STATE OF VERMONT
PUBLIC UTILITY COMMISSION

Case No. 20-____-PET

Petition of Green Mountain Power for approval	)
of its Climate Plan pursuant to the Multi-Year	)
Regulation Plan proceeding May 24, 2019 Final	)
Order and 30 V.S.A. § 218d	)

PREFILED DIRECT TESTIMONY OF
JOSH CASTONGUAY
ON BEHALF OF GREEN MOUNTAIN POWER

January 30, 2020

Summary of Testimony

Mr. Castonguay's testimony explains how the innovation measures GMP has pursued fit within GMP's goals to create a more resilient and sustainable electric grid and delivery system for customers that is safer and more reliable, including the deeper use of storage assets to help build resiliency during times of extended outages, and how in the face of climate change, this work is critical. He also addresses how these measures are reflected in the development of the Climate Plan, including GMP's support of Resiliency Zones designed to improve communications and power availability to key systems to help Vermont recover after disasters, and the development of a new platform that will allow GMP to better manage the continued and necessary growth of distributed energy resources.

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Introduction

Q1. Please state your name, address, and occupation.

A1. My name is Joshua Castonguay. I am employed by Green Mountain Power ("GMP") as Vice President, Chief Innovation Executive.

Q2. Please describe your educational and business background.

A2. I have been employed by GMP since 2003, working in engineering until 2009, and then moving into various leadership positions throughout the organization, including the control center and the transmission and distribution line department, among other responsibilities. In 2017, I became Vice President, Chief Innovation Executive leading generation, engineering, and the team working on our innovative technology and service. I graduated from the University of Maine in 2003 with a Bachelor of Science in Electrical Engineering Technology.

Q3. Have you previously testified before the Public Utility Commission ("Commission" or "PUC")?

A3. Yes, I have previously testified before the Commission, including in Docket Nos. 7628 (Kingdom Community Wind), 7601 (Berlin Solar Project), 6860 (Northwest Reliability Project), and 8680 (Stafford Hill Project). I also submitted testimony in GMP's 2014 rate case in Docket 8190, the 2018 rate case in Case No. 17-3112-INV, the 2019 rate case in

18-0974-TF, the Multi-Year Regulation Plan in Case No. 18-1633-PET, and in the BYOD and Energy Storage tariff proceedings, Case Nos. 19-3167-TF and 19-3537-TF.

Q4. What is the purpose of your testimony in this case?

A4. My testimony explains how the innovation measures GMP has pursued fit within our goals to create a more resilient and sustainable electric grid and clean energy delivery system for customers, including the deeper use of storage for safety and reliability through various GMP programs. In the face of climate change, this work is critical. These innovation measures align with the work we are specifically proposing in the Climate Plan ("CP" or the "Plan"), including our work to plan for Resiliency Zones designed to help Vermont recover after disasters and the development of a new platform that will allow us to manage the continued and necessary growth of distributed energy resources responsibly and safely for customers.

Q5. Why are these projects an important part of how GMP thinks of its response to climate change?

A5. Our focus is always on one thing: our customers. For nearly the entire history of electric distribution, our methods for delivering energy remained fairly consistent, while the natural forces working against our ability to deliver reliable service were also fairly consistent. Over the last decade, the increasingly complex, distributed grid coupled with the acceleration of severe weather impacts due to a changing climate have forced us to completely reevaluate the way we deliver reliable service to our customers. Our mission

also now includes reducing greenhouse gas emissions that are wreaking havoc on our climate and our ability to safely and reliably serve customers.

