STATE OF VERMONT
PUBLIC UTILITY COMMISSION

Case No. 20-____-TF

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
BRIAN OTLEY
ON BEHALF OF GREEN MOUNTAIN POWER

January 30, 2020

Summary of Testimony

Mr. Otley provides an overview of the Climate Plan (the "CP" or "Plan"), including an outline of the categories and types of projects included in the Plan, and identifies the witnesses providing testimony in support of the Plan. Mr. Otley summarizes the weather and reliability impacts to Vermont that have prompted the proactive grid-hardening and innovation efforts proposed in the CP, especially in light of the goal of further electrification as Vermont continues to reduce its carbon emissions in the years ahead. He describes why the categories of projects set forth are necessary, appropriate, and in the best interest of customers. Mr. Otley also summarizes how the capital and O&M spending proposed in the Plan fits with the current Multi-Year Regulation Plan and with future rate cases.

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PREFILED DIRECT TESTIMONY OF

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ON BEHALF OF GREEN MOUNTAIN POWER

Introduction

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

A1. My name is Brian Otley, and I am a Senior Vice President and the Chief Operating Officer for Green Mountain Power ("GMP").

Q2. Please describe your educational and business background.

A2. I have a Bachelor of Arts degree from Dartmouth College. For the first 20 years of my career, I worked in the healthcare Information Technology ("IT") sector. I held numerous functional and executive leadership roles with several healthcare software and services companies. In 2008, I joined GMP as Leader of Information and Innovation. In this role, I was responsible for the IT infrastructure and capabilities of GMP, while also driving positive change into GMP's use of technology across all aspects of its operation and customer service. Beginning in April 2009, I led GMP's Smart Grid activities, including participating in the successful eEnergy Vermont application to the U.S. Department of Energy (the "DOE") for Vermont's Smart Grid Incentive Grant award. In February 2011, I became Vice President of Operations for GMP. In June 2012, I became Chief Information Officer for GMP, concurrent with the approval of the merger with Central Vermont Public Service ("CVPS"). In November 2013, I became Senior Vice

President and Chief Operating Officer of GMP. In this role, I am responsible for all field and customer-related operating activities for GMP.

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

A3. Yes. I filed testimony in Docket No. 7770 and in GMP's 2018 rate proceeding in Case No. 17-3112-INV. I also recently filed testimony in GMP's 2019 rate proceeding, Case No. 18-0974-TF and the Multi-Year Regulation Plan proceeding, Case No. 18-1633-PET.

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

A4. I provide an overview of the Climate Plan, including an outline of the categories and types of projects included in the Plan, and identify the witnesses providing testimony in support of the Plan. I briefly summarize the current and future weather trends and the associated reliability impacts to GMP's infrastructure and operations that have prompted the proactive grid-hardening and innovation efforts proposed in the Plan, particularly in light of greater electrification expected in the years ahead, as Vermont continues to reduce its carbon emissions. I describe why the categories of projects set forth in the Plan are necessary, appropriate, and in the best interest of our customers. I also introduce how the capital and O&M spending proposed in the Plan fits with the current Multi-Year Regulation Plan and with future rate cases—a topic covered in detail by Mr. Ryan.

I. Overview

Q5. What is the Climate Plan?

A5. The Climate Plan is our comprehensive framework to better prepare for climate impacts in order to create a more resilient and safe electric system for our customers. The Plan we present has two interrelated goals: 1) hardening our grid and our restoration response in the face of increasing frequency of severe storms driven by the climate crisis, to better serve our customers; and 2) better preparing our grid to serve as the backbone for Vermont's goals to cut greenhouse gas emissions and transition off fossil fuels, as we electrify a greater portion of our economy in the years ahead.

GMP operates a reliable and increasingly renewable energy delivery system for our customers. As Vermont continues to lead the nation in clean energy policy and as Vermonters continue to transition to electrification as their best method to reduce reliance on fossil fuels, retaining the high reliability level of our electric grid is paramount because customers will rely upon it even more so than they do today. At the same time, the impacts from the climate crisis are here now and are expected to intensify in the years ahead. That is why intentional, proactive resiliency planning is so important for GMP's customers and the state.

GMP is proud that it has partnered with customers to exceed carbon reduction goals by 40% in 2019. In all, GMP's 2019 rebates and business innovation programs offset more than 269 million pounds of carbon—the equivalent of taking 25,000 fossil-fueled vehicles off the road for a year. Vermont's two biggest sources of carbon emissions are driving and heating; switching to electric power for our customers is cleaner than driving or heating with fossil fuels because GMP's power supply is 90%

carbon free and 60% renewable, with a commitment to be 100% carbon free in five years and 100% renewable by 2030.

While we continue to push for a cleaner energy supply, we also need to take more intentional, accelerated action to strengthen our grid against the effects of the climate crisis.

The Climate Plan is GMP's recommendation for systematically and proactively hardening our infrastructure and operational capabilities to help prepare for the increasing impacts we and our customers have seen and will continue to experience from the severe weather patterns caused by the climate crisis. These investments will also help us respond and recover more quickly to any type of threat to our grid, and to help the communities we serve better bounce back from such impacts.

GMP's Multi-Year Regulation Plan ("MYRP" or "Regulation Plan"), approved by the Commission in Case No. 18-1633-PET, allows GMP to file a plan that proposes specific, targeted initiatives designed to respond to the climate crisis, going beyond our regular, necessary grid investments that maintain the reliability of our system. The Commission's Regulation Plan Order of May 24, 2019 noted that GMP's proposed Climate Plan "would be intended to address threats to GMP's system from more frequent and intense storm events related to climate change, and to accelerate the pace of GMP's current storm-hardening measures to maintain service quality." PUC Order at 14, Finding #13. We asked for the ability to file a plan because we could simply not ignore the fact that—literally in the midst of preparing our rebuttal testimony in the Regulation Plan proceeding—we were experiencing really significant major storm damage and even

greater stacking of customer costs. Frankly, we recognized then that we needed to act more comprehensively to address this going forward.

