pushing small amounts of energy at a time to the grid. The ability of the battery to respond quickly in this way allows it to identify and adjust when the voltage and frequency of the utility grid are out of balance. This frequency regulation and voltage support is very important to the resiliency of the grid, and again, PJM will compensate the public purpose microgrid owner for these ancillary services.

This system could be programmed to automatically perform all of these services and more, while still maintaining the ability to island from the grid during an unforeseen emergency. This project has "stacked" at least three key benefits or values for which it can be compensated by the market – demand response, ancillary services, and islanding capability – though other benefits also exist.[19] By stacking these benefits, the system owner will be able to reduce the costs of the project.

The challenging aspect of these stackable benefits, however, is that their value is highly location dependent: proper siting is important in order to maximize the value of these services to the market. Unfortunately, there currently is not a transparent process to identify specific locations where public purpose microgrids or distributed generation might produce the most value. Accordingly, the Task Force recommends the following:

- *A planning document outlining an appropriate process for EDCs to provide project developers with information identifying the most valuable locations for distributed generation and public purpose microgrid deployment* – This analysis should investigate ways for utilities to safely share information on the locations where distributed generation systems and public purpose microgrids would be most beneficial to the macrogrid. As a part of the PJM transmission planning process, developers can submit – and PJM can approve – transmission projects that achieve certain improvements in market efficiency that enable the grid as a whole to deliver power at lower cost, even if they are not technically needed for reliability purposes. Ideally, developers, utilities, and public officials would have access to public data at the *distribution* level that would help identify where distributed generation and public purpose microgrids can provide

[19] Some additional examples include grid hardening, line loss reduction, greenhouse gas emission reduction, voltage support, ramping, and deferral of distribution upgrades.

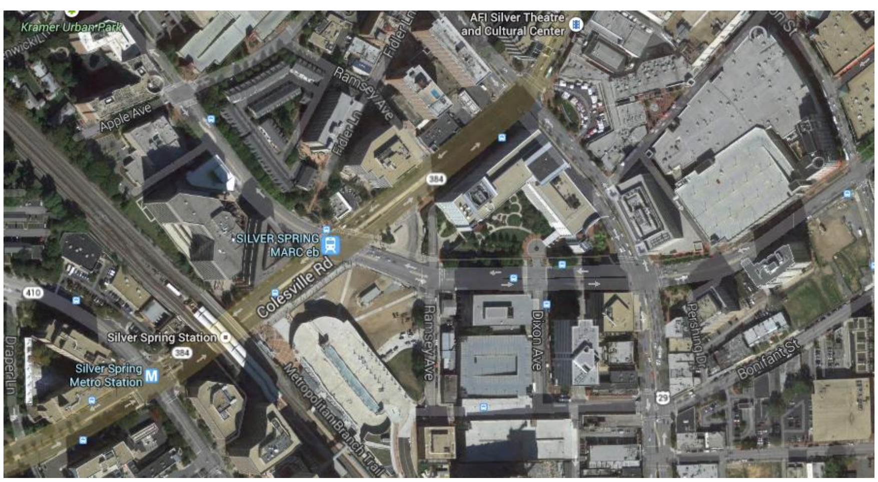
the most benefit in relieving congestion, deferring or avoiding distribution upgrades, mitigating line-losses, and providing other services. The raw data involved in this process, however, is sensitive and proprietary information. The PSC and MEA must coordinate with EDCs as a consequence to determine an appropriate process that accommodates the needs of all parties.

PLANNING FOR PUBLIC PURPOSE MICROGRIDS

1. Where can Maryland leverage public purpose microgrids for significant public benefits?

With the caveat that location matters to monetizing benefits, public purpose microgrids should be located in population centers where they are best able to serve the public in emergency situations. For illustrative purposes only, the Task Force examined the suitability of downtown Silver Spring, Maryland, for a public purpose microgrid. The ¼ mile area around the intersection of Colesville Road and Georgia Avenue in Silver Spring is a major center of commerce and a community hub, with a grocery store, transit center, government services center, and large commercial employer, among other important facilities.

Downtown Silver Spring



With today's technology, private developers and EDCs are technically capable of installing advanced control and communication technologies and distributed generation systems in a microgrid configuration to enable a location such as downtown Silver Spring to remain online when the rest of the grid is down. This would provide a place to gather during times of crisis and allow businesses that provide vital services to the public to remain open. By intelligently incorporating microgrid technologies into a comprehensive disaster response plan, the community would have a valuable asset to support its community resiliency. The regulatory and legal framework necessary to allow these types of systems to grow in number and size is explained in detail in the following sections.

2. How can EDCs, the State government, and local governments incorporate public purpose microgrids into their planning processes?

While representing a shift in the energy paradigm, public purpose microgrids also offer a transformative opportunity for emergency planning and recovery in our State. Accordingly, in order to realize maximum utility from a public purpose microgrid, local governments and emergency managers should work closely with microgrid operators, be they utilities or third party owners, to plan for the ways in which the microgrid will be utilized during an outage. Such planning must take place before an emergency arises.

Additionally, on the EDC level, the Task Force believes public purpose microgrid functionality should become an integral part of the distribution system planning processes. Specifically, the Task Force recommends that EDCs incorporate public purpose microgrids, with accompanying distributed generation and energy storage systems, into their existing distribution grid upgrade planning processes. This will require that the public purpose microgrids are able to meet sufficiently robust operational requirements to ensure that these distribution resources are available when called upon many years in the future. As public purpose microgrids become increasingly cost effective tools to provide grid resiliency and other benefits, the EDC planning process can serve as a conduit for broader deployment. MEA should continue to collaborate with the PSC and EDCs to achieve this objective.

FINANCIAL RECOMMENDATIONS

1. Should the State offer incentives for microgrid and advanced distributed generation technologies?

While MEA currently offers incentives for solar PV and other distributed generation technologies, there are no incentives that support the deployment of advanced control technologies, energy storage, and other infrastructure crucial to leveraging the advantages of microgrids.

Therefore, the Task Force recommends that the State of Maryland offer innovative incentives under a new initiative called the **Grid Transformation Program** ("GTP"). The Task Force recommends that the GTP focus funding on three primary areas. First, the GTP should provide competitive funding for discrete public purpose microgrid projects. Second, the GTP should offer non-competitive funding for advanced control systems. Third, the GTP should offer non-competitive funding for cost-effective energy storage technologies. These three focus points are discussed in more detail below. Additional responsibilities of the GTP are explained more fully in outline form in *Appendix A* to this report.

In terms of overall funding, the Task Force declines to offer a recommended amount, other than to suggest that in order to be impactful, the funding amount must be robust enough to allow for multiple projects. The Task Force notes, however, two efforts in Northeast states. Connecticut, a state with 3.6 million residents as compared to Maryland's 5.9 million residents, launched the nation's first microgrid program in 2013, offering grant funding of $18 million in the first year and $30 million in the second year. In the first year, nine microgrid projects are being funded. Applications are still being evaluated for the second year. Similarly, Massachusetts, a state with 6.6 million residents, recently announced $40 million in funding for resiliency projects, including microgrids.

a. Public Purpose Microgrid Grants (Competitive)

Maryland's public purpose microgrid grants should focus on achieving two goals. First, Maryland should focus on the development of geographically dispersed, dynamic, and resilient public purpose microgrid projects throughout the State. Working with government agencies responsible for emergency management, the State should disperse grant funding with an eye towards geographic diversity to ensure projects are developed that can serve the most Marylanders during emergencies. Second, Maryland's public purpose microgrid grants should assist projects that will serve as case studies for the coordination between regulators, policymakers, local governments, utilities, and other relevant entities in order to identify opportunities, barriers, and risks to the development of future public purpose microgrids and distributed energy systems. The State should select projects based on the level of innovation and diversity of technologies, services, and applications. Awardees will test the opportunities for and barriers to various types of projects, generation technologies, and financing mechanisms. These projects will serve as case studies, creating a replicable model for future deployment.

As a primary component of the GTP, the State of Maryland should issue a competitive Request for Proposals ("RFP") that offers financial incentives and technical/regulatory assistance for the development of public purpose microgrids. Taking a cue from the State of Connecticut's successful microgrid program, the incentives would be limited to the costs of design, engineering, and interconnection infrastructure rather than paying for the generation assets. This funding opportunity will seek to incent public purpose microgrids in geographic locations and system configurations that create the most public good for the largest number of Marylanders. In addition to grant funding, the State will provide technical assistance to developers to help address the legal, regulatory, and institutional barriers addressed in this report, paving the way for further public purpose microgrid deployment in Maryland.

b. Advanced Energy System Controls Grants (Non-Competitive)

An important component of the GTP is the inclusion of advanced control systems. Advanced control systems are an essential element of all types of microgrids. They allow distributed energy resources to provide energy services, such as frequency regulation, voltage support, and demand response, to the macrogrid while also providing an additional revenue stream for distributed generation projects and reducing integration costs to utilities.

One example of advanced energy system controls are smart inverters. Smart inverters provide some automated services to the distribution grid and can potentially communicate with grid operators to provide additional real-time energy services when the grid needs them most. In contrast, most inverters deployed today for solar PV systems are either not able or not enabled to receive signals and instructions from grid operators.

To encourage the use of smart inverters and other advanced control and communication technology, MEA should offer incentives to cover the additional cost of upgrading to smart inverters and other advanced system controls. This could be most effective as a cash grant for residential and commercial systems to cover part or all of the cost difference between advanced technology and the alternative legacy technology that may need to be replaced in the future.

c. Energy Storage Grants (Non-Competitive)

As intermittent energy generators such as solar PV increase their penetration in small geographic areas, the challenges of managing the minute-by-minute fluctuations of energy supply on the distribution system increase. Today's relatively low penetration of solar PV is accommodated by distribution hardware without much impact on voltage levels or power quality. However, as distributed renewable energy deployment increases and certain geographic areas become more saturated, the issue becomes considerably more difficult to manage without additional technology or upgrades.

In addition to smart inverters, battery storage can help solve these issues, offering a suite of benefits to the renewable energy system's owner and the grid as a whole. Even relatively small energy storage systems can provide resiliency and grid system benefits that make projects more economical and improve power quality to the entire electric grid. Batteries are also a "quick dispatch" resource that can push or pull power to or from the grid very quickly when compared to traditional power plants. This attribute makes distributed energy storage very attractive to grid operators, energy developers, and system hosts alike: grid operators are given another tool to keep the lights on, developers can offer customers a better product, and Maryland's businesses and homeowners can potentially island from the grid during outages. Further, this enables more of the "stackable" benefits discussed above.

Accordingly, the MEA should offer grants to encourage the inclusion of energy storage in renewable energy projects that rely on intermittent technologies, especially solar PV. These grants should help buy down the up-front cost of storage and drive system developers towards practices that will make the system more economical and resilient.

