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
JASON LISAI
ON BEHALF OF GREEN MOUNTAIN POWER

January 30, 2020

Summary of Testimony

Mr. Lisai provides in-depth testimony on the generation projects expected as a part of the Climate Plan (the "Plan"). Mr. Lisai's testimony describes how the Plan will enhance GMP's current generation facility upgrade strategy and their maintenance and operations, including the use of innovative strategies to manage these assets in a time of increased severe weather risk. He provides examples of the proposed generation projects; the criteria these generation projects meet that justify their inclusion in GMP's capital and/or O&M spending; and what benefits GMP customers can expect from GMP's delivery of these Plan projects.

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ON BEHALF OF GREEN MOUNTAIN POWER

Introduction

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

A1. My name is Jason Lisai. I am employed by Green Mountain Power ("GMP") as Director, Generation Operations. My business address is 163 Acorn Lane in Colchester, Vermont.

Q2. Please describe your educational and business background.

A2. I graduated from Johnson State College with a bachelor's degree in Environmental Science and Natural Resources in December of 1993. For the first five years of my career, I worked for Corporate Development at Smugglers' Notch Resort as a Planning and Project Coordinator. I was responsible for projects from design to completion for resort operations and development, including master plans for domestic water and wastewater expansion, energy use, and energy efficiency plans. In 2001, I was hired by Sugarbush Resort as Manager of Planning, Development and Regulatory Affairs, and was responsible for local, state, and federal regulatory relations and requirements, resource management of owned and leased lands, and project management of large capital projects. From 2004 until 2011, I was the Director/Vice President of Planning and Development for Sugarbush Resort, responsible for resort development, construction, and regulatory compliance, including oversight of staff, utilities, consultants, and the resort master development plan.

I joined GMP in 2011 as Power Production Supervisor. This role included oversight of field staff, capital projects, and outside contractors in addition to developing and managing operating budgets. I am currently the Director of Generation Operations, which includes oversight of field employees and supervisors, as well as the operation and maintenance of our wind, fuel, and hydro generation assets.

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

A3. Yes. I submitted testimony on behalf of GMP in Docket 8827, Purchase of Enel Plants; Case No. 17-3112-INV, GMP's 2017 rate filing; Case No. 18-0974-TF, GMP's 2019 rate filing; and Case No. 18-2549-PET, the Marshfield Dam Ch. 43 proceeding.

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

A4. I provide testimony regarding the types of projects anticipated for our generation facilities under the Climate Plan. I discuss the types of projects that fall in this category in our Plan proposal; the criteria we have and will utilize to identify these projects and justify their inclusion as a part of the Plan; and what benefits GMP customers and the State of Vermont can expect from GMP's delivery of these measures.

Q5. Can you summarize the changes in GMP's generation and operational units proposed in the Climate Plan?

A5. Yes. GMP's usual criteria for identifying generation projects has been: 1) safety; 2) environmental/regulatory compliance; and 3) reliability. Over the past three years, that has resulted in an average of $19.2M in capital spending on our generation facilities

annually. While this spending has allowed us to continue to operate these facilities safely, we have not yet been able to address specifically the additional projects we need to complete to protect our systems from the significant weather impacts we know Vermont has already experienced and will continue to experience due to climate change. That is why we propose that our Plan projects look through a lens of resiliency first to accelerate the planning, design, and implementation of this work.

Specifically, in the Climate Plan period, generation projects will focus primarily on hydropower generation facilities with priority given to improvements in GMP's operation and management of high/significant hazard dams, high-water events, and catastrophic event emergency operating protocols, in addition to accelerating upgrades based upon age and condition of assets/water control equipment, elevation, and hydrologic modeling, as described below. Utilizing these criteria differs from how we would plan these projects if based solely upon the recommendations of dam safety inspections, which take into account the age of asset and/or equipment failure rather than extreme weather.

Q6. What level of spending do you anticipate at this time is necessary to accomplish the generation facility projects you presently anticipate under the Climate Plan?