The Climate Plan represents thinking beyond reliability—to resiliency. Reliability is about the amount of time the system is up and functioning. It is binary—it asks, "are the lights on or off?" Traditional outage metrics are geared more toward measuring reliability. While reliability is certainly an element of resiliency, resiliency itself is specifically about enhancing systems to overcome catastrophic impacts more quickly. As Vermonters electrify more of their daily lives, including transportation and home heating, we face worsening weather trends and increased storm response costs. The Climate Plan gives us a framework across our operating areas to create a more resilient system that can withstand and recover quickly from major weather events so that our grid can continue to support the increasing customer energy use that relies on electricity in the years ahead.

The Climate Plan that we now file recommends certain capital and operating expenses, targeting improvements that will increase resiliency for customers, enhance public and employee safety, improve GMP's communications and outreach efforts during emergency events, and help ensure continuity of operations under catastrophic conditions for both GMP and the communities we serve. As described in my testimony and that of the other GMP witnesses, the projects we expect to propose are necessary, appropriate, and in the best interests of customers. We see the Climate Plan as needed to keep pace with the very real, significant, and costly damage that is otherwise inevitable as the full effect of the climate crisis takes hold. The Climate Plan will expand and accelerate GMP's system, operations, and innovation investments targeted at infrastructure

hardening and resiliency, over the next five years and beyond. It creates a framework to allow us to undertake targeted resiliency projects that meet defined criteria within specific areas of spending, with appropriate reporting and review. A copy of the Plan is attached as **Exhibit GMP-BO-1**.

Q6. Please introduce GMP's witnesses in support of the Plan and briefly describe their testimony.

A6. We present expert testimony on climate change, and witnesses across our operational areas so that the Commission can review the approach we have proposed directly with these GMP leaders:

Roger Hill, a meteorologist who serves as the forecaster for Vermont utilities presents information about climate change driven weather patterns in Vermont that have increased the risk of severe, infrastructure damaging storms.

Mike Burke describes why GMP believes a targeted approach is needed to upgrade grid facilities with severe weather in mind, and presents the criteria GMP will use for pursuing additional Transmission & Distribution projects under the Plan.

Jason Lisai describes recent flood mapping work undertaken by GMP's consultants and the criteria GMP will use to select Generation projects, particularly to improve safety and operations at hydroelectric facilities, and to move substations out of areas more likely to impacted by high water in years ahead.

Mark Dincecco discusses how GMP plans to set up its systems to maintain "minimally-viable" functionality even during times of extreme weather crisis that interrupt normal operations, and the Information Technology projects that GMP will

pursue as a part of the Plan to leverage technology to communicate with stakeholders in new ways during severe weather.

Josh Castonguay covers how GMP's approach to innovation intersects with the Plan, focusing specifically on how GMP will deploy grid-level storage in conjunction with microgrid capabilities and will work with state and local partners to develop Resiliency Zones that will help its customers and the State better recover from severe, infrastructure damaging storms.

Eddie Ryan covers GMP's proposal for accounting and regulatory treatment of Climate Plan projects, and how it will interact with the Regulation Plan through Fiscal Year 2022 and with GMP's next rate case.

Q7. What is the value to your customers of proactively hardening GMP's grid infrastructure and operations in the face of increased damage caused by severe weather patterns due to climate change?

A7. We believe the value to be significant. GMP thinks it is better to invest proactively in our system for customers to minimize weather related damage that would otherwise occur in the future. This infrastructure is critical as Vermont energy policy and Comprehensive Energy Plan's targets rely heavily on GMP's customers transitioning to the clean energy delivered through GMP's electric grid. As Vermont continues to reduce greenhouse gas emissions by transitioning away from fossil fuels—through transportation and heating, the top two sources of carbon pollution in Vermont—to cleaner electrification, the reliability of the electric grid is essential because it will become the clean energy destination for more and more of Vermont's energy needs. We know that it will take

continued, focused, and proactive measures to respond to the severe weather patterns caused by the climate crisis so that our customers do not experience changes in reliability or escalating storm recovery costs associated with the changing climate.

Q8. Is this valuable for all GMP customers or only certain customers?

A8. The Climate Plan is valuable for all customers, without question. While all projects are targeted at particular substations, circuits, corridors, towns or sites and we will call for increased investments in the areas of our system that show the greatest vulnerabilities, all GMP customers benefit from a stronger, more resilient, and reliable clean energy grid. Plus, having a grid that is as prepared as possible for supporting further electrification is good for the state and customers. The state as a whole also benefits when storm damage is avoided or mitigated and interruptions to economic activity and daily life are minimized.

Q9. What has motivated GMP to now evolve the way it looks at grid hardening and innovation to increase reliability and resiliency in the face of the climate crisis?

A9. GMP is always focused on our customers. We track and routinely review past weather events and the impacts caused by them. Four of GMP's five largest severe weather event recovery efforts have occurred in the last five years. This is a pattern that confirms the effects of climate change are now upon us. This reality and the other climate-fueled severe events we have observed around the country (including the epic flooding of Hurricane Harvey in Houston; the wildfires and associated protective power outages impacting California; and the catastrophic dam failures that have happened in the Midwest) have convinced us that we absolutely must do more now to ensure a stronger

grid for our customers in the face of the effects of the climate crisis. We are increasingly concerned that otherwise customers will see greater damage and greater recovery expense in the months and years ahead.