2. How can public purpose microgrid deployment efforts incorporate EmPOWER Maryland energy efficiency incentives?

Energy efficiency and conservation are the lowest-cost resources for meeting demand anywhere, including within a microgrid. Accordingly, the Task Force concludes that energy efficiency upgrades as promoted through existing EmPOWER incentives must be the first step to public purpose microgrid development as efficient buildings will require a smaller amount of distributed generation to meet the required load.

The EmPOWER Maryland Energy Efficiency Act of 2008 set a statewide goal of a 15% reduction in per capita electricity consumption and 15% reduction in per capita peak demand by 2015, compared to 2007 consumption levels. The State's five largest EDCs are responsible for implementing energy efficiency and conservation programs designed to achieve the majority of the savings goal. EDC-administered programs are available for residential, commercial, and industrial customers and range from simple lighting and appliance rebates to incentives for more complicated projects like combined heat and power systems. While the statute sets a 2015 reduction goal, the PSC has clearly stated that energy efficiency programs will continue beyond the end of 2015. A stakeholder process lead by MEA and PSC Staff is currently underway to recommend a structure and values for future savings goals.

Maryland's EDCs offer a robust suite of rebates and technical assistance for energy efficiency projects, including rebates for efficient equipment, building shell improvements, building retrocommissioning, and CHP systems. These existing rebates can and should be incorporated into microgrid projects to reduce both upfront and lifecycle project costs.

For instance, as part of the EmPower Maryland program, BGE, PEPCO, and Delmarva Power offer specific incentives to Maryland businesses interested in developing CHP installations, while SMECO and Potomac Edison have the ability to offer incentives for CHP through custom incentive programs. The Task Force believes these incentives are particularly useful for the deployment of microgrids with district heating components. BGE and PEPCO both offer up to $2 million dollars per project, with cash distributed in the design, commissioning and operations phase.

The Task Force also recognizes there are opportunities to explicitly incorporate microgrids into EmPOWER incentives moving forward. This could include custom tailored incentives for CHP systems in microgrid applications, as well as other demand reductions made possible through the advanced technologies incorporated into microgrid control systems.

LEGAL AND REGULATORY FRAMEWORK

Legal and Regulatory Framework

POLICY FOCUS: PUBLIC PURPOSE MICROGRIDS

As discussed above, public purpose microgrids will become increasingly viable from an economic standpoint as the costs of distributed generation technologies, energy storage systems, and control systems continue to decline. But economic viability does not equate to legality, and legality does not necessarily imply good policy. The legal and regulatory constructs governing Maryland's electric distribution sector were designed in an age of centralized power plants located far from load with single entities providing both generation and delivery of electric service within predefined geographic service territories. Deregulation of generation fundamentally altered this construct, and now technological advances continue to challenge the current distribution model.

When addressing the legal and regulatory issues associated with the deployment of microgrids in Maryland, the Task Force faced important policy questions about the right scope of deployment. Without a purposeful policy analysis that can be used to inform stakeholders, the Task Force would have developed tools without understanding how – or even if – they should be used. Framing its deliberations, the Task Force focuses on three main policy considerations:

- First, should existing electric distribution companies ("EDCs") be authorized to own and/or operate public purpose microgrids in Maryland?

- Second, should third party entities other than EDCs be allowed to own and/or operate public purpose microgrids that serve multiple customers across multiple properties?

- Third, should third party entities other than EDCs be able to own and/or operate multiple customer, multiple property microgrids that do not provide discrete public purpose benefits?

Looking to the first question, the Task Force concluded that it is in the interest of the State to deploy EDC owned and operated public purpose microgrids in the short term. The Task Force reached this conclusion based on the discussions at the Task Force meetings, the State's experience with several major storms and extended outages, and subsequent lessons learned and shared among state and local emergency response coordinators. Public purpose microgrids will provide specific benefits to citizens during critical times, allowing them to refuel their vehicles, purchase groceries and household supplies, and provide a place to escape from potential extreme weather. They can help first responders better coordinate their efforts to more quickly recover from a widespread power outage. And they will help the State meet long term, anticipated demand for electricity supply.

This model also allows the State to quickly deploy public purpose microgrids. As discussed in detail below, the Task Force believes there is a strong legal foundation for the ownership and operation of public purpose microgrids by EDCs. The Task Force recommends EDCs approach the PSC with transparent applications for project deployment that will ensure their public purpose microgrids provide significant benefits to Marylanders, while protecting ratepayers.

The second question faced by the Task Force – should third parties be allowed to own and/or operate public purpose microgrids that serve multiple customers across multiple properties – is more nuanced. On the one hand, all of the societal benefits of public purpose microgrids would exist regardless of what entity owns or operates the facilities. On the other hand, introducing third party ownership or access to EDC assets represents a fundamental shift in the utility paradigm of monopoly franchises.

The Task Force concluded that limited third party ownership and/or operation of public purpose microgrids is in the policy interests of the State. In this regard, *the Task Force believes the State can play a crucial role in reducing barriers to innovation.* Importantly, this recommendation only applies to public purpose microgrids and not more broadly. The Task Force outlines regulatory frameworks for two different and co-existing types of third party public purpose microgrid providers. Both of these frameworks would require legislative authorization after a full public debate.

First, the Task Force outlines a sample regulatory framework to authorize public purpose microgrids that utilize assets separate and apart from existing EDC distribution assets. The Task Force outlines a tiered regulatory framework for these systems, with a focus on protecting the consumers. Second, the Task Force outlines a sample regulatory framework for third parties to provide public purpose microgrid services over – and not in place of – existing EDC distribution assets. EDCs would be eligible to compete with these third party providers, incenting performance, spurring innovation, and enhancing the resiliency of Maryland's electric distribution system.

The Task Force makes these recommendations understanding that this approach, while limited in its scope, does represent a paradigm shift in the regulatory compact. Accordingly, this analysis and these suggestions are not made lightly. However, the Task Force is confident that Marylanders will continue to demand more resilient electric service, that innovation works best when competition is permitted, and that the appropriate structures and safeguards can be implemented to ensure that our utilities continue to thrive while also having the opportunity to benefit from these new product offerings. Additionally, allowing third party ownership and/or operation of public purpose microgrids would speed the adoption of these systems in Maryland and would provide real world examples to better understand the operational and financial characteristics of third party ownership or service over EDC assets. Further, it would allow all stakeholders to work together to explore seam issues between EDC and third party operation in a more controlled environment. The Task Force believes that the knowledge and experience to be gained in understanding how third parties would manage these assets would be invaluable prior to any broader rollout. New business models could be explored, operational challenges identified and resolved, and potential innovation introduced in a way that might not be possible with an EDC-owned public purpose microgrid. The sample regulatory frameworks contained in this section are the starting point in this process.

The final question – whether third party entities should be able to operate commercial multi-customer, multi-property microgrids that do not provide discrete public purpose benefits – is by far the most controversial. To a certain extent, this would involve deregulation of the distribution system by allowing broad competition against existing utilities. Allowing third party commercial microgrid operators open access to project development and current EDC owned assets would entail a foundational rethinking of what utility companies are. It would require substantial debate and discussion about how to maintain the integrity of the grid while allowing a transition to a new construct. In a number of ways, this is a more complex issue than the deregulation of electricity supply: there are multiple redundancies to provide electricity service should a supplier suddenly go out of business or default, but there is only one wire going into a citizen's residence. Given this complexity, at this time we cannot definitively claim that this course of action is in the policy interests of the State.

While the Task Force is not averse to exploring this question at some point in the future, at this point the recommendations of the Task For focus on learning from the more limited third party public purpose microgrid deployment described in this report and using that information to help inform a broader discussion of open access at a future time.

LEGAL AND REGULATORY FRAMEWORK

SHORT TERM: UTILITY-OWNED PUBLIC PURPOSE MICROGRIDS

The Task Force focused initially on how to deploy public purpose microgrids in the short term, understanding that our citizens justifiably demand progress in improving the resiliency of our electric distribution system, that severe weather events will challenge our utilities as they continue to make important infrastructure improvements, and that meeting long term anticipated demand for electricity supply is critical. After the extensive analysis outlined below, the Task Force concludes that it is possible for the PSC to allow EDCs to own and operate public purpose microgrids in Maryland under existing law, including generation assets. EDCs can incorporate this functionality into existing electric distribution systems, serving multiple customers in a defined and fixed geographic area. In contrast to the deployment of third party owned and/or operated microgrids, the Task Force believes Maryland law provides a flexible framework for EDC-owned microgrids. Specifically, the Task Force concludes that under current Maryland law:

- The PSC is authorized to require or allow EDCs to construct and operate distributed generation facilities to meet long-term, anticipated demand in the State for electricity supply;
- EDCs can own and operate energy storage systems;
- EDCs are not prohibited from selling services from distributed generation facilities and energy storage systems into PJM wholesale markets;
- After PSC approval, EDCs can sell services from distributed generation facilities and energy storage systems to microgrid retail customers;
- After PSC approval, EDCs can assess a "Microgrid Service Charge" through a PSC-approved rider on microgrid customers; and
- EDCs can make a legitimate argument to potentially include a portion of public purpose microgrid costs in the rate base.

While the Task Force believes Maryland law does not preclude EDC-owned public purpose microgrids, only the PSC can conduct the final analysis and issue the orders necessary for the deployment of such systems. Accordingly, the Task Force recommends EDCs seek PSC preapproval prior to microgrid project deployment. By obtaining PSC approval in advance, EDCs can avoid potential violations of the Public Utilities Article and PSC regulations, and can achieve more regulatory certainty with regard to cost recovery. The PSC should consider applications in a proceeding that provides a reasonable opportunity for all interested stakeholders to participate in the process. Over time, PSC preapproval of EDC owned public purpose microgrid deployment would create a precedential framework for future deployment.

Generation

1. Under current law, can EDCs own and operate generation assets in Maryland?

Current law authorizes the PSC to require or allow EDCs to construct, own, and operate generating facilities and transmission facilities necessary to connect such generating facilities to the electric grid in order to meet long-term, anticipated demand in State for both standard offer service ("SOS") and for other electricity supply.[20] Such activity is "subject to appropriate cost recovery."[21]

The General Assembly passed the Electric Customer Choice and Competition Act in 1999. Prior to this legislation, Maryland's electric utilities were vertically integrated, meaning that they owned much of the generation necessary to supply their customers with electricity. The legislation required the State's electric utilities to divest themselves of their generation assets, either through spinning them off to unregulated affiliates or through their sale to third parties.[22] Customers were then able to choose between third party electricity suppliers or remain on SOS provided by the EDCs.