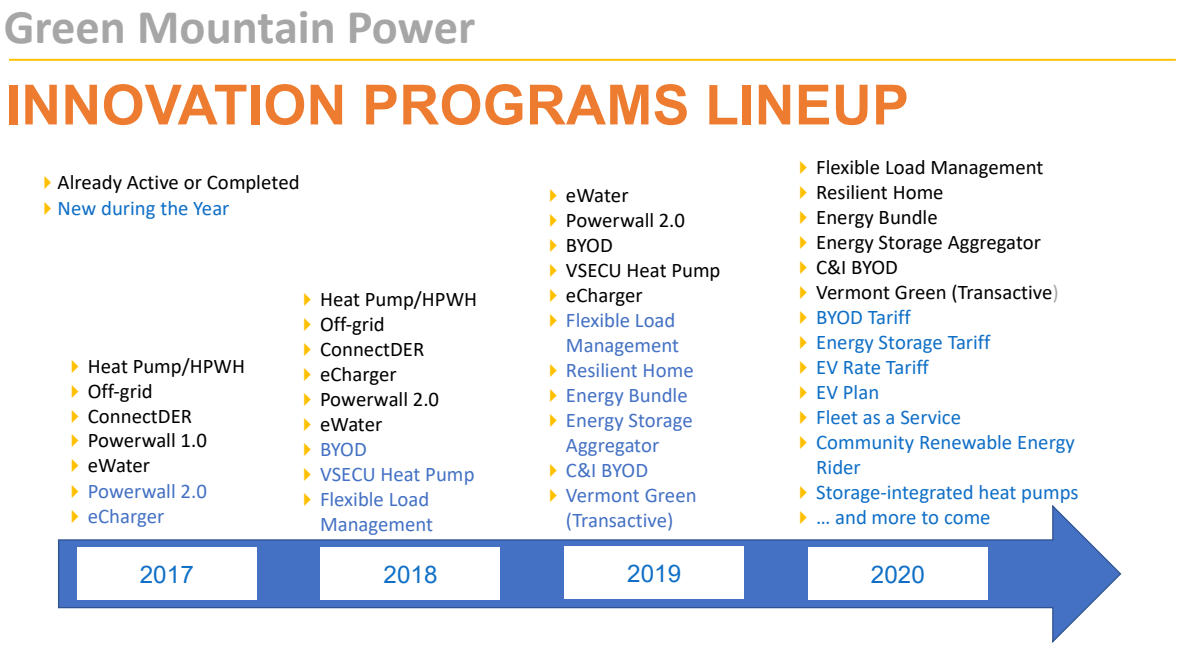
Though GMP has identified a host of hardening and other grid protective measures in the Climate Plan, there is no way to fully prevent severe weather damage in the years ahead. The lesson we've learned from damaging storms in recent years is that all of our state's critical infrastructure is connected: to get to the downed line, one must rely upon the roads; to communicate effectively with Vermonters, one must rely upon the internet, our telecommunications and electric facilities. As we continue to develop a more distributed, local grid, that relies increasingly on clean electrification to power our economy and cut our carbon emissions, these interrelated systems will even more so depend upon mutual resiliency.

Harnessing innovation to improve service for our customers is no longer just one of GMP's goals but instead a must-do in every aspect of our business in order to be sure we are adapting to the threats of the climate crisis. The testimony of other witnesses in this proceeding provide further detail on how critical that work is. Because we recognize how significant the threats to our system and the state are from the climate crisis, we are being proactive and considering how to strategically deploy cable-in-conduit undergrounding; how to target tree removal in certain wider corridors; how to install self-healing automation for circuits at risk; how to better harden our hydroelectric facilities; and how to use technology to better manage assets and increase targeted safety communications. In no aspect of our business are we content to just do things the way we have always done them. We are evolving and recognize that business as usual will

not work. We must continue to evolve and adapt faster to address the challenges we, our customers, our state, and our planet now face.

For the last several years, in our customer-facing programs, we have specifically pursued innovative projects through a pilot structure. As shown in the graphic below, we have developed these projects to build on one another, all with an eye toward making a more distributed, local, customer-focused, cost-effective, resilient grid.

Graphic 1. Innovation Programs Lineup



When developing our customer pilots, we focus on programs and services that can leverage new, clean energy technologies that can reduce overall greenhouse gas emissions, provide increased customer resiliency and safety, and develop the platforms needed to manage a much more diverse, distributed and integrated grid in a cost-effective way for our customers. This is working now. For example, the storage systems that

GMP and our partners have deployed in customer homes, both through our Powerwall pilots and the BYOD program, helped over 1100 customers during the severe storm that hit our state this past Halloween by providing them with backup power during outages caused by high winds and precipitation levels. In that single storm, the batteries from GMP pilots provided over 10,500 hours of backup power allowing our customers to be safe and comfortable during this significant recovery event. Customers received these important safety and reliability benefits from programs that also pay for themselves, due to the structure of the innovative pilots that we have developed to capture and share the value that battery storage provides to the grid. These programs are helping cut carbon and costs, while increasing resiliency and driving down costs for all customers.

