A. INTRODUCTION

Great River Hydro, LLC (the Applicant), has applied for a license from the Federal Energy Regulatory Commission (FERC) to continue the operation and maintenance of the Bellows Falls Hydroelectric Project (Project) located on the Connecticut River, in the town of Walpole, Cheshire County, New Hampshire and the town of Rockingham, Windham County, Vermont. The Project has a total installed power generating capacity of 40.8 megawatts (MW). The Project generates electricity, and the Applicant sells the electricity to the power grid. A more complete description of the Project is provided in Section C of this certification.

In accordance with 33 U.S. Code §1341 (§401 of the federal Clean Water Act [CWA]), federal regulations promulgated under the CWA at Title 40 Code of Federal Regulations (CFR) Part 121, and New Hampshire law under Revised Statutes Annotated (RSA) 485-A:12, III, the Applicant submitted an Application for Water Quality Certification (WQC) to the New Hampshire Department of Environmental Services - Watershed Management Bureau (NHDES) on April 19, 2024. The WQC application (the Application)[2] included a certification request, completed application form, and the links to public documents included in the FERC Amended Final License Application (AFLA).

The purpose of the certification is to provide an assurance that discharges into surface waters of the state and waters of the United States, hereinafter collectively referred to as "surface waters", from the Project will comply with applicable water quality requirements, including New Hampshire surface water quality standards specified under RSA 485-A:8 and New Hampshire Code of Administrative Rules Env-Wq 1700 (Surface Water Quality Standards); 33 U.S. Code §1313 (CWA §303); effluent limitations and other limitations, under 33 U.S.C. §1311 or 33 U.S.C. §1312 (CWA §301 or §302, respectively); standards of performance per 33 U.S.C. §1316 (CWA §306), or prohibition, effluent standard, or pretreatment standard under 33 U.S.C. §1317 (CWA §307); and with any other appropriate requirement of state law (Provisions of the CWA), of which CWA §303 is the most applicable provision for the Project.

B. DECISION

Based on a review of the Application, and subject to conditions included herein, NHDES has determined that discharges from operation of the proposed Project will comply with applicable water quality requirements, including New Hampshire Surface Water Quality Standards and Provisions of the CWA. NHDES hereby grants this certification in accordance with RSA 485-A:12, III, subject to the conditions in Section E of this certification.

C. PROJECT DESCRIPTION

C-1. On May 1, 2017,[3] the Applicant filed the Final License Application (FLA) to FERC for licensing of the Project. On December 07, 2020,[4] the Applicant filed the AFLA, and on June 7, 2023,[5] the Applicant filed a revised composite Exhibit E for the three Applicant-owned

[2] FERC Accession Number 20240423-5125
[3] FERC Accession Number 20170501-5425
[4] FERC Accession Number 20201207-5219
[5] FERC Accession Number 20230608-5103

Hydroelectric Projects concurrently undergoing relicensing on the Connecticut River.[6] On November 21, 2023, FERC accepted the Applicant's AFLA and issued a Ready for Environmental Analysis (REA)[7] for the Bellows Falls Project, et. al.

C-2. In Table 2.1-3 of Exhibit E of the AFLA, the Applicant provided the following summary of the Project:

General Information	
Owner	Great River Hydro, LLC
FERC Project Number	P-1855
Current license term	August 3, 1979 - April 30, 2019
Authorized Generating Capacity	40.8 MW
Location of Dam	Connecticut River at [river mile] 173.7
Nearest Towns/Counties	Walpole, Cheshire County, NH Rockingham, Windham County, VT
Drainage area	5,414 square miles
Major tributaries	NH - Mascoma and Sugar Rivers VT - White, Ottauquechee, Black, and Williams Rivers
Operating range elevation[8]	288.6 - 291.6 ft
Current range elevation[9]	289.6 - 291.4 ft
Normal tailwater elevation	229.0 ft
Impoundment length	26 miles (Cornish, NH/Windsor, VT)
Gross storage	26,900 acre-ft
Useable storage	7,476 acre-ft (at 3-ft drawdown)
Surface area at full pond	2,804 acres
Average annual inflow at the Project	Approximately 10,500 cfs
Required minimum flow	1,083 cfs or inflow, whichever is less
Generated minimum flow	1,300 cfs
Major Structures and Equipment	
Dam	Concrete gravity type construction, 643 ft long, with maximum height of 30 ft and net head of 60.5 ft
Spillway gates	2 steel roller gates, 3 stanchion bays, 1 forebay sluice gate
Bypassed reach	Natural riverbed approximately 3,500 ft long, minimal flow from leakage
Powerhouse intake canal	Paving stones stabilized by a grid of concrete grade beams and walls with a concrete walled forebay, 1,700 ft long
Powerhouse	Steel frame and brick construction
Turbine generating units	3
Turbine manufacturer/type	vertical Francis
Turbine capacities	Each - 16 MW, 3,670 cfs @ 57 ft head

[6] Wilder Hydroelectric Project (P-1892), Bellows Falls Hydroelectric Project (P-1855) and Vernon Hydroelectric Project (P-1904).
[7] FERC Accession Number 20240222-3012
[8] Elevation data are presented using the National Geodetic Vertical Datum of 1929 (NGVD29)
[9] Reflects typical non-spill, non-emergency operation.

Generator capacities	Each - 13,600 kW
Total discharge capacity, including spill	119,785 cfs
Fish ladder	Reinforced concrete; vertical slotted weir fish ladder 920 ft long with 67 pools and 60 ft of vertical rise, collection facility, and viewing windows

C-3. In Section A1 of Exhibit A of the AFLA, the Applicant provided the following overall description of the Project:

"The Bellows Falls Project dam, canal, and powerhouse are located on the Connecticut River at river mile (RM) 173.7, about 1 mile upstream of Saxtons River and 3 miles downstream of the Williams River at the upper end of a sharp bend of the Connecticut River at Bellows Falls, Vermont, in the town of Rockingham, Windham County, Vermont, and in the town of Walpole, Cheshire County, New Hampshire… The Project is located in the towns of Rockingham, Springfield, Weathersfield, and Windsor, Vermont; and Walpole, Charlestown, Claremont, and Cornish, New Hampshire."

"The powerhouse is located downstream of the dam at the end of a power canal that is 1,700 feet (ft) long… The primary Project facilities, which include the dam, spillway, power canal, powerhouse, substation and transformers, a line garage and storage building located near the powerhouse, fish passage facilities… and recreation areas and facilities including three boat launches and picnic areas, a portage, and a visitor center with a fish ladder viewing window... Non-Project facilities located within the Project boundary include two switchyards that contain equipment owned by a regional transmission company."

"Great River Hydro holds fee ownership of 835 acres of land in the Project. Of this acreage, 62 acres are used for plant and related facilities; 86 acres for public outdoor recreational use; 60 acres of other shoreline lands in Charlestown, New Hampshire; and the remaining 627 acres currently support local agriculture, farming, and wildlife management."

C-4. In Section A1.1 of Exhibit A of the AFLA, the Applicant provided the following description of the Project's Impoundment:

"The Project impoundment extends upstream about 26 miles to Chase Island at Windsor, Vermont, about 1 mile below the Windsor Bridge. The impoundment has a surface area of 2,804 acres, about 74 miles of shoreline, and a total volume of 26,900 acre-feet (acre-ft) at elevation (El.) 291.63**3** ft (National Geodetic Vertical Datum of 1929 [NGVD29]) above mean sea level (m.s.l.) at the top of the stanchion boards. The overall operating range of the Project, accounting for both low inflow and most high inflows conditions, is typically between El. 288.63 ft and 291.63 ft, providing about 7,476 acre-ft of storage in the 3-ft range. The storage volume associated with the typical operating range, under non-spill conditions, between El. 289.6 ft and 291.4 ft is 4,642 acre-ft, or 62 percent of the overall usable storage."

C-5. In Section A1.2 of Exhibit A of the AFLA, the Applicant provided the following description of the Project's Dam and Spillway:

"The dam is a concrete gravity structure extending across the Connecticut River between Rockingham, Vermont, and Walpole, New Hampshire. Virtually all of the dam structure is located in New Hampshire. It is 643 ft long with a maximum height of about 30 ft and is divided by concrete piers into five bays. Two

bays contain steel roller-type flood gates and the three other bays contain stanchion flashboards. A steel bridge runs the length of the dam for access and for operation of flashboards. A 25-ton gantry crane sits atop the bridge..."

C-6. In Section A1.3 of Exhibit A of the AFLA, the Applicant provided the following description of the Project's Power Canal and Bypassed Reach:

"A power canal connects the impoundment to the powerhouse... The canal is lined with stone stabilized by a grid of concrete grade beams and walls. The downstream end of the canal is a concrete walled forebay. The canal is 100 ft wide at the top, about 36 ft wide at the bottom, about 29 ft deep, and approximately 1,700 ft long, including the length of the powerhouse forebay. The canal creates a natural bypassed reach between the dam and the outlet of the powerhouse tailrace... The reach is about 3,500 ft long and receives minimal water from leakage and significant amounts through spill during periods when flows exceed station capacity."

C-7. In Section A3 of Exhibit A of the AFLA, the Applicant provided the following description of the Proposed Modifications and Enhancements to the Project:

"Proposed new facilities include a new 680kW minimum flow turbine generator, an affiliated control house and electrical interconnect equipment to local distribution utility in Vermont. The minimum flow unit will recover a portion of the lost energy, resulting from the 300 cfs provided below the dam into the bypassed reach."

"The turbine generator will be housed in a concrete intake structure connected to the downstream face of the spillway Stanchion Bay #1. The concrete intake structure is approximately 33' wide by 33' long and open to the headpond creating a small forebay for the minimum flow unit. The forebay has a floor that is level with the concrete crest of the dam at elevation 278.6 above msl; one half is concrete, and the other half is a floor screen that serves as a horizontal trash rack above the vertically aligned turbine generator. The trash rack measures approximately 14.4' wide by 30.9' long with 2-inch clear spacing between bars. The average velocity through the entire rack is calculated to be 0.97 feet per second (fps). The average velocity through the rack in an area measuring 11.3' wide by 20.4' long concentrated around the unit itself is approximately 1.88 fps. The average velocity of the flow through the modified portion of the Stanchion Bay #1 which conveys water to the forebay is less than 0.71 fps. The above calculations are based on a turbine flow of 300 cfs."