The Electric Customer Choice and Competition Act did not contain any specific provisions allowing EDCs to own generation assets. However, in 2006, the General Assembly amended Public Utilities Article § 7-510(c)(6) to provide:

> *"In order to meet long-term, anticipated demand in the State for standard offer service and other electricity supply, the Commission may require or allow an investor-owned electric company to construct, acquire, or lease, and operate, its own generating facilities, and transmission facilities necessary to interconnect the generation facilities with the electric grid, subject to appropriate cost recovery."*

This provision allows the PSC to approve EDC-owned generation when needed to meet long-term anticipated demand. In the context of EDC-owned public purpose microgrids, this means

[20] Public Utilities Article § 7-510(c)(6).
[21] *Id.*
[22] *Id.* at § 7-508(a).

EDCs may deploy generation, as long as the PSC approves the deployment in advance by finding that distributed generation installed on a microgrid would help meet long-term, anticipated demand in the State for electricity supply.

The Public Utilities Article also authorizes the PSC to approve EDC owned generation and transmission facilities "subject to appropriate cost recovery."[23] Under this provision, the Task Force believes that the PSC is authorized to approval multiple types of appropriate cost recovery options. In some cases, an EDC may wish to sell services from the microgrid generating facility into PJM wholesale markets. This may occur during "blue sky" days when there are not wider grid reliability issues. In other cases, an EDC may wish to serve local retail load directly by selling electricity to local customers instead of at wholesale. This may occur when the wider grid is down or when it is economic to island. In cases where an EDC would island a microgrid, it could charge microgrid customers for the local generation through the Microgrid Service Charge ("MSC"), discussed more fully below.

2. Has the PSC invoked its § 7-510(c)(6) authority before?

Yes. The PSC recently invoked this provision to allow for the development of additional generation in Maryland. In Order 84815 in Case 9214, the PSC cited Public Utilities Article § 7-510(c)(6) as authority to require the EDCs to enter into contracts for differences to support the development of natural gas-based generation in Southern Maryland. Additionally, the PSC has recognized that Section 7-510(c)(6) authorizes it to require or allow utilities to construct, own, and operate generating facilities in order to meet long-term, anticipated demand for electricity supply in the State.[24] Distributed generation constructed and operated as part of a public purpose microgrid can be a viable way to meet long term anticipated, demand in the State for electricity supply, and may therefore be required or allowed by the PSC under current law.

[23] *Id.* at § 7-510(c)(6).

[24] See generally Maryland Public Service Commission, State Analysis and Survey on Restructuring and Reregulation (2008), *available at* http://webapp.psc.state.md.us/Intranet/sitesearch/Kaye%20Scholer_Final%20Report_State%20Analysis%20and%20Survey%20on%20Restructuring%20and%20Reregulation%20for%20the%20MD%20PSC.pdf

3. Does the Fourth Circuit's decision in *PPL v. Nazarian* change this analysis?

The Fourth Circuit decision striking down the PSC's Order 84815 does not alter the Task Force's conclusions, outlined above.

Energy Storage

1. What are the benefits of energy storage systems to microgrids and should EDCs be able to sell services from such systems into the wholesale markets operated by PJM?

The Task Force believes that allowing EDCs to deploy energy storage systems in order to provide microgrid services, while also earning revenue from PJM markets, will prove essential for the economic deployment of public purpose microgrids.

A single energy storage system may be able to provide benefits such as voltage support and deferred distribution upgrades to an EDC's microgrid and macrogrid while at the same time providing benefits such as frequency response and demand response at the wholesale generation and transmission levels. In such a case, limiting the scope of operation of energy storage systems to only the distribution level undervalues such systems by neglecting their value at the wholesale and transmission levels.[25] The Sandia National Laboratories' report *Energy Storage for the Electricity Grid* stresses the importance of synergies to the ultimate viability of energy storage systems: the combination of two or more benefits across jurisdictional lines to increase the cost effectiveness of energy storage systems.[26] As explained by the report, "[i]n some cases, storage used for just one application may provide attractive returns." However, "[i]n other circumstances, it may be necessary to combine benefits from two or more applications so that total benefits exceed total cost."[27]

Energy storage systems can provide economic value to EDCs in two ways, which can span the distribution, transmission, and generation sectors. First, EDCs can use energy storage facilities to achieve specific goals on their electric distribution systems. In the context of public purpose microgrids, energy storage systems would allow EDCs to more readily leverage intermittent renewable energy sources and provide power and frequency regulation services to the microgrid when the wider grid is down. Second, EDCs can earn additional

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[26] *Energy Storage for the Electricity Grid: Benefits and Market Potential Assessment Guide*, Sandia National Laboratories, 119 (2010) (hereinafter "Sandia Assessment Guide").

[27] *Id.*

revenue through selling the services provided by the facilities into PJM.[28] This additional value – the revenue an EDC may receive from selling services into wholesale markets – may be necessary to make microgrids and energy storage system cost effective.[29] Treating energy storage as solely a distribution, transmission, *or* generation asset undervalues storage by neglecting its "ability to provide multiple services that cross between these roles."[30] There is therefore a strong policy rationale for the PSC to provide EDCs with certainty that they can both own energy storage systems and sell services from those systems into the wholesale markets operated by PJM.

By providing certainty to EDCs prior to microgrid deployment as to whether they can sell the services provided by energy storage into PJM markets, EDCs will be better able to weigh the costs and benefits of energy storage systems for deployment in public purpose microgrids.

2. Are energy storage systems generation stations?

The PSC's current regulations define a "generating station" as "property or facilities located in Maryland constituting an integral plant or unit for the *production of electric energy*, including any new production unit that would be added to an existing production plant."[31] The Task Force concludes that this definition does not encompass energy storage systems, as they do not generate electricity. Rather, they store electricity that has been generated by other sources and allow for deployment of such electricity when beneficial from an economic and technical standpoint.

Under current law, PSC approval is required before a person may construct a generating station in the State, as that term is defined by the PSC's regulations. The Task Force does not think that PSC approval prior to construction or deployment of an energy storage system would be required, for the definitional reason described above. However, the Task Force believes EDCs should seek PSC preapproval of cost recovery for energy storage systems as part of the microgrid preapproval process discussed below.

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[28] Most recently, FERC Order 755, now implemented by PJM, compensates ancillary service facilities based on performance – particularly speed – in a way that benefits storage. *See generally* 137 FERC ¶ 61,064 (2011).

[29] Sandia Assessment Guide at 119 (explaining that "[i]n other circumstances, it may be necessary to combine benefits from two or more applications so that total benefits exceed total cost").

[30] *Id.* at 7.

[31] COMAR 20.79.01.02(11) (emphasis added).

3. Under Maryland law, may EDCs sell services from energy storage systems into the wholesale markets operated by PJM?

The Task Force did not identify any State laws or regulations that would prohibit EDCs from selling services from energy storage facilities into the wholesale markets operated by PJM. In fact, the PSC currently allows EDCs to bid consumption reductions from demand response and dynamic pricing programs directly into the PJM capacity and energy markets. Electric companies then use the proceeds to offset the costs of the programs. Similarly, the PSC can consider allowing EDCs to use the extra revenue received from selling services from energy storage systems into PJM markets to help balance the costs of the energy storage systems.

Cost Recovery

1. May EDCs offer microgrid services to specific customers, while charging them for such services?

The Task Force concludes that EDCs are not legally barred from offering customers public purpose microgrid services and charging those customers for that service. Public Utilities Article § 4-503(b), which is designed to prevent undue discrimination and preference in rates, does not present an insurmountable burden to these differential rates. Specifically, the statute contains four limitations on EDCs.

The first limitation is that an EDC may not "charge, demand, or receive from a person compensation that is greater or less than from any other person under substantially similar circumstances."[32] Customers participating in an EDC-owned public purpose microgrid would no longer be substantially similar to other customers because they would be receiving services in addition to those received by other customers, including local generation, advanced controls, and increased grid resiliency. The Task Force believes this would allow an EDC to charge customers of the public purpose microgrid for this additional service.

The second limitation is that an EDC may not "extend a privilege or facility to a person, except those privileges and facilities that are extended uniformly to all persons under substantially similar circumstances."[33] The third and fourth limitations are that an EDC may not

[32] Md. Public Utilities Article § 4-503(b)(1).

[33] *Id.* at § 4-503(b)(2).

"discriminate against a person, locality, or particular class of service"[34] and may not "give undue or unreasonable preference to or cause unreasonable prejudice to a person, locality, or particular class of service."[35] In order to ensure that these prohibitions are not triggered, the Task Force believes EDCs would need to engage in a uniform, objective, and transparent screening process for site locations. EDCs would need to consider the public purpose nature of the microgrid, the willingness of customers to participate in the project, the technical feasibility of the project, and the economic model of the project.

2. When should EDCs be eligible to recover microgrid project costs through base rates rather than only directly from microgrid customers?

The Task Force believes it is appropriate for EDCs to socialize a portion of public purpose microgrid costs through the entire rate base. The portion of public purpose microgrid costs eligible for socialization should be the subject of a fair, open, and rigorous proceeding at the PSC, with a full opportunity for participation by ratepayer advocates and other stakeholders.

As discussed above, public purpose microgrids serve customers who will provide essential services to the public even when the macrogrid is down. Additional ratepayers besides those who are connected to the microgrid would benefit from the community facilities, emergency services, and retail outlets served by these projects. Given this context, the PSC can determine to what extent it is appropriate for EDCs to socialize a portion of the cost of an EDC-owned public purpose microgrid throughout the entire rate base.

At the same time, certain microgrid benefits accrue directly to the customers who are served by the microgrid. Consequently, the Task Force believes it is appropriate for EDCs to recover a portion of the costs of EDC-owned public purpose microgrids from the customers of those systems. For example, an EDC may be able to recover distribution system upgrade costs from its entire rate base, including for automatic reclosure equipment and control systems. However, the EDC also would be able to charge a Microgrid Service Charge ("MSC") to microgrid customers to pay for the generation and backup services supplied by the microgrid. In some instances, electricity from local generation would then be allocated directly to the microgrid customers, allowing the microgrid customers to benefit from continued operations when the wider grid is down and from market arbitrage opportunities.

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[34] *Id.* at § 4-503(b)(3).
[35] *Id.* at § 4-503(b)(4).

3. Is PSC preapproval of EDC-owned microgrid projects appropriate?

As discussed above, the deployment of public purpose microgrids by EDCs involves the innovative application of distributed energy technologies and control systems, as well as novel cost allocation questions. Given this complex landscape, the Task Force believes the PSC should preapprove EDC-proposed microgrid projects after a fair and open proceeding with an opportunity for stakeholder and public participation. Preapproval by the PSC would address the legal issues discussed in this section, as well as whether proposed project costs are reasonable. Upon project completion, and once the microgrid is providing service to the public, the PSC would have option of allowing the EDC to recover incurred costs associated with constructing and operating the microgrid to the extent they conform to what it preapproved and that actual construction costs are prudently incurred. This would allow the EDC to outline project specifics for PSC approval and to continue with certainty that it would be able to recover those prudently incurred costs upon project completion. At the same time, it would ensure the PSC and stakeholders have the ability to scrutinize projects for compliance with the PSC's conditions of approval before cost recovery begins. Eventually, this would create a precedential framework to guide the deployment of future EDC-owned microgrids.

