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LOW IMPACT HYDROPOWER INSTITUTE

LIHI Certificate #201 - Bolton Falls Project, Vermont



The Bolton Falls Hydroelectric Project is located on the Winooski River in Washington County, Vermont. Most of the infrastructure associated with the Project, including the intake, penstocks, bypass pipe, and powerhouse, is located within the town of Duxbury, Vermont. The right abutment of the Project dam is in the town of Waterbury, Vermont.

Project Name	Bolton Falls
LIHI Certificate No.	201

LIHI Certificate Term	January 26, 2024 – January 25, 2034
Owner	Green Mountain Power
State	Vermont
Location	River Mile 43 – Winooski River.
Installed Capacity	6.96 MW
Average Annual Generation	26,301 MWh
Facility Type	Run-of-river
FERC No.	P-2879. License issued 10/05/2022, expires 09/30/2062.

The Project dam is located on the Winooski River at approximately river mile (RM) 43. The total drainage area is approximately 821 square miles, which is approximately 76% of the drainage area at the Winooski River's mouth where it enters Lake Champlain. The Project dam is the fourth dam upstream of Lake Champlain on the Winooski River. It is 33 miles upstream of Winooski One/Chace Mill (LIHI #16), and about 25 miles upstream of Essex 19 (LIHI #146). It is located about 17 miles downstream of Winooski No. 8 (LIHI #77).

The Project dam is 92 feet tall and 275 feet long, and consists of a timber crib dam buttressed with a masonry wall on the downstream face. The dam spillway is capped with a 196-foot-long reinforced concrete overflow spillway, and a 5-foot-high inflatable rubber dam. Redevelopment of the project in the 1980s initially included 5-foot wooden flashboards atop the dam crest; these were replaced by the current 5-foot-high inflatable rubber dam system in 1991. The foundation of the dam is below the normal tailrace elevation, with the deepest section found at approximately elevation 320 feet and approximately 25 feet below the normal tailwater elevation.

The dam was originally constructed in 1898 as a rock-filled timber crib dam. Electricity generation began in 1899 with its two turbine-generator units. During 1899, the dam deflected and to strengthen it, an ashlar-faced stone dam was constructed in 1900 against the downstream face of the timber crib structure. In 1905-1906, a third turbine generator unit was added, utilizing the large landward-side penstock for the supply of water. The new generating unit (No. 3) was in a powerhouse structure at the end of the powerhouse, which housed Units 1 and 2. However, by 1938, the Project had fallen into disrepair, and it was taken off-line. The dam and powerhouse were redeveloped in 1985-1986 under the previous FERC license, which was issued in February 1982. Construction began in May 1985 with power first generated in October 1986. As a result of this redevelopment, the remnants of the previous powerhouses were removed and a new powerhouse containing two equally sized turbine generator units was constructed.

The left abutment includes a concrete-capped masonry tower as well as a lower pad on the upstream face of the left abutment that allows access to the trash rake and penstock gates. The right abutment consists of a concrete cap atop the masonry wall to which the rubber dam is attached. The dam includes two sluiceways into the masonry buttress section for drainage of the timber crib dam. The sluiceways are 4 feet wide by 4.5 feet high. A section of the former (destroyed) powerhouse masonry foundation wall near the dam's left abutment was stabilized with a reinforced concrete facing and anchored to bedrock with post-tensioned anchors in 1992-1993.

The Project forebay consists of two separate concrete intakes for each penstock. The bottom of the intakes are at elevation 360.0 feet, approximately 37 feet below the normal pond elevation. The top of the intakes are at elevation 389.1 feet, approximately 8 feet below the normal pond elevation. The intake structure is equipped with trashracks with 3-inch clear spacing and a trash raking system. The trashrack dimensions are 27 feet wide by 43 feet high and angled 70 degrees from the horizontal plane. The penstocks are each 10-foot-diameter and 120-foot-long and are made of steel encased in concrete.

The powerhouse, located on river left downstream of the dam's left abutment, is a reinforced concrete structure approximately 73 feet long by 57 feet wide.