Meanwhile, other pilots underway help us envision how we will serve customers better as the grid evolves in the future. For example, the Resilient Home pilot is allowing us to test using the home battery as the utility meter. We believe this ground breaking and new capability could evolve in the future to allow us to provide customers with some storage capability as a part of their basic utility service—devices that can measure usage, allow for load control to drive down the costs of the bulk grid, and provide backup power in an outage. Every single home or business must get a meter today as a requirement of receiving electrical service. We can see a future where this requirement transitions to every single home and business getting a device that can provide metering, load control, and resiliency.

Like many energy resources, the ability to stack benefits available from batteries will play an important role in the long-term benefit of these new resources. Our Energy

Bundle pilot tests new ways of delivering packaged energy services to customers by combining fixed pricing for their usage, onsite generation, and storage—not only simplifying these systems for the customer but also providing an entire resiliency package for their use, while still sharing savings back to all customers. It is programs like these, delivered to the market through multiple providers, including directly from GMP, that are critical to partnering with our customers to assure continued reliable and affordable service in the face of climate change while also reducing greenhouse gas emissions.

Q6. How does the Climate Plan intersect with this work?

A6. The Climate Plan supports further innovative work in three ways.

First, as described above, as the grid becomes more local, distributed, and decarbonized, GMP foresees a future where management of onsite, customer storage as a flexible grid resource to benefit all customers in the face of the climate change becomes a routine utility function. That is why we propose to develop a new platform that will allow us to manage the continued and necessary growth of all distributed energy resources as a part of the Plan.

Second, GMP is developing new microgrid capabilities, where we use existing solar and storage facilities and create the ability to island portions of the distribution system. This is important because it will allow us to help create broader areas of resiliency, and ensure power stays on for broader groups of customers at critical locations. Due to the complexities of distribution system protection, and the need to assure the island can operate in a safe and stable manner, this is very hard to achieve—we

are not aware of any places where it has yet been successfully deployed. We are in the midst of development at Panton as our prototype site, and we will use the design and technology to replicate at other locations. As we will discuss further below, through our Resiliency Zone analysis, using our circuit ranking work done previously, we will identify locations where this type of islanding capability is needed for critical infrastructure and propose the projects as they arise.

Third, this work will also include the addition of storage to existing solar systems in key locations as a part of our Resiliency Zone efforts. GMP proposes to work with the State, other utilities, local first responders, and community stakeholders to develop plans for Resiliency Zones in Vermont—areas where the energy and its related communications system is designed to better withstand extreme weather and natural disaster conditions to anchor the recovery efforts by the State and local responders. This work will include smaller projects such as commercial building scale islanding for critical infrastructure in Resiliency Zones. We will work with key groups to further develop this in partnership, to identify where these Zones should exist and the specific elements they each should have. Massachusetts has advanced work that is similar to this through a State-led Municipal Vulnerability Preparedness grant program, for both assessment of needs and funding for programs. While we do not presently have a similar program here in Vermont, we can replicate some of its features in the Resiliency Zone work we start in this Climate Plan, with our focus on delivering benefits to the customers and communities we serve.

Q7. Explain what GMP expects these Resiliency Zones to provide.

A7. These zones will be designed for long-duration outage resistance, through microgrid capability and storage, and will be located in areas that are near critical infrastructure and recovery functions (e.g., communications hubs; health facilities; emergency operations facilities) to help the state and local communities recover more quickly in a time of disaster. The work GMP can do may be complementary to efforts local towns or emergency responders undertake to shore up vulnerabilities in their communities by, for example, better planning for shelter services or rescue and response coordination.

The Resiliency Zone selection and planning process necessarily will be a collaborative one. We will first plan the stakeholder and outreach process, taking into account information we heard during our community meetings for this Climate Plan. We expect to include in the selection of these Zones consideration of the criteria developed with the Department as a part of the Memorandum of Understanding approved in the GMP Joint Venture Solar/Storage projects last year. The MOU was focused on project sizes greater than 1MW. For this resiliency work, we will also focus on projects that could be much smaller. To those, we will add a review of the current state of communications in the area and critical facilities, working with local community partners.

For example, during our stakeholder outreach for the Climate Plan, we met with town and planning officials at our Royalton district office. During that conversation, we learned from a town official from Chelsea that due to lack of cellular communications, loss of power in their town results in even greater communication challenges, which

could create unsafe conditions for residents and first responders in the event of an emergency. A location like this could be targeted for a Resiliency Zone and could include partnership with a communications provider to assure that residents can continue to communicate and have a place to go in times of emergency. For interested communities, these initiatives may also include local cost sharing or other funding sources beyond the GMP portion of any project.