Take for example a scenario where an EDC wishes to own a public purpose microgrid that serves critical loads across four city blocks. In this case, suppose the EDC complied with the nondiscrimination requirements discussed above through a uniform, objective, and transparent screening process applied uniformly to site locations within its service territory. The project would include a combination of CHP and solar with storage systems and include control technologies to provide an interface between the generation, storage, and wholesale markets. The EDC would sell electricity produced by the microgrid into PJM's wholesale markets when the wider grid is operational and provide electricity directly to microgrid customers when the wider grid is non-operational. In exchange for this service, the EDC would charge the microgrid customers a PSC-approved MSC rider. Additionally, since this is a public purpose microgrid, the EDC could seek recovery for some microgrid construction and operation costs from its entire rate base.

To obtain project preapproval, the EDC would submit an application to the PSC detailing the project. The PSC would have an opportunity to consider in advance, among other issues: (1) whether the EDC's generation will "meet long-term, anticipated demand in the State for …

electricity supply" and, if so, whether the EDC's proposed cost recovery for the generation is "appropriate"[36]; (2) whether the EDC can sell services from the microgrid assets into PJM markets; (3) whether the EDC can charge the customers of the microgrid for microgrid services and, if so, what charge is appropriate; (4) whether proposed project costs are prudent; and (5) what types of project and O&M costs the EDC can seek to socialize through base rates, given the microgrid project serves a public purpose. The PSC would also evaluate the process by which the EDC chose the public purpose microgrid, the level of cooperation regarding the microgrid with the jurisdiction in which it is located, the way in which the emergency managers in the jurisdiction envision utilizing the public purpose microgrid, and the public purpose of the microgrid. The PSC would be able to approve the project as proposed, approve the project subject to conditions, or deny the project outright. Upon approval, the EDC would be able to proceed with project deployment. Once the project is complete, the EDC would return to the PSC for permission to begin cost recovery, with the PSC and stakeholders examining the project to ensure compliance with what the PSC previously approved. The EDC would be able to include costs approved for socialization in its next rate case, subject to PSC prudency review.

The Task Force believes this preapproval process would allow the PSC to adequately scrutinize microgrid project deployment, while providing EDCs with sufficient certainty on cost recovery subject to potential PSC conditions as they deploy their projects. Over time, this process would create a precedential framework for EDC-owned microgrid deployment with clear guidelines for projects moving forward. This would allow the State to develop a mechanism for EDC-owned microgrid deployment through the regulatory process, allowing Marylanders to benefit from public purpose microgrids in the shortest possible timeframe.[37] Eventually, the State can incorporate EDC microgrids into the third party microgrid provider framework discussed below, fostering competition, innovation, and cost reductions.

[36] Md. Public Utilities Code Ann. § 7-510(c)(6).

[37] The Task Force also recognizes that the PSC may wish to adopt regulations to create a similar process to what is outlined here in advance of an application by an EDC.

LONG TERM: THIRD PARTY, MULTIPLE CUSTOMER PUBLIC PURPOSE MICROGRIDS

While the Task Force strongly concludes that the State should promote the rapid deployment of EDC-owned public purpose microgrids in the near term, it also concludes that competition for the provision of public purpose microgrid services to multiple customers has the potential to generate significant innovation in the long run. Introducing competition in this space raises complex – and important – market design and consumer protection questions. The Task Force finds that these complex questions require legislation to create an appropriate statutory framework to foster competition for the provision of public purpose microgrid services. If done through an appropriate legal framework, the State can create a platform for innovation that brings important grid resiliency, environmental, and cost-saving benefits to Marylanders.

This section uses the term "third party microgrid" to refer to public purpose microgrids operated by entities other than existing EDCs. Generally speaking, microgrids owned by entities other than EDCs that serve one customer on a single parcel of property are authorized under current Maryland law regardless of system ownership. Going a step further, this section addresses public purpose microgrids owned by entities *other than EDCs* that, importantly, serve multiple customers across multiple properties. While this model is a transformational departure from Maryland's current regulatory structure, the Task Force believes that this model is the appropriate one to create competition for the provision of public purpose microgrid services in Maryland. The Task Force also recognizes that the issues related to the deployment of these systems are complex and recommends that the State further engage stakeholders to determine the appropriate scale and scope of deployment.

The Task Force focused its analysis on two different scenarios and outlined two statutory frameworks that begin to address the issues necessary should the State decide to deploy these systems. First, the Task Force outlines a potential statutory construct for public purpose microgrids owned by third parties that use entirely new distribution assets and serve customers not previously served by an EDC. These systems – deemed **New Asset Microgrids** ("NAMs") – are most viable in new commercial and industrial and mixed-use developments. Second, the Task Force outlines a potential statutory construct for public purpose microgrids owned and at least partially operated by third parties but that utilize the EDC's existing distribution infrastructure. These systems – deemed **Local Microgrid Operators** ("LMOs") – do not utilize new distribution assets. Rather, a third party provider owns and operates generation, storage, and control technologies in the microgrid service area, while the EDC continues to own and earn a return on its traditional distribution assets and maintains the control necessary to ensure the stability of its distribution system. During islanding, the third party would utilize the existing EDC distribution assets to operate the public purpose microgrid. While these systems raise important technical challenges, the Task Force believes LMOs have high innovative potential.

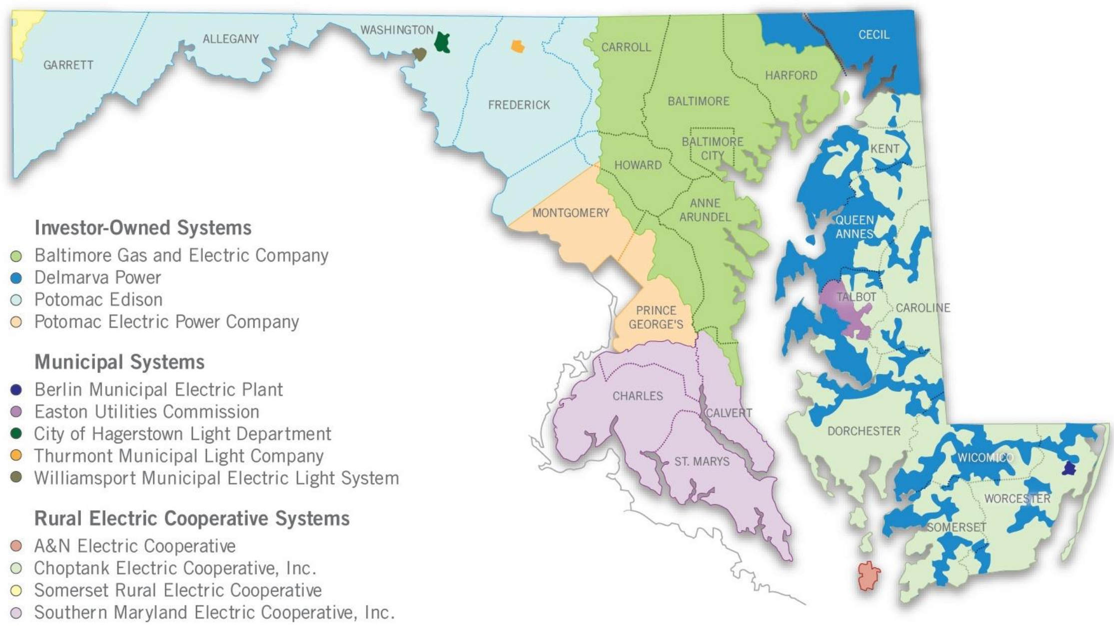
NAMs and LMOs raise unique regulatory questions, including market creation issues. For NAMs, the Task Force focused its analysis on when the State should regulate such systems as public utilities. For LMOs, the Task Force focused primarily on reducing barriers to entry for entities that wish to develop systems in coordination with EDCs. The Task Force recognizes that these issues are complex. This report is only a starting point in an ongoing conversation. Nevertheless, this report begins to lay out starting frameworks for future debate and action.

Regulatory Context

1. What was the policy rationale for granting EDCs monopoly franchises for the provision of electric service in their service territories?

A fundamental tenet of the current regulatory regime is that an EDC is given the exclusive right to provide the distribution of electricity within a specific geographic territory, namely, a franchise. The concepts discussed in this section radically alter that construct. Accordingly, in order to determine whether it is appropriate to expand competition for the provision of public purpose microgrid services, it is essential to understand the policy rationale behind granting EDCs a monopoly franchise. As electricity generation began to center around large power plants located far from load, society began to grant EDCs the right to operate a monopoly franchise under a theory that the alternative – having multiple lines, poles, transformers, and other electric distribution equipment from different EDCs serving the same geographic area – would be impractical and unwieldy. To avoid subjecting society to the high costs of duplicative infrastructure or affording an incumbent unchecked market power, most jurisdictions have granted a regulated monopoly to EDCs for specified geographic areas.

Maryland's EDC Service Territories



In exchange for the grant of a monopoly franchise, EDCs in Maryland are subject to regulation by the PSC. This arrangement is frequently referred to as the "regulatory compact." The regulatory compact is essentially an agreement between the public and an EDC that allows the EDC to earn a defined – and regulated – return on equity and cost recovery for prudently incurred expenses. In exchange, the public benefits from investment in essential services, as well as from regulatory oversight that, among other things, regulates terms of service and rates.

2. How has society introduced competition into the electric industry?

Since the late 1970's, the United States has taken steps at the state and federal levels to deregulate the generation and transmission components of the electric industry, with primary focus on reducing consumer costs through competitive market forces. Prior to the 1980's, the electric industry in the United States was vertically integrated, meaning that utilities owned the majority of the generation necessary to serve their customers, as well as the transmission lines to carry electricity necessary distances.[38]

[38] REGULATION OF PUBLIC UTILITY PERFORMANCE, Scott Hempling, 72 (2013)

After the second Arab oil embargo crisis, however, Congress began taking steps to open up wholesale electricity generation and transmission to competition. The Public Utility Regulatory Policies Act of 1978 ("PURPA") and Energy Policy Act of 1992 introduced and expanded the concept of wholesale electricity generators. FERC issued Order No. 888 in 1996 to require transmission owners to provide non-discriminatory access to their systems. By 2012, seventeen states – including Maryland – authorized retail electric competition, allowing ratepayers to select from a pool of competitive electricity suppliers that can compete on price, environmental stewardship, and other factors.[39]

This shift towards deregulation is predicated on the concept that the generation and transmission sectors of the electric industry are not necessarily best served by one firm. As discussed below, innovations in distributed generation and smart control technologies have started to challenge this assumption in the distribution sector as well.