Following flooding in the spring of 1987 when water levels came within three feet of overtopping the powerhouse roof, the parapet walls around the powerhouse roof were raised several feet. Raising these walls appeared to greatly reduce (but not eliminate) the amount of

damage sustained by the powerhouse following the August 2011 Tropical Storm Irene flooding.

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There is also a 75-foot-long, 36-inch-diameter water bypass pipe that discharges water directly adjacent to the dam's left abutment on the left edge of the spillway. The invert for the bypass pipe intake is at approximately elevation 383 feet, approximately 14 feet below the normal pond elevation.

A 130-foot long, 5-kV underground transmission line ties the powerhouse to an adjacent switchyard. The generator main leads are connected to a 34.5/4.16 kV transformer in the switchyard. Station service power can either be tapped from the generators or supplied separately by GMP. There is also a 34.5 kV transmission line that is approximately 600 feet long that runs from the switchyard mentioned above to a second switchyard with a 34.5/4.16 kV transformer.

The project operates in a run-of-river mode and impounds an approximately 59-acre reservoir. There is a 150-foot-long bypassed reach and the tailrace is approximately 90 feet wide and 60 feet long. To ensure run-of-river operations, the project utilizes a Programmable Logic Controller (PLC) that controls headpond water level as river flows vary by modulating the turbine gate setting. A pressure transducer in the impoundment determines the water level and transmits the information to the PLC for appropriate action. Additionally, a 100-cfs minimum bypass flow is provided year-round in order to facilitate high-quality habitat in the bypassed reach. This flow regime was developed in consultation with the Vermont Agency of Natural Resources.

Waters in the project reach are designated as Class B(2) water as well as a coldwater fishery. Class B(2) waters are meant to support the following designated and existing uses: aquatic biota and wildlife; aquatic habitat; aesthetics; public water supply, with filtration and disinfection or other required treatment; irrigation of crops and other agricultural uses; swimming and other primary contract recreation; and boating, fishing and other related recreational uses.

The project waters support a mix of coldwater and warmwater fish species. Due to downstream dams, there is limited migratory fish presence downstream of the Project and no provision for upstream passage. However, lake sturgeon, landlocked salmon and steelhead migrate from Lake Champlain into the Winooski River to spawn. The first dam on the Winooski River is the Winooski One/Chace Mill (LIHI #16) which was built on a natural falls area. Landlocked salmon and steelhead are trapped and hauled above the Winooski One Dam, while lake sturgeon are not collected or transported. Steelhead are released immediately upstream of the Winooski One Project while landlocked salmon are released above the Essex 19 Dam (LIHI #146) (next dam downstream from the Bolton Falls Dam), where they have access to about 26 miles of additional habitat including spawning habitat. Downstream passage is facilitated via the minimum bypass flow over the spillway or through the bypass pipe. Trashracks are 0.5-inch thick with 3-inch clear spacing. Resident species include northern pike, chain pickerel, smallmouth and largemouth bass, rainbow trout, yellow perch, various crappie species, landlocked salmon, brown trout, brook trout, walleye, bullhead catfish species, and panfish.

Project lands consist of 33 acres of fee-owned land with 4.2 miles of impoundment shoreline. Land cover within the project area is dominated by upland deciduous, mixed, or evergreen forest, and woody wetlands with a small amount of agriculture and developed land. The Winooski River from the Bolton Falls Dam downstream about 9 miles is listed on the Nationwide Rivers Inventory for having "outstandingly remarkable value" for geologic and archaeologic features. Geologic features include segments possessing a unique diversity of geologic features, including Duck Brook cascades, large boulder outcrops, and an excellent example of a glacial delta. The run-of-river operations and minimum flow ensure that Project operations have a de minimis effect on the bypassed reach and downstream reach.

Threatened or endangered species potentially present in the project vicinity include Northern long-eared bat and Eastern pearlshell mussel. Based on consultation with the US Fish and Wildlife Service, there is no critical habitat present in the project area. Further, project activities have been found to have minimal impact on any of the listed species, should they be present.

