GREAT RIVER HYDRO, LLC

Vernon Hydroelectric Project
FERC Project No. 1904-073

APPLICATION FOR NEW LICENSE

Initial Statement and
Exhibits A, B, C, D, F (Public),
G (excluding maps), and H

May 1, 2017

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Final Application for New License for Major Water Power Project — Existing Dam

Vernon Project (FERC No. 1904)

INITIAL STATEMENT AND EXHIBIT A: PROJECT DESCRIPTION

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INITIAL STATEMENT

BEFORE THE FEDERAL ENERGY REGULATORY COMMISSION

Application for License for Major Project—Existing Dam

1. Great River Hydro, LLC (Great River Hydro or Applicant), applies to the Federal Energy Regulatory Commission (Commission or FERC) for a new license for the existing Vernon Hydroelectric Project (Vernon Project or Project) (FERC No. 1904) as described in the attached exhibits. The current license for the Vernon Project was issued on June 25, 1979, and expires on April 30, 2019.

2. The location of the Project is:

State:	New Hampshire	Vermont
Counties:	Cheshire	Windham
Township or Nearby Town:	Hinsdale	Vernon
Waterbody:	Connecticut River	

3. The exact name and business address of the Applicant is:

   Great River Hydro, LLC
   112 Turnpike Road, Suite 202
   Westborough, MA 01581

   The name and mailing address of the persons authorized to act as the Applicant's agent for this application are:

   John L. Ragonese
   FERC License Manager
   Great River Hydro, LLC
   One Harbour Place, Suite 330
   Portsmouth, NH 03801

   Scott Hall
   President
   Great River Hydro, LLC
   112 Turnpike Road, Suite 202
   Westborough, MA 01581

   Erin O'Dea
   Vice President, Legal
   Great River Hydro, LLC
   112 Turnpike Road, Suite 202
   Westborough, MA 01581

4. The Applicant is a Delaware limited liability company and is not claiming preference under Section 7(a) of the Federal Power Act. See 16 U.S.C. 796.

5. The statutory or regulatory requirements of the States of New Hampshire and Vermont that affect the Project as it exists with respect to bed and banks and the appropriation, diversion, and use of water for power purposes, and with respect to the right to engage in the business of developing, transmitting, and distributing power and in any other business necessary to accomplish the purpose of the license under the Federal Power Act, are:

   - Great River Hydro must obtain a water quality certification from the New Hampshire Department of Environmental Services and Section 401 (a)(1) of the Clean Water Act.
   - Great River Hydro must obtain a water quality certification from the Vermont Department of Environmental Conservation and Section 401 (a)(1) of the Clean Water Act.

   The steps which the Applicant has taken or plans to take to comply with the regulations cited above are:

   - Great River Hydro will submit requests for water quality certification from the two state agencies[1] in accordance with 18 C.F.R. § 5.23(b) within 60 days of FERC's issuance of a notice that the license application is ready for environmental analysis.

6. Great River Hydro owns all of the existing Project facilities. No Federally owned or operating facilities are associated with the Project.

[1] By letters dated April 1, 2016, both New Hampshire and Vermont agencies indicated that the Applicant must apply to each state for state-specific water quality certification.

ADDITIONAL INFORMATION REQUIRED BY 18 C.F.R. § 5.18(a)

1. *Identify every person, citizen, association of citizens, domestic corporation, municipality, or state that has or intends to obtain and will maintain any proprietary right necessary to construct, operate or maintain the project:*

   Great River Hydro has or intends to obtain and will maintain the proprietary rights necessary to construct, operate, and maintain the Project.

2. *Identify (providing names and mailing addresses):*

   a. *Every county in which any part of the project and any Federal facilities that would be used by the project would be located:*

      Cheshire County Administration
      33 West Street
      Keene, NH 03431

      Windham County Clerk
      PO Box 207
      Newfane, VT 05345

   b. *Every city, town, or similar local political subdivision:*

      (i). In which any part of the Project, and any Federal facility that would be used by the project, would be located:

      Town of Hinsdale
      PO Box 13
      Hinsdale, NH 03451-0013

      Town of Chesterfield
      PO Box 175
      Chesterfield, NH 03443

      Town of Westmoreland
      PO Box 55
      Westmoreland, NH 03467

      Town of Walpole
      PO Box 729
      Walpole, NH 03608

      Town of Vernon
      PO Box 66
      Vernon, VT 05354

      Town of Brattleboro
      230 Main Street
      Brattleboro, VT 05301

      Town of Putney
      PO Box 233
      Putney, VT 05346

      Town of Dummerston
      1523 Middle Road
      E. Dummerston, VT 05346

      Town of Westminster
      PO Box 147
      Westminster, VT 05158

(ii). *That has a population of 5,000 or more people and is located within 15 miles of the project dam.*

Based on 2010 U.S. Census data the following municipalities meet this criterion.

Town of Swanzey PO Box 10009 Swanzey, NH 03446	City of Greenfield 14 Court Square Greenfield, MA 01301

(iii). *Every irrigation district, drainage district or similar special purpose political subdivision (A) in which any part of the project is located, and any Federal facility that is or is proposed to be used by the project is located, or (B) that owns, operates, maintains, or uses any project facility or any Federal facility that is or is proposed to be used by the project:*

No irrigation or drainage districts meet these criteria.

(iv). *Every other political subdivision in the general area of the Project that there is reason to believe would likely be interested in, or affected by, the application.*

Great River Hydro is not aware of other political subdivisions in the general area of the Project.

(v). *All Indian tribes that may be affected by the Project.*

A. No federally recognized Tribes are located in New Hampshire or Vermont; however, FERC identified the following federally recognized Tribe based in Charlestown, Rhode Island:

Narragansett Indian Tribe
Doug Harris, Deputy Tribal Historic Preservation Officer
4425-A South County Trail
Charlestown, RI 02813

B. The four Vermont state-recognized Abenaki Tribes, whose traditional lands encompass the Project are listed below:

i. Nulhegan Band of the Coosuk Abenaki Nation
Chief Don Stevens
156 Bacon Drive
Shelburne, VT 05482

ii. Elnu Tribe of the Abenaki
Chief Roger Longtoe Sheehan
5243 VT Route 30
Jamaica, VT 05343

iii. Koasek Traditional Band of the Koas Abenaki Nation
Co-chiefs Shirley Hook, Amy Hook Therrien, Carrie Gendreau
PO Box 272
Newbury, VT 05051

iv. Sovereign Abenaki Nation of Missisquoi
Chief Lawrence Moose Lampman
PO Box 133
Swanton, VT 05488

C. Additional Abenaki Tribal groups:

i. Cowasuck Band – Pennacook/ Abenaki People
Sôgmo Paul Pouliot
PO Box 52
840 Suncook Valley Rd
Alton, NH 03809-0052

ii. Koasek Traditional Band of the Sovereign Abenaki Nation
Chief Paul J. Bunnell
32 Hoit Mill Rd, #202
Weare, NH 03281

iii. Abenaki Nation of New Hampshire
262 Lancaster Rd.
Whitefield, NH 03598

3. *For a license (other than a license under Section 15 of the Federal Power Act), state that the applicant has made, either at the time of or before filing the application, a good faith effort to give notification by certified mail of the filing of the application to:*

   a. *Every property owner of record of any interest in the property within the bounds of the Project, or in the case of the Project without a specific boundary, each such owner of property which would underlie or be adjacent to any Project works, including any impoundments; and*

   b. *The entities identified in paragraph (2) above, as well as any other federal, state, municipal or other local government agencies that there is reason to believe would likely be interested in or affected by the application.*

   Because this is an application for a new license under Section 15 of the Federal Power Act (FPA), this regulatory provision does not apply.

4. *PURPA Benefits:*

   Great River Hydro is not seeking any PURPA benefits in association with the relicensing of the Project.

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VERIFICATION STATEMENT

This application is executed in the:

State of: Massachusetts,

County of: Worcester,

By Scott Hall, who being first duly sworn, deposes and says that the contents of this application for new license are true to the best of his knowledge or belief, and signs the application this 1st day of May, 2017.

Great River Hydro, LLC

By: [signature]

Name: Scott Hall

Title: President

Address: 112 Turnpike Road, Suite 202, Westborough MA 01581

Subscribed and sworn before me, a Notary Public of the State of Massachusetts, this 1st day of May, 2017.

[signature]

Notary Public

My commission expires:

ERIN A. O'DEA
Notary Public
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires
November 26, 2021

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ACRONYMS AND ABBREVIATIONS

µS/cm	microsiemens per centimeter
1D	one-dimensional
2D	two-dimensional
acre-ft	acre-feet
ACHP	Advisory Council on Historic Preservation
A.D.	Anno Domini
APE	area of potential effects (as pertains to Section 106 of the National Historic Preservation Act)
ASMFC	Atlantic States Marine Fisheries Commission
AWS	area weighted suitability
B.C.	Before Christ
B.P.	Before Present
C.F.R.	Code of Federal Regulations
cfs	cubic feet per second
cm	centimeter
CRASC	Connecticut River Atlantic Salmon Commission
CSO	combined sewer overflow
CTDEEP	Connecticut Department of Energy and Environmental Protection
CWA	Clean Water Act
°C	degrees Celsius
DA	drainage area
DO	dissolved oxygen
DOI	U.S. Department of the Interior
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
El.	elevation
EO	element occurrence
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
°F	degrees Fahrenheit

FCA	Forward Capacity Auction
FERC	Federal Energy Regulatory Commission
FirstLight	FirstLight Power Resources
FLA	Final License Application
FMF	Fifteen Mile Falls Hydroelectric Project
FPA	Federal Power Act
ft	foot or feet
ft/s	feet per second
FWS	U.S. Department of the Interior, Fish and Wildlife Service
GIS	Geographic Information System
Great River Hydro	Great River Hydro, LLC
HI-Z	HI-Z Turb'N
HPMP	Historic Properties Management Plan
ILP	Integrated Licensing Process
IPANE	Invasive Plant Atlas of New England
ISO-NE	New England Independent System Operator
ISR	Initial Study Report
KOP	key observation point
kV	kilovolt
kVA	kilovolt-ampere
kW	kilowatt
kWh	kilowatt-hour
m^2	square meter
mgd	million gallons per day
mg/L	milligram(s) per liter
mg/m^3	milligrams per cubic meter
mL	milliliter
m.s.l.	mean sea level
MW	megawatt
MWh	megawatt-hour
National Register	National Register of Historic Places
NEIWPCC	New England Interstate Water Pollution Control Commission
NEPA	National Environmental Policy Act

NGVD29	National Geodetic Vertical Datum of 1929
NAVD88	North American Vertical Datum of 1988
NHA	New Hampshire Audubon
NHDES	New Hampshire Department of Environmental Services
NHFGD	New Hampshire Fish and Game Department
NHNHB	New Hampshire Natural Heritage Bureau
NHPA	National Historic Preservation Act
NHSHPO	New Hampshire State Historic Preservation Officer
NITHPO	Narragansett Indian Tribal Historic Preservation Officer
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NTU	nephelometric turbidity unit
NWI	National Wetlands Inventory
PAD	Pre-Application Document
PGA	peak ground acceleration
PHABSIM	Physical Habitat Simulation
PIT	passive integrated transponder
PLP	Preliminary Licensing Proposal
PM&E measures	protection, mitigation, and enhancement measures
Projects	Wilder (FERC No. 1892), Bellows Falls (FERC No. 1855), and Vernon (FERC No. 1904) Hydroelectric Projects
PSP	Proposed Study Plan
PURPA	Public Utility Regulatory Policies Act of 1978
REC	Renewable Energy Credit
RPM	revolutions per minute
RM	river mile
R.S.A.	New Hampshire Revised Statutes Annotated
RSP	Revised Study Plan
RTE	rare, threatened, or endangered
§	Section of a statute such as 18 C.F.R. § 5.6 (c)

SD1	Scoping Document 1
SD2	Scoping Document 2
SGCN	Species of Greatest Conservation Need
SHPO	State Historic Preservation Office
Sound	Long Island Sound
SPD	Study Plan Determination
sq. mi.	square mile(s)
TCP	Traditional Cultural Property
TMDL	total maximum daily load
TransCanada	TransCanada Hydro Northeast Inc.
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USGS	U.S. Geological Survey
USR	Updated Study Report
VAR	volt-ampere-reactive
VANR	Vermont Agency of Natural Resources
VDEC	Vermont Department of Environmental Conservation
VFWD	Vermont Fish & Wildlife Department
VTNHI	Vermont Natural Heritage Inventory
VTSHPO	Vermont State Historic Preservation Officer
VY	Vermont Yankee Nuclear Power Plant
WAP	Wildlife Action Plan
WSE	water surface elevation
WUA	weighted usable area

Final Application for New License for
Major Water Power Project — Existing Dam

Vernon Project (FERC No. 1904)

EXHIBIT A: PROJECT DESCRIPTION

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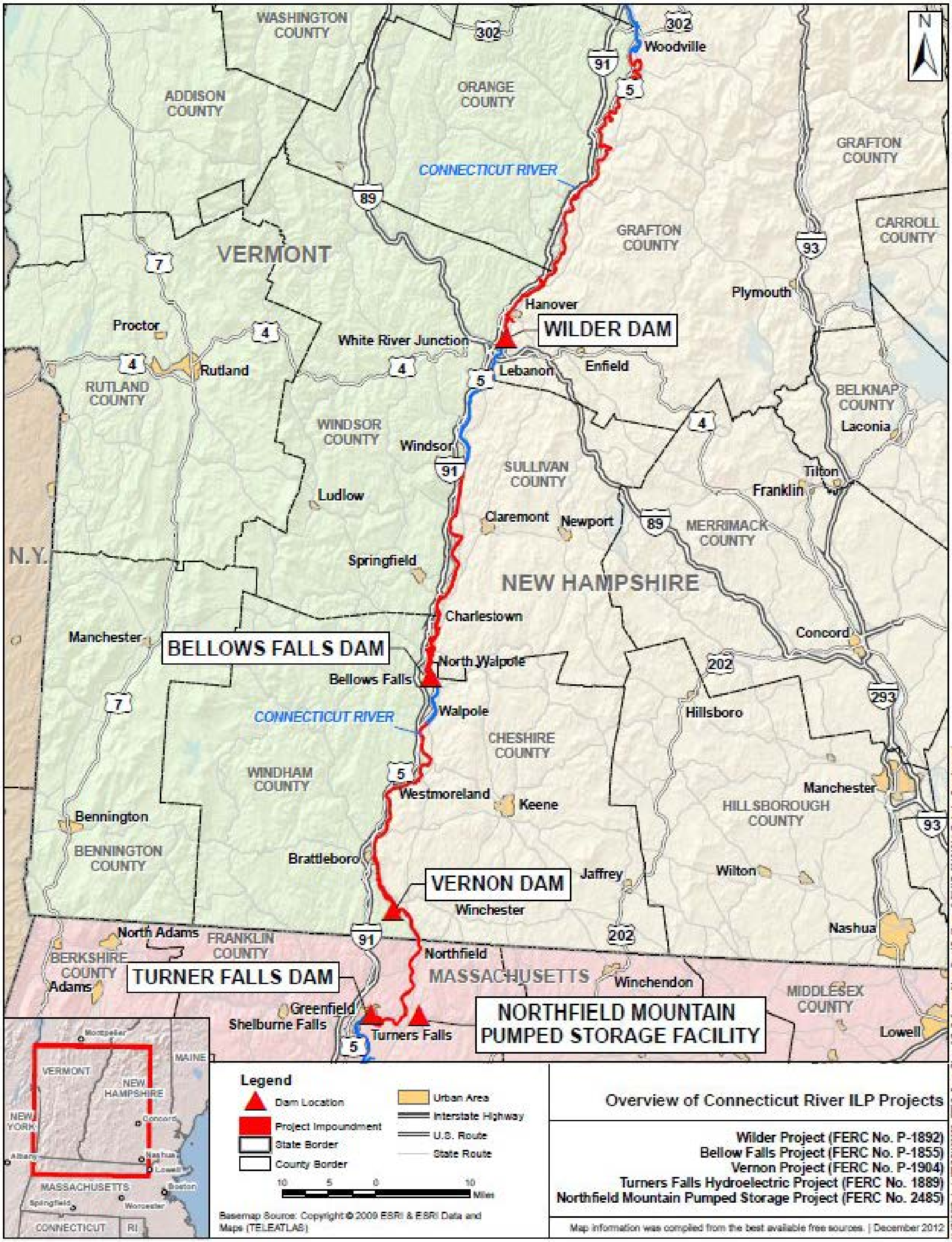
EXHIBIT A: PROJECT DESCRIPTION

Section 5.18(a)(5)(iii) of Title 18 of the Code of Federal Regulations (CFR) refers to Section 4.51 (License for Major Project—Existing Dam) for a description of information that an applicant must include in Exhibit A of its license application. Exhibit A is a description of the Project.

A1 Project Description

The Vernon Project dam and powerhouse are located on the Connecticut River at river mile (RM) 141.9, about 2 miles upstream of the Ashuelot River and 7.4 miles downstream of the West River, in the town of Vernon, Windham County, Vermont, and the town of Hinsdale, Cheshire County, New Hampshire. Figure A-1 illustrates the location of the Project in relationship to the other Projects undergoing concurrent relicensing.[2] The Project is located in the towns of Vernon, Brattleboro, Dummerston, Putney, and Westminster, Vermont; and Hinsdale, Chesterfield, Westmoreland, and Walpole, New Hampshire.

[2] The five projects are collectively referred to as "the Connecticut River Projects" and include Great River Hydro's Wilder (FERC No. 1892), Bellows Falls (FERC No. 1855), and Vernon (FERC No. 1904) Projects along with FirstLight's Turners Falls (FERC NO. 1889) and Northfield Mountain Pumped Storage (FERC No. 2485) Projects.



Source: FERC (2013)

Figure A-1. Project location in relationship to the Connecticut River Projects.

Primary Project facilities are shown in Figure A-2 and include the dam and spillway; the powerhouse, switchyard, and garage/service building (located southwest of the powerhouse across Governor Hunt Road). The Project also includes fish passage facilities, as described in Section A1.5 below, and recreation areas and facilities including a boat launch, portage, picnic areas, fish ladder viewing area, and fishing access (see Exhibit E, Section 3.8, *Recreation Resources and Land Use*).