3. What about competition in the electric distribution sector?

While the United States has moved towards authorizing competition in the wholesale generation and transmission sectors, it has only just begun to authorize competition for the delivery of electricity to retail customers. However, the theory that it is economically beneficial to grant utilities a monopoly franchise in a given area is increasingly challenged as customers and third party developers are more readily able to generate electricity close to load. Accordingly, there has been some movement to allow for competition for the provision of on-site generation, which combines elements of electric distribution and electric generation services.

Recognizing this shift, the Maryland Public Utilities Article exempts parties that provide "on-site generated electricity" from regulation as either an electric company[40] (the statute's term for EDC) or electricity supplier.[41] On-site generated electricity means electricity that "(1) is not transmitted or distributed over an electric company's transmission or distribution system; or (2) is generated at a facility owned or operated by an electric customer or operated by a designee of the owner who, with the other tenants of the facility, consumes at least 80%

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[39] *Id. See also* EIA, Today in Energy, available at http://www.eia.gov/todayinenergy/detail.cfm?id=6250 ("Seventeen states and the District of Columbia have adopted electric retail choice programs that allow end-use customers to buy electricity from competitive retail suppliers").

[40] Md. Public Utilities Article § 1-101(h)(2).

[41] *Id.* at § 1-101(j)(3).

of the power generated by the facility each year."[42] These exemptions are necessary because any provider of generation to another party would likely fall under both the definition of an electric company and electricity supplier.

Today, distributed generation providers have started to offer an alternative to the traditional model of receiving the majority of one's energy from the macrogrid by installing solar PV and CHP, among other technologies. However, these customers still must rely on the EDC unless they are completely disconnected from the macrogrid.

Current Law

1. Have other states approved third party microgrids through the regulatory process rather than through legislation?

While not a blanket legislative authorization, the New York Public Service Commission ("NYPSC") approved a combined heat and power project in 2007 that crosses property lines and serves multiple customers.[43] Now operational, the Burrstone Energy Center project provides electric service and thermal energy to three customers (Utica college, a hospital, and a nursing home) and crosses a public street.[44] The project developer filed a request with the NYPSC for a declaratory ruling as to whether the project is a "qualifying cogeneration facility" under New York law, therefore exempting the project from regulation as a utility.[45] NYPSC eventually held that the system falls under the definition of "qualifying cogeneration facility," notwithstanding the fact that the project serves multiple customers and crosses a public street.[46] While this was a groundbreaking decision for microgrid and CHP system deployment in New York, Maryland does not have an analogous statutory provision creating an exemption for similar systems.

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[42] *Id.* at § 1-101(s).

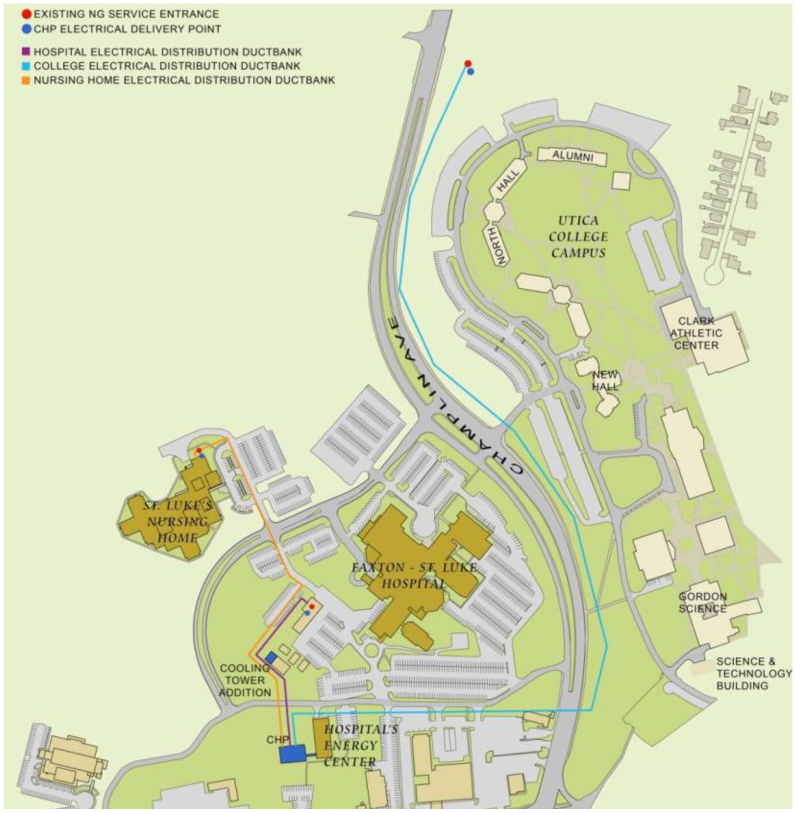
[43] Case 07-E-0802, Burrstone Energy Center LLC, Declaratory Ruling (issued August 28, 2007).

[44] *Id.* at 1.

[45] *Id.* at 1–2.

[46] *Id.* at 4–6.

Map of New York's Burrstone Energy Center



Source: Microgrids: An Assessment of the Value, Opportunities, and Barriers to Deployment in New York State, NYSERDA (September 2010)

2. Are third party public purpose microgrids feasible under current Maryland law? Should Maryland make a limited statutory change to allow some third party public purpose microgrids to operate within the existing service areas of EDCs?

The Task Force believes that third party microgrids are not feasible under current Maryland law for two reasons. First, while the PSC currently has limited authority to transfer franchises between EDCs under certain circumstances, Maryland's current regulatory framework does not give the PSC authority to grant new, limited franchises for third party public purpose microgrids. Second, Maryland law would require the PSC to regulate all third party public purpose microgrids as EDCs, a blanket regulatory treatment that the Task Force believes is inappropriate for some projects. The Task Force believes that if the State wishes to authorize third party public purpose microgrids, it should do so through a comprehensive statutory change.

The first issue with third party microgrid deployment under current Maryland law concerns the PSC's inability to grant franchises to new microgrid providers. In Maryland, "a public service company cannot operate absent (1) a franchise and (2) the [PSC's] authorization to operate or exercise that franchise."[47] As explained by the Court of Special Appeals, "[t]he term 'franchise' … [is] the type of franchise most commonly associated with a utility company's right to dig up the public streets in the course of providing its particular service."[48] A franchise is an "ongoing and widespread authorization" to permanently encroach on public property[49] and may be granted by the General Assembly or a municipality, provided the State has delegated that authority to the municipality.[50] Making permanent encroachments on public property without a franchise constitutes a "a public nuisance and a trespass against the governing authority."[51]

Under current law, franchises generally emanate from the State and not from the PSC.[52] However, the General Assembly has delegated authority to the PSC to transfer franchise rights between utilities in certain cases where a municipality with a municipal utility annexes an area served by an existing EDC.[53] In these cases, the PSC may transfer a limited portion of an EDC's franchise right to the municipal utility if it determines such a change is in the public interest.[54] The PSC has found that a transfer is only in the public interest if there is "strong and

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47 Town of Easton v. PSC, 379 Md. 21, 31-32 (2003).

48 Baltimore Steam Co. v. Baltimore Gas & Elec. Co., 123 Md. App. 1, 20 (1999).

49 Town of Easton v. PSC, 379 Md. 21, 32 (2003).

50 *Id.* at 32.

51 Baltimore Steam Co. v. Baltimore Gas & Elec. Co., 123 Md. App. 1, 20 (1999). EDCs also enjoy exclusive service territories set by the PSC, which dictate the areas in which EDCs can exercise their franchises. The PSC set the first official EDC service territories in 1966 with Order 56203 in Case 6017 explaining that "[t]his is a historic step in the regulation of electric utilities in Maryland. We believe that the public will be benefited in the improvement of service implicit in the responsibility assumed by each utility of the service area designated to it and in the avoidance of wasteful application. This should assure the orderly and most economical development of electric service for the citizens of Maryland." *Id.* The PSC retains jurisdiction on this issue today with ongoing Case 8800, through which it periodically approves changes to EDC service territories.

52 Berlin v. Delmarva Power & Light Co., 95 Md. App. 585, 590-91 (1933)

53 *See* Md. Public Utilities Article § 7-210(d) (explicitly authorizing the PSC to modify a franchise of an existing EDC in certain cases if the PSC "determines that modification of the service territory of an electric company and the transfer of a franchise or right under the franchise is in the public interest").

54 *Id.*

clear evidence of the need, equity, and practicality of the proposed change."[55] This authority has been recognized by the Court of Appeals as valid.[56]

The PSC's current authority to transfer franchise rights does not apply to public purpose microgrids. Therefore, under current law, the General Assembly or a local government with proper authority delegated by the General Assembly would need to grant a franchise for every third party microgrid, regardless of their size and scope.[57] The Task Force believes this piecemeal process would be unreasonably burdensome for developers. It is essential to create a coordinated, streamlined process that will reduce barriers to entry to public purpose microgrids. Therefore, the Task Force believes it is appropriate for legislation to create a process through which the PSC can grant limited authorization to third party public purpose microgrid providers to serve specific customers in predefined boundaries within existing EDC franchise areas.

The Task Force also recognizes that allowing third party public purpose microgrids to operate simultaneously with existing EDCs is a transformational departure from Maryland's – and the nation's – current regulatory structure. The Task Force makes these recommendations understanding that this approach, while limited in its scope, does represent a paradigm shift. The Task Force believes, however, that limiting development to public purpose projects will ensure this departure will not unnecessarily encroach upon existing EDC franchises, while allowing for innovative projects that provide the enhanced resiliency demanded by Marylanders in the face of major storms.

In addition to the franchise issue above, third party microgrids are not feasible under current Maryland law because the PSC must regulate such microgrids in accordance with ratemaking requirements applicable to EDCs. The Public Utilities Article defines an "electric company" as "a person who physically transmits or distributes electricity in the State to a retail electric customer."[58] A third party owned and operated microgrid as envisioned by the Task Force

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[55] Re Mayor and Council of Federalsburg, Maryland, 68 Md PSC 501, 504 (1977).

[56] Town of Easton v. PSC, 379 Md. 21, 32 (2003).

[57] A third party microgrid would be considered a public service company under Maryland law because that definition defines a public service company as, in part, an electric company. Md. Public Utilities Article § 4-102. As discussed in notes 60-62 and the accompanying text below, a third party microgrid would be considered an electric company under current Maryland law.