"The length of the concrete intake structure along the spillway face is approximately 33 feet or 26.9% of the 120 foot total length of Stanchion Bay #1, reducing the pre-minimum flow unit maximum discharge capacity of 18,600 cfs potentially by approximately 5011 cfs. However, the design of the concrete intake structure will include three new spill conveyance structures, comprised of a 25-foot wide vertical crest gate, a 14-foot wide downward opening, bottom-hinge crest gate and 14-foot wide bay of removable stoplogs with a combined capacity of 5476 cfs, thus increasing the spill capacity of the existing dam by 465 cfs in addition to generation flow through the minimum flow unit itself…"

"The turbine will utilize adjustable-pitch wicket gates to allow ramping of output power for smooth grid interconnection. An existing auxiliary steel bulkhead used to repair and maintain stanchion sections of the dam will continue to function as a means of blocking flow to the intake structure and turbine for construction inspection, service or repair."

"The turbine will utilize an elbow draft tube (horizontal outlet) with steel liner supplied by Natel, rather than a straight (vertical) conical draft tube. The elbow draft tube better integrates to the existing conditions."

C-8. In Section A1.6.1 of Exhibit A of the AFLA, the Applicant provided the following description of the Project's Upstream Fish Passage Facilities:

"The upstream fish passage system consists of a conventional vertical-slotted weir fish ladder at the powerhouse and an upstream concrete barrier dam in the bypassed reach... The barrier dam prevents upstream migrating fish from being attracted by spillway discharge into the reach and later becoming trapped in isolated pools after spill ends. The barrier is located just upstream of the Boston and Maine Railroad Bridge. The fish ladder is a 920-ft-long, reinforced concrete structure with accessory electrical, mechanical, and pneumatic equipment that is designed to provide passage for migrating Atlantic Salmon past the dam by way of the forebay and canal, a vertical distance of about 60 ft. Upstream migrating fish are attracted to the tailrace channel by flow from the turbines. Once in the tailrace area, fish are attracted to the main entrance weir at the east end of the powerhouse."

"Attraction water is provided by the upper three weirs containing slide gates, which open and close depending on the forebay water surface elevation (WSE) to maintain the required fish ladder flow. A skimmer gate/sluiceway is located in the forebay and is used for additional fish ladder attraction water. Water from this channel enters two diffuser openings at the fish ladder entrance. Fish enter the 8-ft-wide fish ladder entrance channel and "climb" to the forebay by swimming through a series of 67 slots and cascading pools with each succeeding weir spaced 8 ft apart and 12 inches higher than the last. After passing 34 pools, the fish enter a level turning section and pass through another 10 pools to the counting/trapping area. There, fish are guided by flow and crowder screens, travel through a 3-ft-wide flume, and pass an underwater viewing window where they may be observed and counted. From the counting/trapping area, fish continue to climb through an additional 22 pools to the ladder's 8-ft-wide exit channel into the forebay and canal. The exit channel (i.e., the last pool) includes a motor-driven head gate, widely spaced trashracks (sufficient to pass adult salmon), and slots for wooden stop logs. The last three weirs contain adjustable weir gates that can be lowered (opened) to provide a nearly constant 25 cfs fish ladder flow when the forebay WSE drops through its 3-ft operating range."

"The fish ladder visitor center is located adjacent to the upper two pools and exit channel. The building's basement serves as a public viewing gallery with two underwater windows. The upper floor provides informational displays on hydro generation, recreation, archaeology, and anadromous fish restoration and has a picture window view of the fish ladder to the south (downstream). The Connecticut River Atlantic Salmon Commission (CRASC) provides an annual *Fish Passage Notification Schedule*, which sets the dates for upstream passage for all dams on the Connecticut River. Typically, the upstream fish ladder operates from May 15 through July 15 and in fall from September 15 through November 15 for Atlantic Salmon; however, in recent years, fish ladder operation has been suspended because of low salmon returns and abandonment of the program by the U.S. Department of the Interior, Fish and Wildlife Service (FWS) and the states."

C-9. In Section A1.6.2 of Exhibit A of the AFLA, the Applicant provided the following description of the Project's Downstream Fish Passage Facilities:

"As of February 11, 2016, CRASC no longer requires downstream passage operations at Bellows Falls for Atlantic Salmon smolts... CRASC's annual *Fish Passage Notification Schedule* had set the dates for

downstream passage for all dams on the Connecticut River. Downstream passage flows were provided for adult Atlantic Salmon from October 15 to December 31 if 50 or more adults were documented as having passed upstream. Downstream passage was provided by the forebay sluiceway/skimmer gate with fish being guided to the gate by a solid, partial depth diversion boom across the canal. A small auxiliary gate located on the east side of the powerhouse was opened to direct fish that may get under the diversion boom to the sluiceway. The gate is motorized and operated locally as needed to pass river debris and ice."

C-10. In Section B1.1 of Exhibit B of the AFLA, the Applicant provided the following description of the existing operations of the Project:

"Project operations are automated and controlled from a consolidated hydro operations control center located in Wilder, Vermont. Great River Hydro, LLC (Great River Hydro), typically operates the Project in a coordinated manner with other Great River Hydro generating facilities on the Connecticut River, taking into consideration variations in electricity demand as well as natural flow to maximize the efficient use of available water."

"When inflows are within the Project's generating capacity, Great River Hydro uses the limited impoundment storage at the Project to dispatch generation as required to meet the generation dispatch schedule managed by New England Independent System Operator (ISO-NE). During any day, generation can vary between the required minimum flow and full generating capacity, depending on inflow and impoundment storage. Over the day, the Project generally passes the average daily inflow."

"…Anticipated inflow calculations predict impoundment water surface elevations (WSEs) (all elevations are mean sea level (m.s.l.), NGVD 29) and determine whether spill gates must be operated to pass flow in excess of Project generating capacity. Estimated inflow is calculated using discharge from the Project plus/minus changes in impoundment elevation measured at the dam on an hourly basis, averaged over a rolling 6-hour period. Impoundment drawdown rates are typically less than 0.1 to 0.2 foot (ft) per hour and do not exceed 0.3 ft per hour and depend upon station turbine discharge capability and rate of inflow. Due to the length and [river] channel characteristics of the impoundment, changes in WSE and flow at the dam are not mirrored at upstream locations within the impoundment due to reduced influence and affect from operations at the dam and increased influence and contribution from inflow as distance from of the dam is increased. There is approximately 3,000 cubic feet per second (cfs) per hour per 0.1 ft of elevation, and 0.3 ft per hour represents a maximum station output with little to no inflow."

"The maximum station discharge with all three units operating is approximately 11,400 cfs, although 98 percent of the time flows are less than 11,235 cfs. The Project itself has a maximum discharge (generation plus spill) capacity of 119,785 cfs, and the flood of record, occurred in March 1936, was 156,000 cfs. Since then, three upstream U.S. Army Corps of Engineers (USACE) flood control structures have been built (Union Village, Ompompanoosuc River; North Hartland, Ottauquechee River; and North Springfield, Black River) and Moore dam, which has some flood control capability, was constructed. These facilities have helped to decrease the peak flow during flood events. Since the Moore dam began operating in the late 1950s, the highest flow recorded at the Bellows Falls Project (as measured at the dam) was 103,397 cfs during Tropical Storm Irene on August 29, 2011."

"The licensed minimum flow requirement at the Bellows Falls powerhouse is 1,083 cfs (or inflow if less) and is provided primarily through generation, typically at least 1,200 cfs. There is no minimum flow requirement through the dam into the bypassed reach, but leakage provides some flow in the bypassed

reach (flows range between 125 to 300 cfs as calculated or estimated over the course of various studies. Additional non-generation flows are provided seasonally at the powerhouse on a schedule provided annually by the Connecticut River Atlantic Salmon Commission (CRASC) based on fish counts at downstream projects. If required, fish passage flows are provided in spring (May 15–July 15) and in fall (September 15–November 15) for upstream fish passage (25-cfs fishway flow and 55-cfs attraction flow) and for downstream fish passage (225 cfs). As of 2016, CRASC no longer requires downstream passage operations at Bellows Falls for Atlantic Salmon smolts in spring, and it only requires fall downstream passage operations if 50 or more adults are documented passing upstream... During the summer recreation season, beginning the Friday before Memorial Day and continuing through the last weekend in September, Great River Hydro maintains a self-imposed minimum impoundment WSE of elevation (El.) 289.6 as measured at the dam from Friday at 4:00 p.m. through Sunday at midnight and on holidays during this period, unless the Project is experiencing high flows above generating capacity."

C-11. In Section B1.3 of Exhibit B of the AFLA, the Applicant provided the following description of the proposed operations of the Project, with the proposed operations exhaustively described in "Attachments A – Great River Hydro's Proposed Alternative Operation for the Projects", and "B - Evidence of Support for Proposed Alternative Operation - Memorandum of Understanding [MOU] Wilder, Bellows Falls and Vernon Hydroelectric Projects FERC Relicensing" (dated December 1, 2020), of Exhibit B of the AFLA. [Attachments A and B of Exhibit B are attached to this Certification as **Attachment 1**.]:

"Great River Hydro, with support from relevant state and federal resource agencies, and regional and national non-governmental organizations that have actively participated in scoping and study phases of relicensing, proposes a modified project operation that significantly reduces both the frequency, amplitude and rate of change in project-related discharge and impoundment water surface fluctuation in comparison to Existing Project Operation…"

"The proposed operation focuses on creating more stable reservoir water surface elevations, reducing the magnitude of changes and the frequency of sub-daily changes in discharge from the project, increasing the amount of time that the project is operated as inflow equals outflow and at full reservoir. At the same time, the proposed operation maintains Great River Hydro's capability to be flexible and responsive to current wholesale energy, forward capacity, reserve and other ancillary services markets managed by the New England Independent System Operator (ISO-NE). The proposed operation will also remain responsive to ISO-NE system emergencies when ISO-NE requires operation for reserves, security, system stability (e.g., VAR support), system over-supply conditions (ISO-NE minimum generation emergency or negative prices), and critical events or emergencies involving dam and public safety. The proposed operation ensures the Project's ability to address future regional energy demands and system needs as those evolve over time."