Great River Hydro holds fee ownership of 287 acres of land in the Vernon Project. Of this, 16 acres are used for plant and related facilities, 34 acres are for public outdoor recreational use, 14 acres currently support local agriculture, and the remaining 223 acres are currently natural forest areas.

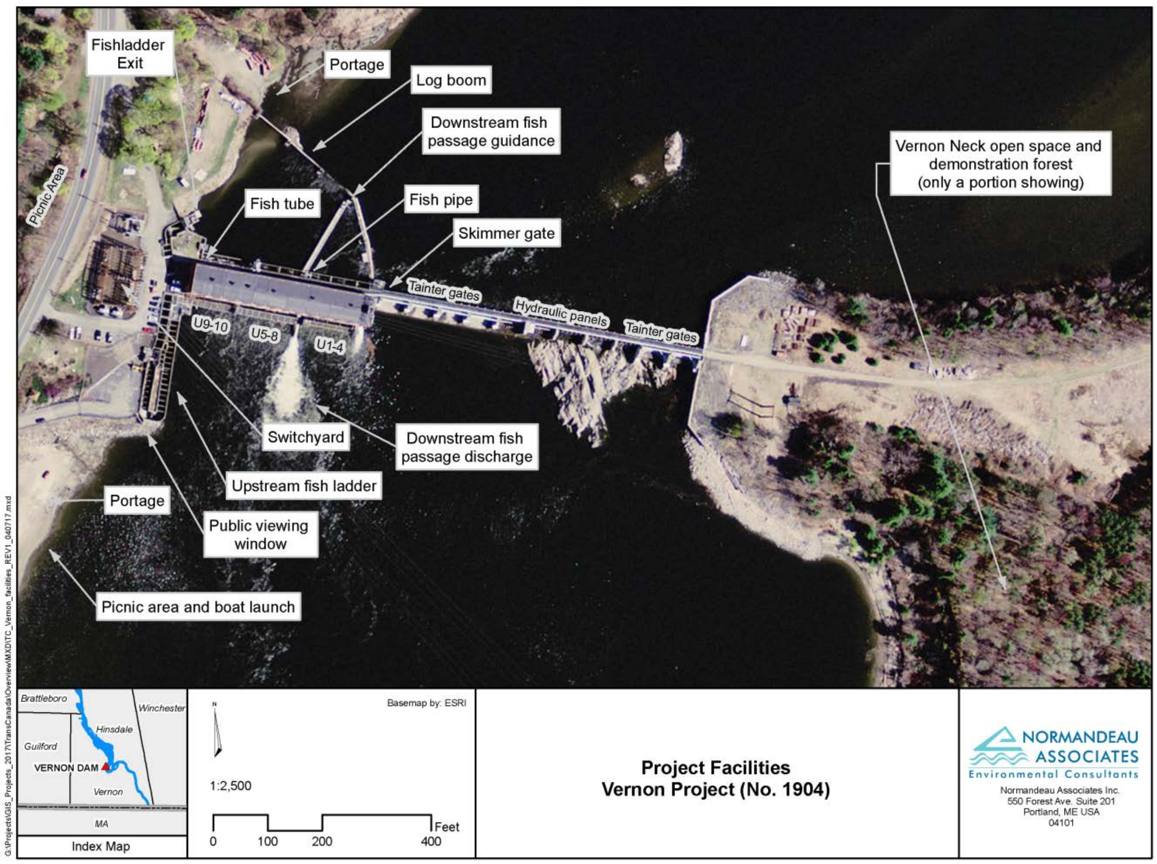


Figure A-2. Primary Project facilities.

A1.1 Impoundment

The Project impoundment is approximately 26 miles long and extends upstream approximately to the Walpole Bridge (Route 123 Bridge) at Westminster Station, Vermont. The impoundment has a surface area of 2,550 acres and a total volume of about 40,000 acre-ft at El. 220.13 ft (National Geodetic Vertical Datum of 1929 [NGVD29]) 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. 212.13 ft and El. 220.13 ft providing about 18,300 acre-ft of storage in the 8-ft range. The more typical impoundment operating range under non-spill conditions is between El. 218.3 and El. 220.1 ft for usable storage capacity of 4,489 acre-ft or 24.5 percent of the overall usable storage.

A1.2 Dam and Spillway

The dam is a composite overflow and non-overflow ogee-type, concrete gravity structure extending across the Connecticut River between Hinsdale, New Hampshire, and Vernon, Vermont (Figure A-3). The dam is 956 ft long with a maximum height of 58 ft. It consists of the integral powerhouse with a sluice gate block section that is about 356 ft long and a concrete overflow spillway section about 600 ft long. The spillway portion of the dam is divided into 12 bays containing, from west to east, a trash/ice sluice, four tainter gates, two hydraulic flashboard bays, three stanchion bays, and two tainter gates. In addition, eight submerged hydraulic flood gates are located below the ogee spillway and the 10-ft by 50-ft tainter gates (Table A-1). The various bays are separated by concrete piers supporting a steel and concrete bridge that runs the length of the dam for access and for operation of flashboards. The trash sluice is a skimmer gate that passes logs and other debris deflected away from the powerhouse by a log and ice boom in the powerhouse forebay.

Figure A-3. Dam spillway and powerhouse (looking upstream).

Table A-1. Spillway facilities.

Gate Type	Number	Size (height or width, by length in ft)	Elevation (NGVD29)
Fishway sluice	1	9 x 6 (inlet end) 4 x 5 (discharge end)	210.13 194.33
Trash/ice sluice	1	13 x 13	209.13 (sill)
Tainter gates	2	20 x 50	202.13 (crest)
Tainter gates	4	10 x 50	212.13 (crest)
Hydraulic panel bays	2	10 x 50	212.13 (crest)
Stanchion bays	2	10 x 50	212.13 (crest)
Stanchion bay	1	10 x 42.5	212.13 (crest)
Hydraulic floodgates	8	7 x 9 (invert)	173.13 (sill)

A1.3 Powerhouse and Appurtenant Facilities

The powerhouse is integral to the dam and is approximately 356 ft long by 55 ft wide by 45 ft high; it is a reinforced concrete substructure with a structural steel and brick superstructure. It contains 10 turbine generating units, electrical transformers, switchboard (for local station operation in emergency conditions), machine shop, excitation equipment, emergency generator, air compressor, an overhead crane, offices, storage rooms, and ancillary equipment. The maximum hydraulic capacity (calculated as the sum of each individual unit's maximum discharge capacity) is 17,130 cubic feet per second (cfs) and nameplate generating capacity of the Project as a whole is 32,400 kilowatts (kW). Table A-2 provides turbine and generator specifications and Figure A-4 shows Unit No. 10.

Table A-2. Turbines and generators.

Unit Nos.	Nos. 1–4	Nos. 5–8	Nos. 9–10
Turbines			
Type	Single runner vertical Francis	Vertical axial flow Kaplan	Single runner vertical Francis
Design head (ft)	35	32	34
Horsepower rating at design head	4,190	5,898	6,000
Maximum hydraulic capacity (cfs)	1,465	1,800	2,035
Minimum hydraulic capacity (cfs)	400	300	500
Revolutions per minute (rpm)	133.3	144	75
Intake trashrack clear spacing (inches)	1.75	1.75	3.625
Generators			
Nameplate capacity (kilovolt-ampere ([kVA])	2,500	5,000	6,000
Power factor	0.8	0.9	0.7
Nameplate kW	2,000	4,000	4,200
Phase/frequency	3/60	3/60	3/60
Voltage	2,300	13,800	13,800

Figure A-4. Powerhouse, Unit No. 10.

The concrete gravity intake is integral with the powerhouse structure with two water passages for Unit Nos. 9 and 10, and a single water passage for Unit Nos. 1–8. Water enters directly from the forebay intakes and into the scroll or wheel cases. The draft tubes discharge into a short tailrace excavated partly in the bank (for Unit Nos. 9 and 10) and partly in the bedrock bed of the river. The scroll cases and draft tubes are formed in the concrete of the substructure which was poured on bedrock. The only units that have draft tube gates are Units No. 5 through No. 8. These gates are operated with a common electrical hoist that can be positioned in any bay via an overhead monorail (Table A-3).

The water passages for Unit Nos. 9 and 10 have trashracks with 3.625-inch clear spacing and head gates consisting of two concrete gates with an electrically driven fixed hoist. Units Nos. 1–8 have trashrack clear spacing of 1.75-inches. Unit Nos. 1–4 head gates consist of a single steel-hinge gate, one for each unit. Units Nos. 5–8 have one steel slide gate for each unit equipped with an electrically driven fixed hoist (Table A-3). A hydraulic trashrack rake is used to pull river debris away from the unit intakes. It is manually operated and is driven to the trashracks in front of each unit on a set of tracks that are located on top of the forebay intake structure. The rake head is lowered to the bottom of the racks and is then retracted riding up the rack removing the debris. The debris is then conveyed into a trailer for removal. An ice sluice/skimmer gate is located on the east side of the forebay and is 13 ft wide by 13 ft high.

Table A-3. Dimensions and composition of head gates, draft tubes and draft tube gates.

Unit	Type	Dimensions	Composition
Units 1–4	Head gates	16 ft, 6 inches high x 19 ft wide	Steel
	Draft tubes	Varies in dimension Maximum = 12 ft high x 16 ft wide	Cast into concrete foundation
	Draft tube gates	No draft tube gates	n/a
Units 5–8	Head gates	18 ft high x 18 ft, 6 inches wide	Steel
	Draft tubes	Varies in dimension Maximum = 11 ft high x 19 ft wide	Cast into concrete foundation
	Draft tube gate	11 ft high x 19 ft wide	Steel
Units 9–10	Head gates	2 gates per unit 18 ft high x 16 ft, 6 inches wide	Concrete filled steel
	Draft tube	Varies in dimension Maximum = 20 ft high x 27 ft wide	Cast into concrete foundation
	Draft tube gates	No draft tube gates	n/a

A1.4 Electrical Facilities

Project electrical facilities include the turbine generating units, four step-up transformers, bus structures, switching equipment and switchboard, generator terminals and an approximately 500-ft, 13.8-kilovolt (kV) interconnection that runs underneath the station to two outdoor 13.8- to 69-kV step-up transformers located in an outdoor substation west of the powerhouse (Figure A-4). Non-Project facilities located within the Project boundary include switchgear, bus work, and a 69-kV interconnection owned by the regional transmission company, New England Power Company, doing business as National Grid.

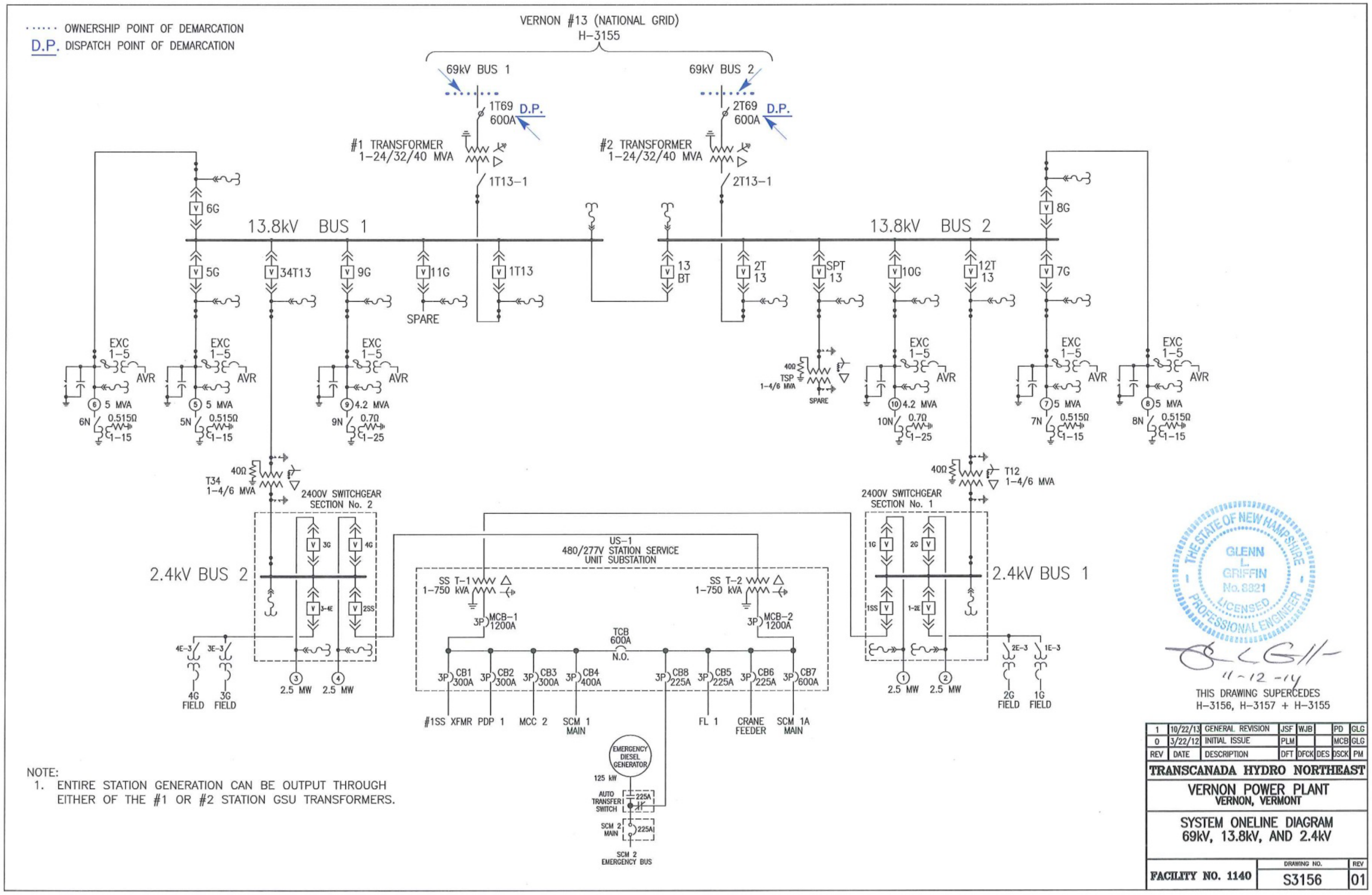


Figure A-5. Transmission interconnection schematic.

A1.5 Fish Passage Facilities

A1.5.1 Upstream Passage Facilities

The fish ladder (Figure A-6) is a reinforced concrete structure (Ice Harbor and vertical slot design) that is 984 ft long and has accessory electrical, mechanical, and pneumatic equipment that is designed to provide passage for migrating Atlantic Salmon and American Shad past the dam, a vertical distance of about 35 ft. Upstream migrating fish enter the tailrace area where they are attracted to entrance weirs at the west end of the powerhouse. Fish are attracted into the fish ladder and "climb" by swimming through a series of 51 pools created by a sequence of overflow weirs in the lower section and by a series of vertical slot pools in the upper section. After passing the first 26 overflow weir pools, each 15 ft wide by 10 ft long, and 12 inches higher than the last, fish enter the counting/trapping area and a regulating pool.

Figure A-6. Upstream fish passage facilities.

A constant WSE of about 208 ft is maintained in the regulating pool and a steady flow is provided. Flow in the regulating pool can be supplemented as needed by a floor diffuser from the attraction water intake at the fish ladder exit. Fish are guided by flow and crowder screens through a narrow opening, passing an underwater viewing window where they can be observed and counted. They can also be trapped and diverted to a holding pool by means of manually activated pneumatic trapping gates. From the counting/trapping area, fish continue to climb through the vertical slot section of the fish ladder, consisting of an additional 25 pools each about 6 inches higher than the last. At the upper end of the fish ladder, fish pass through a flume, past screens protecting the attraction water intake, through a 12-ft-wide exit channel, and into the forebay. The exit channel is divided by a concrete center pier and includes pairs of motor-driven head gates, widely-spaced trashracks (11-1/8-inch clear spacing, sufficient to pass adult salmon), and slots for wooden stop logs. A public viewing area and underwater window are located just south of the powerhouse parking lot.

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. As of 2016 and if required, upstream passage is provided in spring from April 15 through July 15 (actual start date depends on passage counts at Turners Falls and Holyoke) for Atlantic Salmon and American Shad (and for Blueback Herring, although none have passed since 2000; See Exhibit E, Section 3.5, *Fish and Aquatic Resources*) 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.

A1.5.2 Downstream Passage Facilities

Downstream fish passage facilities consist of a “fish pipe” that discharges about 350 cfs through the powerhouse at a point located between Unit Nos. 4 and 5, and a 156-ft-long louver array that extends from the forebay to the fish pipe entrance. The angled louver array consists of stainless steel panels with 3/8-inch x 2-inch louver vanes placed 3 inches on center and angled 60 degrees from the direction of the panels. Panels extend to a depth of 12–14 ft below the normal operation impoundment WSE. The louver intercepts and directs downstream-migrating fish that enter the forebay from mid-river and from the east shoreline into the fish pipe. A second smaller “fish bypass" (or “fish tube”) is located near Unit No. 10. It discharges about 40 cfs and functions as a secondary passage route for fish that are not intercepted by the louver array and are able to enter the western end of the forebay. Downstream passage is provided for:

- Adult American Shad from April 15 (or the same date as upstream passage begins) through July 31;
- Juvenile American Shad from August 1 through November 15;
- Adult American Eels from September 1 through November 15; and

- Adult Atlantic salmon from October 15 through December 31, if 50 or more adults are documented passing upstream.

As of February 11, 2016, CRASC no longer requires downstream passage operations at Vernon for Atlantic Salmon smolts (see Exhibit E, Section 3.5, *Fish and Aquatic Resources*).

A2 Lands of the United States

No lands of the United States are located within or adjacent to the Project boundary.

A3 Literature Cited

FERC (Federal Energy Regulatory Commission). 2013. Scoping document 2 for the Wilder (FERC No. 1892-026), Bellows Falls (FERC No. 1855-045), Vernon (FERC No. 1904-073), and Turners Falls (FERC No. 1889-081) hydroelectric projects, and the Northfield Mountain Pumped Storage Project (FERC No. 2485-063). Federal Energy Regulatory Commission, Washington, DC. April 15, 2013.