One need only look at the headlines around the country in the past year in order to understand the consequences of inaction. In 2019, Pacific Gas & Electric, a major California utility, went into what is being called the first "climate change bankruptcy," after its infrastructure sparked numerous wildfires that, fueled by years of drought and driven by extreme winds, destroyed entire communities and resulted in significant loss of life. Since then, PG&E has forced proactive power outages in an attempt to avoid even more fires and damage. These power outages have cost customers and the California economy billions of dollars. The climate crisis has shown up in a different, yet similarly devastating way in the Midwest, where historic flooding from intense, high-precipitation storms caused river system conditions that wiped out riverfront communities and overtopped levies and dams.

While writing our most recent Integrated Resource Plan, and in the midst of our Multi-Year Regulation Plan proceeding, GMP experienced one of the worst and most damaging storm events in our history. The weather at the end of November and beginning of December 2018 caused approximately 2,700 outage events impacting over 114,000 GMP customers. The storm caused almost $13 million in costs to repair the damage to the grid, and required seven days to fully restore power to our customers. While we've known for several years that the weather patterns and trends we track and prepare for have been intensifying, this event made it unmistakable that "business as usual" was no more.

Even more recently, we experienced a storm at the end of October 2019 that packed strong winds and high precipitation rates, which caused significant grid damage and river system flooding. This weather system caused over 1,700 outage events, which impacted approximately 114,000 GMP customers. The recovery cost of this one event, combined with another major storm experienced earlier in the same month, will be approximately $4.6 million.[1] Subsequent to the Halloween event, the State made a request for a federal disaster declaration as a result of the statewide impacts and damage; the request was recently granted.

Weather events such as these are becoming more frequent and are impacting power systems routinely. Storm restoration costs have gone up significantly, even as individual, day-to-day reliability remains high. That is because the storms we are experiencing are more severe and are causing more damage. Most Vermonters think of Tropical Storm Irene in 2011 as the most devastating single event in recent memory, but the two events described above have affected equivalent numbers of GMP customers. As well, during these events, the high precipitation rates caused water elevations to exceed the previous records for the Missisquoi and Lamoille rivers. These weather events and their effects on power systems are completely consistent with the long-term forecasts of regional effects from the climate crisis of higher precipitation and warmer than normal temperatures with more frequent high intensity events.

[1] The gross costs were another $1.2M, absorbed directly by GMP as required by the Regulation Plan. The net cost will be reported in GMP's exogenous adjustors filing at the end of January 2020 and will reflect the $1.2 deductible that applies annually to any Major Storm recovery costs.

Q10. Are there alternatives to the Plan that GMP has considered?

A10. The Climate Plan is our recommendation to take a more intentional, aggressive, and proactive approach to resiliency because investments made sooner will be better for our customers—and are likely to be less than the cost of repair and recovery from future severe weather events without them. But absolute costs are not the only motivating factor, since it can be extremely difficult to gauge what might have been saved through proactive hardening. That is why we consider both cost and overall system strength, especially when considering that our clean energy grid needs to be the landing place for much of Vermont's transition off of greenhouse gas emitting fossil fuels. While we have considered continuing the traditional pace of investment in system hardening, and thereby accepting a more reactive approach to the damage caused by the increase in severe weather, we do not think that is the right path.

Q11. Will the Plan create significant, new annual costs for GMP customers?

A11. No. While the Climate Plan will involve some O&M spending that will improve the resiliency of our infrastructure and operations, the majority of the costs will be spent on capital projects. These important spending initiatives tend to have low annual impact on customer costs as these projects are depreciated over the relatively long useful life of the project assets, thereby reducing the annual effect of this work on customers' monthly bills. By proactively improving the resiliency of our grid through the acceleration of this hardening work we believe we will be reducing costs to customers in the long run. If recent history is the best predictor of future events supported by the long-term climate forecasts, then Vermont will be seeing a higher frequency of severe and destructive

weather systems going forward and our customers will inherit the costs that go along with repairing the damage caused by these storms.

Q12. Does GMP have an estimate of the overall expected rate impact of the expenditures that will occur under the Plan?

A12. Yes, we have preliminary estimates. While the exact cost of each year of resiliency investments is not known at this time, we plan to target approximately $8–$15 million of annual investments for these projects, largely capital costs with some expense. We will not include projects in rates until the PUC reviews and approves them. We expect to manage that level of investment within an annual rate adjustment between 0.3% and 0.7%, and of course will also manage the remainder of our costs within the Regulation Plan and in future years to lower the overall impact. This preliminary estimate does *not* include the benefits that we strongly believe will also flow to customers from these innovations and investments, and so the estimate is a conservative approach. We do recognize that hardening our infrastructure and deepening the resiliency of our systems and response is the right thing to do in the face of climate change, even though it will have a cost impact. We can make these improvements to bolster our ability to avoid outages, respond even better when they do occur, and build in resiliency to help dampen the impact of these storms, but we absolutely cannot guarantee that we will fully avoid the consequences of damaging storms from climate change. However, the investments we are proposing here are targeted, necessary, and will provide benefits to customers through reliability, resiliency, and safety—and do so cost-effectively.

The reason the rate impacts of this proposal are low is because many of the investments we seek to undertake are for long-lived assets. We have reviewed the extensive project list and estimate that for every $10M in spending for Plan distribution system capital projects, there is an approximately 30 basis point rate impact. That compares very favorably with the annual rate impact of similar levels of direct storm recovery reimbursement expense. That is one of the reasons we feel so strongly that these proactive investments are the right thing to do.

In addition, GMP will propose a slate of projects under the Climate Plan yearly, and during the Regulation Plan will not seek to recover costs in rates until such projects are completed and approved. This annual review approach differs from plans we have reviewed in other states, which are often pitched as very large multi-year efforts with specific spending levels. The Climate Plan thereby creates greater flexibility to manage projects and costs year to year, and is right-sized for our infrastructure and customer base with affordability in mind. While the exact yearly impact based upon our ability to manage it within the changes to base rates cannot be known at this time, we believe the overall cost is well justified when compared to the very significant expense and potential economic impacts of not acting.