While we have not yet identified all the criteria to define Resiliency Zones, we will include consideration of the following:

- No current distribution feeder back-up capability—only radial distribution lines feeding the area.
- Whether or not the sub-transmission feeding the area is radial or looped.
- Challenging reliability statistics—meaning the local incident count and duration of outages are higher than our averages.
- Unserved or underserved with broadband in the community.
- Poor or no cellular connectivity.

These are just a few of the criteria to be used and through our stakeholder work we will develop more, which will focus us into the most vulnerable parts of our service territory during severe outage events.

Q8. How will GMP plan for these Resiliency Zones as a part of the Climate Plan?

A8. Through our outreach and stakeholder meetings, we will take the selection criteria and identify locations with the most critical needs where our customers and the community would best be served by greater resiliency in the electrical system. For example, a

location like Chelsea, with challenging communications and reliability, would certainly rank higher than a location with strong electric reliability and communication technologies. From there, we will work with the stakeholders in the highest ranked areas to identify the key vulnerable facilities in the community and develop an action plan of projects and partnerships needed to strengthen the resiliency in that specific area. We expect to refine the Resiliency Zone selection criteria through the regulatory process, taking feedback from regulators and other state agencies to better focus our efforts.

We want to emphasize that partnerships will be very important in the creation of Resiliency Zones, and depending on the specific needs of the location, we may look to an RFP or RFI to provide certain services, and other funding sources may come into play to help communities achieve their goals beyond the work GMP would perform. We would welcome partnering with communications providers, municipalities, and the State for aspects of the work. For example, we could leverage GMP infrastructure, such as our poles, to help provide communications services to customers and locations in need. In addition, we could add fiber to those T&D projects pursued as a part of the Plan, to aid not only our own communications now and in the future, but also potentially to further the State's broadband goals in underserved areas. Climate change, and the impacts on customers, requires this kind of partnership and community focus.

Q9. Turning to Distributed Energy Resources ("DERs"), how does the deployment of additional DERs dovetail with your proposed Climate Plan projects?

A9. As mentioned above, the work we have done to deploy DERs, such as energy storage and thoroughly test its capabilities—from providing emergency power, to metering data, to

grid services, and peaking energy—shows us that DERs are ready to be utilized as a significant and meaningful grid resource and as part of utility service, as we address the changing climate in partnership with our customers. By providing all of these services, it can improve customer reliability and safety while decreasing overall costs for all customers.

Think of how different this is from the existing dominant paradigm: traditional transmission and distribution resources like poles and wires are able to provide reliable energy service but do not provide additional benefits that offset the expense of installing them or lower costs for customers. And they remain vulnerable to the impacts of severe weather. That is why we see storage as an essential utility service, and a very important piece of the new, transformed grid. Vermont is lucky to have an abundant supply of solar energy due to development over the last decade. Solar on its own does not provide resiliency during a grid outage; however, when paired with storage it can become a clean, resilient source of emergency power. We are going to continue pursuing various methods for the deployment of DERs, such as our proposed tariffs for residential storage, BYOD, and our aggregator pilot, along with programs like our residential charger service, and intend to continue to do so outside of this proposed Climate Plan. We also expect to propose discrete projects in the years ahead that utilize DERs within Resiliency Zones as part of this Climate Plan. While battery storage has been one of the most successful DERs, it is very important we continue to pursue all options that include resources like EV chargers, heat pump controls, water heater controls, and more. But first we will pursue a key piece of infrastructure that is needed to tie all of this together—a new

platform to provide us with the choreography necessary to manage tens of thousands and ultimately hundreds of thousands of distributed energy resources in a manner that manages cost, reliability, and distributed flexibility. This platform will include focused forecasting capabilities, optimization of DERs and the ability to communicate with existing GMP control platforms to most effectively dispatch the fleet of resources under our management to drive down costs and carbon for the customers we serve.

Q10. What is the DER platform enhancement that will be proposed in the CP?

A10. As a part of the Plan, GMP will undertake the development of this new platform that will allow us to manage the continued and necessary growth of distributed energy resources connected to our grid without placing constraints on DER expansion or jeopardizing the reliability and safety of the grid. It will also allow GMP the best opportunity to consistently capture the value streams associated with access, management, and coordination of those DERs, so costs can be saved and value can be delivered back to our customers while also maintaining our high level of grid reliability. As Vermont does more to eliminate our dependence on fossil fuel, we will see continued electrification of heating and transportation, the top two sources of carbon pollution in Vermont.