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Final Application for New License for Major Water Power Project — Existing Dam

Vernon Project (FERC No. 1904)

EXHIBIT B: PROJECT OPERATIONS AND RESOURCE UTILIZATION

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EXHIBIT B: PROJECT OPERATIONS AND RESOURCE UTILIZATION

Section 5.18(a)(5)(iii) of Title 18 of the Code of Federal Regulations (CFR) refers to Section 4.51 (License for Major Project—Existing Dam) for a description of information that an applicant must include in Exhibit B of its license application. Exhibit B is a statement of Project operation and resource utilization.

B1 Existing and Proposed Project Operation

B1.1 Existing Project Operations

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Table B-1. River profile and high flow operations, inflows, and impoundment elevations.

Anticipated Inflow (cfs)	Maximum Water Surface Elevation (ft) at the Dam (NGVD29)[a]
<17,000	220.13
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45,000–70,100	218.6
70,100–<105,000	Impoundment elevation rises from 218.5 and is maintained at 220.1 as long as possible, including partial to full stanchion board removal as needed
>105,000	All gates, flashboard panels are opened and all stanchion bays removed, WSE surcharges as inflow increases.

a. All vertical elevations in Exhibit B are stated in National Geodetic Vertical Datum of 1929 (NGVD29).

B1.3 Proposed Project Operations

At this time, Great River Hydro is not proposing changes to operation of the Project, pending additional stakeholder consultation and analysis of potential alternative operations scenarios.

B2 Dependable Capacity and Annual Generation

B2.1 Estimate of Dependable Capacity and Average Annual Generation

At full load, with inflow equaling a maximum station discharge of at least 14,500 cfs, the Project has the capability of producing 32.0 megawatts (MW). Nine-year average annual generation, accounting for 2008 as first full year of re-developed Unit Nos. 5–8 operation (2008–2016) is approximately 162,557 megawatt-hours (MWh).

B2.2 Annual Plant Factor

The average annual plant factor is calculated as the average annual generation / nameplate capacity x 8,760 hours per year. Nameplate capacity of the Project is 32.4 MW. Based on the 10-year average annual generation, average annual plant factor = 162,557 MWh / (32.4 MW x 8,760 hours) = 57.3 percent.

B2.3 Project Flows and Flow Exceedance Curves

The Vernon Project has a total drainage area (DA) of 6,266 square miles (sq. mi.). Inflow is from discharge from the Wilder and Bellows Falls Projects and natural inflow from the 852 sq. mi. of intermediate DA downstream of the Bellows Falls Project. Only 13.5 percent of inflow enters as unmanaged flow downstream of the Bellows Falls Project, except under flood flow conditions when the USACE dams on the West River store water temporarily (see Exhibit E, Section 3.1.1, *Overview of the Basin*). Under normal generating conditions, it takes about 4 hours for flow releases from the Bellows Falls Project to reach Vernon dam.

The Vernon impoundment is approximately 26 miles long and extends upstream approximately to Dunshee Island, located downstream of the Walpole Bridge (Route 123) at Westminster Station, Vermont. The impoundment is riverine in character and ranges in depths of several feet to about 50 ft near the dam. Bathymetry in the impoundment changes rapidly as a result of underlying bedrock, channel constriction, deposition, and scour primarily associated with high flows, such as those that occurred with Tropical Storm Irene in late August 2011. Because of the relatively flat terrain from the upper extent of the impoundment to the dam, the Project has limited storage capacity, which is primarily a function of impoundment length and operating range. Under normal generation conditions, regulated flow from the FMF Project reaches Wilder dam in about 8 hours on average. Flows released at the Wilder Project generally reach the Bellows Falls dam in another 8 hours on average and another 4 hours to the Vernon dam. Table B-2 summarizes the minimum, mean, and maximum values of average monthly flows from 1979 through 2015.

Table B-2. Vernon Project estimated minimum, mean, and maximum average monthly flow values (cfs), January 1979—December 2015.

Month	Minimum	Year	Mean	Maximum	Year
January	2,995	1981	10,029	23,811	2006
February	3,121	1980	8,775	24,882	1981
March	5,123	2015	15,918	38,958	1979
April	8,901	1995	29,832	47,078	2008
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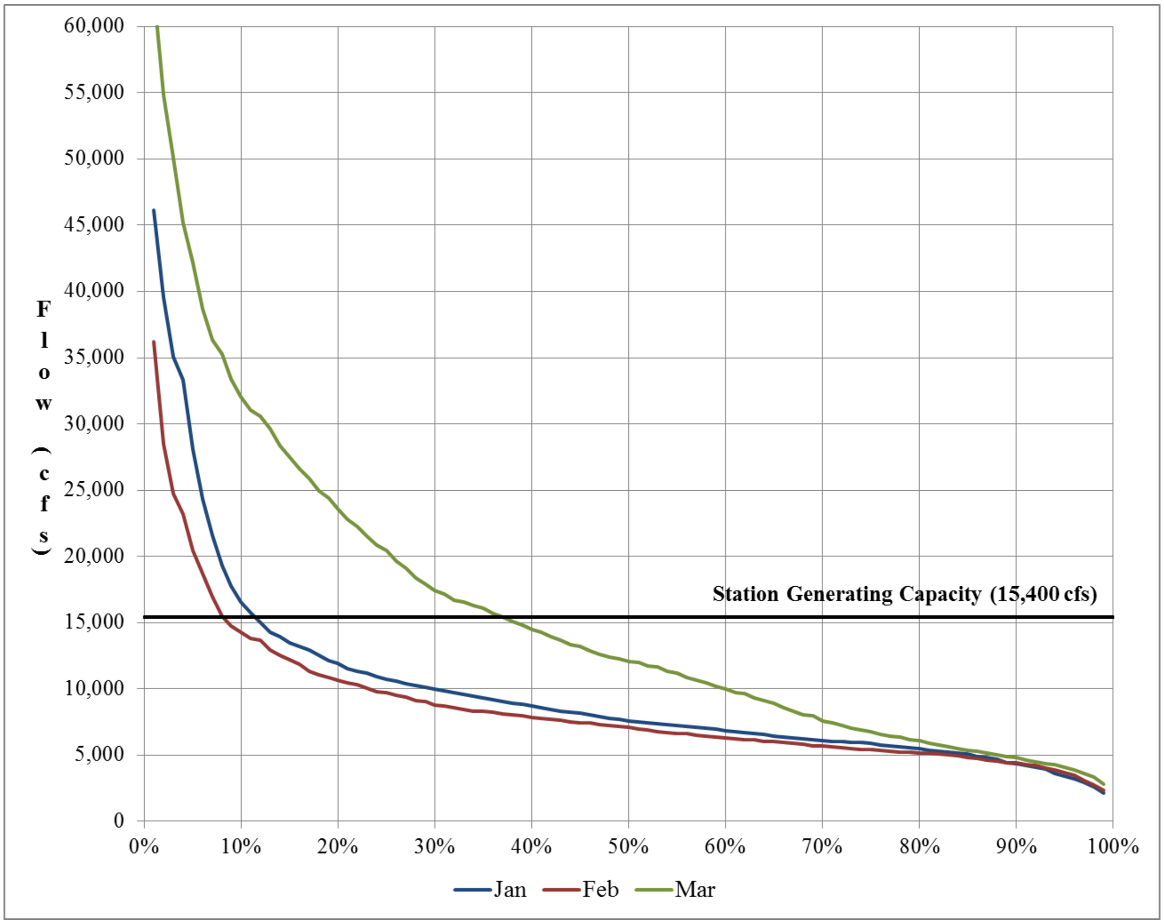
October	2,095	2001	9,453	29,571	2005
November	3,207	2001	11,629	26,381	2005
December	4,118	2001	12,063	25,972	1983

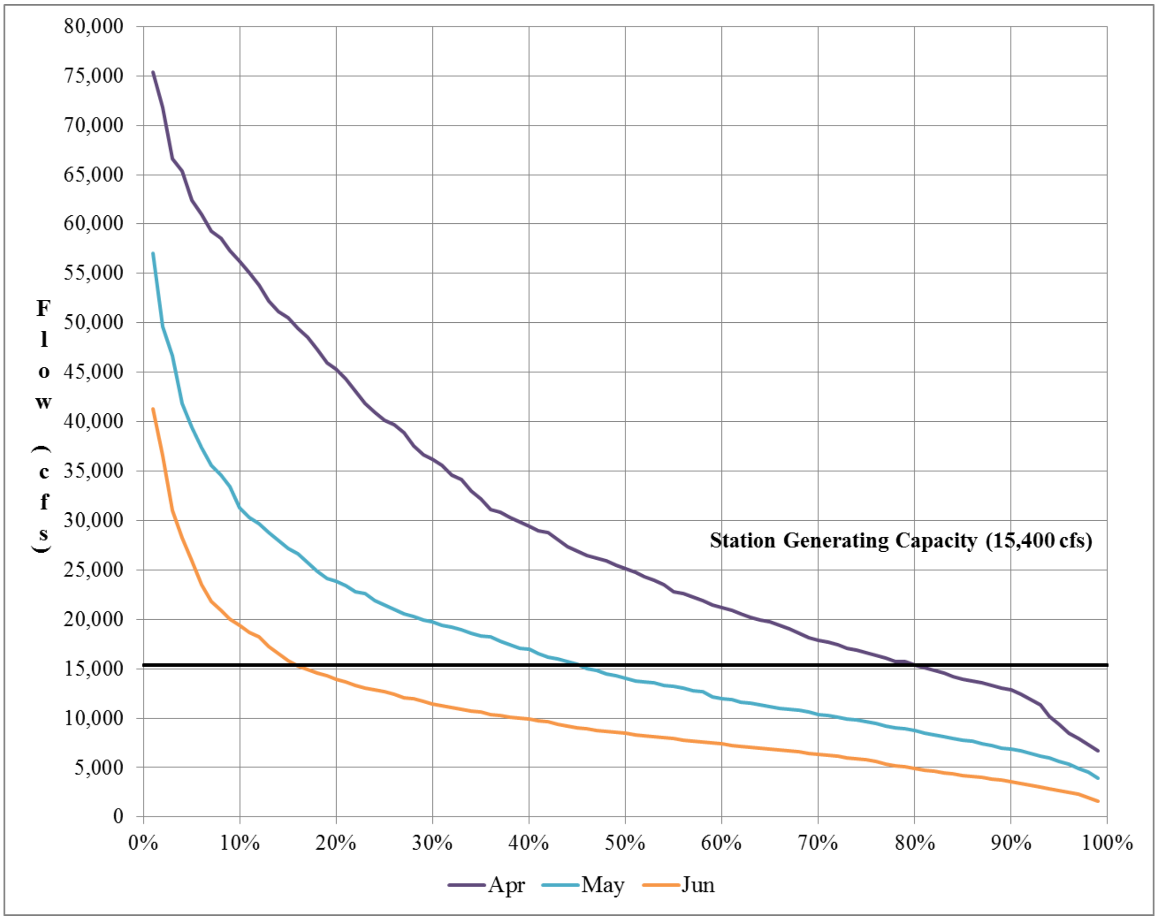
Source: USGS (2016, as modified by Great River Hydro)

Figures B-1 through B-4 provide monthly flow exceedance curves for the Vernon Project from January 1, 1979, to December 31, 2015. Data are based on U.S. Geological Survey (USGS) gage no. 01154500, Connecticut River at North Walpole, New Hampshire (subsequently referred to as the North Walpole gage), located downstream of the confluence with Saxtons River (about 2 miles downstream from Bellows Falls dam). To estimate flow at only the Vernon Project, the daily flow data from the North Walpole gage were prorated by 1.141 based on gaged DA to produce the monthly flow exceedance curves. This proration was used to account for the normally small amount of inflow from the Cold and West rivers and smaller tributaries that flow into the North Walpole gage.



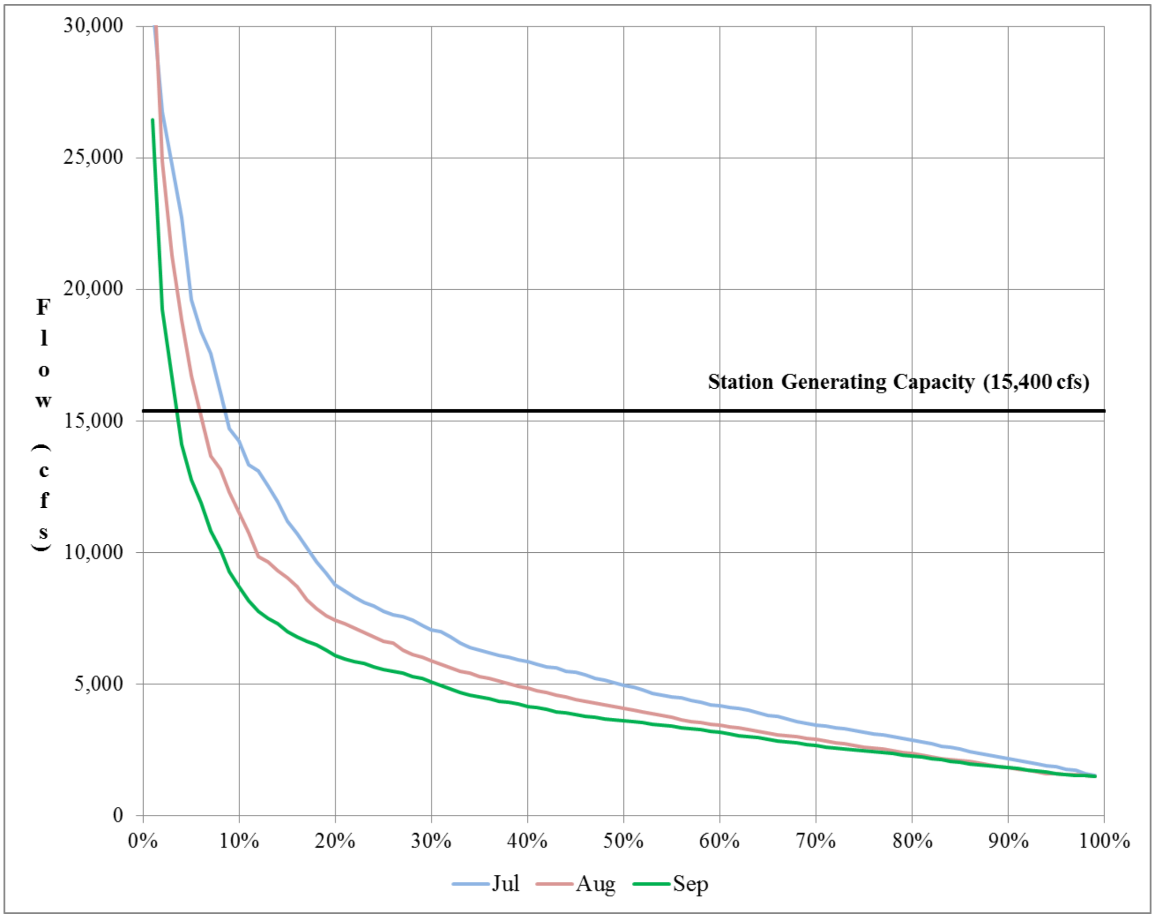
Source: USGS (2016, as modified by Great River Hydro)

Figure B-1. Flow exceedance curves, January–March (based on flow data from January 1, 1979 to December 1, 2015).



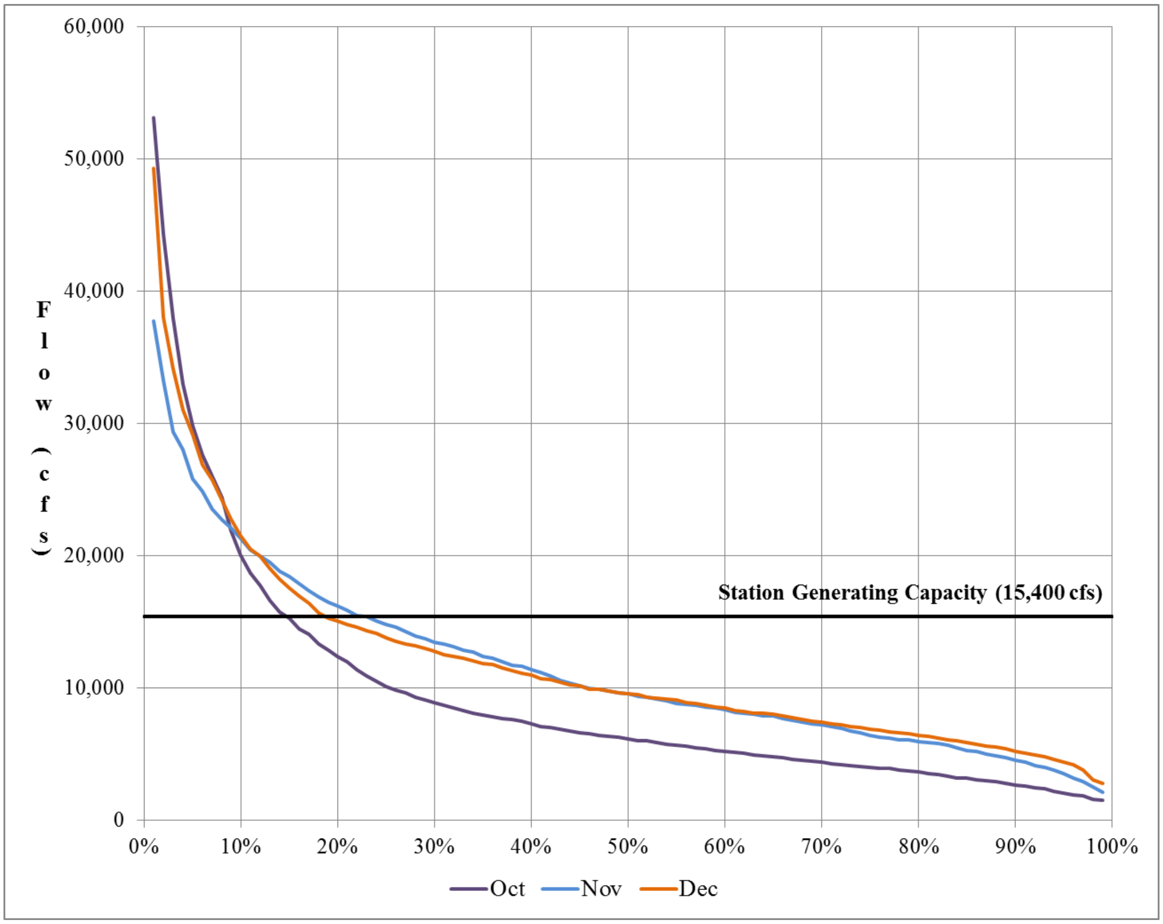
Source: USGS (2016, as modified by Great River Hydro)

Figure B-2. Flow exceedance curves, April–June (based on flow data from January 1, 1979 to December 1, 2015).