Q13. What analysis does GMP expect to provide to support its proposal that these new expenditures are necessary and in customers' best interest?

A13. In this Climate Plan, we provide the criteria GMP will use for each area of CP spending when selecting projects and moving forward with permitting and project execution. Once the Commission reviews and agrees that we are focusing on the right areas and the

correct criteria, we expect to present each year the list of projects we propose to pursue that meet these criteria and their preliminary expected costs. Recognizing that work we must pursue to assist other companies (such as telecommunications make-ready work and developer line extensions), our capital project work, and permitting challenges inevitably will require us to remain flexible in our project execution, while we are under the Regulation Plan we propose to not seek rate base treatment of projects until the rate year following completion. Therefore, there are multiple modes of review and check-in points to ensure GMP is employing the right selection criteria for its projects and then executing projects that are in the best interests of our customers. Thereafter, we will integrate the framework set forth in this Plan in our IRP and rate reviews.

Q14. Please provide an overview of how GMP currently incorporates climate change mitigation efforts into its capital planning and what more GMP proposes to do differently and/or faster through the Plan, and why.

A14. GMP has delivered reliability projects for many years as part of our annual capital construction work and our ongoing operational improvement efforts. This work includes replacing aging infrastructure, relocating distribution lines to better and more accessible rights of way, using construction elements such as tree wire vs bare wire, creating redundant physical environments for our control center, call center, and data center function, among others. Much of this work aids not only reliability but also resiliency. However, the pace at which we have been able to rebuild and improve the resilience of circuits and harden our operational preparedness is no longer adequate in the face of escalating weather events driven by climate change. The Plan excludes reliability

projects that GMP has committed to complete at the pace of capital construction within the bounds of our Multi-Year Regulation Plan. Instead, we will on an annual basis include projects beyond our base capital planning that meet the criteria we have established in this Plan for selecting projects that will deliver customer benefit. We believe this is a more responsible, transparent, and intentional approach to this specific, directed resiliency investment, rather than simply seeking approval to set an overall higher base capital investment limit during the term of the MYRP.

II. Outreach and Communications

Q15. What outreach have you done regarding the Plan and the reasons for it?

A15. In the development of the Plan we held meetings with town officials, emergency responders, and other relevant stakeholders throughout our service territory. Our focus was to meet with stakeholders in areas that have seen the biggest impacts from recent weather events to share our planning, better understand their approaches to resiliency, and find ways to coordinate our efforts in the years ahead. During these valuable meetings, it was clear that these community leaders are knowledgeable about the weather impacts from climate change and are factoring in severe weather into their planning activities. During these meetings, we shared an overview of the Climate Plan, the changing weather patterns, the threats the new weather patterns present, and the types of work GMP is planning to do with innovation and to accelerate our hardening efforts; and we tried to identify any opportunities for coordinated planning that might exist between us. These meetings were productive and left both GMP and the local leaders with good data and appreciation for the work that needs to be done together. Attached is **Exhibit**

GMP-BO-2 that summarizes the meetings and lists the dates, locations, and groups attending.

Q16. For context, can you describe what GMP uses for current customer communication and outreach channels?

A16. GMP has ongoing communications with our customers through multiple platforms on a variety of topics—reaching them regularly about energy use, customer programs and services, and especially storms and safety. We think of our communication with customers as a continual conversation, taking place all the time using varying channels—our call center, text alerts, traditional media releases, social media, message boards, monthly energy statements, emails, and the GMP app—and we will offer live chat on the GMP website in 2020 which will let customers communicate directly with GMP energy consultants in real time. That multiplatform approach allows us to connect in the way each customer likes best. This is especially important in the lead-up to significant weather events when outages are possible and safety is critical, during the storms themselves, and in the recovery phase, which can be multiple days, as crews work to repair severe, widespread damage to the grid.

Our storm communications are strong and comprehensive because getting information to customers quickly is key to their safety, comfort, and convenience. Before storms, we alert customers with weather and safety information via social media, text alerts, and news releases to media. During storms and the recovery, we have increased staffing in our call center. In fact, every GMP employee has a storm job, with many people cross-trained to work in the call center as needed. We take increased customer

calls through our automated self-service phone system. For example, during the severe storm that occurred on Halloween 2019, GMP handled 40,000 customer calls. GMP also sends text alerts with outage status updates, and shares updates about recovery work and safety information through traditional and social media—responding to hundreds of customer messages online in close to real time. We also make individual calls to critical care customers, who are identified as requiring power for health-related equipment, to make sure they know about predicted outage durations, and the need to take steps to stay safe. We do in-person outreach in hard-hit communities, communicating directly to town leaders, and open our service centers to customers so they can get updates, charge their phones, have a bite to eat, or just get warm.

To further facilitate a coordinated response, we have a GMP employee who works out of the State of Vermont Emergency Operations Center in Waterbury when it is activated, as it was during the recent Halloween 2019 storm. This ensures quick information sharing from GMP directly to first responders and local leaders in the hardest hit areas. We have also convened conference calls with local leaders and emergency responders in hard-hit regions to make sure they have the latest information about ongoing restoration work and outage durations—and they can get answers and share information with GMP. These are valuable calls that share critical information back and forth efficiently and help GMP to better respond quickly to community needs. This kind of targeted outreach and information sharing is at the heart of the communications technology enhancements the Climate Plan aims to make, so that we can quickly and directly share weather updates, safety alerts, and restoration information with the communities where damage is greatest.

Q17. Please provide an overview of how you plan to enhance targeted communication systems through the Climate Plan.

A17. These communications technology projects are described in detail in Mr. Dincecco's testimony. The Climate Plan contains investments that over time would create a more structured and targeted mechanism than exists today for communicating directly with subsets of stakeholders, such as emergency responders, law enforcement, town officials and road commissioners, and elected officials, about the information they need. Improving our capabilities to push communications out and respond to stakeholders across a variety of channels, including non-customer stakeholders who need critical information, will be essential in the years ahead as communications is one of the most important elements of any storm planning and recovery operation.