A6. The total currently estimated level of spending over five or more years is $16,250,000 for projects that would meet the criteria as described in testimony. Each of the projects we have identified for the first three years is focused on improving resiliency and reducing risk at high hazard class dams or accelerating replacement of critical infrastructure with modernized equipment and technology, and none of these projects are otherwise within

our capital plan. **Exhibit GMP-JL-1** shows our preliminary estimated spending by year for these projects, along with our high level estimate of spending in years four and five.

Q7. How many years do you anticipate it will it take to transform GMP's generation facilities to meet the growing challenges of extreme weather and why do you believe it is necessary and appropriate for GMP to pursue these projects more quickly?

A7. The transformation is ongoing and is not something we think of as being able to "finish" after a certain number of years. That is the main reason we are proposing this as an annual project and review process. Nevertheless, as a part of our normal operations, we maintain a 10-year plan for generation facility improvements, which gets updated annually. Within that 10-year plan are certain projects designed to improve the operating resilience of our generation facilities.

For this Climate Plan, we have looked at a shorter planning horizon to consider what more we can do in the next few years to aid resiliency. The majority of the generation projects being recommended for completion as a part of the Plan are resilience-focused projects that we believe should be moved forward within the next five years, rather than further out, in order to deliver these improvements sooner in response to the climate crisis. These are important and urgent projects that will improve our ability to manage our hydroelectric facilities under the severe weather conditions we expect to see with increasing frequency.

We know that we need to change the way we consider our standard planning horizon and regulatory approvals for projects such as these, and believe there is substantial risk facing GMP and its customers if we do not move quickly to expand our

system hardening to account for increased severe weather. Establishing firm project schedules for this work can be challenging, because it is some of the most intensive that we undertake that involves multi-agency permitting, field studies, engineering, and planning. Many projects may require FERC and or PUC Chapter 43 authorization as well as various technical permits which can take years, as seen with our current efforts at our Marshfield generation facility. Moving these projects to a separate list to pursue in a shorter planning and completion cycle will help GMP advance them more quickly and reprioritize our overall 10-year list as project timelines become more certain. All of this ultimately is designed to provide more resilient operations more quickly for customers.

I. Impacts to Generation Facilities Due to Extreme Weather

Q8. What types of impacts are you seeing and expecting to see at your generation facilities due to increased severe weather?

A8. As described by Roger Hill in his testimony and consistent with my personal experience managing our generation fleet over the past decade, Vermont has already seen increased precipitation and flooding as a result of the changing climate. That is why the generation projects under the Climate Plan will focus on the prioritization of high-water event management and catastrophic event emergency operating protocols, in addition to accelerating certain upgrades to help harden our facilities against high water.

Higher water and more extreme precipitation events create several challenges at our generation facilities, particularly our hydroelectric run of river and dammed storage facilities. Many of our facilities continue to rely upon the operation of original equipment locally at the facility, some of which is manually operated by field personnel.

Impacts that we expect to challenge us are more severe damage due to age of equipment; increased frequency of operation of water control equipment; serviceability of hydro facilities during and after a significant event; and ultimately increased Operation and Maintenance costs to maintain these plants in good and safe operating conditions.

Q9. Regarding hydroelectric facilities, can you describe the assets GMP owns and how they are classified?

A9. GMP owns and operates 39 hydropower facilities in Vermont, of which seven are classified as "High Hazard" dams and four as "Significant Hazard" dams.[1] *See* **Exhibit GMP-JL-2**. Dam classifications are determined pursuant to Chapter 1 (General Requirements) of the Federal Energy Regulatory Commission's *Engineering Guidelines for Evaluation of Hydropower Projects*[2] and Vermont PUC Rule 4.510 – Size and Hazard Classifications. The hazard classification is defined by impact of a failure or operation error, and subsequent loss of human life or economic and environmental impacts. *See* Table 1 below. These already known risks, combined with the impacts understood from the increased frequency of significant high-water events, requires GMP to accelerate the planning and implementation of improvements at these critical locations.