[58] Md. Public Utilities Article § 1-101(h)(1). The statute exempts three arrangements from this broad definition: (1) a person who provides electric service to tenants in a building; (2) a person who generates

would fall under this definition of electric company because it would involve a person physically distributing electricity in the State to a retail electric customer.[59] Since third party microgrids clearly fall under the definition of "electric company," these microgrids would be subject to the same regulation as existing EDCs, including the PSC's authority to ensure rates are just and reasonable through traditional ratemaking procedures.[60]

As discussed in detail below, the Task Force believes that a blanket regulatory treatment for all private public purpose microgrids is inappropriate because the policy rationale for regulation of EDCs as natural monopolies may not exist for smaller microgrid systems, especially those owned and operated by the members of the microgrid. While the PSC does have statutory authority to authorize "alternative forms of regulation" for electric companies, the Task Force believes the State should tackle the major questions raised by privately owned microgrids comprehensively rather than on a piecemeal, project-by-project basis.[61] A comprehensive approach to competition in this space could reduce barriers to entry by third parties to provide public purpose microgrid services, while protecting ratepayers and microgrid customers.

Creating a New Statutory Framework

1. Have other states authorized microgrids that serve multiple customers and cross property lines through the legislative process?

In 2013, Connecticut passed legislation authorizing municipal microgrids, becoming the first – and only – state to legislatively authorize microgrids serving multiple customers that utilize electric distribution and generation assets belonging to entities other than utilities. Connecticut's legislative authorization is broader in scope than the public purpose microgrids deemed appropriate at this time by the Task Force because it allows municipalities to operate microgrids for any purpose. However, it is similar to the "new asset microgrid" model

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on-site generated electricity; and (3) a person who distributed electricity within a site owned by the person incident to a primary landlord-tenant relationship. *Id.* at § 1-101(h)(2).

[59] *Id.* at § 1-101(cc) (defining retail electric customer as "a purchaser of electricity for end use in the State").

[60] *See generally* Md. Public Utilities Article § 4-102.

[61] Public Utilities Article § 7-505(c). Specifically, the PSC "may adopt an alternative form of regulation under [if it] finds, after notice and hearing, that the alternative form of regulation: (i) protects consumers; (ii) ensures the quality, availability, and reliability of regulated electric services; and (iii) is in the interest of the public, including shareholders of the electric company." *Id.* at § 7-505(c)(2). The statute does not limit the forms of regulation the PSC may approve. *Id.* at § 7-505(c)(3).

discussed below in that it allows third parties to own and operate microgrids that are separate and apart from existing EDC distribution systems.

Specifically, Connecticut's legislation requires the Connecticut Public Utilities Regulatory Authority to "authorize any municipality or state or federal governmental entity that owns, operates, or leases any Class I renewable energy source[62] … or generation source under five megawatts to independently distribute electricity generated from such source across a public highway or street."[63] These systems must satisfy the statutory definition of a microgrid, defined as "a group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid and that connects and disconnects from such grid to enable it to operate in both grid-connected and island mode."[64] A municipality or state of federal governmental entity may petition EDCs "to complete the interconnection of such microgrid[s] to the electric grid in accordance with the [Public Utilities Regulatory Authority's] interconnection standards." Participating entities are exempt from regulation as an EDC because the statute provides they "shall not be considered an electric company."[65]

2. What are realistic policies that allow for third party owned and/or operated public purpose microgrids?

The Task Force believes there are two viable scenarios for third party owned and/or operated public purpose microgrids in Maryland. Both of these options would need to be addressed legislatively. First, in areas with new customers that are not yet served by an EDC distribution system, third parties may wish to own and operate public purpose microgrids that interface with the EDC system at a single or multiple points of interconnection. This would occur almost exclusively in areas with new construction, such as planned commercial and multi-use developments, with the developer building out the distribution infrastructure itself. This concept can also be used to construct secondary backup grids similar to the one under development in Hoboken, NJ. These systems can be referred to as **New Asset Microgrids**

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[62] Class I renewable energy sources include energy derived from solar power, wind power, a fuel cell, methane gas from landfills, ocean thermal power, wave or tidal power, low emission advanced renewable energy conversion technologies, a run-of-the-river hydropower facility … or a sustainable biomass facility." Conn. Gen. Stat. § 16-1(a)(26)

[63] Conn. Public Act No. 13-298 § 39 (2013).

[64] Conn. Gen. Stat. § 16-243y.

[65] Conn. Public Act No. 13-298 § 39 (2013).

("NAMs"). Second, in areas with existing EDC assets serving all customers of the microgrid, a third party could provide public purpose microgrid services across existing EDC assets. The Task Force believes that in most cases it would be uneconomic for a third party to develop a public purpose microgrid with distribution assets separate and apart from EDC assets in an area where customers are already served by EDC assets. The third party service model is therefore designed to introduce competition and bring the benefits of public purpose microgrids to those who are already served by an EDC, without unnecessarily duplicating assets already deployed by EDCs. The entities that provide these services can be referred to as **Local Microgrid Operators** ("LMOs").

3. What decision making framework guided the recommendations of the Task Force concerning regulatory oversight necessary for third party public purpose microgrids?

In developing its sample regulatory structures, the Task Force utilized a decision making framework first fully articulated by the Maine Public Utilities Commission ("MPUC"). In a 1980 case, MPUC conducted a comprehensive review of decisions from around the country considering when a small system crosses the point at which a state should regulate the entity as a public utility.[66] In rendering its decision, MPUC established a seven factor test for whether a system serves the "public in general" or merely "particular individuals."[67] If a system serves the "public in general," it is considered a public utility subject to state rate regulation. If a system serves only "particular individuals," it is not considered a public utility and would be free from state rate regulation.[68] As explained by MPUC in a later case, these factors "tend to focus on the relative degree of identity of interests between those taking utility service and the owners of the utility and whether the utility has undertaken to serve the general public."[69]

[66] Kimball Lake Shores Association & Douglas P. Forbes, Order M. #221, 1980 Me. PUC LEXIS 1 (1980). Specifically, MPUC considered whether an informal water system operated by a sole proprietor constituted a public utility subject to state regulation. *Id.*

[67] *Id.* at *29–37.

[68] *Id.* at *9.

[69] Central Monhegan Power, Docket No. 96-481, 1996 WL 677622, at *4 (1996).

The Task Force finds this seven factor framework to be a useful tool in considering the scope of regulation appropriate for various NAMs and LMOs.[70] These seven factors, adapted here to address microgrids, are:

1. *The size of the undertaking.* As the number of microgrid customers increase, the microgrid begins to service the "public in general" rather than merely "particular individuals."

2. *Whether the enterprise is operated for a profit.* If a microgrid operates for a profit, interests may be more aligned with ownership than with customers. This suggests regulation is appropriate, especially over rates.

3. *Whether the system is owned by its users.* If a microgrid is owned by its customers, "it establishes a substantial identity of interest between the enterprise and its customers."[71] This suggests rate regulation is less appropriate. As explained by MPUC, "those who are not strangers to the enterprise do not need to be protected from that enterprise through governmental regulation."[72]

4. *Whether the terms of the service are under the control of its users.* A microgrid under the control of its users will more likely track their interests, suggesting regulation is less appropriate. As explained by MPUC, "[i]f … users overcharge themselves they have harmed none of the public and may return the money to themselves if they wish. If they undercharge themselves on a rate that is less than just and reasonable they must make up the deficit if they wish the system to continue to operate effectively. The intervention of a public agency is unnecessary."[73] This is true even if the microgrid is operated for profit, so long as the users maintain ultimate control over the terms of service and/or which entity provides the service.

5. *The manner in which the service is offered to prospective users.* If a microgrid offers service to prospective users on a take-it-or-leave-it basis or if service is mandatory,

[70] REGULATION OF PUBLIC UTILITY PERFORMANCE, Scott Hempling, 23 (2013) (explaining that "[g]roup self-supply is an old question with modern applications. Neighborhoods and industrial parks are considering "micro-grids" for electric service … They will have to confront questions of exclusivity and bypass").

[71] Kimball Lake Shores Association & Douglas P. Forbes, Order M. #221, 1980 Me. PUC LEXIS at *31 (1980).

[72] *Id.* at *30.

[73] *Id.* at *33.

regulation may be more appropriate. If customers have a choice to participate in the microgrid or would be able to participate in the ownership or control of the microgrid, regulation may be less appropriate. Additionally, regulation may be less appropriate if service is offered through a long term, fixed price contract. In this case, microgrid customers would have agreed to the terms of the contract and, assuming the terms of the contract are fixed, it would be difficult for the microgrid provider to change its rates.

6. *Limitation of service to organization members or other readily identifiable individuals*. If participation in the microgrid is limited to a particular set of customers, it is more likely that the microgrid will operate in the interest of those customers. If a microgrid involves multiple customers types (i.e., commercial and residential), it is less likely the microgrid will operate in the interest of all customers. This is especially true if one customer type dominates the microgrid (i.e., one large industrial user and just a few residential customers).

7. *Whether membership in the group is mandatory.* As explained by MPUC, the "lack of freedom of choice is one of the indicia of a bona fide public utility. If a customer is required to take service from a particular system, even one partially owned and controlled by him, that system has become, in effect, a monopoly. The terms of membership (including the absence of regulation) may be totally unacceptable to the customer who must nevertheless abide by those terms if he wishes to obtain service."[74]

The Task Force paid considerable attention to these factors when developing the sample frameworks below, with an eye towards the identity of interests between the public microgrid owner/operator and its customers. The Task Force also paid considerable attention to system ownership and control.

[74] *Id.* at *36–37.

"*New Asset Microgrids*" – Public Purpose Microgrids Utilizing New, Non-EDC Distribution Assets

The first possible public purpose microgrid service provider scenario is one that utilizes entirely new, non-EDC distribution assets. These systems – or **New Asset Microgrids** ("NAMs") – would connect to existing EDC systems through single or multiple points of interconnection and would have the ability to operate in grid connected or island mode. In this way, NAMs would operate similarly to what is possible under current Maryland law for campus-type microgrids, allowing developers of those systems to expand their business opportunities to a previously untapped market. However, there are two critical distinctions: NAMs would involve multiple properties and, most importantly, multiple customers. Involving multiple customers introduces the complex question of how closely the PSC's regulation of NAMs should mirror that of EDCs. The Task Force believes this is the most important question when considering how to authorize these types of systems. This section outlines a sample regulatory framework that begins to address the issues the Task Force deems relevant should the State pursue this model.

Ultimately, the Task Force believes a tiered regulatory framework for public purpose NAMs is an appropriate starting point if the State authorizes these types of systems. Under this framework, public purpose microgrids that serve small loads would be exempt from PSC rate regulation. Except for systems owned by municipalities, public purpose microgrids above the exemption size and up to a maximum size would be approved by the PSC for operation without rate regulation only upon a determination that the system's characteristics do not present a substantial likelihood of operating against the interests of any particular customer class. In all cases, the NAM developer would need to petition the PSC to receive a determination that providing the NAM with a limited authorization to serve customers in a specific, fixed area is in the public interest, given the public purpose benefits of the system.