III. Weather and Reliability Impacts

Q18. What climate risks do Vermonters face and how do they impact your system?

A18. The northeast region of the U.S. is seeing the accelerating impact of climate change in the form of warmer temperatures, much higher precipitation levels, and an increase in the frequency of severe weather events. While those of us who repair and protect critical infrastructure have been aware of it for many years, the data is now incontrovertible that the climate crisis has brought fierce and damaging weather to our state. While California is contending with expansive and deadly wildfires as a result of severe drought conditions paired with increasingly severe windstorms, in Vermont we are contending with more widespread tree-related damage from gradient wind events, flooding, and damaging winter precipitation in the form of ice and heavy, wet snow.

We see these effects in the GMP outage data we track. Each outage event, small or large, receives a root cause category on our outage management system. Tree-related damage is by far the leading cause of outages for GMP's customers. Vermont is a rural state with a tree canopy that continues to expand and heighten year over year, particularly because of the extended growing season we now have due to warmer weather increasing growth. Where power lines may have been originally located in open fields and roadsides, they are now surrounded by mature growth trees. Each year, GMP does proactive tree trimming to maintain its rights of way, but we are seeing more frequent instances of eighty- and one-hundred-foot trees falling from well outside GMP's right of way and damaging our lines, especially during the more frequent severe wind and precipitation events.

In general, the long-term forecasts for our region indicate that the effects of climate change will bring overall warmer temperatures and higher precipitation levels along with more frequent, intense/severe weather events. Mr. Hill goes over all of this in detail in his testimony. These forecasts are consistent with the climate changes GMP is increasingly seeing over the past ten years and are resulting in the following impacts:

- More moisture in the atmosphere, which brings higher precipitation levels;
- Higher summer temperatures fuel more frequent and severe thunderstorm/gradient wind events;
- Higher overall winter temperatures bring lower water ratio precipitation events which drive severe icing and heavy snow loading, possibly interspersed with increased duration extreme cold events; and

- Higher frequency of severe weather events brings more storm impacts to GMP's system reliability.

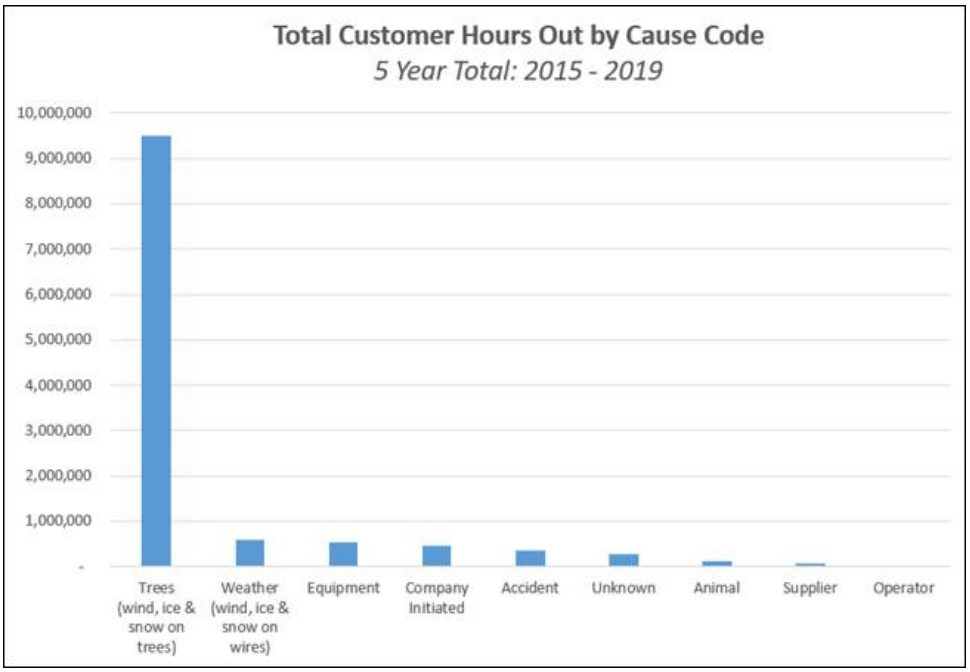
In a rural state like Vermont, with mountainous terrain and extensive tree canopy, the impact of these more severe weather patterns will stress our power system infrastructure and the high level of reliability we have been able to deliver to our customers. In fact, recent storm modeling work we asked our outside expert engineers at VHB to complete (described in Mr. Lisai's testimony) further confirms the impacts that may be expected from severe storms in the years ahead. Managing river system water levels has a big impact on downstream flooding and having the automated controls and operating flexibility needed to manage these water levels during severe events is essential to maintaining the infrastructure of our plants, the safety of our employees, and the safety of the public who are in proximity to these river systems. The Climate Plan is our recommendation for leveraging innovation and expanding our resiliency investments and accelerating our hardening work across these areas in order to be better prepared for these effects of climate change.

Q19. You note above that tree damage is the most common source of damage, what are the costs?

A19. Across Vermont, the leading statistical cause of outages is impacts from tree contacts. Here is a chart that tracks customer outage hours by damage type:[2]

[2] Under PUC Rule 4.900, the "Trees" category includes damage from trees within and outside the right of way caused by severe weather (and excludes any other tree damage causes such as animals or car accidents); the "Weather" category reflects outages caused by severe weather other than through tree damage.