"With the proposed Project operation, Great River Hydro will predominantly maintain a specified WSE (Target WSE) at the dam and as a result, maintain flow below the Project equal to the approximate inflow as measured or calculated at the dam (inflow equals outflow or IEO). Specifically, a Target WSE of 291.1ft m.s.l. (NVGD 29) will be maintained at the Bellows Falls dam by passing inflow within a Target WSE Bandwidth between 291.6 ft and 290.6 ft to account for potential differences between anticipated inflow and actual instantaneous inflow. A minimum of 300 cfs of the total flow below the Project will be continuously provided below the Bellows Falls dam in the bypassed reach associated with the Project. In addition to IEO Operation, the Project will have restricted discretionary Flexible Operation capability to

respond to elevated energy prices as well as unrestricted capability to respond to emergencies and ISO-NE transmission and power system requirements…"

C-12. In Section 5.1 of Exhibit E of the AFLA, the Applicant described the effects of the proposed environmental measures related to aquatic resources for the Project:

"Under the Great River Hydro proposal, the proposed operation will reduce the frequency of impoundment WSE fluctuations by 58-100 percent, the with the greatest reduction occurring during critical spawning periods. The magnitude of WSE change is expected to be less than 0.4 ft in most month and year scenarios (average 0.23 ft)."

"Station discharge will match inflow 67-100 percent of the time in spring, summer, and fall months, and 39-60 percent of the time during winter. Increases in base flow levels and the reduction in frequency, occurrence, and amount of change in flow, particularly during critical seasonal periods under the proposed operation, will reduce the frequency and magnitude of gravel and cobble-bar wetting and dewatering and provide a more stable environment for riverine species. The proposed flow regime is expected to increase success of spawners using shallow shoal habitats, including Smallmouth Bass, Fallfish, and Sea Lamprey."

"The higher base flow and Transition Operation of up-ramping and down-ramping preceding and following Flexible Operation will also provide more consistency for mussel recruitment and less likelihood of stranding for mussels and other less mobile species, including fry. Similarly, reduction in frequency, occurrence and amount of change in flow, particularly during critical seasonal periods will reduce nest scour or abandonment due to high velocities, reduce displacement of newly emerged fry of many species, and should provide extended periods of more stable flow for nest construction by Fallfish and Sea Lamprey."

C-13. In Section 2.2.2 of Exhibit E of the AFLA, the Applicant described the proposed non-operational protection, mitigation, and enhancement measures for the Project, including:

"Continuing to manage, maintain, and enhance as demand and use requires the various recreation areas and facilities associated with the three projects."

"Continuing to manage undeveloped land through cooperative agreements with farmers to maintain prime agricultural lands productive but also managed for critical wildlife habitat such as grassland bird nesting."

"Continue to maintain and operate fish passage facilities. and operate as requested in Schedule of Operations letters issued annually by the Connecticut River Salmon Restoration Commission (CRASC)."

"Operate fish ladders at [the Project] from April 1 thru July 15 to support upstream passage for resident early spring spawners such as White Sucker and Walleye and diadromous species as adult Sea Lamprey and juvenile American Eel."

[Incorporate into the Bellows Falls Project one canoe campsite, Lower Meadow Campsite in Charlestown NH, which is a non-project recreation area on Great River Hydro fee-land]

"Design, install and implement tools, equipment, and resources as needed, within the Project boundary, portions of the river affected by project operations and in the hydro operations control center to assist

While less than 1 percent of the banks have exposed bedrock in the Bellows Falls riverine reach downstream of the dam, nearly 20 percent of the banks are composed of boulders, suggesting bedrock may be present just below the surface. The large percentage of cobble banks in the riverine reach compared to the impoundment is consistent with bank heights greater than 15 feet for 70 percent of the bank length."

"Forty percent of the banks in the Bellows Falls impoundment are unstable... Although significant variation exists, bank instability in the impoundment is generally greater with increasing distance from the dam… The lower levels of erosion closer to the dam may be due to the presence of armoring along the higher banks on the Vermont shore and the low banks on the New Hampshire side. Lower banks have limited gravitational force to drive erosion. The highest levels of erosion in the Bellows Falls riverine reach are found in the most downstream portions of the reach. The percentage of unstable banks in the Bellows Falls riverine reach is approximately 7 percent lower than in the Bellows Falls impoundment, largely because no unstable banks are present in the first mile downstream of Bellows Falls dam where bedrock, boulders, and armoring are prevalent."

"The amount of erosion in the Bellows Falls impoundment appears to have decreased through time as determined by comparing maps of erosion completed in 1958, 1978, and 2014... Between 1958 and 2014, the percentage of eroding banks decreased from 28 to 14 percent. Historical comparison is challenging, however, because vegetated eroding and failing armor banks were not likely considered eroding in earlier mapping efforts. An analysis of georeferenced historical aerial photographs indicates that the rate of erosion has decreased significantly at many locations, particularly in the lower Bellows Falls impoundment... In addition to temporal variations in the rate of erosion, the rate of erosion in the impoundment varies spatially as well. Two years of erosion monitoring at four sites in the impoundment as part of Studies 2-3 recorded recession at the top of the bank at two sites and no erosion at the other two locations. With 7 ft of bank recession at a monitoring site in Charlestown, New Hampshire, in the lower impoundment, current erosion rates in the Bellows Falls impoundment range from 0 ft per year to as high as 3.5 ft per year."

"Analysis of bank erosion data compiled as part of Studies 2-3,[10] bolstered by the supplemental analysis for Study 3… indicates that continued erosion in the Project areas is the result of high flows that exceed the applicable Project's maximum station discharge. Multiple forces act on the riverbanks through time to move the cycle of erosion forward... The continuation of erosion, however, ultimately depends on the removal of sediment that accumulates at the base of the bank from upslope erosion."

C-17. In Section 3.4.2.2 of Exhibit E of the AFLA, the Applicant described the effects of the proposed operations on the occurrence of erosion within the Project's impoundment and riverine reaches:

"…The lack of a clear correlation between Project related WSE fluctuations and erosion occurrence in impounded reaches would continue to exist under Great River Hydro's proposal. Great River Hydro will continue impoundment drawdown rates (no more than 0.3 ft/hour and typically 0.1‑0.2 ft per hour), which serve to limit the rate of impoundment fluctuations and utilize available storage when available to reduce the potential for sudden spill events downstream of the dams which might otherwise lead to entrainment threshold velocities in the riverine reaches. Operations dominated by IEO… and characterized from the water resources perspective… would further reduce the factors (e.g. stability in

[10] FERC Accession Number 20170206-5045

C-21. In Section 3.7.1.4 of Exhibit E and in Attachments A and B of Exhibit B of the AFLA [Attachments A and B of Exhibit B are attached to this Certification as **Attachment 1**], the Applicant described the presence of Cobblestone Tiger Beetle (CTB) at the three Applicant-owned Hydroelectric Projects concurrently undergoing relicensing on the Connecticut River,[13] and how the Proposed Alternative Operations would attain species specific management goals at the Projects:

"The cobblestone tiger beetle is listed as threatened in both New Hampshire and Vermont. It has an extremely restricted habitat and is found on cobble and gravel beaches on river edges and the upstream side of riverine islands where the river deposits small- to medium-sized cobble in times of high flow… Before Study 26[14], individuals of this species were found in the vicinity of the Wilder, Bellows Falls, and Vernon Project areas with existing records spanning from Johnston Island (Lebanon, New Hampshire, in the Wilder riverine reach) to Walpole Island (Walpole, New Hampshire, in the Bellows Falls riverine reach). A previous record also existed as far south as the West River (Brattleboro, Vermont, in the Vernon impoundment), but that record was just outside the defined influence of Vernon Project operations."

"Study 26 commenced with a desktop analysis to review sites of previous records and identify potentially suitable new habitat available to cobblestone tiger beetles in the study area. Sources of data included maps of cobblestone tiger beetle observations and existing aerial photographs. Survey sites were subsequently chosen from these habitat areas based on accessibility and field checks to verify the habitat suitability. The 13 selected sites were each visited 3 times during the summer of 2014 in warm, humid conditions (ideal foraging/breeding conditions for adults)."

"During Study 26, the cobblestone tiger beetle was found to be widely distributed throughout the study area. Adult cobblestone tiger beetles were positively identified at 7 of the 13 survey sites. Survey scientists found them at least once at each of the 5 previously recorded sites, and at 2 survey sites, Hart Island (Wilder riverine reach) and Walpole Island (Bellows Falls riverine reach); cobblestone tiger beetles were observed during all 3 survey visits between July and August 2014. One new site, a mainstem riverbank cobble bed in Ascutney, Vermont, was identified for the species."

"In an assessment of habitat features of occupied sites, Study 26 results indicate that adult cobblestone tiger beetles have specific habitat preferences related to the size and variability of cobble substrate. The mean cobble size ranged from about 2 to 3 inches in all high-quality habitats, and the target species was absent at most sites with cobble averaging either smaller or larger than this range. In addition, the cobble diameter variability (measured as standard deviation of the a-axis) of high-quality survey sites fell within an approximate range of 0.75 to 1.5 inches. Among the study sites, the majority of appropriate habitat was available in the Wilder riverine reach with one high-quality site in the Bellows Falls riverine reach."

The Applicant's Proposed Alternative Operations include a Cobblestone Tiger Beetle (CTB) Management Goal, which is to, "maintain multiple consecutive-day periods (≥3) in which Flexible Operations… do not exceed flow thresholds that maintain ≥75% uninundated habitat at most sites for each month during the CTB active period (June through September), excluding periods when inflows are above these thresholds."

[13] Refer to Footnote 6
[14] FERC Accession Number 20160617-5204

measure all withdrawals and discharges of the Project and report them to the NHDES Water Use Registration and Reporting Program.