Source: USGS (2016, as modified by Great River Hydro)

Figure B-3. Flow exceedance curves, July–September (based on flow data from January 1, 1979 to December 1, 2015).



Source: USGS (2016, as modified by Great River Hydro)

Figure B-4. Flow exceedance curves, October–December (based on flow data from January 1, 1979 to December 1, 2015).

B2.4 Area-Capacity Curve

The impoundment has a surface area of 2,550 acres and a maximum total volume of about 40,000 acre-ft at El. 220.13 ft (National Geodetic Vertical Datum of 1929 [NGVD29]) 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. 212.13 ft and El. 220.13 ft providing about 18,300 acre-ft of storage in the 8-ft range. The more typical impoundment operating range under non-spill conditions is between El. 218.3 and El. 220.1 ft for usable storage capacity of 4,489 acre-ft or 24.5 percent of the overall usable storage. The stage versus storage values are shown in Table B-3 and plotted in Figure B-5.

Table B-3. Stage versus storage curve.

Elevation (ft NGVD29)	Approximate Storage (acre-ft)
212.0	21,711
213.0	23,531
214.0	25,637
215.0	27,821
216.0	30,074
217.0	32,395
218.0	34,782
219.0	37,233
220.0	39,747
220.1	40,000

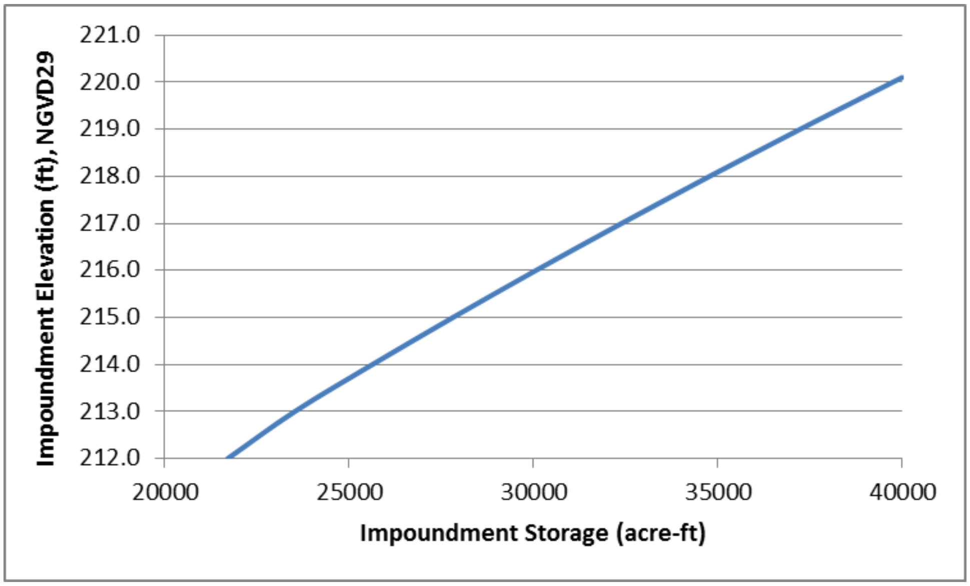


Figure B-5. Area-capacity curve.

B2.5 Hydraulic Capacity

The estimated maximum hydraulic capacity of each unit is: Unit Nos. 1–4 (each) 1,465 cfs at 35.4 ft of head; Unit Nos. 5–8 (each) 1,800 cfs at 32.0 ft of head; and Unit Nos 9–10 (each) 2,035 cfs at 36.6 ft of head. The Project maximum hydraulic capacity (calculated as the sum of each individual unit's maximum discharge capacity) is therefore 17,130 cfs.

Minimum hydraulic capacities are 400, 300, and 500 cfs for Unit Nos. 1–4, Nos. 5–8, and Nos. 9–10, respectively, for a Project minimum hydraulic capacity of 3,800 cfs.

B2.6 Tailwater Rating Curve

The Project discharges directly into the Connecticut River. Normal tailwater elevation is 184.63 ft. The tailwater curve data represent the stage discharge relationship just downstream of the dam in the Vernon tailrace. The tailwater rating values are shown in Table B-4 at Turners Falls impoundment WSE of 176 ft, and in Table B-5 at Turners Falls impoundment WSE of 185 ft. The curves are plotted in Figure B-6.

Table B-4. Tailwater rating curve (Turners Falls impoundment WSE at 176 ft NGVD29).

Tailwater Elevation (ft NGVD29)	Flow (cfs)
150.2	0
184.3	10,000
187.6	20,000
190.4	30,000
192.9	40,000
195.2	50,000
197.3	60,000
199.3	70,000
201.2	80,000
202.9	90,000
204.6	100,000
218.6	200,000
229.5	300,000
239.1	400,000

Table B-5. Tailwater rating curve (Turners Falls impoundment WSE at 185 ft NGVD29).

Tailwater Elevation (ft NGVD29)	Flow (cfs)
150.2	0
186.5	10,000
189.0	20,000
191.5	30,000
193.8	40,000
195.9	50,000
197.9	60,000
199.8	70,000
201.6	80,000
203.3	90,000
204.9	100,000
218.6	200,000
229.5	300,000
239.1	400,000

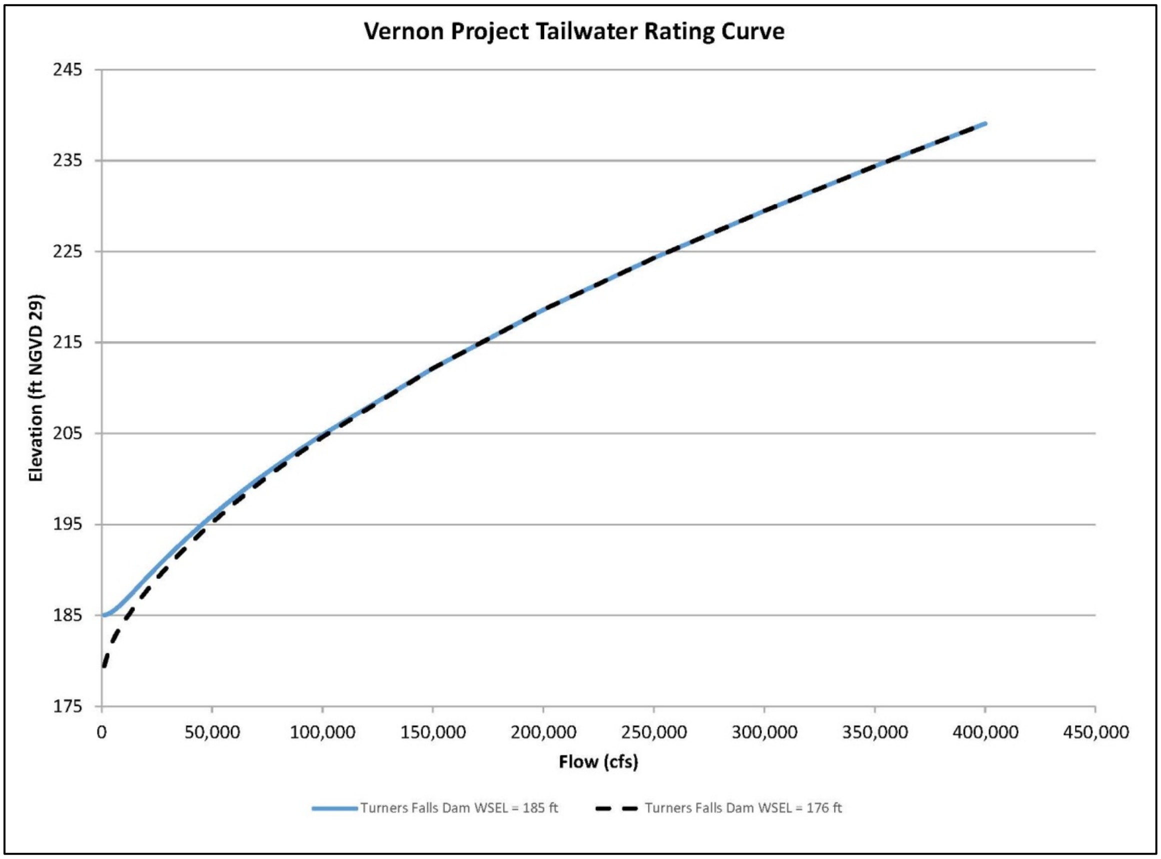


Figure B-6. Tailwater rating curve.

B2.7 Powerplant Capability

Powerplant capability is the Project's output in MW over a range of gross heads, depicted in Figure B-7.

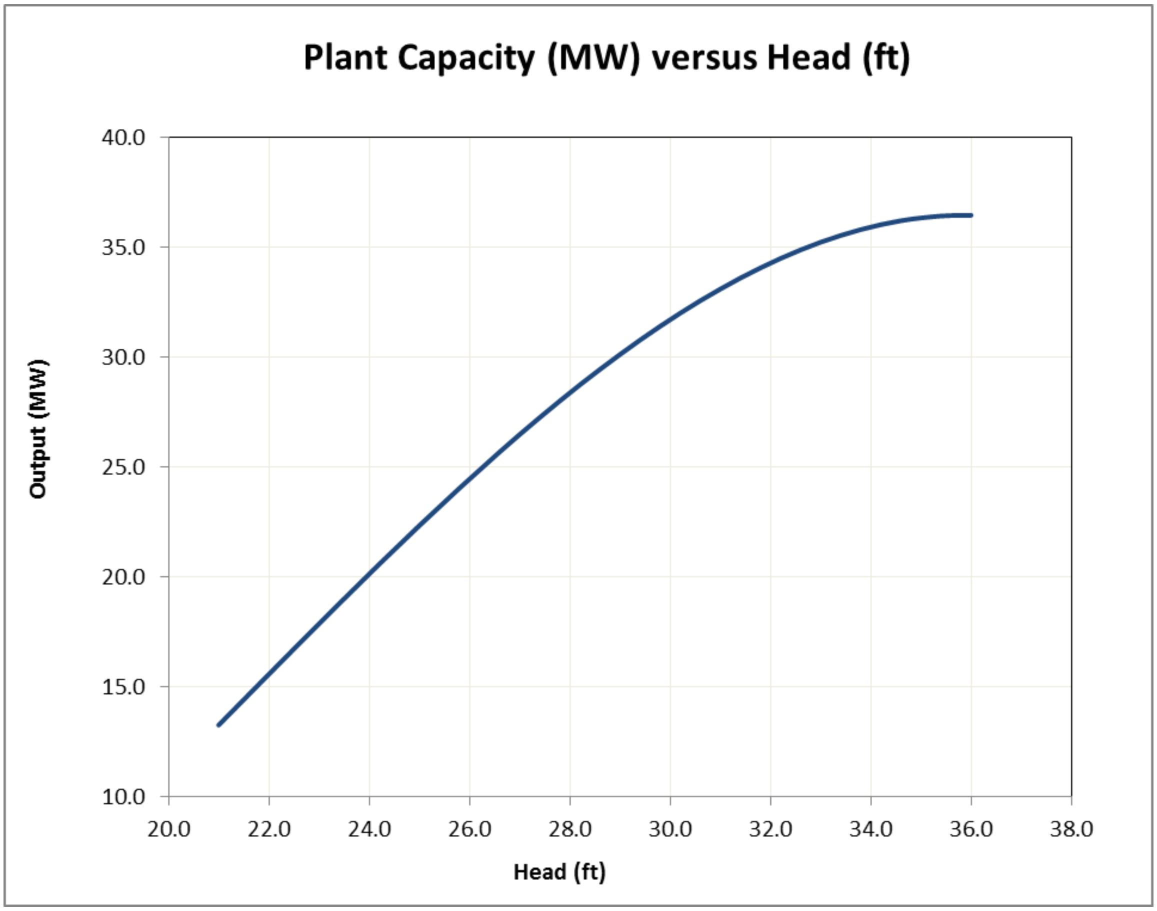


Figure B-7. Powerplant capability.

B3 Utilization of Project Power

The Project is located in the regional electric system that is operated by ISO-NE, which supplies electric power to the New England states. ISO-NE is responsible for regional grid operation, dispatch of generation, wholesale market administration, and power system analysis and planning to ensure that system reliability and adequate generation and transmission resources are available to meet regional needs. ISO-NE prepares both short- and long-term projections of electricity supply and demand. The *2016–2025 Forecast Report of Capacity, Energy, Loads, and Transmission* projects annual increases of 0.9 percent in summer peak demand, 0.6 percent in winter peak demand, and 0.8 percent in annual energy use from 2016 to 2025 (ISO-NE, 2016).

As stated in Section B2.1, the Project has the capability of producing 32.0 MW and 162,557 MWh annually, on average, to the regional power grid. The Project uses approximately 1.218 MWh annually for station service.

Over the term of the new license, the Project will continue to directly provide renewable power and can support and facilitate the further penetration of additional variable energy (wind and solar) resources into the region through reserve capacity and grid stability functionality. Project generation displaces fossil-fired generation, reduces power plant emissions, and provides substantial environmental benefit. The Projects also provide forward capacity, real-time reserves, voltage-ampere reactive (VAR) support,[1] and Renewable Energy Credits (RECs) within the ISO-NE power pool.

B4 Plans for Future Development

Great River Hydro has no specific plans for future efficiency improvements, incremental development, or re-development of the Project.

B5 Literature Cited

ISO-NE (New England Independent System Operator). 2016. ISO New England CELT report – 2016-2025 forecast report of capacity, energy loads and transmission. May 2, 2016. Available at: https://www.iso-ne.com/system-planning/system-plans-studies/celt/?document-type=CELT%20Reports&publish-date=[2016-01-01T00:00:00Z%20TO%20*. Accessed March 21, 2017.

USGS (U.S. Geological Survey). 2016. National Water Information System web page, Water data for the Nation. Available at: http://nwis.waterdata.usgs.gov/nwis. Accessed March 21, 2017.

[1] Voltage is regulated through reactive power production and consumption, and resources on the grid may be compensated for providing this reactive power capability. Voltage-ampere reactive (VAR) is the unit of measurement for reactive power.

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Final Application for New License for Major Water Power Project — Existing Dam

Vernon Project (FERC No. 1904)

EXHIBIT B: PROJECT OPERATIONS AND RESOURCE UTILIZATION

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EXHIBIT B: PROJECT OPERATIONS AND RESOURCE UTILIZATION

Section 5.18(a)(5)(iii) of Title 18 of the Code of Federal Regulations (CFR) refers to Section 4.51 (License for Major Project—Existing Dam) for a description of information that an applicant must include in Exhibit B of its license application. Exhibit B is a statement of Project operation and resource utilization.

B1 Existing and Proposed Project Operation

B1.1 Existing Project Operations

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 in order to maximize the efficient use of available water.

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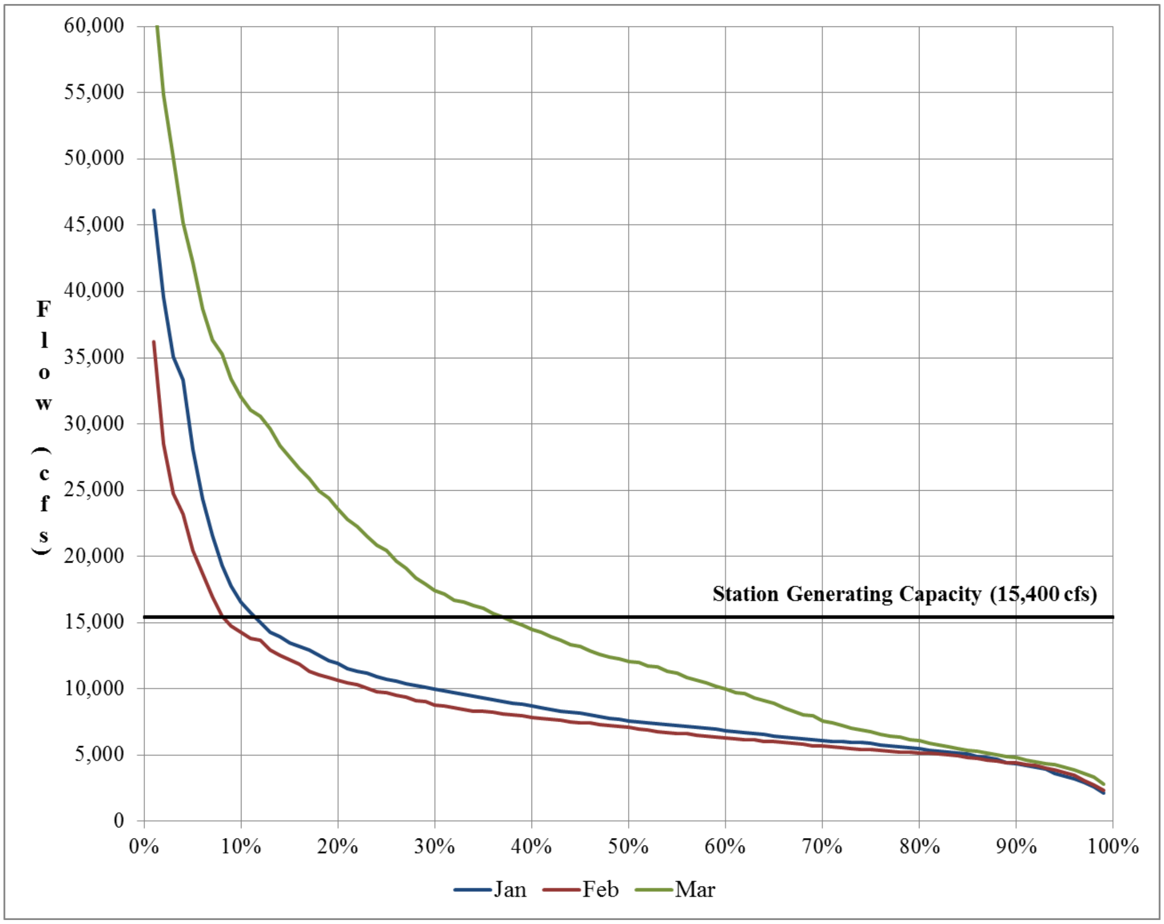
December	4,118	2001	12,063	25,972	1983