Chart 1. Customer Outage Hours by Damage Type



During this five-year period, over 75% of customer outage hours were due to tree contacts, with non-tree weather damage as the second highest cause of outage hours. These tree contacts occur in a variety of weather conditions (such as high winds, ice and heavy snow loading, lightning and flooding), but during major storm events tree impacts are an even higher statistical cause of outages than during non-storm conditions. It is important to note that the tree damage is not simply from trees within our rights of way, which in theory trimming could address. Instead, the higher, faster-growing canopy, combined with the more severe storms, means mature trees outside our rights of way are falling more frequently, causing damage to our system.

In addition, in the more frequent high wind events that have occurred lately, we have seen direct pole and attendant infrastructure damage—literally the high winds snapping poles in half that are well within their useful life.

Finally, damage from floods has increased. Flooding affects both GMP's own infrastructure, such as when one of our facilities is inundated, and customers, such as when a customer's basement floods where the electrical panel or other critical electrical appliances are located. Flooding events affect GMP's ability to respond and repair, such as when roads are washed out or areas of cross-country poles are inundated.

The following chart shows a history of major storm recovery costs over the past ten years:

Chart 2. Ten-Year History of Major Storm Recovery Costs

Storm	Events	Customers Affected	Customers out at Peak	Cost
Hurricane Irene – Aug 28th to Sept 3rd, 2011	**1,604**	**140,655**	**57,000**	**$13,659,237**
Merger				
Superstorm Sandy - Oct 29th to Oct 31st, 2012	920	42,076	21,000	$3,939,942
High, Downsloping Winds - Oct 22nd to Oct 23rd, 2012	902	39,857	24,000	$2,353,816
Severe Thunderstorms - June 2nd to June 3rd, 2013	443	26,339	18,000	$1,862,009
Severe Thunderstorms - Sept 11th to Sept 13th, 2013	1,195	46,588	32,000	$1,573,395
December Ice Storm - Dec 22nd to Dec 24th, 2013	416	38,156	11,000	$4,043,873
Severe Thunderstorms - July 3rd to July 6th, 2014	619	35,230	22,000	$2,745,266
Heavy Wet Snow event, Dec 9th to Dec 17th, 2014	**3,130**	**147,832**	**39,000**	**$17,512,424**
Severe Thunderstorms - July 23rd to July 25th, 2016	742	35,761	26,000	$3,814,420
Gravity Wave Wind Event - May 5th to May 7th, 2017	570	30,651	23,000	$2,072,251
Halloween Gradient Wind Event - Oct 29th to Nov 4th, 2017	**2,688**	**124,825**	**81,000**	**$7,845,088**
Gradient Wind event - April 4th to 6th, 2018	884	54,854	34,000	$3,327,292
Thunderstorms and Gradient wind event - May 4th to 6th, 2018	995	58,214	38,000	$2,818,328
Heavy Wet Snow and Wind Event - Nov 26th to Dec 3rd, 2018	**2,686**	**114,213**	**52,000**	**$11,480,282**
High Wind Nor'easter - Oct 16th to Oct 19th, 2019	725	36,864	14,800	$1,522,607
High Winds & Flooding Event - Oct 31st to Nov 4th, 2019	**1,709**	**113,964**	**56,000**	**$5,203,725**

Q20. How does weather forecasting factor into your Plan?

A20. GMP watches several weather models constantly, using both utility-specific resources and public weather modeling software. Over the past decade, GMP has significantly increased our external and internal meteorological competencies. Currently, Dr. Alan

Betts, Northview Weather, and Jay Shafer of Northern Vermont University (Lyndon) are conducting a 30-year climate impacts lookahead for all Vermont distribution utilities through VELCO.

We plan to continue investing in this expertise, and we believe broadly sharing weather information, forecasts, and trends among Vermont's utilities, emergency responders, towns, and even the regional planning commissions will be important in the years ahead to better align the collective efforts of these groups. We also see incorporating weather forecasting more formally into our next IRP process as a risk mitigation requirement, a necessary element of resiliency planning.

Q21. Does the Plan propose any enhanced monitoring or reporting regarding weather trends, storm damage, and the efficacy of the measures taken under the Plan?

A21. As a part of the Plan, we will file a report yearly when proposing upcoming projects, designed to reflect on work accomplished in the prior year and lessons learned. The report will include information describing the projects undertaken and the number of customers served by projects undertaken in the Plan. Over time, we will also track the rolling SAIFI/CAIDI results for circuits improved through Plan projects. We also plan to incorporate the long-term weather trends analysis being led by VELCO when it is completed in the coming year, and to discuss with the Vermont System Planning Committee the goals of the Plan and the work undertaken.

IV. Summary of Plan Project Areas

Q22. Please summarize each area of spending covered by the Plan.

A22. Generally, the Plan provides details on the project investments GMP is recommending in these broad areas:

- Relocate critical electrical system assets based on 100-year and 500-year floodplains;
- Accelerate the pace of upgrades at GMP's high hazard dam facilities based upon updated flood event modeling;
- Accelerate the pace of system automation and hardening projects across GMP's Generation, Substation and Distribution assets, utilizing resilient techniques;
- Harden GMP's Information Technology & Telecommunications assets and capabilities for the stresses of large-scale events by creating cloud-based failover systems;
- Expand GMP's communications outreach capabilities to customers and groups like town leaders, state officials, and first responders, and increase resource logistics and materials inventory supply chain during severe weather events;
- Expand the impact of innovation by:
    - Increasing dynamic controls of strategic load devices;
    - Developing next-generation distribution-level balancing applications to ensure reliability and capacity for increasing volumes of distributed energy resources on the distribution system; and

- Develop microgrid/islanding capability with storage that can be utilized in select resiliency zones throughout GMP territory to ensure continuity of critical facilities during severe events.

The Climate Plan proposes measures that will improve our system reliability under normal operational conditions, but more importantly increase our ability to withstand more extreme weather and effectively respond during severe weather events that cause widespread service interruptions when they do occur.

Q23. Can you expand a little bit on each of the measures you just described above?