D. DISCHARGES

Potential and proposed discharges to surface waters from the Project include discharges of various water quantities to the Project's impoundment, and to the Connecticut River downstream of the Project's dam, which affect flow of the Connecticut River and water surface elevation levels of the Project's impoundment.

E. CERTIFICATION CONDITIONS

Unless otherwise authorized or directed by NHDES, the following conditions shall apply:

E-1. **Compliance with Surface Water Quality Standards:** The Applicant shall ensure that the discharges from the Project will maintain and protect Surface Water Quality Standards of surface waters that are affected by the Project, including the chemical, physical, and biological integrity of those surface waters, to achieve the purposes of the legislative classification of those surface waters.

This condition is necessary to ensure that the discharges from the Project will comply with the Surface Water Quality Standards because those standards apply to all surface waters of the state and any person who undertakes any activity that affects the beneficial uses or the water quality of surface waters. Those standards require, among other things, that all surface waters be restored to meet the water quality criteria for their designated classification, including existing and designated uses, and to maintain the chemical, physical, and biological integrity of surface waters; provide for the protection of designated uses; and maintain surface water quantity at levels that protect existing and designated uses.

Citations that authorize this condition: CWA §401; RSA 485-A:8; RSA 485-A:12, III; and Env-Wq 1700.

E-2. **Proposed Modifications to the Project:** The Applicant shall consult with NHDES, NH Fish and Game Department (NHFGD), US Fish and Wildlife Service (USFWS) and FERC and receive prior written approval from NHDES regarding any proposed modifications to the Project, including any modifications to the operation of the Project that could have a significant or material effect on discharges to surface waters from the Project.

This condition is necessary to ensure that the discharges from the Project, with any proposed modifications, would comply with the Surface Water Quality Standards. This certification is based on the Project's proposed operation as described in the Application and the Applicant's request for certification for the Project, as modified by conditions of this certification. Additional, proposed modifications to the Project may require amendment of the associated FERC license, a new or additional WQC, or compliance with New Hampshire's antidegradation requirements of the Surface Water Quality Standards before the modifications are implemented. Therefore, the Applicant must notify NHDES of proposed modifications to the Project so that NHDES can determine the applicability of certain laws and rules implemented by NHDES.

Citations that authorize this condition: CWA §401; 40 CFR § 121.10; RSA 485-A:12, III; and Env-Wq 1708.

which the impoundment was lowered for DWM habitat winter protection.

For the purpose of this condition, "consistent temperatures" shall be calculated using the mean average temperature of the previous seven days

E-6d. **Impoundment Drawdown Procedure for Scheduled Maintenance or Repairs:** If impoundment drawdown is necessary to complete scheduled maintenance or repairs, the Applicant shall lower the impoundment water level no more than six inches per 24-hour period. If scheduled maintenance or repairs do not require impoundment drawdown, this drawdown rate does not apply.

E-6e. **Impoundment Refill Procedure:** When refilling the impoundment of the Project after drawdown for maintenance or emergencies, the Applicant shall maintain downstream reach flows specified in Condition E-6b, release 70 percent of the inflow to the Project downstream to the River, and utilize the remaining 30 percent of inflow to refill the impoundment. (This 70 percent/30 percent of inflow ratio, is the same refill rate as proposed for the Flexible Operations, in E-7d(iii)3., below.)

E-6f. **Flexible Operations:** At the discretion of the Applicant, Project operations may deviate from IEO operations to a mode using storage to generate power, known as Flexible Operations, as described in **Attachment 1**. There are no limitations on the number of Flexible Operations events per day or the duration of the event, other than those indirect limitations due to inflow, minimum discharges as described in E-6b, and the Transition Operations described in E-6f(iv).

E-6f(i). Flexible Operating Impoundment Range: During Flexible Operations, the WSE of the impoundment shall be maintained as described, for each time period specified below.

E-6f(i)1. October 1 to May 31: Between 289.6 and 291.1 feet (a 1.5-foot range)

E-6f(i)2. June 1 to Sept 30: Between 290.1 and 291.1 feet (a 1.0-foot range)

E-6f(ii). Maximum number of hours of Flexible Operations per month: Flexible Operations shall not exceed the maximum allowable hours for each time period specified below.

E-6f(ii)1. December - March: 65 hours per month

E-6f(ii)2. April - June: 10 Hours per month

E-6f(ii)3. July: 20 hours (with no more than 10 hours from July 1 through July 15)

E-6f(ii)4. August - October: 20 hours per month

E-6f(ii)5. November: 42 hours (with no more than 10 hours from November 1 through November 15)

E-6f(iii). Maximum discharge during Flexible Operations: The maximum discharge during Flexible Operations shall be based on the calculated inflow at the

hour in which the Flexible Operations begin.

E-6f(iii)1. When the calculated flow is 1,800 cfs or less, the maximum discharge is 4,500 cfs.

E-6f(iii)2. When the calculated inflow is greater than 1,800 cfs, the maximum discharge shall be no greater than 2.5 times the calculated inflow at the hour which the Flexible Operations begin.

E-6f(iv). Transition Operations: Transition operations shall be required to transition to or from an IEO to a Flexible Operation event.

E-6f(iv)1. Up-Ramping: The Applicant shall increase downstream flow at a specified rate for the one-hour period that precedes scheduled Flexible Operations. The Up-ramp rate at the Project shall be the lesser of 1 cfs/square mile of drainage area (approximately 5,414 cfs) or the flow half-way between current IEO flow and the Flexible Operation flow.

E-6f(iv)2. Down-Ramping: The Applicant shall decrease downstream flow at a specified rate for the period following scheduled Flexible Operations, unscheduled Flexible Operations, Claimed Capacity Audits (CCA) and Reactive Power Demonstrations (RPD), until the flow is equal to inflow at the dam. Decreases in flow will occur on an hourly basis, as a percentage of the previous hour's flow. The first hour after the Flexible Operation hour shall be no greater than approximately 70 percent of the Flexible Operation flow and each successive hour shall be approximately 70 percent of the previous hour.

E-6f(iv)3. Refill: The impoundment shall be restored to the target WSE within a maximum 48-hour period subsequent to the post-Flexible Operation Down-Ramping when the impoundment WSE is restored to the stable Target WSE by passing 70 percent of the inflow at the dam and retaining the remaining fraction (30 percent) as impounded water above the dam. The hourly flow rate below the dam during refill will be the greater of approximately 70 percent of inflow or the Downstream Minimum Flows required by Condition E-6b.

The 48-hour refill period begins immediately following Down-Ramping after a Flexible Operations event and ends no more than 48-hours later unless the reservoir is within 0.1 ft of the Target WSE. The 48-hour period includes any temporary interruptions during the refill period.

Conditions E-6a through E-6f are necessary to ensure that the discharges from the proposed Project will comply with the Surface Water Quality Standards because minimum flows downstream of the Project

and the Applicant, and incorporated in the USFWS's Comments, Recommendations, Terms and Conditions, and Prescriptions, which was filed with FERC on May 16, 2024,[17] including but not limited to the fish passage operational periods described in Condition E-9a. If USFWS modifies their recommendations or Prescriptions for Fishways after this certification is granted, the Applicant shall provide NHDES and NHFGD with a copy of the modified recommendations or prescription within 30 days of the modification.

E-9a. Fish Passage Operational Periods: Upon license issuance, upstream fish passage shall be operated from April 1 to July 15 and downstream fish passage shall be operated from August 1 to December 1. Upon completion and implementation of enhancements as set forth in the "Settlement Agreement on Fish Passage,"[18] executed on behalf of New Hampshire by the NHFGD, the USFWS and the Applicant, and incorporated in the USFWS's recommendations and prescriptions, American eel passage shall be provided from May 1 to November 15.

This condition is necessary to ensure that the discharges from the proposed Project will comply with the Surface Water Quality Standards because the implementation of the recommendations would help protect, mitigate, and enhance fish and wildlife resources that are impacted by the Project and provide for adequate fish passage.

Citations that authorize this condition: CWA §401; RSA 485-A:8; RSA 485-A:12, III; Env-Wq 1703.01; Env-Wq 1703.19; and Env-Wq 1708.03(a).

E-10. **Invasive Plant Species Management Plan (IPSMP):** The Applicant shall prepare an IPSMP in consultation with NHDES, USFWS, NHFGD, VANR, and VDF&W, and filed with FERC, and submit it to said agencies within 180 days of license issuance or other time period mutually agreeable to the Applicant and NHDES. The final IPSMP shall be submitted for NHDES approval, prior to implementation.

The IPSMP shall include the below items, at a minimum:

E-10a. Monitoring Measures for Invasive Aquatic Plants, including: an updated baseline invasive aquatic plant survey (area to be determined during consultation with above resource agencies); early detection and rapid response protocol (EDRR); and cyclical monitoring of existing invasive aquatic plants;

E-10b. Control measures for existing invasive infestations; and

E-10c. Activities to prevent the spread of invasive plants, including activities associated with daily operations (including during flexible operations) and routine maintenance; and future construction (pre-construction, during construction and post-construction) or major maintenance.

This condition is necessary to ensure that the discharges from the proposed Project will comply with the Surface Water Quality Standards because if not properly monitored and managed, invasive species can result in detrimental differences in community structure that are not naturally occurring (which is a

[17] FERC Accession Number 20240516-5130
[18] Refer to Footnote 16

ATTACHMENT 1

"Evidence of Support for Proposed Alternative Operation - Memorandum of Understanding [MOU] Wilder, Bellows Falls and Vernon Hydroelectric Projects FERC Relicensing"
(dated December 1, 2020); and

"Great River Hydro's Proposed Alternative Operation for the Projects"

MEMORANDUM OF UNDERSTANDING
WILDER, BELLOWS FALLS AND VERNON
HYDROELECTRIC PROJECTS FERC RELICENSING

The parties to this Memorandum of Understanding, dated as of December 1, 2020, are **Great River Hydro, LLC** ("Great River Hydro"), together with the following: **the United States Fish and Wildlife Service**, **the New Hampshire Department of Environmental Services**, **the New Hampshire Fish and Game Department**, **the Vermont Department of Environmental Conservation**, **the Vermont Department of Fish and Wildlife** (collectively, the "Resource Agencies"), **The Nature Conservancy**, and **the Connecticut River Conservancy** (such two parties, together with the Resource Agencies, the "Stakeholders").