1. NAM authorizing legislation should allow the PSC to establish a NAM tariff that incorporates the value of the EDC distribution grid, while creating a process to factor in the value a NAM may provide the EDC distribution system.

The Task Force believes that any NAM authorizing legislation pursued by the State should allow the PSC to establish a NAM tariff that incorporates the value of the distribution grid to the NAM. The Task Force realizes that EDCs should be compensated fairly for the value their macrogrid provides to microgrids. At the same time, the Task Force recommends that the tariff allows NAMs to realize the value of their systems to the EDC. As discussed above, microgrids can provide distribution system upgrade deferral and other benefits to the electric distribution system. The Task Force believes it is essential to incorporate all relevant values into the NAM tariff. As discussed above, the Task Force also believes MEA should study tariff structures and interconnection issues related to smart inverters and islanding capabilities. The Task Force believes authorizing legislation should also take these recommendations into account.

2. All NAMs should satisfy a statutory definition of public purpose microgrid that includes the ability to island and a cap on maximum load served.

NAMs should achieve the policy goals discussed in this report, including the vital grid resiliency and public benefit objectives of the Task Force. It is therefore important for authorizing legislation to require NAMs to operate as true public purpose microgrids. Accordingly, the Task Force believes it is appropriate for the regulatory framework to include a definition of public purpose microgrid that requires NAMs to serve at least two critical community assets. The legislation can explicitly outline customer types that are considered critical community assets, such as grocery stores, fuel stations, and government facilities, and provide the PSC with authority to determine whether non-specified customers are critical community assets on a case-by-case basis. The definition should also require NAMs to be able to island when the macrogrid is down. This will necessarily ensure that generation within the microgrid is sufficient to meet critical local loads.

Additionally, the Task Force believes that that it is appropriate for NAMs to be limited to a maximum cap of total load served. As discussed by MPUC, a factor in determining whether an entity is indeed a public utility is the scale of the operation. At a certain point, a microgrid becomes a macrogrid, both in terms of number of customers and load served. A statutory limit is therefore necessary to set a point at which a system is an EDC rather than a NAM. The Task Force believes the State should select a limit that would ensure the microgrid is capable of serving multiple types of customers in a multitude of different configurations, while limiting the scope of deployment to an appropriate size. This cap can be determined through a fair and open proceeding at the PSC or through the legislative process.

3. NAMs with small loads should be exempt from PSC rate regulation, regardless of system ownership or control.

The Task Force believes it is appropriate to categorically exclude all public purpose microgrids with a small total load served from PSC rate regulation, regardless of who owns the system.

The Task Force believes an exemption for small systems would appropriately balance the need to reduce barriers to entry for smaller system with the important policy rationale behind the regulation of public utilities. A microgrid with a limited number of customers suggests it is more likely the interests of the customers and operator will be aligned. To the extent that interests are not aligned, however, the Task Force recommends below that these customers retain the right to petition the PSC for remediation. A cap for small loads can also be congruent with the 2 MW statutory system size limit for net-metering, which is currently the main mechanism through which third parties provide customers with the delivery of electricity from distributed generation. The relationship between the owners of these systems and customers is not regulated by the PSC, suggesting a similar exemption for smaller microgrids would be in line with what the General Assembly has already deemed appropriate.

As with the maximum load cap, the system sizes that fall within this exemption can be determined through a fair and open proceeding at the PSC or through the legislative process. Authorizing legislation also should contain a mechanism to prevent developers from utilizing this small system exemption to avoid regulation on the larger regulatory tiers discussed below.

4. All NAMs up to the maximum system size cap owned by the State or local governments should be exempt from PSC rate regulation.

The Task Force believes that it is appropriate to allow public purpose Municipal NAMs – NAMs owned by the State and local governments – to operate without PSC oversight of rates, regardless of system size. Municipal NAMs would be able to serve both government and private facilities, provided those facilities are critical community assets. This would allow the State and local governments to achieve important grid resiliency objectives and public purpose benefits, while promoting other important policy goals. State and local governments would act in the public interest when setting rates and ensuring service quality, in line with the policy rational behind exempting municipal utilities from PSC regulation. Municipal NAMs would be under the direct jurisdiction of elected officials, providing accountability and appropriate oversight.

5. All other public purpose NAMs above the small load exemption and up to the maximum load size should only be exempt from PSC rate regulation upon a determination by the PSC prior to project construction that the NAM does not present a substantial likelihood of operating against the interests of any particular customer class.

The Task Force believes that is appropriate to allow public purpose NAMs above the small load exemption and up to the maximum load size to operate without rate regulation only upon a determination by the PSC that the proposed system does not present *a substantial likelihood of operating against the interests of any particular customer class*. As discussed above, perhaps the largest policy question facing NAMs is under what circumstances the policy rationale for regulating Maryland's current utilities as EDCs applies to NAMs. Ultimately, the Task Force believes the most relevant issue is whether the interests of a NAM's customers are protected even if the NAM isn't regulated as an EDC.

The Task Force also recognizes that each public purpose NAM project will present different consumer protection issues based on location, customers, ownership, and the specifics of how it will operate. Accordingly, the Task Force believes the PSC should analyze the appropriate regulatory treatment for such systems on a case-by-case basis, similar to the existing Certificate of Public Convenience and Necessity (CPCN) process for new generating stations or high-voltage transmission lines. The Task Force proposes the NAM authorizing statute set out the standard for PSC review (that the proposed system does not present a substantial likelihood of operating against the interests of any particular customer class), followed by specific factors the PSC can consider in making its determination. In line with the MPUC factors discussed above, these factors should include: (1) the size of the microgrid (in terms of total customers and load served); (2) whether the microgrid is operated for-profit; (3) whether the microgrid is a co-operative; (4) whether and to what extent the microgrid is under the control of its customers; (5) whether and in what manner microgrid service is offered to prospective customers, including whether service is provided in accordance with a fixed price, long term contract; (6) the identity of interests among customers; and (7) whether it is mandatory to become a customer. The PSC would have the option of approving the system for operation without continuous PSC oversight over rates, for operation with oversight over rates, or to disapprove the project in its entirety. As with the PSC preapproval of EDC-owned systems discussed above, this would create a precedential framework for public purpose NAM deployment in Maryland.

Take for example a hypothetical public purpose microgrid project developed by a for-profit developer. The project would involve 6 MW of generating capacity, enough to serve the high school, grocery store, fire station, and business complex that would be the sole customers of the microgrid. The microgrid would be governed by a contractual arrangement that gives the four customers substantial control over the project. In this case, the project developer would file an application with the PSC, laying out how the project does not present a substantial likelihood of operating against the interests of a particular customer class. The PSC would have the opportunity to analyze the project using the factors discussed above, in addition to other factors it deems appropriate. In this case, the PSC would arguably have a strong basis to approve the project and allow it to operate without PSC oversight, given that the project involves relatively sophisticated customers who have substantial control over the system.

In contrast, assume that the project involved four commercial customers comprising 80% of the system's load, as well as residential customers comprising the remaining 20% of the system's load. Assume also that the contractual arrangement assigned control over the system based on electricity consumption. Here, the PSC arguably would be able to conclude that the system should only be approved with PSC oversight over rates based on the lopsided control structure. Indeed, this structure arguably does present a substantial likelihood of operating against the interests of a particular customer class: the residential customers.

As a final note, the Task Force focused particular attention on whether co-operative NAMs – NAMs owned by and under the ultimate control of their customers – should *de-facto* be able to operate without PSC oversight of rates.[75] The Task Force concluded that some co-operative NAMs may be dominated by a particular class of customers, allowing service to diverge from the interests of all customers. For instance, a co-operative NAM composed of ten large commercial users and two small residential users may potentially be dominated by the commercial users. Ownership in the hands of customers does not necessarily protect all of those customers. Since each system is different, the Task Force concluded that a blanket exemption for co-operative NAMs is inappropriate.

[75] The State subjects co-operative utilities (SMECO and Choptank) to essentially the same form of rate regulation as investor owned utilities, with the exception that such entities do not receive an authorized rate of return.

6. Customers of all NAMs, as well as the Office of People's Counsel on behalf of residential customers, should have the right to petition to PSC to investigate whether a NAM is operating in the interest of its customers.

The Task Force believes that it is appropriate for NAM customers to have a statutory right to petition the PSC for remediation. This would apply to all NAMs, including those that fall within the small load exemption. In some cases, a NAM may begin to operate against the interests of a customer or group of customers. The PSC may be required to address these issues. In order to ensure adequate representation, the Task Force also recommends that the Office of People's Counsel ("OPC") be authorized to file a petition on behalf of a customer or group of customers.

"Local Microgrid Operators" – Public Purpose Microgrids Operated by Third Parties Utilizing Existing EDC Distribution Assets

The majority of Maryland ratepayers are served by existing EDC distribution assets. In most cases, it would be uneconomical for these ratepayers to forego the existing EDC distribution grid for an entirely new public purpose microgrid. Given this reality, the Task Force believes that the State may wish to authorize **Local Microgrid Operators** ("LMOs") that provide public purpose microgrid services *using existing EDC assets*. Under this model, new entrants, including current developers of campus-style microgrids, would be able to develop and operate public purpose microgrids. EDCs would continue to earn a return on their assets and would also be able to develop their own public purpose microgrid projects, codifying the precedential framework discussed above for short term public purpose microgrid deployment. The Task Force believes this model would allow Marylanders to realize the benefits of public purpose microgrids offered on a competitive basis, spreading adoption and incenting innovation. While this model involves close coordination between private developers and EDCs, the Task Force believes it can be workable model to develop distributed generation in a way that continues to utilize – and provide compensation for the use of – existing EDC assets. This section introduces the issues the State would need to consider when developing a regulatory framework for these systems.

1. How would LMOs interface with EDCs?

Under this model, an LMO would not own distribution assets (i.e., the wires) and the EDC would remain eligible to recover all applicable costs from ratepayers who are also served by the LMO. The LMO would own and/or contract for generation, storage, and control systems, and could operate as the electricity supplier for the microgrid customers. This would allow customers to take advantage of competitive public purpose microgrid services without unnecessarily duplicating distribution assets. Furthermore, generation and storage systems would be able to be customer sited and owned, bringing the benefits of system ownership to LMO customers.