A23. Yes. Specifically, this work includes:

Facilities Relocation. The biggest threat to GMP's substation facilities is flooding during high precipitation events. While across the country, climate change impacts are being felt—for example, as fires in California—in Vermont, forecasters say flooding and water is the main concern. As the climate has changed and the Northeast is seeing much higher precipitation levels and more intense flooding events, GMP has modeled larger floodplain inundation during severe precipitation events and the corresponding impacts to our grid infrastructure that serves Vermonters. The Plan will outline projects that will mitigate floodplain impacts, including resiliency-based substation projects that either relocate or elevate critical assets in the substations that will be impacted by 100-year and/or 500-year floodplain modeling.

High Hazard Dam Upgrades. GMP operates 39 hydroelectric dams in Vermont, seven of which are classified as high hazard facilities due to the impact a failure of the facility could have on the downstream population. GMP is recommending the

acceleration of certain operating upgrades at a subset of our hydroelectric sites to improve their operability during high water levels from severe precipitation events to better safeguard the public and GMP employees.

Facility Automation. GMP will propose the acceleration of certain facility communications and automation projects, at its hydroelectric facilities and elsewhere, which will establish or enhance the communications links and operational automation of these facilities to make them more intelligent. During major storm events, or even unplanned service interruptions, the increased intelligence at these sites allow GMP to diagnose, troubleshoot, and repair issues faster and more safely through automated controls.

T&D Hardening. The Plan sets criteria for the acceleration of projects to harden circuits through relocation; to promote self-healing; and to increase the use of improved construction techniques, such as insulated tree wire, Hendrix construction, and single-phase undergrounding, where appropriate. We have identified appropriate projects, that are in the best interests of our customers, through the use of specific criteria and analysis of results of similar completed projects.

Resiliency of Information Technology. GMP has spent the past decade increasing the level of software-based tools used by our workforce in day-to-day operations and severe storm recovery. Interruptions to our access of these tools can have significant impacts to our customers and operations. GMP's IT resiliency recommendations focus on projects that will allow us to better withstand or quickly recover from catastrophic events that can impact IT system availability, telecommunications availability, or availability of other automated sensing or controls

within our operations. We plan to implement failover cloud-based environments to maintain basic functions needed for response and customer service. The Climate Plan also sets forth criteria to develop, over time, expanded web-based portals for customer and stakeholder communication that will enable faster, more targeted, and multi-channeled exchange of information during these events.

Resiliency Through Innovation. As GMP's energy delivery system has de-centralized and become more distributed over the past decade, we have seen the positive impact of localized solutions for energy generation and—more recently—storage. Customers taking more control of their energy impacts and solutions are a key element for the clean energy transformation that is necessary for Vermont and our planet. Resiliency holds the same opportunity for localized solutions to improve the performance of energy delivery in an affordable way. The Climate Plan aligns with the use of programs and pilots that can deliver resiliency solutions at or near the customer location, in coordination with the other elements of GMP's Regulation Plan. At the same time, the Climate Plan recommends the development of certain distribution-level balancing analytics and applications so that supporting GMP's grid transition to even higher levels of decentralization and distribution can occur safely and reliably. Finally, the Plan recommends the development of "Resiliency Zones" to create with storage a higher level of resiliency for the critical facilities and infrastructure required to manage catastrophic events in certain communities in Vermont.

Q24. How will the Climate Plan intersect with other innovative work you are doing to improve community resiliency?

A24. It helps us continue to deliver on community resiliency in a few ways. Through our Regulation Plan, we will continue to create pilots and related programs to benefit customers, including tariffs if approved, for the adoption of DER and load control, including behind the meter storage. Our experience with the Powerwall residential-scale storage systems during extended outages from severe weather events is very positive. Customers with storage have been able to ride through up to three days of outage duration by managing their electric usage during these events—meaning they never lost power. Customers who have paired their solar generation with a battery have been able to ride through outages for even longer durations. This is critical, and shows what proactive work can mean for safety, reliability, and resiliency in the face of climate change.

Through our Plan here, we expect to expand over time the number of strategic places where local generation is paired with storage and grid management tools to help customers and communities recover from severe events. We already expect to commission the islanding capabilities of our Panton facility in 2020, which will provide the local resilience of a utility-scale solar facility paired with a grid-scale storage system to island a portion of a distribution circuit during widespread outage events. The learning from that project will allow us to assess the capability to pursue similar projects at our other solar/storage facilities, and through Resiliency Zone work, as described by Mr. Castonguay.

Those Resiliency Zones will be placed in strategic locations throughout our service territory in partnership with local communities to enhance the ability of their essential infrastructure to withstand severe weather impacts. For example, GMP may codevelop a resiliency solution pairing renewable generation and storage to align with the needs of emergency shelters, emergency responders, law enforcement or healthcare facilities to allow them to operate independently even during widespread damage to the grid. As we have learned from our innovative pilots, by partnering with customers to develop and share capabilities that have multiple value streams, we can deliver solutions that benefit the participating customers, as well as all other GMP customers by helping drive down costs. We will be working with stakeholders to identify the most appropriate Resiliency Zones, factoring in the presence of emergency response infrastructure (healthcare facilities, emergency response facilities, telecommunications facilities, shelters, etc.), proximity to critical grid infrastructure, and other resiliency assets (such as customer-owned generators, storage, or generation facilities) that can be incorporated into the Resiliency Zone plan.