Recitals

Great River Hydro is the owner and licensee of the Wilder Hydroelectric project (FERC No. 1892) ("Wilder Project"), the Bellows Falls Hydroelectric Project (FERC No. 1855) ("Bellows Falls Project"), and the Vernon Hydroelectric Project (FERC No. 1904) ("Vernon Project"), collectively, the "Projects".

The licenses for each of the Projects expire on April 30, 2021. If issuance of a new license (or other disposition) does not take place on or before April 30, 2021, pursuant to 18 C.F.R. 16.18(c), annual licenses under section 15(a)(1) of the FPA are renewed automatically. In accordance with the Federal Energy Regulatory Commission's ("FERC") Integrated Licensing Process regulations set forth in 18 C.F.R. Part 5, Great River Hydro submitted applications for new licenses for each of the Projects on May 1, 2017.

Great River Hydro and the Stakeholders have been engaged in discussions focused on reaching agreement on proposed operations of the Projects under new FERC licenses. The parties to this memorandum concur with the Proposed Alternative Operation for the Projects, attached as **Exhibit A**.

Understanding Between the Parties

The parties hereby recite as follows:

A. FERC License Application and WQC Proceedings. The Proposed Alternative Operation will be presented in the amended license applications as Great River Hydro's proposed operation of each Project (the "FERC License Application") and, pending any new information that would suggest otherwise, as its proposed operation of each Project in Great River Hydro's applications for water quality certifications from the New Hampshire Department of Environmental Services and the Vermont Department of Environmental Conservation in accordance with Section 401 (a)(1) of the Clean Water Act (the "WQC Proceedings").

B. Stakeholder Representations. Subject to the Resource Agency Reservations below, the Stakeholders represent the following:

The Stakeholders support the Proposed Alternative Operation as representing an agreed upon operation of the Projects, addressing many flow, impoundment and operational related resource concerns that are a result of, or are perceived to be a result of, operations of the Projects.

The Proposed Alternative Operation will be acceptable and supported by the Stakeholders in the FERC License Application process and, pending any new information that would suggest otherwise, included in the draft WQC issued for public comment. No further data or information related to the Proposed Alternative Operation is anticipated to be required to support the inclusion of the Proposed Alternative Operation in the draft WQC. However, if additional data or information is necessary to support the inclusion of the Proposed Alternative Operation in the draft WQC, the Stakeholders will confer with Great River Hydro.

The Stakeholders represent they will not propose additional or alternative operation proposals or license conditions that are inconsistent with the Proposed Alternative Operation, or would require a modification to the Proposed Alternative Operation.

Nothing in this Memorandum shall preclude the state and federal resource agencies from complying with their obligations under the National Environmental Policy Act, the Clean Water Act, the Endangered Species Act, the Federal Power Act, the Fish and Wildlife Coordination Act or any other applicable state or federal laws or regulations. However, by entering into this Memorandum the Resource Agencies represent, based on the information available to them as of the date of this Memorandum and subject to the Resource Agency Reservations below, that they believe their statutory obligations are, or can be, met consistent with the Proposed Alternative Operation.

Nothing in this Memorandum shall be interpreted to limit the right of The Nature Conservancy and the Connecticut River Conservancy from providing information or giving testimony in any regulatory, administrative or judicial proceeding, or to fully pursue any issue that, in its opinion, is not adequately addressed by Exhibit A.

C. Resource Agency Reservations. Nothing in this Memorandum shall preclude the state resource agencies responsible for issuing water quality certifications:

- from modifying the format or language of Exhibit A to better match typical water quality certification format or language provided it is consistent with the Proposed Alternative Operation;
- from including, if necessary, conditions in the WQCs related to potential resource issues not specifically addressed by the Proposed Alternative Operation, including, but not limited to, fish passage, whitewater rafting, recreation and monitoring;

- from including other conditions in the water quality certification provided they are not inconsistent with the Proposed Alternative Operation;
- from making revisions to the Proposed Alternative Operation in the draft Water Quality Certification prior to issuance for public comment based on any new information that would suggest revisions are necessary to support the inclusion of the Proposed Alternative Operation (as revised), in the draft WQC; and
- from issuing a final Water Quality Certification with revisions to the Proposed Alternative Operation based on comments received on the draft Water Quality Certification.

Prior to issuing the final Water Quality Certification, the States shall confer with Great River Hydro and the other Stakeholders in an effort to reach agreement on any substantive amendments to the draft Water Quality Certification made as a result of public comment or new information.

Nothing in this Memorandum shall be interpreted to preclude or otherwise limit EPA from complying with its obligations under the Clean Water Act, Clean Air Act, and National Environmental Policy Act, or other federal statutes. Nothing herein shall preclude EPA or the States of New Hampshire and Vermont from fully and objectively considering all public comments received in any regulatory process related to the Project, from conducting an independent review of the Projects under applicable statutes, or from providing comments to FERC.

Nothing in this Memorandum shall be interpreted to preclude or otherwise limit the U.S. Fish and Wildlife Service from completing consultation with FERC under Section 7 of the Endangered Species act, or as predetermining the outcome of such consultation.

D. Great River Hydro Representations. Great River Hydro supports the Proposed Alternative Operation as representing a reasonable balance between power and non-power resources by significantly increasing a broad range of resource protection while maintaining the Projects' capabilities to be flexible and responsive to current wholesale energy, forward capacity, reserve and other ancillary services markets managed by the New England Independent System Operator (ISO-NE). Under the Proposed Alternative Operation, the Projects can remain responsive to ISO-NE system emergencies and critical events, other emergencies involving dam and public safety and ensures their ability to address future regional energy demands and system needs as those evolve over time.

E. Confidentiality. Other than information regarding how Great River Hydro currently participates and intends to participate in ISO-NE wholesale energy, capacity, reserve and ancillary markets, any data or technical supporting information shared as a part of the Mitigation Discussions that supports the conclusion of this Memorandum that the Proposed Alternative Operation meets the regulatory obligations of a Resource Agency shall be

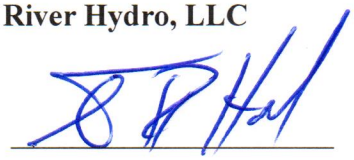
considered public and may be used by the Stakeholders to support its decision, provided that the terms of the Confidentiality Agreement for Mitigation Discussions shall continue to govern the use of proposals, counterproposals, meeting notes and informal discussions.

F. Representations and Warranties. The Parties represent and warrant to each other that: (1) this Memorandum has been duly authorized, signed and delivered by each party; (2) this Memorandum shall not, in any manner, limit any regulatory function of a Resource Agency; (3) this Memorandum shall not grant any person the right to initiate a suit to enforce its terms against a Resource Agency; (4) this Memorandum shall not be construed as a waiver of sovereign immunity or any other defense any Resource Agency may raise to any claim in a suit related to the subject matter of this agreement; and (5) this Memorandum shall not be construed to limit the right of The Nature Conservancy and the Connecticut River Conservancy to provide information or give testimony in any regulatory, administrative or judicial proceeding, or to fully pursue any issue that, in its opinion, is not adequately addressed by Exhibit A.

G. Counterpart Signatures and PDF Signatures. This Memorandum may be executed by the parties in separate counterparts, each of which when so executed and delivered shall be an original, but all such counterparts shall together constitute one and the same instrument. Signatures to this Memorandum transmitted by fax, by electronic mail in "portable document format" (.pdf), or by any other electronic means intended to preserve the original graphic and pictorial appearance of the Memorandum, shall have the same effect as physical delivery of the paper document bearing the original signature. The parties agree that any such reproduction shall, to the extent permitted by law, be as admissible in evidence as the original itself in any judicial or administrative proceeding (whether or not the original is in existence and whether or not the reproduction was made in the regular course of business) and that any enlargement, facsimile or further reproduction shall likewise be admissible in evidence.

[*signatures on following page*]

Great River Hydro, LLC

By: 

Name: Scott D. Hall

Title: President and CEO

United States Fish and Wildlife Service

By: _____

Name: _____

Title: _____

New Hampshire Department of Environmental Services

By: _____

Name: _____

Title: _____

New Hampshire Fish and Game Department

By: _____

Name: _____

Title: _____

Vermont Department of Environmental Conservation

By: _____

Name: _____

Title: _____

Vermont Department of Fish and Wildlife

By: _____

Name: _____

Title: _____

The Nature Conservancy

By: _____

Name: _____

Title: _____

Connecticut River Conservancy

By: _____

Name: _____

Title: _____

Great River Hydro, LLC

By: _____

Name: _____

Title: _____

United States Fish and Wildlife Service

By: _____

Name: _____

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New Hampshire Department of Environmental Services

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New Hampshire Fish and Game Department

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Title: _____

Vermont Department of Environmental Conservation

By: _____

Name: _____

Title: _____

Vermont Department of Fish and Wildlife

By: _____

Name: _____

Title: _____

The Nature Conservancy

By: _____

Name: _____

Title: _____

Connecticut River Conservancy

By: _____

Name: ___Andrew Fisk_____

Title: ____Executive Directo___

EXHIBIT A

Proposed Alternative Operation

Exhibit A

Great River Hydro's Proposed Alternative Operation for the Projects

INTRODUCTION

Great River Hydro, LLC (Great River Hydro or GRH) proposes to operate each of the Wilder, Bellows Falls and Vernon Projects (Projects or Facilities) in a similar manner under the terms of a new License, as the preferred (or proposed) alternative over the No-Action Alternative. The proposed alternative (also referred to herein as the Proposal) focuses on

- creating more stable impoundment water surface elevations,
- reducing the magnitude and frequency of sub-daily changes in discharge from the stations,
- increasing the amount of time that the project is operated as inflow equals outflow (IEO) and at full impoundment,
- reducing the magnitude and rate of change in flows downstream of the dams, and
- reducing the average frequency, average duration and average range of impoundment fluctuation under conditions when inflow to the Project at the dam is within the range of the Project powerhouse hydraulic capacity.