[1] Vergennes #9 and #9B operate under one FERC license and so are combined in this count.
[2] Available at https://www.ferc.gov/industries/hydropower/safety/guidelines/eng-guide/chap1.asp.

Table 1: Dam Hazard Classification Summary[3]

Exhibit GMP-JL-3 lists all of GMP's dams in Vermont and also indicates the capacity and watershed of each. GMP will review all the facilities on this list when it determines the next priorities under the Climate Plan.

Hazard Potential Classification	Loss of Human Life	Economic, Environmental, Lifeline Losses
Low	None expected	Low and generally limited to owner
Significant	None expected	Yes
High	Probable. One or more expected	Yes (but not necessary for this classification)

Q10. What do flood impact models tell us about the resiliency of GMP's generation assets?

A10. As we worked to develop this Plan, we asked consulting engineering firm VHB to help us identify and model a "design storm" to represent a potential extreme climate change scenario that could reasonably occur, given prior storm experiences and anticipated climatic changes. *See* **Exhibit GMP-JL-4** (Tropical Storm Irene Plus 50-Percent Scenario). GMP has previously completed hydrologic modeling of the most extreme scenario, known as the probable maximum flood ("PMF") at several sites. However, this new climate change "design storm" scenario is focusing on a more likely event rather than the most conservative PMF event, and we will use it going forward for Climate Plan

[3] *See* Federal Energy Regulatory Commission Engineering Guidelines for Evaluation of Hydropower Projects (Aug. 2015) Section 1-2.2 at 3. https://www.ferc.gov/industries/hydropower/safety/guidelines/eng-guide/chap1.pdf.

planning. This additional climate change information will help inform GMP as well as stakeholders in decision and response planning processes.

Specifically, based upon review of past storms, GMP requested that VHB analyze what could happen if 50 percent more rain than had occurred in Tropical Storm Irene (2011) fell in the Winooski River watershed. This watershed, located in northwestern Vermont, includes population centers and areas damaged by Tropical Storm Irene such as Barre, Northfield, Mad River Valley, Montpelier, Waterbury, Essex Junction, Burlington, and Winooski. The VHB report describes the hydrologic modeling that was performed to assess this scenario, and the magnitudes of streamflow and water levels at key GMP locations in the watershed. A "Plus 50" scenario was chosen because Tropical Storm Irene's impact on the Winooski River overall was not as extreme as the storm's localized impact in some sub-watersheds (including parts of the Winooski watershed such as the Dog and Mad Rivers) and in other parts of Vermont. In essence, it is reasonable to plan for a storm 50% stronger than Irene in this watershed based on the intensity of flooding experienced in some areas of Vermont at that time and since. GMP asked VHB to model how the Winooski River watershed would fare if a storm stronger than Irene hit directly within that area. The model assumed a similar event duration and existing soil saturation conditions as in Tropical Storm Irene.

The results are sobering. There are seven GMP dams, five hydropower stations owned by others, and three state-owned flood control reservoirs, all of which interact in the Winooski River watershed. As set forth in detail in the report, for a storm event that involves 50 percent more rain than Tropical Storm Irene falling in the Winooski River

watershed, peak stream flows in many locations would in fact be significantly *higher* than 50 percent above those we experienced in Tropical Storm Irene. That is because soil moisture absorption interacts with peak runoff in a way that amplifies the effects of the increased precipitation. As VHB found, "simulating the larger design storm on the same antecedent conditions, the hydrologic modeling predicts that peak runoff rates would be as much as 260-percent greater in headwater locations, because the soil's capacity to absorb rainfall would become depleted during the earlier portions of the rainfall event, leading to significantly higher rates of runoff during the later periods of the storm." **Exhibit GMP-JL-4** at 9. In many areas of the watershed, flows would be expected to exceed the magnitude of the 500-year flood, and water elevations would be expected to exceed the design limits of the hydropower stations.