The continued State efforts to expand broadband to rural areas of Vermont may also be aided by this Plan. We are exploring with the Department of Public Service (the "Department") and VELCO whether GMP should install fiber optic cable as an element of certain of the Climate Plan projects where distribution lines will be re-built. By definition, these types of projects will be in more vulnerable, remote areas where broadband access is scarce—areas that are more likely to experience extreme storm service interruptions. By installing fiber optic cable while performing resiliency projects on our most vulnerable distribution lines, we believe we can, for just modest incremental

cost, make that fiber available as backhaul for broadband deployment, along with using it ourselves to support the self-healing technologies and field communications necessary for our own system. The incremental costs to incorporate fiber into the projects we are already pursuing would be modest, as GMP has the expertise to run fiber. The installed fiber would not only potentially aid GMP's own system now, it might also "future proof" our system, as technology changes (since fiber availability will continue to be important even as wireless technologies expand) and aid communities as 5G or other technologies are deployed in the years ahead. The presence of fiber can also address customer equity challenges in accessing GMP's emerging behind-the-meter programs now and in the future. Reliable broadband is a prerequisite for many of these programs, including GMP's residential EV charging program, and a lack of broadband access creates inequity in access to such programs.

V. Summary of Proposed Regulatory Process for the Plan

Q25. Please talk about how GMP's current base capital spending approved in the Regulation Plan fits with the many important upgrades and resiliency improvements that are also needed, and how the Plan addresses that issue.

A25. The current base capital spending in GMP's Regulation Plan is based on a business-as-usual scenario, and in fact represents a reduction in the historical capital spending that existed prior to our 2019 rate case and Regulation Plan proceedings. While GMP agreed to cap and limit capital investment for our business-as-usual work, we also expressed concerns about increasingly frequent, damaging storms and the looming impact of the climate crisis on customer reliability. Within the limits of the Regulation Plan, there is

available capital each year for a certain pace of projects, including some reliability and resiliency work; but it is not enough to deliver the recommendations we are seeking in the proactive work of the Climate Plan.

Without the Climate Plan, GMP would need to make very hard decisions regarding where to deliver limited resiliency improvements over longer timeframes despite more severe weather events—and we recognize that our base spending will, in the face of these trends, actually result in lower reliability for our customers and greater costs. This is not an outcome we believe is acceptable for our customers or for the state, especially when considering that GMP's electric grid is intended to be the place for many of our customers' transitions away from fossil fuels to fight climate change. The Climate Plan therefore includes new projects—not a part of our base capital plan—to address these issues, selected under the criteria discussed in this filing.

Q26. Over what time period does GMP expect to execute the Climate Plan, and how does that intersect with other regulatory obligations the company has?

A26. The Climate Plan is a proposed framework for the PUC to address climate change-specific mitigation efforts in its regulation of GMP as a Vermont utility now and in the years ahead. While we have internally used a five-year planning horizon to develop criteria and preliminary project lists, we know that the work undertaken will last longer than five years and evolve over time. Over the course of the Regulation Plan and the next IRP, we will have the chance to begin to integrate this work into our typical business planning, so that we should begin to know whether the goals of the Climate Plan are being achieved and whether the type of criteria we have utilized here should become a

standard part of our operational and capital planning—in our IRPs, rate cases, or future regulation plans.

Q27. What regulatory treatment does GMP propose for the Plan?

A27. Mr. Ryan covers this topic in more detail, but here is a summary of how we propose to treat reporting, spending, and approval for rate base treatment under the Plan:

- GMP will identify annual Plan projects (capital and expense) by department using criteria established in this proceeding.
- GMP will file a preliminary annual Plan project list and budget for preliminary Commission and Department review. During the current Regulation Plan, this will likely occur with the Annual Rate Base filing. Projects will not be proposed to be included in rate base at that time.
- GMP will then pursue the identified Plan projects in the following fiscal year, applying Allowance for Funds Used During Construction ("AFUDC"), per GMP policy, for capital projects during construction. When projects are placed in service, AFUDC will stop and GMP will record and defer collection of project costs in a regulatory asset from the date the project is recorded to plant in service until the date the project is reflected in a base rate filing.
- In our subsequent Annual Base Rate filing, GMP will identify completed Plan projects (capital and any expense), and seek Commission approval to include those amounts in rates in the following fiscal year period. This means that no Plan costs will be included in rates until the project is completed and approved by the Commission.

- Incremental non-power O&M benefits associated with approved capital projects will flow through to benefit customers. GMP will track any Plan-specific O&M expenses separately from Base O&M so that they do not affect synergy calculations during the period of the Regulation Plan, which coincides with the ten-year synergy savings commitment.

We believe this proposed treatment, especially during the early years when the Plan is getting started and our Regulation Plan is in place, will help discipline our own planning and spending while allowing the Department and Commission to transparently track our work.

Q28. How does GMP propose to report on projects and spending for the Plan?

A28. GMP will submit a schedule of proposed CP projects and budgets in an annual CP Project Report, as part of GMP's Annual Base Rate filing under the Regulation Plan on June 1, 2020. This initial CP report will describe proposed FY21 CP projects. GMP will file an updated version of this CP Project Report on June 1, 2021, showing CP projects that have been completed in FY21, together with proposed CP projects and associated budgets for FY22. Combined, this will represent a forecast of the work we plan to do in the coming year and a reconciliation of that forecast against the actual work we delivered in the year recently closed.

Q29. How will the Department and Commission review Plan projects and spending?

A29. We would expect and welcome the Department's and Commission's feedback on our preliminary annual schedule of proposed CP projects, and then the Commission and Department will have the opportunity to review completed projects in the subsequent CP Report prior to approving any projects in rates.

Q30. What about after the end of GMP's current Regulation Plan—what does GMP expect regarding Plan projects in future rate cases or regulation plans?

A30. Mr. Ryan discusses this topic in more detail in his testimony. GMP's current regulation plan concludes on September 30, 2022. GMP has committed to filing for a full cost of service review in advance of that date to have a new regulation plan in effect on October 1, 2022. We recommend rolling the remaining elements of the Plan into the full cost of service review (and any future regulation plan we may have) and make them components of any adjustments resulting from that proceeding.

Q31. Does that conclude your testimony?

A31. Yes, at this time.