At the same time, the proposed alternative maintains Great River Hydro's capability to be flexible and responsive to current wholesale energy, forward capacity, reserve and other ancillary services markets managed by the New England Independent System Operator (ISO-NE). Great River Hydro also proposes to remain responsive to ISO-NE system emergencies and critical events and other emergencies involving dam and public safety. The proposal ensures the Project's ability to address future regional energy demands and system needs as those evolve over time. Additional non-operational elements of the proposal are also specified.

This Proposal is largely based on model simulations (simulations) provided by GRH that compared historic to proposed operation at each Project for the months of February, June, August and November in 2009, 2015, 2016 and 2017. GRH believes the simulations present an overly opportunistic representation with respect to the utilization of flow and managing to operational limits, which may result in overstatement of the actual impact of proposed Flexible Operations on the natural resources. This is because the simulations were created with perfect foresight with regards to pricing and inflow. Such perfect foresight will not be available during implementation of the proposal which will likely result in the Projects being operated more conservatively than indicated in the simulations in order to ensure compliance with the operational requirements specified herein.

The term agencies, resource agencies, or relevant resource agencies, used herein includes, but may not be limited to, the United States Fish and Wildlife Service, the New Hampshire Department of Environmental Services, the New Hampshire Fish and Game Department, the Vermont Department of Environmental Conservation, and the Vermont Department of Fish and Wildlife.

DEFINITIONS

1. **Cobblestone Tiger Beetle (CTB) Management Goal**: Maintain multiple consecutive-day periods (≥3) in which Flexible Operations (item 6) do not exceed flow thresholds that maintain ≥75% uninundated habitat at most sites for each month during the CTB active period (June through September), excluding periods when inflows are above these thresholds.

   Rationale: Existing Project operations impact the State listed Cobblestone Tiger Beetle (CTB). The thresholds stated in the goal are intended to increase the duration and area of available CTB habitat to facilitate CTB reproduction and survival from June 1 through September 30. This time period is considered the primary active period for CTB adults and larvae. Lack of persistent habitat can reduce the available time for feeding and/or prey availability. Limited habitat availability resulting from prolonged or repeated inundation also can cause delays in pupae and larvae development, decrease survival of larvae and affect the mating behavior of adults. Based on analysis of IEO/ Flexible Operation simulations provided by GRH, the expectation is that the limited number of Flexible Operation hours allowed during the active season for these species will meet this species-specific goal.

2. **Dwarf Wedgemussel (DWM) Management Goal**: Increase habitat stability by stabilizing/reducing impoundment fluctuations and providing multiple consecutive-day periods (≥3) at IEO each month during the period April 1 through October 15.

   Rationale: Existing operations impact the State and Federally listed Dwarf Wedgemussel. The identified goal is intended to facilitate DWM growth, breeding, and juvenile settlement in the riverine section below the Wilder Project and in the Wilder and Bellows Falls impoundments. Time spent moving in response to relatively rapid changes in water level that could occur due to Flexible Operation is time not spent feeding, which can lead to increased energy expenditure and predation risk, resulting in reduced growth and/or increased susceptibility to mortality. Periods of IEO are also intended to facilitate successful breeding (male gamete release/fertilization in females), believed to occur in the months of August and September, by maximizing the chance male gametes will reach females and not be mobilized to points downstream. Similarly, extended periods of IEO will increase the potential for metamorphosed glochidia released from host fish to successfully settle on a DWM bed versus being mobilized and settling off-bed. Based on analysis of Flexible Operation simulations provided by GRH, the expectation is that the limited number of Flexible Operation hours allowed during the active season for these species will meet this species-specific goal.

3. **Dwarf Wedgemussel Pre-Winter Habitat Operation**: Dwarf Wedgemussel pre-winter habitat protection operation is intended to create overwintering habitat that is protected from potential water drawdown that could expose mussel beds to freezing air temperatures. Mussels reduce their mobility and settle into the substrate for the winter as water temperatures drop below 15° Celsius (° C). By lowering the water surface elevation (WSE), the habitat they occupy will remain submerged over the winter, protecting largely immobile mussels from exposure and freezing air temperatures. To accomplish this, GRH will lower the WSE at the Wilder and Bellows Falls dams to an elevation at or above the low limit of each of the respective Flexible Operating Impoundment Ranges (specified below in item 9) and maintain that WSE for the limited period of time during which water temperatures consistently drop from 15° C to 10° C.

This period is typically 10-21 days in length, occurring in the late-October to early-November timeframe. Once water temperatures are consistently below 10° C within identified DWM habitats within the Wilder and Bellows Falls Project impoundments, the WSE can be adjusted upward to the Target WSE (item 17) and utilize the elevation range above the low limit described above for Flexible Operations. The WSE at each the Wilder and Bellows Falls dams will remain at or above this DWM habitat winter protection WSE throughout the subsequent period when water temperatures are at or below 10° C and no earlier than March 1 unless inflow exceeds respective station capacity and inflow levels require flood profile operation WSE at the dams (item 11).

4. **Emergency and System Operation Requirements** are when a Project must respond to:

   a. Emergencies outside the control of GRH when dam safety, public safety or flood control require action or response.

   b. Emergency System Operations, Conditions and Emergencies when the ISO-NE requires GRH to be fully available and if necessary responsive. Examples include ISO-NE Reserve Deficiencies (a.k.a. Reserve Constraint Penalty Factors) when reserves are depleted on the power grid, for fuel security emergencies or scarcity events, for ISO-NE system (or system) stability (e.g., VAR support), and system over supply (negative prices). GRH is not informed as to how the Projects are called upon or held in reserve to respond to specific system conditions or emergencies. However, based on ISO-NE Reserve Constraint Penalty Factors (RCPF) reports, which indicate when the region's power grid is short of operating reserves, there were 109 activations between 2011 and July 2013 within the entire ISO-NE System that may or may not have required actions at the Wilder, Bellows Falls or Vernon Projects. A summary of information gleaned from these reports for the period 2014 through 2018 is provided in the table below which shows that, in general, these events occurred relatively infrequently and are often short in duration. This information only provides a sense of the limited scale, frequency and number of these events; it does not mean any action actually took place with regard to the GRH projects. GRH facilities are often held in reserve even in a portion of the events referred to below. With regards to ISO-NE declared "Minimum Generation Emergencies" or "MIN GEN Emergencies" which may initiate and produce negative pricing, GRH consulted ISO-NE staff who stated that, to the best of their knowledge, the last MIN GEN Emergency occurred in March 2016.

YEAR	# of System Events	System Event Duration Range	# of Local * Events	Local Event Duration Range
2014	20	5-110 minutes	Cannot determine	
2015	3	10-65 minutes	6	5-20 minutes
2016	3	5-115 minutes	1	5 minutes
2017	2	15-20 minutes	8	5-305 (5-19-17) minutes
2018	2	10-160	0 listed	

*Local event but precisely where is not identified in the RCPF report

5. **ISO-NE required audits, demonstrations and tests** are requirements necessary for participation in and to qualify resources for systems support and markets. Present audits include Claimed Capacity Audits and Reactive Power Demonstrations (see below).

a. Claim Capacity Audit (CCA) is an ISO-NE audit currently required at the Wilder Project and may be (unanticipated presently) required in the future at the Bellows Falls and Vernon Projects. A CCA demonstrates maximum capacity for the Project through a two-hour generation run and is used by the ISO-NE for calculating capacity related market participation. Wilder Project requires a CAA to be performed annually to address summer capacity capability and every three years to demonstrate winter capacity capability. CCAs are performed under conditions specified by the ISO-NE and are performed under the best conditions related to head and inflow in order to maximize the generation within the two-hour audit as specified in the table below. While the ISO-NE does not require CCAs at Vernon and Bellows Falls, Great River Hydro may need to perform a similar test on occasion in order to demonstrate claimed capacity to the ISO-NE should a disparity arise between ISO-NE and GRH capacity numbers.

Project	Maximum Impoundment Elevation at start of CCA (NGVD29)	Maximum Impoundment Drawdown during 2-hour CCA and prior to Refill (feet)	Impoundment Refill
Wilder	385.00	0.60	See item 19.c
Bellows Falls	291.63		
Vernon	220.13		

b. Reactive Capacity Demonstration (RCD) is a 2-step ISO-NE audit currently required at the Wilder, Bellows Falls and Vernon Projects every five years, to verify capability to provide voltage reactive power or VAR to the regional power grid. Hydro generators are excellent sources of VAR support to the power grid, through which voltage can be increased or decreased depending upon the need to boost or reduce voltage of the grid. This audit requires GRH to demonstrate capability in both a minimum [station] generation and a maximum generation condition. Minimum station generation would typically be less than the required minimum base flow specified in item 16. Maximum station generation (item 15) would typically be higher than the calculated inflow. A 5-business day advance notice must be given to the ISO-NE, which determines if system conditions are suitable for a test before authorizing GRH to conduct the audit on a specified date/time. The duration of each portion (minimum generation and maximum generation condition) of the audit generally last an hour if things perform as planned; otherwise the audit could require an additional hour(s). The minimum generation audit will pass inflow either through generation, spill or a combination of both. The maximum generation audit will require a maximum pond elevation (Top of Boards) as specified in item 10 (Full Operating Impoundment Range) below.

c. Other future requisites are requirements specified by the ISO-NE, which are unknown and unanticipated at this time, to demonstrate and meet performance capability requirements, in accordance with ISO-NE market rules that may be changed from time to time. Great River Hydro will notify and consult with the relevant resource agencies a minimum of 60 days in advance of ISO-NE's implementation if GRH determines there is a significant modification to ISO-NE CCAs or RCDs as described above, or present additional requisites or requirements which require GRH to deviate from present demonstration capabilities and which cannot be reasonably accomplished through IEO/Flexible Operation as proposed and implemented under a new License.

6. **Flexible Operation** is when the Projects are operated at the Licensee's discretion and deviate from operation at IEO and stable pond (item 13) in accordance with this Proposal.