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Historic resources present include the Bolton Falls Dam and three new archaeological sites considered historic resources, therefore eligible for listing in the National Register of Historic Places. The dam has been eligible for listing in the National Register of Historic Places since March 19, 1981, and may be eligible for nomination to the Historic American Engineering Record. The project's Historic Properties Management Plan, developed with the Vermont State Historic Preservation Office (SHPO), governs the preservation of these properties and includes mitigation measures such as: (1) management of known archaeological resources; (2) protocols for conducting additional archaeological review when undertakings have any potential to impact the historic properties within the Project area; and (3) consultation and reporting protocols with the Vermont SHPO, Tribal Nations, and FERC to minimize impacts to archeological resources due to Project maintenance and recreational activities.

Recreation resources at the Project include a Day Use Area and a portage trail. The Day Use Area consists of a parking lot, a picnic area with one grill, and access to the river downstream of the tailrace. The portage trail consists of a take-out approximately 0.4 miles upstream from the dam, a put-in area at the Day Use downstream access point and an approximate 0.5-mile trail connecting the take-out and put-in areas.

Compliance Status

The Certificate includes the following facility-specific condition:

Satisfied in 2025. **Condition 1:** Until all planned recreation enhancements are completed, the facility Owner shall provide updates on the status of implementation of each enhancement in the annual compliance submittals to LIHI.

2025: No material changes or compliance issues were identified. The project remains in compliance based on the annual review. For Condition 1, the project submitted completion documentation for all recreation enhancements, thus satisfying the condition. The project filed a non-capacity amendment application with FERC to construct a retaining wall, in consultation with resource agencies.

2024: Annual reporting for the current Certificate has not yet taken effect.

Certification History

May 21, 2023: The Low Impact Hydropower Institute has issued a final decision on the certification of the Bolton Falls Hydroelectric Project. The 10-year certification term is January 26, 2024 to January 25, 2034.

April 19, 2024: The Low Impact Hydropower Institute (LIHI) has preliminarily approved Low Impact Certification for the Bolton Falls (pending LIHI #201) Hydroelectric Project, FERC# P-2879. The project is located on the Winooski River in Vermont. The full application and reviewer's report are available below.

This decision is preliminary pending the 30-day appeal window. Only those who commented on the initial applications during the 60-day comment period are eligible to file an appeal. Such appeal needs to include an explanation as to how the Projects do not meet the LIHI criteria. Appeal requests can be submitted by email to comments@lowimpacthydro.org with "Bolton Falls" in the subject line, or by mail addressed to the Low Impact Hydropower Institute, 1167 Massachusetts Ave, Arlington, MA 02476. All requests will be posted to the website. The applicant will have an opportunity to respond and any response will also be posted. Requests must be received by 5 pm Eastern time on May 19, 2024. If no appeal requests are received the certification terms will be January 26, 2024 through January 25, 2034.

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January 30, 2024: The Low Impact Hydropower Institute has received a complete application for Low Impact Certification of the Bolton Falls Hydroelectric Project. LIHI is seeking public comment on this application. Specifically, we are interested in knowing whether you think the Project meets the LIHI Low Impact Certification Criteria, as revised in the 2nd Edition Handbook. Please review the program and criteria in LIHI's revised Handbook and then review the Project's application materials below. Comments that are directly tied to specific LIHI criteria (flows, water quality, fish passage, etc.) will be most helpful, but all comments will be considered. Comments may be submitted to the Institute by e-mail at comments@lowimpacthydro.org with "Bolton Falls Project Comments" in the subject line, or by mail addressed to the Low Impact Hydropower Institute, 1167 Massachusetts Avenue, Arlington, MA 02476. **Comments must be received on or before 5 pm Eastern time on March 30, 2024** to be considered. All comments will be posted to the web site and the applicant will have an opportunity to respond. Any response will also be posted.

Certification Files

2024 Certification

- Bolton Falls Certification Review Report 2024
- Bolton Falls – Certification Application 2024

Key Documents

- 2022 FERC License and Water Quality Certification
- 2022 FERC Environmental Assessment
- 2023 FERC License Amendment to Replace Turbines

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