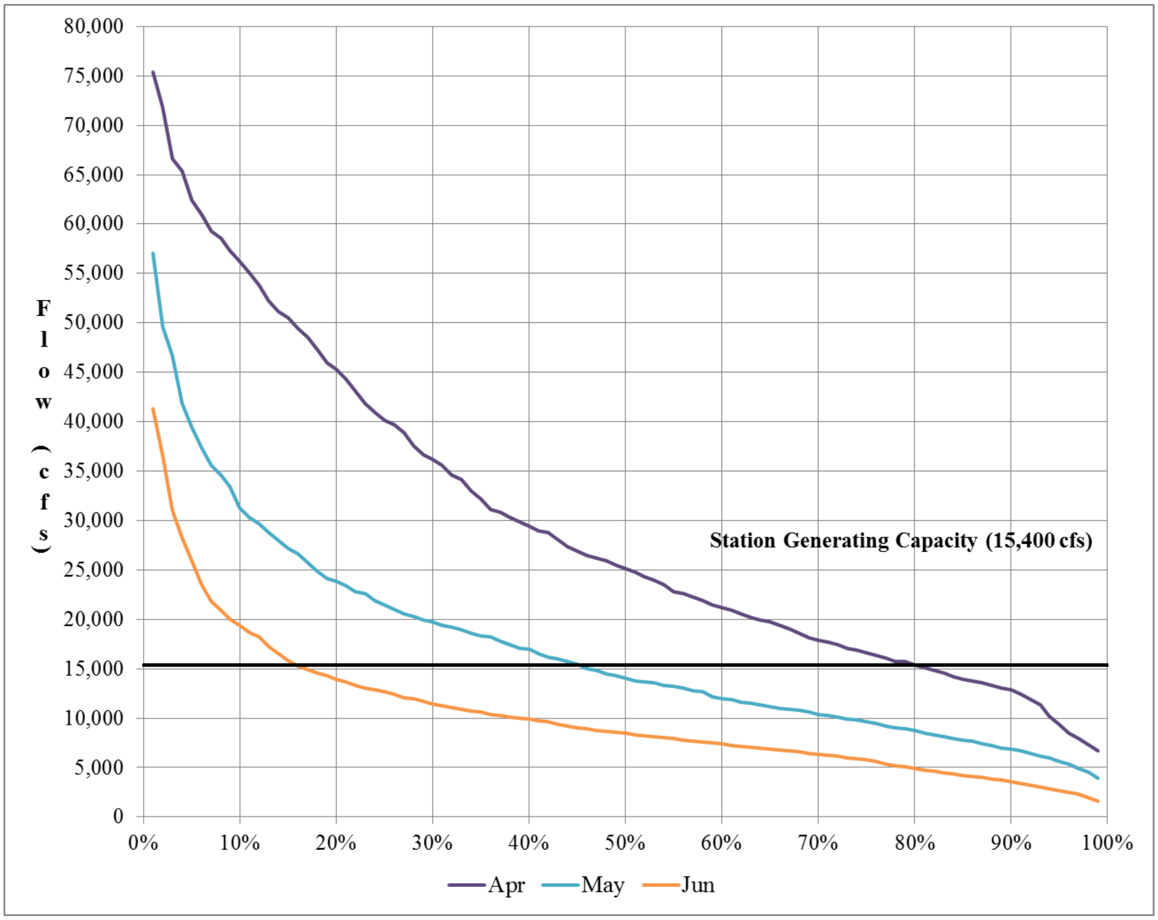
Source: USGS (2016, as modified by Great River Hydro)

Figures B-1 through B-4 provide monthly flow exceedance curves for the Vernon Project from January 1, 1979, to December 31, 2015. Data are based on U.S. Geological Survey (USGS) gage no. 01154500, Connecticut River at North Walpole, New Hampshire (subsequently referred to as the North Walpole gage), located downstream of the confluence with Saxtons River (about 2 miles downstream from Bellows Falls dam). To estimate flow at only the Vernon Project, the daily flow data from the North Walpole gage were prorated by 1.141 based on gaged DA to produce the monthly flow exceedance curves. This proration was used to account for the normally small amount of inflow from the Cold and West rivers and smaller tributaries that flow into the North Walpole gage.



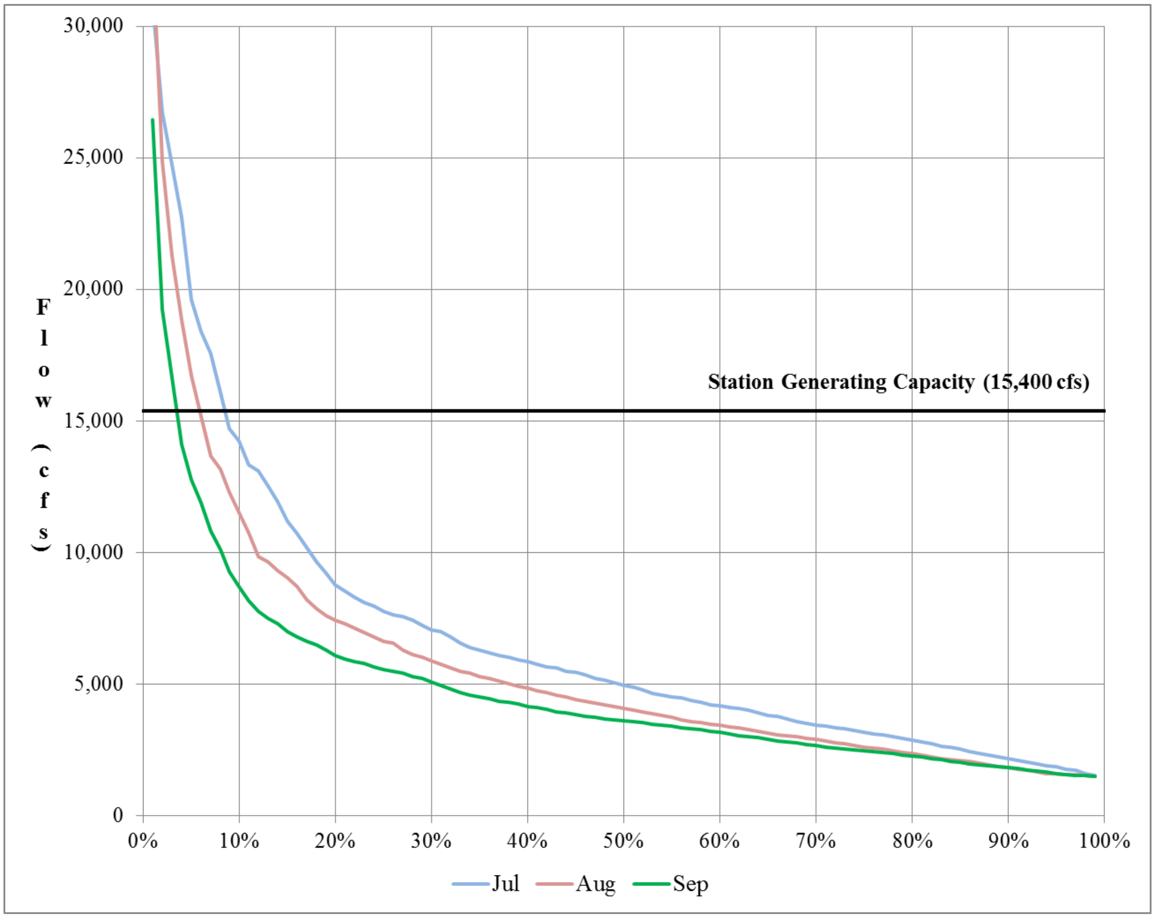
Source: USGS (2016, as modified by Great River Hydro)

Figure B-1. Flow exceedance curves, January–March (based on flow data from January 1, 1979 to December 1, 2015).



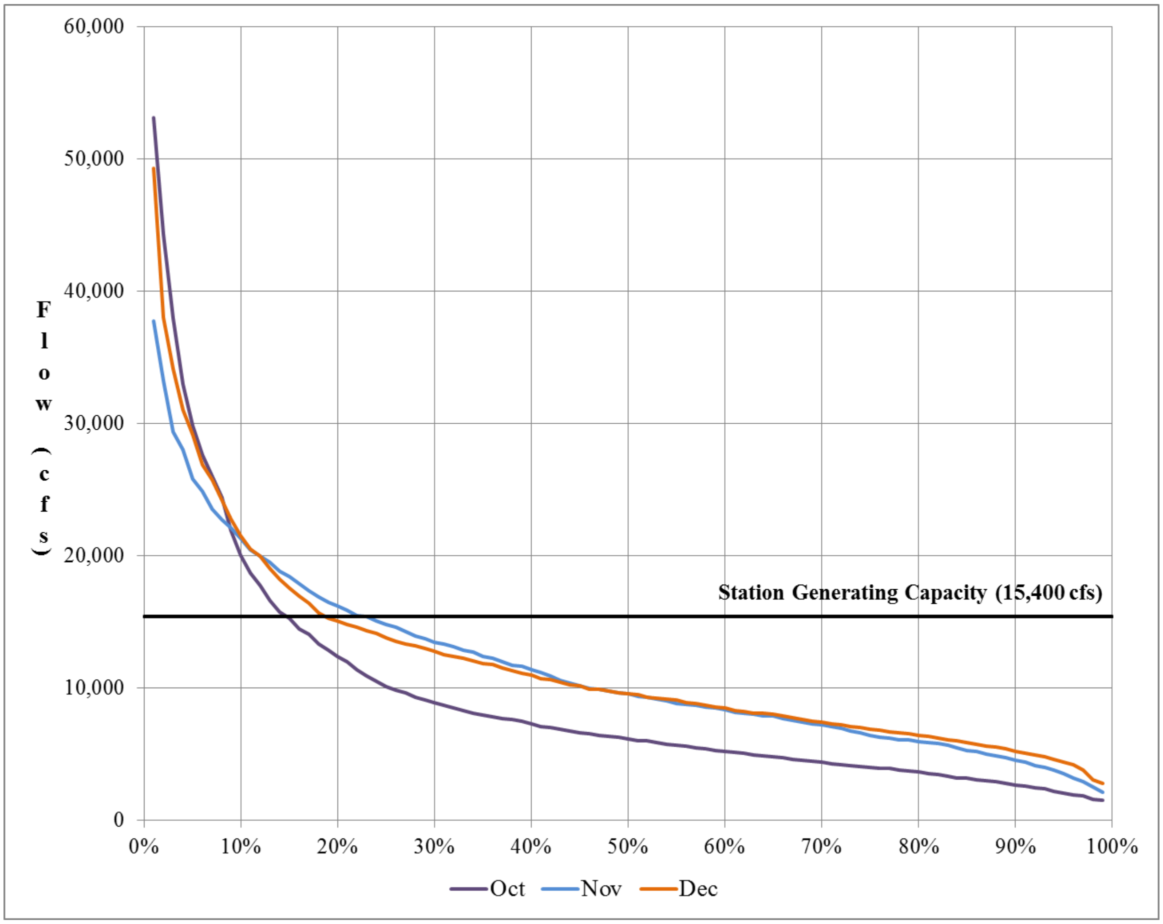
Source: USGS (2016, as modified by Great River Hydro)

Figure B-2. Flow exceedance curves, April–June (based on flow data from January 1, 1979 to December 1, 2015).



Source: USGS (2016, as modified by Great River Hydro)

Figure B-3. Flow exceedance curves, July–September (based on flow data from January 1, 1979 to December 1, 2015).



Source: USGS (2016, as modified by Great River Hydro)

Figure B-4. Flow exceedance curves, October–December (based on flow data from January 1, 1979 to December 1, 2015).

B2.4 Area-Capacity Curve

The impoundment has a surface area of 2,550 acres and a maximum total volume of about 40,000 acre-ft at El. 220.13 ft (National Geodetic Vertical Datum of 1929 [NGVD29]) 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. 212.13 ft and El. 220.13 ft providing about 18,300 acre-ft of storage in the 8-ft range. The more typical impoundment operating range under non-spill conditions is between El. 218.3 and El. 220.1 ft for usable storage capacity of 4,489 acre-ft or 24.5 percent of the overall usable storage. The stage versus storage values are shown in Table B-3 and plotted in Figure B-5.

Table B-3. Stage versus storage curve.

Elevation (ft NGVD29)	Approximate Storage (acre-ft)
212.0	21,711
213.0	23,531
214.0	25,637
215.0	27,821
216.0	30,074
217.0	32,395
218.0	34,782
219.0	37,233
220.0	39,747
220.1	40,000

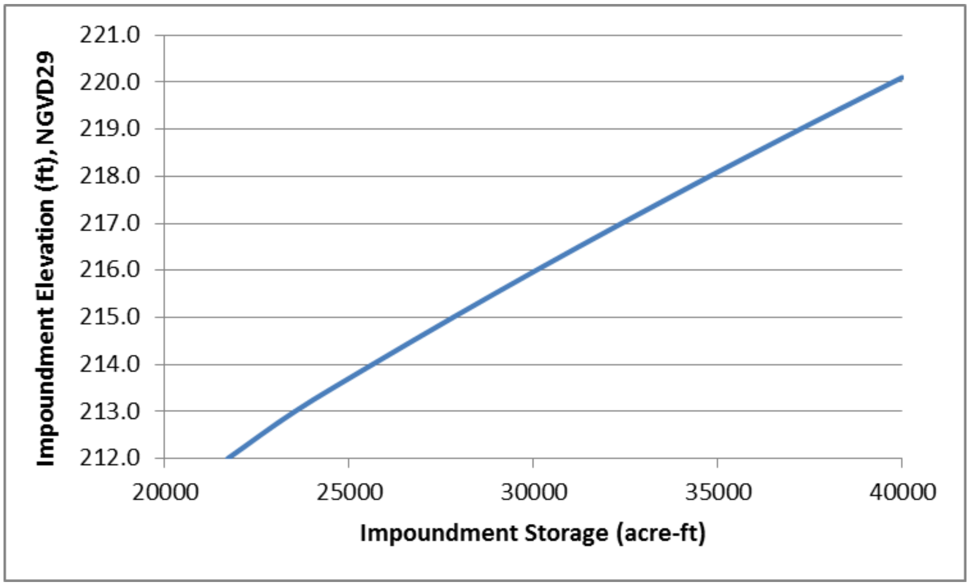


Figure B-5. Area-capacity curve.

B2.5 Hydraulic Capacity

The estimated maximum hydraulic capacity of each unit is: Unit Nos. 1–4 (each) 1,465 cfs at 35.4 ft of head; Unit Nos. 5–8 (each) 1,800 cfs at 32.0 ft of head; and Unit Nos 9–10 (each) 2,035 cfs at 36.6 ft of head. The Project maximum hydraulic capacity (calculated as the sum of each individual unit's maximum discharge capacity) is therefore 17,130 cfs.

Minimum hydraulic capacities are 400, 300, and 500 cfs for Unit Nos. 1–4, Nos. 5–8, and Nos. 9–10, respectively, for a Project minimum hydraulic capacity of 3,800 cfs.

B2.6 Tailwater Rating Curve

The Project discharges directly into the Connecticut River. Normal tailwater elevation is 184.63 ft. The tailwater curve data represent the stage discharge relationship just downstream of the dam in the Vernon tailrace. The tailwater rating values are shown in Table B-4 at Turners Falls impoundment WSE of 176 ft, and in Table B-5 at Turners Falls impoundment WSE of 185 ft. The curves are plotted in Figure B-6.

Table B-4. Tailwater rating curve (Turners Falls impoundment WSE at 176 ft NGVD29).

Tailwater Elevation (ft NGVD29)	Flow (cfs)
150.2	0
184.3	10,000
187.6	20,000
190.4	30,000
192.9	40,000
195.2	50,000
197.3	60,000
199.3	70,000
201.2	80,000
202.9	90,000
204.6	100,000
218.6	200,000
229.5	300,000
239.1	400,000

Table B-5. Tailwater rating curve (Turners Falls impoundment WSE at 185 ft NGVD29).

Tailwater Elevation (ft NGVD29)	Flow (cfs)
150.2	0
186.5	10,000
189.0	20,000
191.5	30,000
193.8	40,000
195.9	50,000
197.9	60,000
199.8	70,000
201.6	80,000
203.3	90,000
204.9	100,000
218.6	200,000
229.5	300,000
239.1	400,000

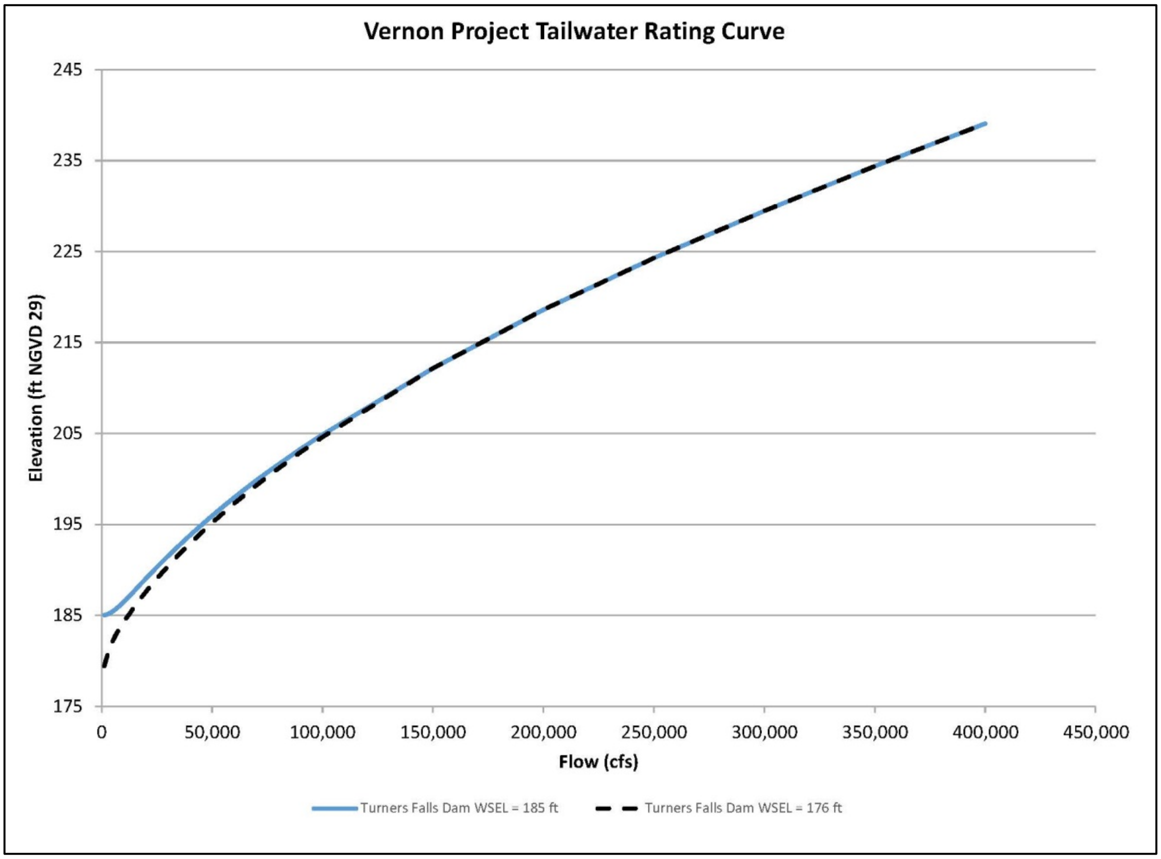


Figure B-6. Tailwater rating curve.