LMOs would deploy these systems in coordination with the EDC. The EDC would retain its traditional control of the wires and would charge microgrid customers a distribution rate based on its current rates. The EDC would compensate the LMO directly for any grid benefits delivered by the microgrid, such as deferred transmission and distribution upgrade costs. The LMO would be able to use these payments to balance the costs of developing and operating the system. As noted by some participants in the Task Force discussions, the ability of EDCs to utilize microgrids in place of transmission and distribution upgrades would require an assurance that the microgrid asset would be in place when necessary to ensure system stability. This certainty spans more than a legal obligation – LMO microgrid controls will likely need to be integrated into EDC systems. As mentioned by one of the participants in the Task Force discussions, when an EDC defers transmission and distribution upgrades due to a microgrid, there must be an agreement that the EDC can call on it as necessary as if it were part of its infrastructure.

2. How would billing function?

The Task Force believes it may be appropriate for an LMO to charge its customers a Microgrid Service Charge ("MSC") for microgrid services through the existing EDC billing system on top of the distribution rates charged by the EDC. While some participants in the Task Force discussions suggested that an ESCO model or PPAs would be workable for LMOs, the Task Force concludes that authorizing billing through existing EDC billing systems would provide LMOs with more certainty regarding cost recovery. The ESCO model and PPAs are contractual financial arrangements that are specific to the signatories of the agreements. This would present issues if a microgrid customer were to move from inside the microgrid to a location outside the microgrid. In contrast, implementing a MSC through the EDC billing system, would allow the charge – and cost recovery – to transfer automatically from one occupant of the property to the next. While developers should be able elect the PPA model if they so choose, the Task Force believes a EDC billing model should be available to developers.

3. What form of regulation is appropriate for LMOs?

For LMOs, EDCs will continue to own underlying distribution assets and will be subject to the PSC's traditional ratemaking process. LMOs will be a service provider on top of those assets, similar to a competitive electricity supplier. Accordingly, the Task Force concludes authorizing legislation should at a minimum establish a licensing requirement similar to what exists for electricity suppliers.[76] Requirements could include proof of technical and managerial competency and financial integrity.[77] The PSC can also promulgate consumer protection requirements through the regulatory process, similar to what currently exists for electricity suppliers.[78]

LMOs differ from competitive suppliers however, in that they would install permanent assets close to customers. Therefore, it is unlikely that the terms of service offered by LMOs will allow customers to readily switch between providers. Viewed through the lens of the MPUC decision making framework discussed above, the Task Force believes it is appropriate for the PSC to retain strong regulatory oversight over LMOs. This should include authority to regulate the terms on which LMO services are offered, including the length of supply contracts and reliability metrics. LMO customers, EDCs, and the Office of People's Counsel should also retain the right to petition the PSC for remediation in cases of abuse and poor service quality.

4. How would developers propose projects and seek approval from the PSC?

In order to facilitate open competition and reduce barriers to entry, the Task Force believes that authorizing legislation pursued by the State should set forth a process for the PSC to consider LMO development proposals with strong EDC and stakeholder input. This process would involve LMO developers receiving commitments from future customers and composing a project development, financing, and operations plan. Next, the LMO would coordinate with the EDC directly to develop the project. The developer would be required to file an application with the PSC, similar to the existing CPCN process, where the PSC would review the project, make changes if necessary, and either affirm or deny the application. Upon filing an application, the EDC would need to work collaboratively with the LMO developer in order to facilitate project development, and would be able to assess the feasibility of the proposed project and suggested changes necessary to make it work within the existing electric

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[76] Md. Public Utilities Article § 7-507 (2014).
[77] *Id.* at § 7-507(b) and (c).
[78] *Id.* at § 7-507(e).

distribution system. Under this proposed structure, the PSC would have authority to determine whether the project serves a public purpose by serving more than two critical community assets. The process would also allow the PSC to apply the licensing requirements discussed above to the specific LMO project. Finally, the application process would provide a venue for the EDC to work in good faith the LMO to implement the system on its existing electric distribution system.

Once approved, the LMO would be responsible for reasonable costs associated with interconnection and grid integration, including the EDC system upgrade costs necessary to integrate the LMO's controls, storage, and generation. In order facilitate competition between utilities and LMOs, the Task Force suggests that this framework formalize the EDC-owned microgrid deployment process, so that EDCs compete on a level playing field with new entrants.

5. How would the development and application process for LMOs work in practice?

As an example of how this proposed process would work, assume that a developer has worked with a group of five customers, including a grocery store, fire station, and office complex, located next to each other to develop a proposed public purpose LMO project. Existing EDC infrastructure serves each customer. The developer proposes to install natural gas fuel cells and solar PV with storage to meet the load of these customers. The developer would also do deep energy efficiency retrofits to the customer's buildings to reduce the local generation necessary to meet load, qualifying for EmPOWER incentives. Finally, the developer would install smart control systems, which would include islanding capabilities. The developer would file an application with the PSC. Upon receipt of the application, the EDC would work with the developer to finalize project definition and costs. During this effort, suppose the parties determine the project would allow the EDC to avoid a costly investment in the distribution infrastructure that serves the area. Accordingly, the EDC would work with the LMO to determine how to the EDC could rely on the microgrid services offered by the LMO to defer this investment. Upon approval from the PSC, the developer would recover costs through a MSC assessed on top of existing EDC bills, allowing the charge to carry over to future customers.

Conclusion

The legal and regulatory issues raised by the deployment of public purpose microgrids – both EDC and third party owned – are complex. Many of the issues addressed in this report did not exist ten or fifteen years ago. However, the decreasing cost of distributed generation and the increased frequency of severe weather events has started to challenge the legal and regulatory structures that exist today. The State must address these issues as society places increasing importance on grid resiliency.

This report is a starting point to begin the deployment of public purpose microgrids in Maryland. EDC-owned public purpose microgrids are possible today and the Task Force recommends that State move forward quickly to deploy these systems. These systems will offer tangible benefits to Marylanders and will begin to revolutionize how power is generated and consumed. Third party owned and/or operated public purpose microgrids are more complex. The Task Force recommends that the State take a long term view of these systems, engaging stakeholders to determine the appropriate scale and scope of deployment. The sample regulatory frameworks outlined in this report for NAMs and LMOs begin to address the issues the Task Force believes the State would need to tackle should it decide to deploy these systems. The Task Force believes these constructs have high innovative potential. We look forward to working with stakeholders to further engage on these issues so that all Marylanders can benefit from a resilient – and innovative – electric distribution system.

APPENDIX A: GRID TRANSFORMATION PROGRAM OUTLINE

This appendix summarizes the roles and responsibilities of the **Grid Transformation Program** ("GTP"), as recommended by the Task Force.

1. MEA, in consultation with the PSC, will conduct the following studies:

    a. A review of interconnection procedures for distributed generation and microgrids, with the goal of ensuring safe interconnection with the macrogrid while enabling islanding, smart inverter, and advanced control technologies and reducing soft costs.
        i. MEA will evaluate the current process of interconnection and permitting in each EDC service territory throughout the State.
        ii. This analysis will focus on next generation interconnections building upon Maryland's streamlined interconnection procedures for systems 10MW and smaller.
        iii. MEA will submit these recommendations to the PSC, with a focus on islanding capabilities and advanced control technologies.

    b. A planning document outlining an appropriate process for EDCs to provide project developers with information identifying the most valuable locations for distributed generation and microgrid deployment.
        i. The benefits of microgrids vary depending on generation technology, storage capacity, configuration, and geographic location.
        ii. Areas with high levels of congestion and line-loss are key geographic targets, as they are some of the least efficient portions of the distribution grid, and also are the sections of the grid that are most vulnerable to severe weather and attack.
        iii. Accordingly, granular data associated with this action item is sensitive and is not publically available.
        iv. MEA will work with EDCs to develop a process aimed at identifying the most valuable locations for microgrids and distributed generation.

    c. A tariff study examining the value of distributed generation and microgrids to the macrogrid and society.

i. The rapid development of distributed generation, especially solar PV, has raised questions about cross-subsidization, the value of solar energy and the incentives that apply.
ii. MEA will engage in a tariff study to determine a methodology to determine the value of distributed generation to the macrogrid and society, with a focus on real world inputs and valuations.

2. The State will work with EDCs to incorporate microgrids into their planning processes as a means to increase grid resiliency.

   a. Incorporation of microgrids and distributed generation into the macrogrid is important to maximize the value of that system and ensure safe interconnection.
   b. MEA will work with EDCs and the PSC to implement the results of the three studies discussed above.
   c. As outlined in the body of the Task Force Report, it is necessary the PSC must be involved in the deployment of microgrids, therefore integrating microgrid and distributed energy systems into an existing institution for evaluation by the PSC

3. MEA will assist the State in the development of incentives that support the deployment of advanced controls, energy storage, and other technologies vital for the deployment of microgrids.

   a. Public Purpose Microgrid Competitive Grants
      i. The State should issue an RFP for grants, low-interest loans, and technical and regulatory assistance for the deployment of public purpose microgrids
      ii. Projects will focus on the development of public purpose microgrids in key geographic regions, and awards will be made in each region.
      iii. Objective: Development of first public purpose microgrids in Maryland will work further address the barriers to microgrid deployment discussed in this report.
      iv. In addition to cash grants, the State should help the developers find access to low-cost capital to develop the project.
      v. The State will work with developers to collect key data on economic opportunities, identify and overcome challenges in the process of commissioning.

vi. Upon award, MEA will engage with EDCs and regulatory agencies and the PSC to ensure project deployment.

b. Advanced Energy Controls Grants
   i. The State should award non-competitive grants for energy system controls that facilitate communication with grid operators to ensure system stability and maximize the value of distributed energy assets.
   ii. Examples of technologies that could qualify under this program include smart inverters, micro EMS, communications equipment, and power management software.
   iii. This program will focus on interoperability, resiliency, power quality and the development of transactive energy markets.
   iv. As this industry matures, the State will need to refine program requirements to drive the market towards best available technology and effective standards.

c. Energy Storage Grants
   i. The State should award non-competitive grants for the installation of energy storage technologies including batteries to promote resiliency and mitigate the impact of variable production of renewable energy.
   ii. Even small storage solutions will help to mitigate the impact of renewables to the grid and can provide services to the grid including ramping and voltage control.
   iii. To qualify for the Energy Storage Grant, it must be installed with advanced energy controls like smart inverters that can provide benefits to the larger grid.

4. Through the GTP, MEA will assist local governments and emergency planners to incorporate public purpose microgrids into emergency plans
   a. MEA will work with local governments and emergency planners so that there is an understanding of how public purpose microgrids will be used in emergencies.
   b. This will ensure maximum benefit from public purpose microgrids deployed across the State.

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While many stakeholders were present for these discussions, Task Force Participants were defined as stakeholders who participated in the Task Force through presentations and written comments. These deliverables were considered during the drafting of the Task Force Report, however the recommendations exclusively reflect the views of the Task Force Members.