Through pilots and our Vermont RES Tier 3 work, we have shown that we can manage these resources as they become electrified, to benefit all customers through cutting carbon and costs as we make this important and necessary transition. An example of this is our residential EV charger program, where the customer gets an EV charger at no cost in exchange for allowing shared access by GMP to shift charging time away from the peaks to benefit all customers. The tools we currently use work adequately with the

thousands of distributed resources we currently manage, but the fact is that they are partially manual and not up to handling the level of sophistication and coordination required as this number grows to tens and even hundreds of thousands of resources. In that world, which we envision rapidly approaching as we get past the tipping point of transportation electrification and deep carbon reductions, we will need a more automated and intelligent platform to manage the resources and the grid, rather than manually dispatching and shifting resources around as we do with these current tools. We need a more robust platform that will tie it all together, optimizing the resources each day to flatten our load profile, increase the operating efficiency of the grid, and reduce costs for all customers.

In preparation for this work, GMP has recently been working with C&I customers within our Flexible Load Management ("FLM") pilot to bring industrial equipment, building environmental control systems and other accessible and controllable load devices in the C&I setting into our grid coordination efforts, to further expand the number and capacity of grid resources we are able to connect with, and learn better what we need to manage this even more distributed grid.

The scope of this work will develop the ability to essentially do circuit-level balancing of demand against local distributed generation and power fed from the serving substation, factoring in the capacity and control of local DERs. This work will build DER baselines for every circuit; incorporate weather forecasts and historical demand patterns; determine dispatch schedules to achieve different objectives, such as peak shifting, maximum DG absorption, resiliency preparation, etc.; and issue dispatch

instructions to various DER devices and control sub-platforms to realize the desired outcomes.

These types of solutions that match GMP's needs for managing the distribution system in the future are not readily available on the commercial market at this time. Our evaluation to date has been focused on a scan of the commercial market to update our knowledge of current vendor capabilities in this area, and then begin to evaluate ways to develop partnership relationships with expert firms in this area to jointly develop the analytics, modeling and dispatch components we believe necessary to the operation of our grid in the future.

Q11. How does GMP propose to address future, to-be-determined projects like the Resiliency Zones as part of the innovative category?

A11. The key driver for identifying projects in this category will be directly connected with the work of determining the location and needs of Resiliency Zones. We will work with various stakeholders to identify these zones and then define projects that solve the specific issues and challenges applicable to each location. We would welcome the Commission and Department's involvement in that work. Examples of projects could be the islanding of a small commercial building for an emergency shelter for residents; first responder location islanding—like a fire station; or creating and islanding a communications hub. GMP will engage with the appropriate stakeholders which would include local community leaders and emergency responders, Vermont Emergency Management, state and regional planning and community development leaders, and others, to identify the appropriate criteria. This in turn will help us identify the key

locations, and together with local community leaders, we will develop the projects necessary and put them forward for the Commission's review. Additionally, GMP is actively engaging right now on defining a scope for a new DER platform to support the resiliency work discussed above, and will be proposing this solution when we have identified the appropriate partner.

Q12. Is there anything else you want the Commission to know about the intersection of your innovation and climate resiliency work?

A12. GMP thinks this is an important moment to act and be proactive for customers, by further leveraging innovation to deliver clean, reliable, and cost-effective power in the face of climate change and the challenges it brings to our customers, and our state. For Vermont to have any chance of meeting its GHG reduction targets so that it can do its part to mitigate the effects of climate change, we must do the work to keep clean energy flowing and affordable for customers. GMP has the ultimate responsibility of delivering energy to all our customers in as low-carbon and affordable a way as we can, with safety at the forefront. We think all of the projects envisioned in the Climate Plan will be important ways to address climate impacts, by implementing highly localized and targeted system improvements that have multiple benefits to our customers and communities, including helping cut carbon and drive down costs for all. GMP and Vermont's other distribution utilities are in the position to partner with customers, energy companies, local communities and the State to deliver this energy future now. With continued innovation, strong partnerships, and strategic investments, Vermont can continue to set the example of how to best serve customers and be an energy transformation leader.

Q13. Does this conclude your testimony at this time?

A13. Yes, it does.