Operational changes, such as the lower new normal operating level and pre-emptive reservoir drawdowns ahead of a storm that were recently agreed to by ANR and GMP for the Molly's Falls hydropower facility[4] can ameliorate the flooding risk at and immediately downstream of this facility, but the flood mitigation benefits would be localized because of uncontrolled flows from other tributary streams. At Molly's Falls, GMP is also proposing physical upgrades to the spillway and water-control gates to improve flow capacity and management of dam releases. Because the flood mitigation benefits would be localized near the Molly's Falls facility, both facility design upgrades and operational changes would be necessary at other facilities downstream and on

[4] *See* Attachment A of the ANR-GMP MOU, Exhibit GMP-8 in Case No. 18-2549-PET.

tributary streams, to account for this type of extreme weather event. Operational changes such as pre-emptive releases and lowering reservoir water levels to increase water-storage capacity in advance of high-flow events are only practicable at storage reservoirs such as Clark Falls and the Waterbury Reservoir. At locations without useable storage, GMP would rely on physical upgrades to improve flood resilience. For example, the work proposed for the West Danville facility will accelerate replacement of the original wooden head gate (vintage 1912) with modernized equipment and remote operational capabilities, thus mitigating risk during high water events and improving response time.

Overall, the modeling already completed under this design storm criteria makes clear that we should be accelerating our hydroelectric generation station work to enhance resiliency not only for their operation but also for the communities surrounding them, given the critical role these facilities may play in mitigating flood risk.

Q11. Can you summarize the "lessons learned" from the VHB work described?

A11. The VHB report, **Exhibit GMP-JL-4**, tells us that it is critical that GMP act as quickly as it can to further harden, modify, and update its own facilities and operations in order to maximize the chance of limiting damage during extreme weather events. It also confirms that our criteria and prioritization for accelerating improvements and increasing our ability to remotely monitor and operate our high and significant hazard dams is reasonable. To me, it confirmed that GMP is on the right path to propose this specific resiliency work as a part of this Plan and to seek to enhance our overall approach to incorporating resiliency into our planning process in the years ahead.

II. Description of Climate Plan Generation Facility Projects

Q12. What types of generation facility projects appear necessary based upon that elevation and inundation modeling?

A12. Dams and hydro facilities are primarily where resiliency investments should be accelerated based upon this modeling. GMP will also address assets within floodplains and adjacent to the hydroelectric facilities, such as substations.

First, we will plan for dedicated relay technician resources for vulnerable hydroelectric generation plants. As we do with our lineworkers during storm restoration, these resources would be dedicated to critical and vulnerable areas during a high-water event. This operations expense is necessary and appropriate in order to best protect the public and maximize our ability to protect from extreme events the assets for which our customers pay.

In addition, we would accelerate improvements to high/significant hazard dams and associated critical infrastructure at hydroelectric facilities such as water control gates, primary and emergency spillways, and specific sections of penstock. This key infrastructure is relied upon to control, stop, and/or manage water during these potentially hazardous events.

GMP will also expand and harden fiber/communication installations at vulnerable generation sites so that we can install more effective automation controls to enhance our operating protocols during emergency events. For example, some remote sites now require field personnel to manually operate water control gates and/or measure water levels in reservoirs. Providing a more robust fiber connection and automated equipment

to such sites will minimize the response time to more effectively and more safely manage a high-water event.

III. Criteria Utilized for Selecting Generation Facility Projects under the Climate Plan

Q13. What criteria will GMP use to determine whether a particular generation facility project should be included as a part of the Climate Plan?

A13. The criteria we use to determine whether a generation facility project should be advanced under the Climate Plan will differ from our standard capital planning.

Hydropower generation facility upgrades will be selected to improve GMP's management of high/significant hazard dams, high-water events, and catastrophic event emergency operating protocols taking into account:

- Age of assets/water control equipment; elevation of systems; and effects expected based upon hydraulic and hydrologic modeling will aid in project selection.
- Priority is given to facilities that have not received electrical modernization to improve safety, reliability, and GMP's ability to remotely monitor and operate a facility.