B2.7 Powerplant Capability

Powerplant capability is the Project's output in MW over a range of gross heads, depicted in Figure B-7.

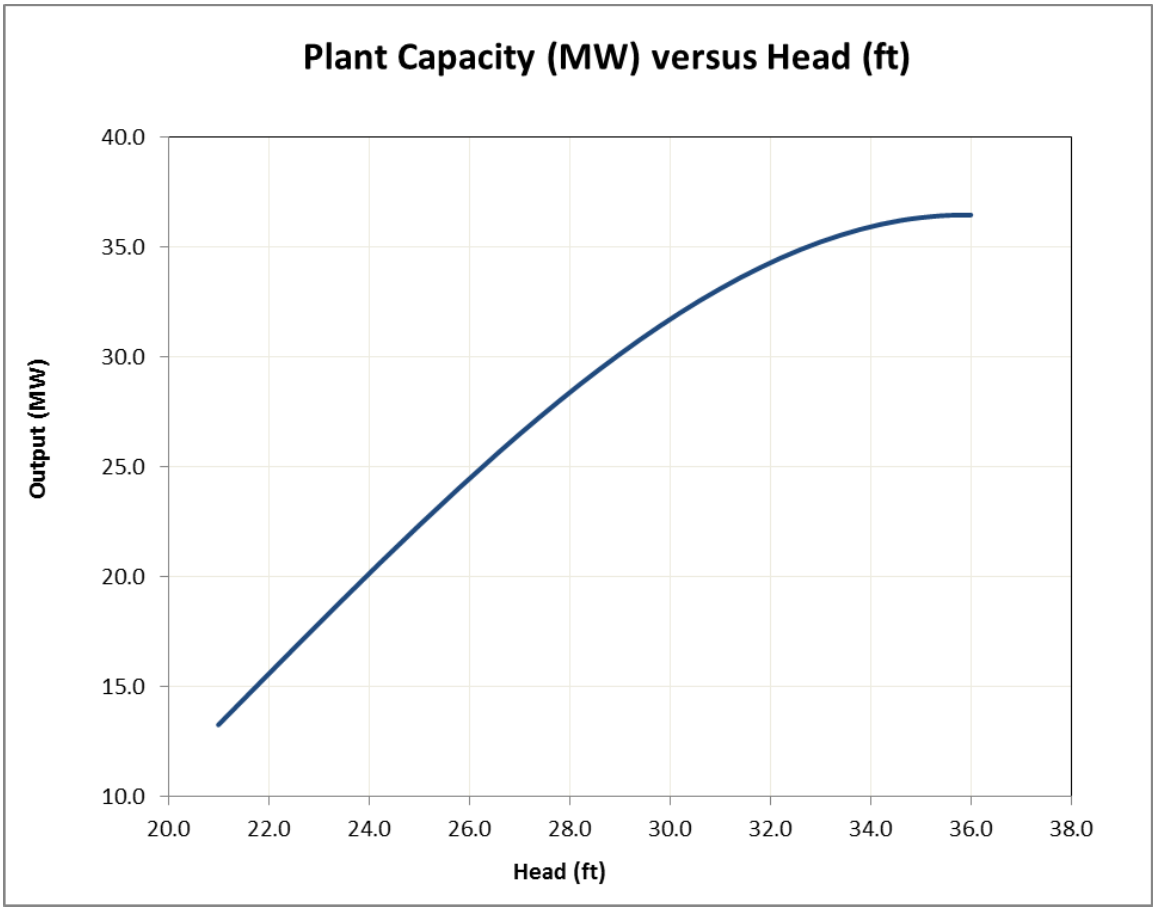


Figure B-7. Powerplant capability.

B3 Utilization of Project Power

The Project is located in the regional electric system that is operated by ISO-NE, which supplies electric power to the New England states. ISO-NE is responsible for regional grid operation, dispatch of generation, wholesale market administration, and power system analysis and planning to ensure that system reliability and adequate generation and transmission resources are available to meet regional needs. ISO-NE prepares both short- and long-term projections of electricity supply and demand. The *2016–2025 Forecast Report of Capacity, Energy, Loads, and Transmission* projects annual increases of 0.9 percent in summer peak demand, 0.6 percent in winter peak demand, and 0.8 percent in annual energy use from 2016 to 2025 (ISO-NE, 2016).

As stated in Section B2.1, the Project has the capability of producing 32.0 MW and 162,557 MWh annually, on average, to the regional power grid. The Project uses approximately 1.218 MWh annually for station service.

Over the term of the new license, the Project will continue to directly provide renewable power and can support and facilitate the further penetration of additional variable energy (wind and solar) resources into the region through reserve capacity and grid stability functionality. Project generation displaces fossil-fired generation, reduces power plant emissions, and provides substantial environmental benefit. The Projects also provide forward capacity, real-time reserves, voltage-ampere reactive (VAR) support,[1] and Renewable Energy Credits (RECs) within the ISO-NE power pool.

B4 Plans for Future Development

Great River Hydro has no specific plans for future efficiency improvements, incremental development, or re-development of the Project.

B5 Literature Cited

ISO-NE (New England Independent System Operator). 2016. ISO New England CELT report – 2016-2025 forecast report of capacity, energy loads and transmission. May 2, 2016. Available at: https://www.iso-ne.com/system-planning/system-plans-studies/celt/?document-type=CELT%20Reports&publish-date=[2016-01-01T00:00:00Z%20TO%20*. Accessed March 21, 2017.

USGS (U.S. Geological Survey). 2016. National Water Information System web page, Water data for the Nation. Available at: http://nwis.waterdata.usgs.gov/nwis. Accessed March 21, 2017.

[1] Voltage is regulated through reactive power production and consumption, and resources on the grid may be compensated for providing this reactive power capability. Voltage-ampere reactive (VAR) is the unit of measurement for reactive power.

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Final Application for New License for
Major Water Power Project — Existing Dam

Vernon Project (FERC No. 1904)

EXHIBIT C: CONSTRUCTION HISTORY AND PROPOSED CONSTRUCTION

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EXHIBIT C: CONSTRUCTION HISTORY AND PROPOSED CONSTRUCTION

Section 5.18(a)(5)(iii) of Title 18 of the Code of Federal Regulations (CFR) refers to Section 4.51 (License for Major Project—Existing Dam) for a description of information that an applicant must include in Exhibit C of its license application. Exhibit C is a construction history and proposed construction schedule for the Project.

Section 4.51(d) Exhibit C is a construction history and proposed construction schedule for the Project. The construction history and schedules must contain:

(1) If the application is for an initial license, a tabulated chronology of construction for the existing project's structures and facilities described under paragraph (b) of this section (Exhibit A), specifying for each structure or facility, to the extent possible, the actual or approximate dates (approximate dates must be identified as such) of:

> *(i) Commencement and completion of construction or installation;*
>
> *(ii) Commencement of commercial operation; and*
>
> *(iii) Any additions or modifications other than routine maintenance; and*

(2) If any new development is proposed, a proposed schedule describing the necessary work and specifying the intervals following issuance of a license when the work would be commenced and completed.

C1 Construction History

This is not an application for an initial license; however, a brief overview of the Project's construction history is provided below.

C1.1 Original Construction

The Vernon Project was originally constructed in 1909 with a powerhouse extension on the Vermont side adding two additional units (Unit Nos. 9–10) in 1925 (see Exhibit E, Section 3.10, *Cultural and Historic Resources*). The original license for the Project was issued by the Federal Power Commission (predecessor to the Federal Energy Regulatory Commission [FERC]) on March 26, 1945, and in 1955, the Project was purchased by New England Power Company. The original license expired on June 30, 1970, and the Project operated under annual licenses until the license was renewed on June 25, 1979. The license had been amended on July 31, 1970, for the use of the Project as a cooling water source for Vermont Yankee located just upstream.

C1.2 Modifications/Additions to the Project

On October 5, 1978, FERC approved a Settlement Agreement concerning fish passage facilities for Atlantic Salmon at the upstream Wilder Project (No. 1892) and Bellows Falls Project (No. 1855), and for Atlantic Salmon and American Shad at the Vernon Project. The settlement was executed on December 30, 1977, among the Licensee; the States of Massachusetts, Connecticut, New Hampshire, and Vermont; U.S. Fish and Wildlife Service; and four non-governmental organizations (the Environmental Defense Fund; the Massachusetts Public Interest Research Group, Inc.; For Land's Sake; and Trout Unlimited). The settlement called for staged design, construction, and operation of passage facilities at the three Projects; Vernon's construction was the first in the series. The upstream fish ladder was subsequently completed and operation began in 1981.

In 1986, a major reconstruction of the spillway crest water control mechanisms was completed and included the addition of a trash sluice (skimmer) gate, six tainter gates, and two 50-foot bays of hydraulic panels in the spillway section, and a vehicle-accessible metal grid deck was added for access to the gates and spillway improvements. A new trashrack raking system was constructed along the powerhouse forebay at that time.

On July 26, 1990, the Licensee entered into a Memorandum of Agreement with the Connecticut River Atlantic Salmon Commission for permanent downstream fish passage facilities for the Wilder, Bellows Falls, and Vernon Projects. Downstream passage facilities at Vernon were constructed in 1995 and consist of a 250-cubic feet per second (cfs) "fish pipe" and louver array, as well as a 40-cfs "fish bypass" (also known as a "fish tube") (see Exhibit A.5, *Fish Passage Facilities*).

On June 12, 1992, FERC issued an order amending the license for the proposed replacement of four existing 2.0-megawatt (MW) turbine generating units (Units Nos. 5 through 8) with two 14.0-MW turbine generating units (Unit Nos. 11 and 12). As required by Article 403 of the 1992 license amendment, downstream fish passage facilities at the Project were completed in 1995. After several extensions, the license was further amended on July 28, 2006, authorizing the replacement of the original 2.0-MW Unit Nos. 5–8 with four new 4.0-MW units. The redevelopment of Units 5–8 was completed and the units were commissioned in 2008.

On February 27, 1998, FERC approved the transfer of the license from New England Power Company to USGen New England, Inc.

Under a multi-license amendment dated November 19, 1998, regional electrical transmission facilities were removed from the Project including step-up transformers and switchyards. At that time, the powerhouse was automated and began operations via remote control from a consolidated hydro operations center in Wilder, Vermont.

On January 24, 2005, FERC approved the transfer of the license to TransCanada Hydro Northeast Inc.

Under a Purchase and Sale Agreement, dated November 1, 2016, Great River Hydro NE, LLC agreed to acquire all of the equity interests in TransCanada Hydro Northeast Inc. On January 10, 2017 FERC authorized the transaction under Section 203(a)(1)(A) of the Federal Power Act (158 FERC ¶62,019). In furtherance of the acquisition, the licensee was converted to a limited liability company. Accordingly, the licensee applied for FERC approval to transfer the licenses for Project Nos. 1855 (Bellows Falls), 1892 (Wilder), 1904 (Wilder), 2077 (Fifteen Mile Falls) and 2323 (Deerfield River) from TransCanada Hydro Northeast Inc. to TransCanada Hydro Northeast LLC. On February 22, 2017, FERC approved the transfer of the licenses to TransCanada Hydro Northeast LLC, pending submittal of evidence of the conversion and the signed acceptance sheet (158 FERC ¶62,119). On April 18, 2017, TransCanada Hydro Northeast LLC filed the acceptance sheet and evidence of the conversion as required by the February 22, 2017 Order. The transaction closed on April 19, 2017.

On April 19, 2017, TransCanada Hydro Northeast LLC was renamed Great River Hydro, LLC and provided written notice of the name change to FERC by filing dated April 24, 2017 so that FERC could revise its records to accurately reflect the name change of the licensee of the Project as Great River Hydro, LLC.

C2 Schedule for Proposed Project Development

Great River Hydro is not proposing any new construction or new development at the Vernon Project at this time.

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Final Application for New License for
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Vernon Project (FERC No. 1904)

EXHIBIT D: STATEMENT OF PROJECT COSTS AND FINANCING

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EXHIBIT D: PROJECT OPERATIONS AND RESOURCE UTILIZATION

Section 5.18(a)(5)(iii) of Title 18 of the Code of Federal Regulations (CFR) refers to Section 4.51 (License for Major Project—Existing Dam) for a description of information that an applicant must include in Exhibit D. Exhibit D is a statement of costs and financing.

D1 Original Cost of the Existing Project

The Vernon Project was previously licensed in 1979, and this Application is for a new license rather than initial license. Federal Energy Regulatory Commission (FERC) regulations at 18 C.F.R. § 4.51(e)(1) do not require a statement of costs of lands, water rights, structures, or facilities in applications for new licenses.

D2 Amount Payable in the Event of Project Takeover

Section 14 of the Federal Power Act (FPA) reserves to the United States the right to take over a non-publically owned project upon expiration of its license. To date, no agency or interested party has recommended a federal takeover of the Vernon Project. If such a takeover were to occur, Great River Hydro, LLC (Great River Hydro), would be entitled to be reimbursed for its net investment, not to exceed the fair value, of the property taken, plus severance damages suffered (16 United States Code [U.S.C.] § 807). However, the information required by FERC's regulations (18 C.F.R. 4.51(e)(2)) that would be needed to quantify the compensation to be paid to Great River Hydro pursuant to Section 14 is provided below.

D2.1 Fair Value

The FPA does not define the term "fair value"; however, for the purpose of this Application, Great River Hydro will rely upon a historical cost basis (not depreciated) as of December 31, 2016, of $108,502,000 as the estimate of fair market value of the Vernon Project.

D2.2 Net Investment

The FPA generally defines a Licensee's net investment in a project as the original cost of the project, plus additions and betterments, minus depreciation and other amounts (16 U.S.C. § 796(13)). For the purpose of this Application, net investment is represented as the net book value of the Vernon Project, equal to $84,394,000 as of December 31, 2016.

D2.3 Severance Damages

Under Section 14 of the FPA (16 USC § 807(a)) "severance damages" are those "reasonable damages, if any, to property of the licensee valuable, serviceable, and [which is then] dependent [for its usefulness upon the continuance of the license] but not taken" in the event of a federal takeover. All Project structures, facilities, equipment, and contractual obligations or requirements are required for the successful operation of the Vernon Project; therefore, Great River Hydro estimates that there would not be any severance damages.

D3 Estimated Capital Cost of New Development

Great River Hydro has no plans for future development of the Vernon Project.

D4 Estimated Average Annual Cost of the Project

This section describes the estimated annual costs of the Vernon Project. The estimated average annual cost of the total Project (in 2017 dollars) is approximately $7,327,917 based on a 30-year period of analysis. The average annual cost of the Project as proposed includes the annualized values of capital costs, taxes, depreciation and amortization, operations and maintenance costs, as well as capital and operations and maintenance costs associated with proposed protection, mitigation, and enhancement (PM&E) measures. Capital costs also include life cycle costs over the course of a 30-year analysis such as runner replacements, generator rewinds, and oil circuit breaker replacements and routine replacement of vehicles and tools. Under the no-action alternative and Great River Hydro's proposed action, the Vernon Project will continue to operate as it currently operates. Because Great River Hydro is not proposing any new PM&E measures at this time, no capital or O&M costs for proposed PM&E measures are included.

D4.1 Cost of Capital

The estimated average annual capital costs for the Vernon Project as currently proposed is $1,800,000 per year. This cost includes life cycle costs such as runner replacements, generator rewinds, and oil circuit breaker replacements and routine replacement of vehicles and tools.

D4.2 Local, State, and Federal Taxes

As a limited liability company, income tax liabilities associated with Great River Hydro are passed through to the owners. Therefore, no state or federal taxes are listed in this section. Property taxes for the Vernon Project are paid to the local municipalities. Property taxes are estimated to be $2,930,000 for 2017.

D4.3 Depreciation or Amortization

For the purpose of this Application, financial depreciation for the Vernon Project, as for all Great River Hydro generating assets, is assumed to be straight-line over a 30-year period of analysis. Estimated 2017 depreciation expenses are $1,107,335.

D4.4 Operation and Maintenance Expenses

The estimated annual operation and maintenance expense for 2017 at the Vernon Project is approximately $1,490,582. This cost is based on estimates developed by Great River Hydro, and historical TransCanada expenses associated with the Project. These costs do not include estimated operations and maintenance costs associated with potential alternatives other than Great River Hydro's current proposal.

D5 Estimated Annual Value of Project Power

Project energy is sold into the New England Independent System Operator (ISO-NE) regional market on a day-ahead and real-time basis at the prices that clear for each generating facility. Capacity commitments are priced through a regional Forward Capacity Auction process. The Vernon Project also receives revenue for providing ancillary services to the regional system. Table D-1 summarizes estimated revenues from energy production, capacity, and ancillary services based on 2016 prices and 10-year average generation. The total estimated annual valuation of Project power is $9,193,091 or $56.55/megawatt-hour (MWh).