7. **Flexible Operation Hours** are the hours of Flexible Operation (item 6) that will count towards the maximum number of hours of Flexible Operation allowed each month as specified in item 23. Determination of the number of Flexible Operation hours that have been used each month for comparison to the maximum number of Flexible Operation hours allowed, will be as follows:

a. The minimum duration of a Flexible Operation event is one hour. Should an event be less than an hour for any reason, the event will be counted as one hour. ISO-NE is responsible for the dispatch of a unit or station and as such GRH is not able to precisely determine or dictate when a unit starts or stops. ISO-NE typically dispatches units at or near the top of the hour (e.g., 1:00, 2:00, etc.) under non-emergency situations. Should an event last more than 15 minutes past the top of the hour that event will be considered to have lasted and counted as if it were for that entire hour (e.g., if an event ends and Down-ramping Transition Operation is initiated within 15 minutes past the top of the hour, it will not be considered an additional hour; if after 15 minutes past the top of the hour, it will count as an additional Flexible Operation hour.) Examples are provided below.

When Up-ramping is implemented in accordance with item 19.a, hours for Flexible Operation begin the hour immediately following the Up-ramp hour. If Up-ramping is not implemented in accordance with item 19.a, due to Real-Time pricing, hours for Flexible Operation begin as soon as Flexible Operation begins as specified above. In all cases, the time that Flexible Operation ends for the purpose of determining the number of allowed hours which have been used each month (item 23) is when Down-ramping begins.

Examples (assuming no Up-ramping)

Approximate Time Flexible Operation Event Begins*	Time Flexible Operation Event Ends and Down-ramping Begins	Number of Flexible Operation Hours
2:00 pm	2:57 pm	1
2:00 pm	3:15pm	1
2:00 pm	3:16 pm	2

* ISO-NE dispatches units near the top of the hour.

b. Should GRH need to conduct more than two CCA tests per year at a single Project (due to problems, changing conditions, or failure to reach expected levels), GRH will alert the relevant resource agencies that 1) it must conduct additional tests, 2) that each additional test will require maximum impoundment elevation (see table under item 5.a) and no ramping, and 3) that the number of Flexible Operation hours for each additional test will be determined in accordance with 7.a above and counted either in the current or in the next month's allocation (item 23) if none were available in the current month.

8. **Flexible Operation Maximum Discharge** (item 27) is the maximum discharge from the Project powerhouse during Flexible Operation and is a function of inflow (item 12) and the maximum station generating capacity (item 15).

9. **Flexible Operating Impoundment Range** is bounded by the following Water Surface Elevation (WSE) limits except during the Dwarf Wedgemussel (DWM) pre-winter habitat protection operation (item 3). These limits are no greater than the current typical range of operation under normal operating condition for Bellows Falls and Vernon, one foot less than current operation for Wilder [which is 382.0 to 384.5 ft (msl NGVD 29)], 0.5 feet less at Bellows Falls during the active DWM period, and will be no greater than 1.5 feet at any of the Projects.

Project	WSE Range (msl NGVD 29)	Maximum Fluctuation During Any Flexible Operation Event (feet)
Wilder	383.0 and 384.5	1.5
Bellows Falls	Oct 1 – May 31: 289.6 and 291.1 June 1-Sept 30: 290.1 and 291.1	Oct 1 – May 31: 1.5 June 1-Sept 30: 1.0
Vernon	218.3 and 219.63	1.33

It is anticipated that the typical impoundment operating range as a function of Flexible Operation will be on average less than the Proposed Flexible Operating Impoundment WSE Range measured at each dam and as specified in the table above. GRH may, at some future date and at its discretion, after gaining more operating experience with the proposed operation, request to meet with relevant resource agencies to discuss the potential for reducing the Target WSE Bandwidth (Item 18) and/or modifying the Flexible Operating Impoundment Range, by raising both the upper and lower limits of the range, but not increasing the difference between the upper and lower limits (i.e., the maximum fluctuation shown in the table above).

10. **Full Operating Impoundment Range** is the historic full operating range for each Project that generally corresponds with the maximum height (top) of the flashboards or gates down to the low limit. This range is utilized for managing high flows and not for power generation. Water surface elevations (WSE) must be lower if extreme high water or dam safety emergencies require stanchion flashboards and beams to be removed from the concrete dam crest. In order to rebuild the stanchion flashboards, the impoundment WSE must be lowered to the crest before rebuilding the structures can be accomplished.

Wilder Project: Top of Boards 385.0 ft; Low limit to manage flood flows 380.0 ft; Concrete Stanchion Flashboard Crest 368.0 ft (msl NGVD 29).

Bellows Falls Project: Top of Boards 291.63 ft; Low limit to manage flood flows 288.63 ft; Concrete Stanchion Flashboard Crest 278.63.0 ft (msl NGVD 29).

Vernon Project: Top of Boards 220.13 ft; Low range to manage flood flows between 218.6 - 212.13 ft; Concrete Stanchion Flashboard Crest 212.13 ft (msl NGVD 29).

11. **High Water Operation** is when inflow at the dam exceeds the maximum station generating capacity (item 15). In most cases this requires each project to follow its Flood Profile Operating procedures, that require specific elevations be maintained at the dam for specific ranges of flow. These elevations fall within the Full Operating Impoundment Range of each Project (item 10).

12. **Inflow** to each Project is estimated based on anticipated inflow arriving at the dam from upstream. In real-time it is calculated and monitored through actual change in WSE measured at the dam on an hourly basis and adjusted through actual discharge from the Project.

13. **Inflow Equals Outflow (IEO) Operation** is defined as follows:

    a. When the Project maintains discharge through the powerhouse equal to inflow at the dam by maintaining a stable target WSE together with any required non-generation flow (e.g., Bellows Falls bypass flow, fish passage related flow) or,

    b. When inflow exceeds the maximum station generating capacity (item 15) and all inflow is passed via a combination of spillage and discharge through the powerhouse or if the station were out of service, via spillage alone.

14. **Maintenance Requirements** are either scheduled periodic maintenance or unscheduled maintenance due to an unanticipated situation or condition. Maintenance requirements can, in some cases, be pre-planned and executed accordingly or unplanned and require various elements such as investigation and problem identification, engineering, planning and execution.

15. **Maximum Station Generating Capacity** (in cfs) is the maximum flow that can be passed through the powerhouse for each Project as shown in the last column of the table below:

Project	Number and Type of Turbines	Maximum Flow / Turbine (cfs)	Minimum Flow / Turbine (cfs)	Maximum Nameplate Rated Capacity * (cfs)	Maximum Station Generating Capacity** (cfs)
Wilder	2- Kaplan 1-Vertical Francis	6000 700	400 400	12,700	11,700
Bellows Falls	3- Vertical Francis	3670	700	11,010	11,400

Project	Number and Type of Turbines	Maximum Flow / Turbine (cfs)	Minimum Flow / Turbine (cfs)	Maximum Nameplate Rated Capacity * (cfs)	Maximum Station Generating Capacity** (cfs)
Vernon	4- Vertical Francis	1465	400	17,130	15,400
	4-Vertical Kaplan	1800	300		
	2-Vertical Francis	2035	500		

* The maximum nameplate hydraulic capacity is based on design specifications of the turbine (or nameplate rating) and is the sum of the hydraulic capacities of all units in the powerhouse. It is not a realistic representation of what the Station can actually pass through the turbines at the same time, which is largely determined by net head.

** The maximum station generating capacity represents the maximum Station discharge based on operating data and represents the maximum discharge that can actually be passed through the turbines.

16. **Minimum Base Flows** are minimum flows required to be maintained below each dam at all times. As described below, flows are expected to be equal to inflow and significantly higher than these base flows the vast majority of time. The proposed Minimum Base Flows are all greater than the minimum base flows required in the current FERC licenses and include a seasonal component.

During the following periods the requirement will be to provide, at a minimum, the approximate inflow as measured at the dam.

- While operating in the Inflow Equals Outflow (IEO) mode (item 13) – discharging inflow will require maintaining Target WSE within the bandwidths specified (item 18) and hourly (minimum required frequency) adjustments necessary to maintain proximity to Target WSE.
- While operating in Flexible Operation and Up-ramping and Down-ramping Transition Operation (item 19), flows will be maintained above or equal to inflow. Instantaneous inflow measurements will be calculated in accordance with item 12.
- The economic minimum dispatch flow (Eco-Min) specified to the ISO-NE will be the estimated hourly inflow. When prices go negative, station discharge will be set to the specified Eco-Min (i.e., the estimated inflow). When a System Minimum Generation Emergency is declared by the ISO-NE, a combined spill plus station discharge will equal the Eco-Min. Both of these situations will resemble IEO and any discrepancy between estimated Eco-Min and real-time inflow would be captured within the Target Elevation Bandwidth and adjusted once either the negative pricing situation or the System Minimum Generation Emergency has ended.

While operating in Transition Refill Operation (item 19.c) discharge will be approximately 70% of estimated inflow and adjusted as necessary through hourly real-time monitoring and calculation of estimated inflow. Discharge during refill will not fall below the seasonal Minimum Base Flow thresholds shown below.

For the purpose of establishing a base flow below the dams for IEO/Flexible Operational Planning purposes and deciding whether or not to implement Flexible Operation by utilizing allocated hours (item 23) in the Day-Ahead (DA) market or in responding to Real-Time (RT) price signals in the RT market, all flows associated with Transition Operation Up-ramping; Flexible Operation; Transition Operation Down-ramping and; Transition Operation Refill will be maintained above the following Project and seasonal Minimum Base Flow thresholds. The only time Project flows prior to or following these periods may be less than these thresholds is when the inflow calculated in accordance with item 12 is less. It is anticipated that flows will be higher than the base flows the vast majority of the time.