For substation relocation, GMP will use flood plain/inundation analysis based upon 100- or 500-year flood maps and modeling, which are set forth in **Exhibit GMP-MB-1,** and the ranking noted in the attached **Exhibit GMP-MB-4**.

Q14. Describe specifically how you will identify the types of generation facility projects you will include under the Climate Plan.

A14. In order to identify the projects that should be included in our Climate Plan spending, we will utilize hydrologic models, dam failure analysis, and high and significant hazard dam classifications, along with the age of asset of critical equipment.

The hydrologic modeling to identify projects for Plan spending will use calibrated computer models that estimate the magnitude of flows in a river system during design storm events. For this Climate Plan evaluation, a "design storm" event is a storm 50% stronger than Irene, as explained above, which was selected to represent a potential extreme storm event that could occur due to climate change. It is important to note that the Plan "design storm" we will use is different than an inflow design flood which is used for design standards when making physical improvements to projects. The hydrologic modeling evaluates rates of rainfall and runoff during the design storm events, and analyzes the routing of runoff through the tributaries and rivers as well as through GMP's hydropower facilities within the watershed. Model output includes magnitude, timing, duration, and rate-of-change of flows and water levels at GMP facilities and other locations.

Our consultants will complete a dam failure analysis using a calibrated hydraulic model to simulate a hypothetical breach of a dam and in turn determine where the water goes, how fast the water reaches downstream locations, and what areas become flooded. We can then use the results of the breach analysis to identify potential impacts to downstream communities and determine the hazard potential classification of a dam. The

results of a dam failure analysis will also be used to develop inundation maps for use in emergency action planning.

With this information, along with our age of asset and operations information, GMP will select projects we recommend accelerating. Specifically, we anticipate these projects will involve high and significant hazard class dams that could impact public and employee safety; other dams with critical water control/management equipment; and modernization of hydroelectric facilities to enhance remote operation and hardened communication.

Q15. Describe the generation facility projects so far identified by GMP under these criteria.

A15. Attached as **Exhibit GMP-JL-1** is a list of generation facility projects that we presently have identified as appropriate for further development under these criteria. As permitting and other planning needed to advance these projects occurs, we will place these projects within our yearly project plan and follow the Climate Plan budgeting, capital planning, and accounting processes, as described further in Eddie Ryan's testimony.

Q16. Is this a complete list of the projects GMP proposes for the first year of the Climate Plan? If not, how does GMP propose to address future, to-be-determined projects?

A16. No. This is a preliminary list. For these projects, permitting and other planning issues that have longer timeframes are variables that need to be managed to create a complete first-year list of projects. Therefore, the list and spending estimates will change and solidify as we are able to obtain permits and resolve other planning issues. Meanwhile,

GMP expects that the pace of climate impacts will continue to accelerate, and the strategies and innovative technologies we use to increase our resilience may evolve over time as new methods and opportunities become known. That is why the Plan proposes annual reports of projects that will be investigated and projects that were completed in the prior year, as a method of giving GMP appropriate flexibility to plan and execute these projects while maintaining strong oversight. This will also allow GMP to evolve the project list over time.

Q17. Can you talk about why these proposed projects are necessary, appropriate, and in the best interest of GMP customers?

A17. As Eddie Ryan notes, for any project actually chosen to be undertaken and completed as a part of the Climate Plan, GMP will complete its normal capital review process, providing the backup required showing that the project is beneficial to ratepayers. The criteria we will utilize to select projects to pursue as a part of the Plan helps ensure they are necessary, appropriate, and in the best interest of our customers, while project reporting under the Plan and the normal GMP capital planning process provide additional opportunities for regulatory oversight.

Q18. Does this conclude your testimony at this time?

A18. Yes, it does.