Table D-1. Valuation of annual Project output.

Revenue Source	Value
On-peak Energy	$2,680,181
Off-peak Energy	$2,264,803
Forward capacity	$1,953,600
Real-time reserves	$259,478
Volt-ampere-reactive support	$15,029
Renewable energy credits	$2,020,000
Total value	$9,193,091
Total value per MWh	$56.55/MWh

D6 Sources and Extent of Financing and Annual Revenues

Capital projects are financed using cash flow from operations and as necessary, additional debt obligations or equity injections. Based on the value of Project power described in Section D5, the Vernon Project will have adequate financial resources to meet the costs of operations for the term of the new license.

D7 Estimated Cost to Develop License Application

Because additional analysis based on recently filed study reports is likely, it is anticipated that an amended Final License Application (FLA) will be prepared. The revised estimated cost to develop the Vernon Project License Application, including those costs is approximately $4,300,000.

D8 On-peak and Off-peak Value of Project Power

The average annual price in for on-peak Vernon Project power is estimated as $35.66/MWh. The real-time off-peak price is estimated as $25.18/MWh. Prices are annual average, location-specific prices from ISO-NE at Node 599 based on the full 2016 calendar year and are anticipated to be reasonably reflective of 2017 prices. Pricing nodes are specific locations on the transmission system for which the ISO-NE calculates and publishes wholesale electricity prices. Each is related to one or more of the power grid's electrical buses—specific components at which generators, loads, or the transmission system are connected. This location-specific pricing helps give market participants a clear and accurate signal of the price of electricity at every location on the grid.

D9 Estimated Average Annual Change in Project Generation and Value of Project Power Due to Changes in Project Operation

Great River Hydro is not proposing any changes in Vernon Project operation at this time, therefore, project generation and the value of Project power will not change. Project generation and value of power could change under an amended FLA in which potential alternatives to the current Great River Hydro proposal may be presented.

Final Application for New License for Major Water Power Project — Existing Dam

Vernon Project (FERC No. 1904)

EXHIBIT F: GENERAL DESIGN DRAWINGS AND SUPPORTING DESIGN REPORT (PUBLIC VERSION)

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EXHIBIT F: GENERAL DESIGN DRAWINGS

Section 5.18(a)(5)(iii) of Title 18 of the Code of Federal Regulations (CFR) refers to Section 4.51 (License for Major Project—Existing Dam) for a description of information that an applicant must include in Exhibit F of its license application. Exhibit F consists of general design drawings of the principal project works described under section 4.41(b) (Exhibit A) and supporting information used to demonstrate that existing project structures are safe and adequate to fulfill their stated functions.

F1 General Design Drawings for Existing Project Features

Exhibit F consists of general design drawings of the principal Project works. These Exhibit F design drawings are filed separately in the final license application, and Great River Hydro LLC (Great River Hydro), requests that they be treated as Critical Energy Infrastructure Information (CEII) under Federal Energy Regulatory Commission (FERC) regulations at 18 CFR § 388.112.

Only the list of general design drawings is included in this public version of Exhibit F.

Table F1-1. List of general design drawings.

Exhibit No.	Sheet No.	Title
F-1	Sheet 1F	General Layout of Plant
F-2	Sheet 2E	Details of Spillway
F-3	Sheet 3F	Powerhouse & Switchyard
F-4	Sheet 4D	Section of Powerhouse Units 1-4
F-5	Sheet 5E	Section of Powerhouse Unit 6 & 7
F-6	Sheet 6D	Section of Powerhouse Units 9-10
F-7	Sheet 7A	Section of Powerhouse Units 5 & 8
F-8	Sheet 8A	Section of Powerhouse at Removal Shaft
F-9	Sheet 9A	Fish Ladder General Plan
F-10	Sheet 10A	Fish Ladder Sections
F-11	Sheet 11A	Fish Ladder Sections
F-12	Sheet 12A	Fish Passage Facilities: Downstream Fish Migration General Arrangement
F-13	Sheet 13A	Fish Passage Facilities: Downstream Fish Migration Fish Diversion Boom Details
F-14	Sheet 14A	Fish Passage Facilities: Downstream Fish Migration Fish Diversion Boom Details
F-15	Sheet 15A	Fish Passage Facilities: Downstream Fish Migration Fish Diversion Boom Details
F-16	Sheet 16A	Fish Passage Facilities: Downstream Fish Migration Trash Sluice Exit - Plan & Sections

F2 Supporting Design Report

Sections 4.41(g)(3)and (4) require that an applicant file with FERC two copies of a Supporting Design Report when the applicant files a license application. The purpose of the Supporting Design Report is to demonstrate that existing and proposed structures are safe and adequate to fulfill their stated functions.

Great River Hydro hereby requests waiver of the Commission's requirement to include a Supporting Design Report in Section F-3 of Exhibit F (18 CFR § 4.41(g)(3)) because the most recent (6^{th}) Part 12 Independent Dam Safety Inspection Report (filed November 9, 1992) fulfills the requirements of the regulations for filing a Supporting Design Report as part of the application for new license. All of the Project's Independent Dam Safety Inspection Reports are on file with FERC. On August 8, 1997 FERC granted an exemption from future Part 12 inspections based on an assessment and documentation provided to FERC demonstrating that the Vernon Project has low hazard potential.

Final Application for New License for
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EXHIBIT G: PROJECT AREA MAPS

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EXHIBIT G: MAPS OF LOCATION, BOUNDARY, FEDERAL LANDS, AND NONFEDERAL LAND OWNERSHIP

Section 5.18(a)(5)(iii) of Title 18 of the Code of Federal Regulations (CFR) refers to Section 4.51 (License for Major Project—Existing Dam) for a description of information that an applicant must include in Exhibit G of its license application. Exhibit G contains a set of Project maps that conform to requirements stated in Section 4.39.

G1 Project Area Maps

Exhibit G drawings are maps of the Project area showing the existing FERC Project boundary for the current license. No tentative boundary is indicated because there are no proposed developments and there are no other adjustments to the boundary.

G1.1 Federal Lands

No federal lands are located within the Project boundary.

G1.2 Non-Federal Lands

The Exhibit G drawings identify lands that Great River Hydro, LLC (Great River Hydro), owns in fee, and lands over which Great River Hydro has acquired, or plans to acquire rights to occupancy and use other than fee title, including rights acquired or to be acquired by easement or lease. These drawings are electronically filed separately as large format documents and Project boundary files as ArcGIS files (in zipfile format).

G2 Exhibit G Drawings

The Exhibit G maps and Project boundary description tables are identified as shown in Table G2.1.

Table G2-1. Exhibit G drawings.

Exhibit No.	Sheet No.	Title
G-1	Sheet 1	Exhibit G: Vernon Project – No. 1904 (Plant Area)
G-2	Sheet 2	Exhibit G: Vernon Project – No. 1904 (Project Boundary Sheet)
G-3	Sheet 3	Exhibit G: Vernon Project – No. 1904 (Project Boundary Sheet)
G-4	Sheet 4	Exhibit G: Vernon Project – No. 1904 (Project Boundary Sheet)
G-5	Sheet 5	Exhibit G: Vernon Project – No. 1904 (Project Boundary Sheet)
G-6	Sheet 6	Exhibit G: Vernon Project – No. 1904 (Project Boundary Sheet)
G-7	Sheet 7	Exhibit G: Vernon Project – No. 1904 (Project Boundary Sheet)

Exhibit No.	Sheet No.	Title
G-8	Sheet 8	Exhibit G: Vernon Project – No. 1904 (Project Boundary Sheet)
G-9	Sheet 9	Exhibit G: Vernon Project – No. 1904 (Project Boundary Sheet)
G-10	Sheet 10	Exhibit G: Vernon Project – No. 1904 (Project Boundary Sheet)
G-11	Sheet 11	Exhibit G: Vernon Project – No. 1904 (Project Boundary Sheet)
G-12	Sheet 12	Exhibit G: Vernon Project – No. 1904 (Project Boundary Sheet)
G-13	Sheet 13	Exhibit G: Vernon Project – No. 1904 (Project Boundary Sheet)
G-14	Sheet 14	Exhibit G: Vernon Project – No. 1904 (Project Boundary Sheet)
G-15	Sheet 15	Exhibit G: Vernon Project – No. 1904 (Project Boundary Sheet)
G-16	Sheet 16	Exhibit G: Vernon Project – No. 1904 (Project Boundary Sheet)
G-17	Sheet 17	Exhibit G: Vernon Project – No. 1904 (Project Boundary Sheet)
G-18	Sheet 18	Exhibit G: Vernon Project – No. 1904 (Project Boundary Sheet)
G-19	Pages 1-4	Vernon Project, P-1904 - Project Boundary Description table

Final Application for New License for
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Vernon Project (FERC No. 1904)

EXHIBIT H: PLANS AND ABILITY OF APPLICANT TO OPERATE PROJECT EFFICIENTLY FOR RELICENSE

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LIST OF FIGURES

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EXHIBIT H: PLANS AND ABILITY OF APPLICANT TO OPERATE PROJECT EFFICIENTLY FOR RELICENSE

Section 5.18(a)(5)(iii) of Title 18 of the Code of Federal Regulations (CFR) describes information that an applicant for a new license (License for Major Project—Existing Dam) must include in Exhibit H of its license application. Exhibit H contains the miscellaneous information specified in the regulation.

H1 Efficiency and Reliability

The purpose of the Vernon Project is to generate power and ancillary services for sale to the wholesale electric power market. Great River Hydro has a long-term commitment to maximizing the hydroelectric power on the Connecticut River. While seeking to maximize power production, Great River Hydro also has a long-term commitment to preserving the environmental resources of the area. Great River Hydro believes that continued operation of the Vernon Project maximizes the public benefit provided by the Project.

Great River Hydro has operated the Vernon Project since the [former]licensee, TransCanada Hydro Northeast LLC was acquired by Great River Hydro NE, LLC on April 19, 2017 as explained in the cover letter accompanying this application. All of the management and operating personnel of the prior licensee have continued with Great River Hydro. Great River Hydro personnel have decades of experience operating these and other hydroelectric assets in the United States.

H1.1 Increase in Capacity or Generation

No additional capacity or generation for the Vernon Project is proposed.

H1.2 Project Coordination with Other Water Resources Projects

Operation of the Vernon Project is coordinated with other Great River Hydro hydroelectric generating facilities on the Connecticut River, taking into consideration variations in demand for electricity, natural flow variations, intermediate tributary inflow, federal flood control projects and travel time for dispatched flows between hydro projects to maximize the efficient use of available water. Estimated and anticipated inflow forms the basis for bidding into the New England Independent System Operator's (ISO-NE) day-ahead energy market. Day-ahead hourly bids reflect must-run generation periods associated with minimum flow periods; periods when sustained higher flows are anticipated; and opportunistic generation when inflow and available storage allows response to anticipated high electricity demand. When inflows are less than maximum generating capacity, Great River Hydro uses the limited impoundment storage at the Project to dispatch generation as required to meet the generation schedule managed by the ISO-NE. Generation can vary during the course of any day between the required minimum flow and full generating capacity, if flows are available. Over the course of a day, the Project generally passes the average daily inflow. During periods of sustained high flows, Great River Hydro dispatches Project generation in a must-run status to use available water for generation. Once flows exceed powerhouse capacity, it operates the Project in a “river profile” manner. Communication with downstream hydro projects and upstream tributary flood control projects facilitates coordination among all parties when managing for flood flows. Great River Hydro is proposing to continue the current mode of operation.

Great River Hydro facilitates flow and real-time operations information with the operators of the downstream Turners Falls Project, owned and operated by FirstLight. Article 304 of the Vernon license requires Great River Hydro to coordinate Project operations with FirstLight. A letter Agreement amending the original 1993 Headwater Benefit Agreement was filed with FERC on June 20, 2003. The Agreement requires Great River Hydro to provide to FirstLight by 10:00 am each day, an estimate of total discharge (cfs-hours) expected the next day at the Vernon Project. As soon as Great River Hydro receives the hourly dispatch schedule for the next day from ISO-New England (ISO-NE), it faxes or emails the schedule for Vernon discharges to FirstLight. Typically this occurs between 1:30 pm and 2:00 pm. If any subsequent dispatch schedules are received during the day showing changes in the projected hourly release schedules, the revised schedule for Vernon is faxed or emailed to FirstLight.

FirstLight has stated in its Final License Application, filed April 20, 2016: “Not having reliable and timely estimates of Vernon’s hourly release schedule the day ahead prevents FirstLight from the most efficient management of the TFI [Turners Falls impoundment] for power production.” Great River Hydro disagrees with this statement. Article 304 does not require coordination to ensure FirstLight efficiently manages the Turners Falls impoundment, as efficient management is largely a function of FirstLight’s own coordinated operation of the impoundment that serves two purposes: as the impoundment for the Turners Falls Project and as the lower reservoir for the Northfield Mountain Pumped Storage Project (NMPS). Great River Hydro provides an estimate of total inflow from Vernon early in the day ahead to allow for FirstLight to plan and manage its operations and consider the quantity of inflow it will receive in order to participate in the ISO-NE day ahead energy market, as well as to schedule generation or pumping at NMPS. FirstLight has sufficient operational capability to manage reservoir operations at both Turners Falls and NMPS to accommodate the estimated inflow. Promptly after receiving the hourly dispatch schedule for the next day from ISO-NE, Great River Hydro provides the schedule for Vernon discharges to FirstLight. No other information is available to distribute to FirstLight beyond the ISO-NE schedule. Sharing pre-bid flow or generation forecast information with another wholesale generator participating in the same market is illegal. If flow conditions change, or the ISO-NE dispatch schedule changes, Great River Hydro immediately notifies FirstLight. Lastly, as per the Agreement, FirstLight maintains real-time Vernon tailrace water level monitoring equipment and has the capability to determine precisely what is occurring at Vernon in real time.

With this information, together with their project operations data (unseen by Great River Hydro), FirstLight has the capability to determine Vernon discharge. FirstLight can verify their calculations as Great River Hydro publishes discharge flow information from Vernon, as well as the upstream projects owned by Great River Hydro, in real-time at www.h2Oline.com. Furthermore, Great River Hydro has published travel times for flows between its upstream projects. Great River Hydro estimates the travel time for discharges from Vernon to reach Turners Falls dam to be approximately 4 hours. Collectively, this flow information provides ample flow information for FirstLight to plan, manage, and operate their projects in a coordinated manner as required under Article 304. Therefore it is Great River Hydro's position that: 1) Great River Hydro is in full compliance with the Agreement filed with the Commission on June 20, 2003; and 2) Great River Hydro provides or facilitates the availability of sufficient anticipated dispatch schedule information, real-time flow, and tailrace information such that FirstLight can, should it choose to, operate their projects in an efficient and coordinated manner with the upstream hydro projects. To the extent that FirstLight seeks additional provisions, the need for such provisions is not a matter of flow and operational coordination but perhaps economic optimization, which is not material to, nor the purpose of, Article 304 in the Vernon license.

H1.3 Project Coordination with Other Electric Systems

All power generated by the Vernon Project is sold into the wholesale electric power market. The coordination and dispatch of the power is controlled by the ISO-NE of the New England Power Pool (NEPOOL) based upon the prices offered to the market and the demands for services.

With industry restructuring and in response to the Federal Energy Regulatory Commission's (FERC) open access requirements in Order No. 888, NEPOOL has undertaken certain reforms. A key element of this reform is the transfer of control over the region's transmission grid to an ISO that is responsible for the operation of the NEPOOL Control Area in addition to the administration of the new competitive wholesale electric markets. As the power pool operator, ISO-NE directs and coordinates the operation of virtually all of the region's major generation and transmission facilities to meet the operating rules and criteria of the North American Reliability Council. Peaking hydropower operations are particularly important to two ancillary services important to reliability: load following and system protection.

H2 Licensee's Need for the Project

Great River Hydro does not directly use Vernon Project output. Project output is sold into the wholesale electric power market.

The Vernon Project is located in the regional electric system that is operated by the ISO-NE and that supplies electric power to the New England states. ISO-NE is responsible for regional grid operation and dispatch of generation, wholesale market administration, and power system analysis and planning to ensure system reliability and adequate generation and transmission resources to meet regional needs. ISO-NE prepares both short- and long-term projections of electricity supply and demand. The 2016–2025 Forecast Report of Capacity, Energy, Loads, and Transmission projects annual increases of 0.9 percent in summer peak demand, 0.6 percent in winter peak demand, and 0.8 percent in annual energy use from 2016 to 2025 (ISO-NE, 2016).

The Vernon Project provides 32,400 kilowatts (kW) of authorized capacity and on average 162,557 annual megawatt-hours (MWh) to the regional power grid, 88,118 MWh during peak hours and 79,439 MWh during off-peak hours. In New England, peak hours are defined as the hours between 7:00 a.m. and 11:00 pm on non-holiday weekdays. Off-peak hours in New England are weekday hours between 11:00 p.m. and 7:00 a.m., all day Saturdays, Sundays, and six holidays of January 1st, Memorial Day, July 4th, Labor Day, Thanksgiving, and Christmas. Over the term of the new license, the Project will continue to provide renewable power and support variable energy resources (VERs) through reserve capacity, thereby displacing fossil-fired generation and reducing power plant emissions by over 90,000 tons of CO_2 that otherwise would be emitted from a natural gas generating station and thus creating an environmental benefit. The Project also provides forward capacity, real-time reserves, voltage-ampere reactive (VAR) support[1] and Renewable Energy Credits (RECs) within the ISO-NE power pool.

The New England regional electric system is experiencing an increased penetration of VERs into the energy mix. These resources are by definition variable and can affect real-time power supply and grid stability. Vernon Project's capacity to provide reserved capacity and ancillary services such as real-time reserves and VAR support is both complementary to existing VER's but can facilitate greater penetration of these resources into the energy mix. Emerging energy markets such as "firm renewable energy" or expansion of ancillary services will undoubtedly develop over the course of a new license in response to this changing and presently undefined energy landscape. Therefore, maintaining the flexibility and capability to provide these necessary and complementary hydropower benefits is strategically important to ensuring further VER development in the region.