Wilder	**Bellows Falls***	**Vernon**
Oct 1 - March 31: 1,500 cfs April 1 - May 31: 2,000 cfs June 1 - Sept 30: 1,100 cfs	Oct 1 - March 31: 1,600 cfs April1 - May 31: 3,000 cfs June 1 - Sept 30: 1,400 cfs Bypass Reach below dam: 300 cfs year round	Oct 1 - March 31: 1,600 cfs April 1 - May 31: 3,000 cfs June 1 - Sept 30: 1,400 cfs

***** Minimum Base Flow is the combined flow below dam and station.

Emergencies, facility outages, station trips that result in unanticipated reductions in station discharge will be considered unavoidable flow reductions, and GRH will restore flows below the Project to at least the estimated inflow as quickly as possible. When spill, other than the continuous 300 cfs in the Bellows Falls bypassed reach, is required during non-business hours to respond to emergencies or System minimum generation emergencies noted above, to maintain IEO, transition flows or the base flows as described, GRH will require personnel to come to the affected station(s) and check for public safety risks below the gates and confirm none exist before opening a spill gate. As soon as that is accomplished a gate(s) will be opened to provide the proper flows. This entire process typically takes one hour or less.

17. **Target Water Surface Elevation (WSE)** is a specified elevation (item 21) at each Project dam to be maintained under IEO Operation by adjusting station discharge. The Target WSE would be monitored no less frequently than hourly, and station discharge would be adjusted as frequently as reasonably possible to ensure accurate WSE. Station discharge is calculated and adjusted based on unit discharge curves and formulas within the accuracy of the unit's control systems.

18. **Target WSE Bandwidth** is a range, 0.5 ft above and 0.5 ft below the Target WSE, available for use during IEO Operation, in order to absorb unanticipated changes in inflow at the dam or slight deviations or imbalances between hourly inflow and hourly discharge due to miscalculation of inflow or unit discharge. See item 21 for elevations associated with the bandwidth. GRH may, at some future date and at its discretion, after gaining more operating experience with the proposed operation, request to meet with relevant resource agencies to discuss the potential for reducing the Target WSE Bandwidth and/or modifying the Flexible Operating Impoundment Range (item 9) by raising both the upper and lower limits of the range, but not increasing the difference between the upper and lower limits (i.e., the maximum fluctuation shown in the table under item 9).

19. **Transition Operation** describes actions required to precede Flexible Operation in some cases and follow Flexible Operation in all cases. There are three elements associated with Transition Operation:

a. **Up-ramping**: A flow increase for the hourly period that would precede most (exceptions specified below) initial Flexible Operation hours at a specified flow depending upon the Project, so that the overall flow difference between the IEO flow and the scheduled Flexible Operation flow is gradual and not instantaneous. Up-ramping rates are specific to each Project and would only apply when Flexible Operation is scheduled in advance (i.e., in the Day-Ahead market) and not when Flexible Operation is initiated in Real-Time or for CCA and RCD audits. Up-ramp rates are specified at each Project as:

Wilder Project: the lesser of 1 of 2 large units (approximately 5000 cfs) or half-way between the IEO flow and the Flexible Operation flow;

Bellows Falls Project: the lesser of 1 cfs/square mile of drainage area (cfsm) (approximately 5,414 cfs) or the flow half-way between current IEO flow and the Flexible Operation flow;

Vernon Project: the lesser of 1 cfsm (approximately 6,266 cfs) or half-way between current IEO flow and the Flexible Operation flow.

b. **Down-ramping**: A flow decrease at a specified rate for the period following Flexible Operation until the flow is equal to inflow at the dam. Decreases will occur on an hourly basis, as a percentage of the previous hourly flow. The first hour after the Flexible Operation hour will be no greater than approximately 70% of the Flexible Operation flow and each successive hour will be approximately 70% of the previous hour.

c. **Refill**: A maximum 48-hour period subsequent to post-Flexible Operation Down-ramping when the impoundment WSE is restored to the stable Target WSE by passing a fraction of the inflow at the dam and retaining the remaining fraction as impounded water above the dam. The hourly flow rate below each Project dam during refill will be the greater of approximately 70% of inflow or the base flow specified in item 16.

The 48-hour maximum refill period begins immediately following Down-ramping after a Flexible Operation event and ends no more than 48 hours later unless the reservoir is within 0.1 foot of the Target WSE (item 21). The 48-hour period includes any temporary interruptions during refill (e.g., purposely pausing refill and passing all inflow, or decisions to implement another Flexible Operation event prior to the impoundment reaching a WSE equal to the Target WSE minus 0.1 feet.) GRH expects to only pause refill for extended periods as needed when participating in the Real-Time Market, as described in 19.a above. Based on analysis of Flexible Operation simulations provided by GRH, it is expected that the number and duration of pauses will be minimal especially during the critical spawning months spanning from April through July 15.

PROJECT OPERATION DESCRIPTIONS

20. All Projects will comply with IEO Operation (item 13), applying Target WSE (item 17) and associated Target WSE Bandwidths (item 18) as described below, unless:

    a. Flexible Operation (item 6) along with Transition Operation (item 19) are applied as specified herein, and implemented;

    b. IEO Operation is suspended due to either High Water Operation (item 11), or Emergency and System Operation, Requirements and Audits (items 4 and 5); or

    c. IEO Operation is suspended due to non-emergency Maintenance Requirements that mandate deviating from IEO Operation, but only after consultation with relevant State and Federal resource agencies prior to initiating a necessary deviation and developing a suitable refill plan and schedule.

21. Target WSEs and Target WSE Bandwidths for each Project are described in the following table (all elevations are mean sea level (msl), NGVD 29):

	Wilder Project	**Bellows Falls Project**	**Vernon Project**
Target WSE	384.5 ft *	291.1 ft *	219.63 ft
Target WSE Bandwidth	Between 385.0 and 384.0 ft, representing 0.5 ft above and below the Target WSE	Between 291.6 and 290.6 ft, representing 0.5 ft above and below the Target WSE	Between 220.13 and 219.13 ft, representing 0.5 ft above and below the Target WSE

*Except during DWM pre-winter habitat protection operation period, triggered and maintained as water temperatures drop from 15° Celsius (° C) to 10° C within identified DWM habitats within the projects (item 3).

22. Rates of change in station discharge to maintain a Target WSE (matching inflow with outflow) will be limited to reasonable changes necessary to continue or adjust the actual WSE to the Target WSE within the Target WSE Bandwidth, largely dependent upon rate of change in inflow, the degree of flow control using MW setpoints on the generator and the monitoring accuracy of WSE at the dam. Changes in station discharge necessary to match inflow should not occur more than once per hour (unless rate of change in inflow is rapidly accelerating or declining) and would not be greater than reasonably necessary to restore a balanced IEO condition at the Target WSE. Specifics regarding how to distinguish between flow adjustments for IEO and Flexible Operation for compliance purposes will be addressed in the operation compliance and monitoring plans (OCMPs) required by the §401 Water Quality Certifications and the FERC Licenses.

23. Flexible Operations are limited, in part, by maximum allowable hours specified below, which are allocated on a monthly basis in order to reflect the seasonal criticality of instream aquatic resources as well as the criticality and fuel security concerns associated with winter peaking loads in New England:

    December, January, February, March: no more than 65 hours in each month

    April, May, June: no more than 10 hours in each month

July: A total of 20 hours with no more than 10 hours from July 1 through July 15. Although a maximum of 10 hours is allowed from July 1 through July 15, in order to further enhance the potential for successful Sea Lamprey spawning, GRH will strive to minimize the hours of Flexible Operation at each Project during this period when conditions allow.

August, September, October: a total of no more than 20 hours in each month.

November: a total of 42 hours with no more than 10 hours from November 1 through 15.

24. Flexible Operations (item 6) will comply with the Flexible Operating Impoundment Range (item 9).

25. The duration (in hours) of each Flexible Operation event will be determined in accordance with item 7.

26. The minimum duration of a Flexible Operation event will be one hour in most cases.

27. Flexible Operation Maximum Discharge will be based upon the calculated inflow at the hour in which the Flexible Operation will occur as follows:

    a. When calculated inflow is approximately 1800 cfs or less, Flexible Operation Maximum Discharge is 4,500 cfs.

    b. When calculated inflow is greater than approximately 1800 cfs, the Flexible Operation Maximum Discharge is limited to 2.5 times the calculated inflow and will not exceed the maximum station generating capacity (item 15).

28. For the purpose of protecting Dwarf Wedgemussels (DWM) from freezing in the winter, the Wilder and Bellows Falls Project impoundments will be temporarily lowered in the Fall of each year as described in item 3.

29. There are no limitations on the number of Flexible Operation events per day or the duration of Flexible Operation events other than those indirect limitations due to inflow and Transition Operation requirements as specified herein.

30. Scheduled Flexible Operation will require one hour of Transition Operation Up-ramping (item 19.a). Unscheduled (in response to Real-Time price signals) Flexible Operation, and Emergency and System Operation, Requirements and Audits (Items 4 and 5) will not require Up-ramping.

31. All Flexible Operation events will require Transition Operation Down-ramping and Refill as specified in item 19.

32. The Transition Operation elements specified in item 19 will be applied at the Projects as follow:

	Up-Ramping	**Down-Ramping**	**Refill**
IEO Operations	Not Applied	Not Applied	Not Applied
Flexible Operations, Scheduled	Applied during the hour prior	Applied as Defined	Applied as Defined
Flexible Operations, Un-Scheduled	Not Applied	Applied as Defined	Applied as Defined

High Water Operations	Not Applied	Not Applied	Not Applied
CCA and RPD Audits	Not Applied	Applied as Defined	Applied as Defined
Emergencies and System Emergencies	Not Applied	Not Applied	Not Applied

33. **Compliance:** Specifics regarding how compliance with this Proposal will be determined and the information that will be provided by GRH for this purpose, will be included in the operation compliance and monitoring plans (OCMPs) required by the §401 Water Quality Certifications and the FERC licenses. Should review of information submitted to the relevant resource agencies pursuant to the OCMPs indicate that operation of any Project is not complying with this Proposal, GRH will consult with the State and Federal resource agencies to discuss their concerns and, if necessary, will identify and implement appropriate corrective actions.

34. **Consultation**: If after evaluating operation data pursuant to Item 33, the relevant resource agencies observe instances where operations do not appear to adequately represent a) the simulations discussed in the last paragraph of the Introduction, b) attain the five bulleted focus areas in the Introduction, or c) attain CTB and DWM management goals (items 1 and 2) at levels suggested by GRH simulations, GRH will, if requested, meet with the agencies to discuss their concerns and possible corrective actions.