H2.1 Costs and Availability of Alternative Sources of Power

Great River Hydro does not directly use Vernon Project output. Project output is sold into the wholesale electric power market. Great River Hydro does not have retail or wholesale customers that rely on Project output.

H2.2 Effects of Alternative Sources of Power

If the Vernon Project no longer generated energy, the existing mix of peak and off-peak energy, as well as the ancillary services, including load following, capacity,

[1] Voltage is regulated through reactive power production and consumption, and resources on the grid may be compensated for providing this reactive power capability. Voltage-ampere reactive (VAR) is the unit of measurement for reactive power.

and spinning and non-spinning reserves, would have to be provided by other suppliers to the bulk energy system at market rates.

Peaking hydropower operations are particularly important to system reliability, including the ability to provide load following and system protection.

H2.2.1 Effects on Customers

Great River Hydro has no retail or wholesale customers.

H2.2.2 Effects on Operating and Load Characteristics

Great River Hydro has no power distribution role other than delivering Project output into the bulk power system of New England and therefore has no load requirements.

The Project does provide ISO-NE with the ability to bring units to the electric grid quickly in the event of a grid disturbance such as loss of a major unit or other load change occurrence.

H2.2.3 Effects on Communities Served

Great River Hydro has no power distribution role and therefore does not serve communities directly. If the Wilder Project no longer generated energy, communities in the region would continue to rely on the existing mix of peak and off-peak energy, as well as the ancillary services, including load following, capacity, and spinning and non-spinning reserves provided by other suppliers to the bulk energy system at market rates.

The operation of the Project has, and will continue to have, a positive effect on local economies in the area. Great River Hydro employs 7 people at the Vernon Project—5 maintenance technicians, 1 specialist, and 1 manager. It is anticipated that this level of local employment will continue for the foreseeable future. Great River Hydro also has a positive impact on local economies through: outside contracted services that are often locally sourced, provision of recreational access and resources, and property tax payments of over $2.93 million for the Vernon Project.

H3 Cost of Production and Alternative Sources of Power

H3.1 Average Annual Cost of Project Power

Exhibit D includes a detailed estimate, including the basis for the calculations, of Great River Hydro's cost of Project power.

H3.2 Projected Resources to Meet Capacity and Energy Requirements

As stated above, Great River Hydro does not support an electric service territory and, therefore, does not have any electricity capacity or energy requirements.

Great River Hydro participates in the ISO-NE forward capacity market and has obligations for providing 32 MW's capacity from the Vernon Project through May, 2021.

H4 Effect on Industrial Facility

Great River Hydro does not use the Project power for its own industrial facility.

H5 Indian Tribe Need for Project Electricity

Great River Hydro is not an Indian Tribe.

H6 Effect on Transmission System

The Vernon Project facilities do not include a transmission system. Project Single-line diagrams and Asset Separation drawings designating ownership lines of demarcation are included as Figures H-1 and H-2, respectively...

H7 Statement of Need for and Usefulness of Modifications

At this time, Great River Hydro has no plans to modify the generation facilities associated with the Project.

H8 Financial and Personnel Resources

H8.1 Financial Resources

Great River Hydro has sufficient financial resources available to meet its obligations under a new license to operate the Vernon Project.

H8.2 Personnel Resources

Great River Hydro employs personnel resources sufficient to operate, maintain and meet its obligations under a new Vernon Project license. All personnel receive training commensurate with their responsibilities in an ongoing effort to improve their ability to operate the Project in the safest and most efficient manner possible. Great River Hydro also contracts with local outside entities to provide maintenance support for the Project. Training includes topics such as operator and technical trade progression and testing, confined space entry, fall protection, portable fire extinguisher use, HazCom, respiratory protection, lockout/tagout, and FERC dam safety and license compliance. Employees are also trained annually on the site specific EAP, including various role responsibilities and Incident Command System response protocols.

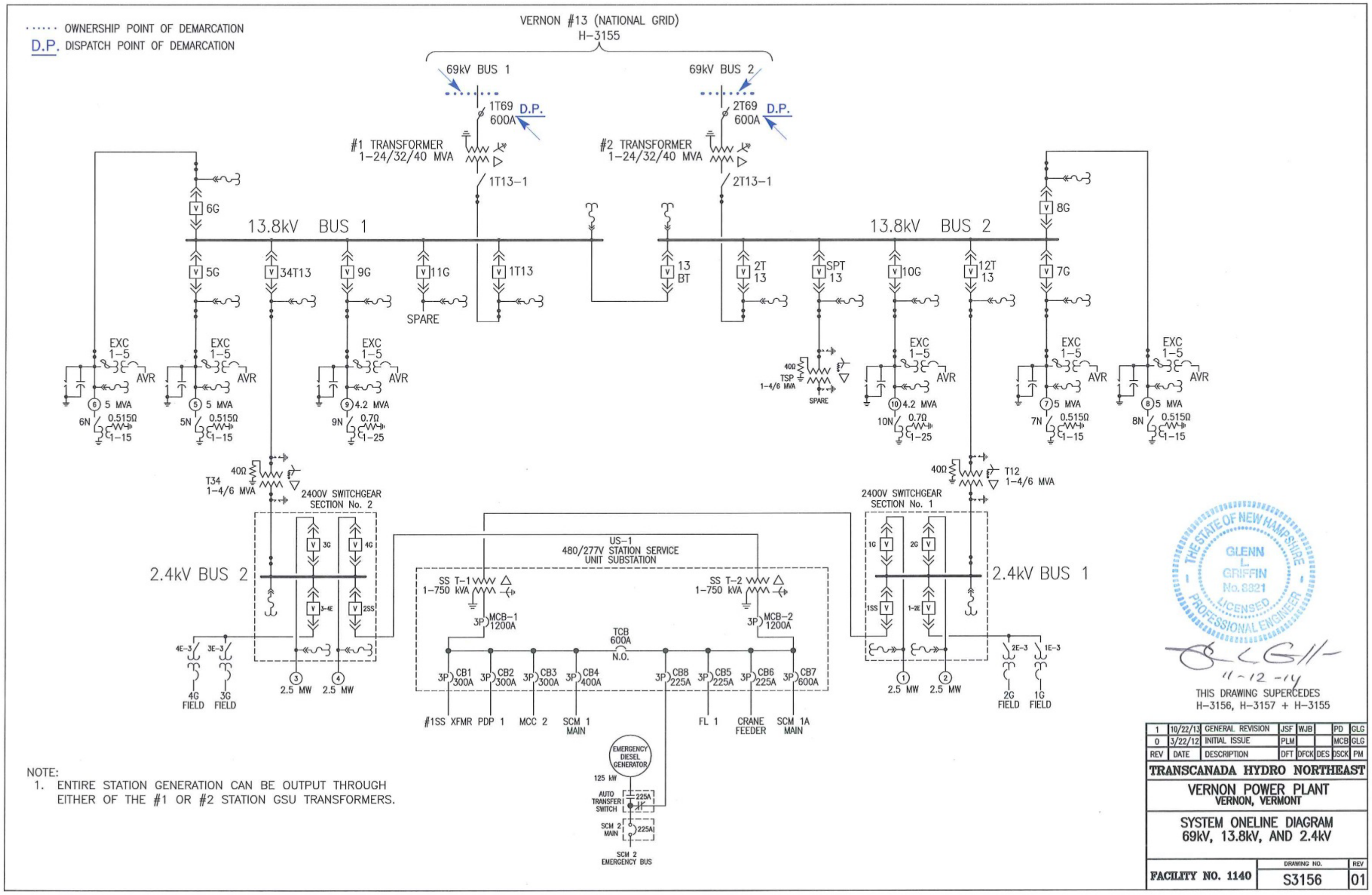

Figure H-1. Transmission interconnection schematic.

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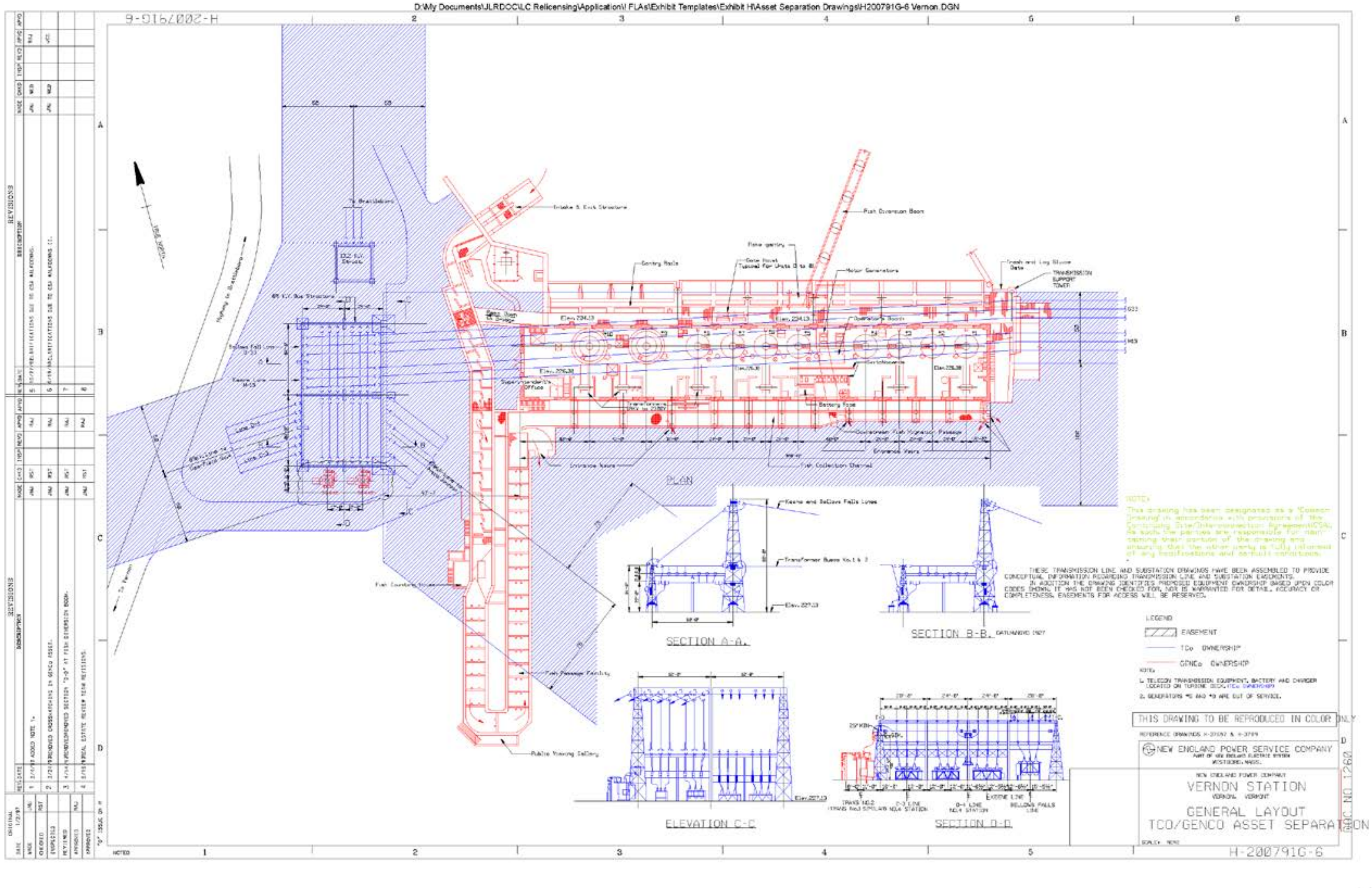

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Figure H-2. Asset separation lines of ownership demarcation.

H9 Project Expansion Notification

Great River Hydro currently has no plans to expand the Project to encompass additional lands. The Vernon Project maps provided in Exhibit G indicate the current project boundary.

H10 Electricity Consumption Efficiency Improvement Program

Since Great River Hydro sells all of the Vernon Project output to the wholesale electric power market, the information required by this section is not applicable to the Project.

H11 Indian Tribe Names and Mailing Addresses

There are no Indian Tribes with lands occupied by the Project or which would otherwise be affected by the relicensing. Tribal groups that have identified themselves as having traditional cultural connections to the Connecticut River Valley in New Hampshire and Vermont consist of the Vermont state-recognized Abenaki Nation, including the Elnu Abenaki Tribe, the Nulhegan Abenaki Tribe, the Koasek Traditional Band of the Koas Abenaki Nation, and the Abenaki Nation at Missisquoi; NH-based Abenaki Tribal groups Cowasuck Band – Pennacook/ Abenaki People, Koasek Traditional Band of the Sovereign Abenaki Nation and Abenaki Nation of New Hampshire; and the Commission identified federally recognized Narragansett Indian Tribe, based in southern Rhode Island. Addresses are included in the Additional Information accompanying the Initial Statement for this Application.

H12 Safe Management, Operation, and Maintenance of Project

Refer to Exhibit B of the License Application for additional information on management, operation and maintenance beyond what is provided below.

H12.1 Existing and Planned Operation of the Project during Flood Conditions

Information on existing and planned operation of the Project during flood conditions is detailed in Exhibit B of this License Application. Great River Hydro maintains a current EAP that is updated on an annual basis and submitted to the FERC for approval. A “state of readiness” test is conducted annually to verify the communications paths and the contacts listed in Great River Hydro’s EAP. Every 5 years, Great River Hydro conducts a full, functional exercise of one of the Connecticut River project EA P’s that includes all of the facility-related emergency response agencies including state and federal agencies. A complete copy of the Vernon Project's EAP is located at the Vernon Powerhouse. Each of the local Emergency Management Directors has a copy of their sections of the plan. No operational changes are proposed that might affect the existing EAP for the Vernon Project.

H12.2 Warning Devices Used to Ensure Downstream Public Safety

The Vernon Projects public safety warning devices include signage warning of downstream releases, thin ice hazards, portage trails, and signs warning of no boating, swimming, fishing beyond this point. Warning devices also include boat barriers and buoys near spillways. Real-time flow information and day-ahead generation schedules are provided via phone and web-based systems in an effort to alert recreational instream public users of flow conditions at the dam that could affect downstream areas. These measures are specified in the Vernon Project Public Safety Plan filed with the FERC. A field inspection is conducted annually prior to the start of the primary recreation season to ensure measures are in place and functional.

H12.3 Proposed Changes Affecting the Existing Emergency Action Plan

Great River Hydro is currently updating the EAPs for the Connecticut River however, no operational changes are proposed that might affect the existing EAP for the Vernon Project. Its overall EAP program fully complies with FERC's EAP engineering guidelines.

H12.4 Existing and Planned Monitoring Devices

A Surveillance and Monitoring Plan (SMP) for the Vernon Project is filed with FERC. The purpose of the SMP is to describe the instrumentation and monitoring program for the dam and how the information pertains to and monitors critical dam conditions that relate to potential failure modes and design assumptions for the project structures. The SMP is reviewed with the FERC engineer during the operation inspection of the Project.

H12.5 Project's Employee and Public Safety

Great River Hydro personnel, including history under previous licensees, have an outstanding history of operating the Vernon Project in a work-safe environment. There have been zero lost-time accidents for the past six years at this Project.

Great River Hydro has a commitment to employee safety that begins with compliance with applicable local, state, and federal regulations regarding the safe operation of industrial and electrical facilities. As Great River Hydro operates the Project's generation facilities, this commitment is implemented primarily through a rigorous safety program that includes safety training, inspection and maintenance programs, certification programs, incident reporting and database and root-cause analysis of near-miss safety incidents.

Great River Hydro is committed to maintaining and operating its facilities in a manner that allows the public to safely enjoy recreational activities. The Vernon Project has a Public Safety Plan on file with FERC. It considers a variety of public use and risks on the basis of locations and identifies safety measures implemented to provide adequate warning and safety measures implemented to address the risk and exposure. A field inspection is conducted annually prior to the start of the primary recreation season to ensure measures are in place and functional.

Specific to downstream, in-stream use, real-time flow information is available by telephone (1-800-452-1737) or the “WaterLine” website (www.h2oline.com) providing opportunity flow information for boaters and public safety flow information for anglers that also use areas downstream of the Vernon Project for boating, wading, and fishing.

Records available to Great River Hydro indicate that that Vernon Project has had no public safety incidents tied to operation or maintenance of the Project.

H13 Current Project Operation

Operation of the Project is described in Exhibit B.

H14 History of the Project and Upgrade Programs

A complete Project history is described in Exhibit C.

H15 Generation Lost Over the Last Five Years

There have been two significant unscheduled outages over the last five years. Unit No. 10 shut down due to a failed servo piston resulting in a 27 day outage in July-August 2013. Unit No. 9 also had a servo piston oil leak issue causing a 14 day outage occurring in July 2014. These outages were restored through maintenance and repairs. Lost generation is estimated at approximately 150 MWh in 2013 and 80 MWh in 2014.

H16 Compliance with Terms and Conditions of Project License

Great River Hydro and the previous licensee have an excellent record of compliance with the terms and conditions of the current license. A review of records indicates a long-standing history of compliance with all of the license articles and regulations.

H17 Actions Taken by Licensee Affecting Public

Great River Hydro has worked to ensure that actions at the Vernon Project do not negatively affect the public. Great River Hydro plays a prominent role in ensuring the efficient, productive use of water for hydroelectric generation and public use. The Project provides renewable electricity, contributes to the stability of the regional power system, supports the penetration of additional variable energy resources such as wind and solar in to the regional power grid and displaces about 90,000 tons of CO_2 that would otherwise be emitted from a natural gas generation alternative. This significantly affects the general public beyond the public use opportunities the Project provides and supports including boating, fishing, hiking, hunting, and camping. The Project also supports other day-use and overnight-use activities, such multi-day paddling trips, as wildlife viewing and picnicking, and recreational sports areas. In addition to the public use benefits, Great River Hydro contributes to the public benefit through the employment of fulltime and seasonal staff. Great River Hydro educates and trains local communities on its EAP that has assisted and encouraged communities to develop local response plans related to flooding and inundation. Lastly, by contributing over $2.9 million in local property tax, Great River Hydro supports community and public services that would otherwise fall on other taxpayers in these communities.

H18 Ownership and Operating Expenses if Project is Transferred

If the Project license were transferred to another entity, Great River Hydro's cost of operating and maintaining the Project (see Exhibit D) would be eliminated.

H19 Annual Fees for Federal or Indian Lands

The Vernon Project is not located on federal or Indian lands.