UNITED STATES OF AMERICA

BEFORE THE FEDERAL ENERGY REGULATORY COMMISSION

DRAFT APPLICATION FOR NEW LICENSE FOR MAJOR PROJECT – EXISTING DAM

BLENHEIM-GILBOA PUMPED STORAGE POWER PROJECT

FERC PROJECT NO. 2685

EXHIBIT A
PROJECT DESCRIPTION

December 2016

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NEW YORK STATE OF OPPORTUNITY | NY Power Authority

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1 Introduction

The Blenheim-Gilboa Pumped Storage Project (B-G Project) is located on Schoharie Creek, a tributary of the Mohawk River, about 40 miles southwest of Albany, New York, in the northern Catskill Mountains. The B-G Project is owned and operated by The Power Authority of the State of New York (Power Authority).

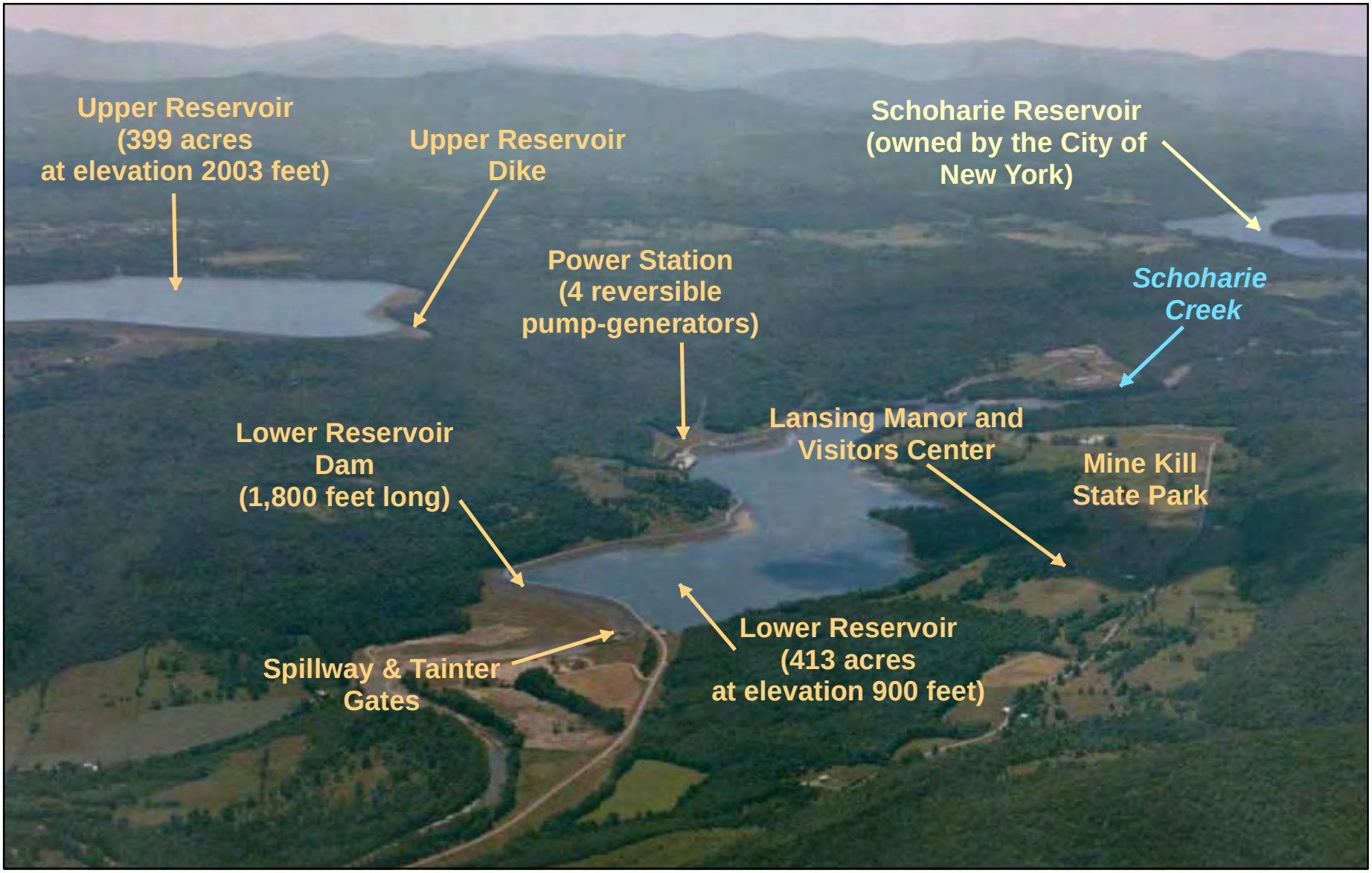
This exhibit is required under the Federal Energy Regulatory Commission (FERC) regulations which can be found in 18 Code of Federal Regulations (CFR) Section 4.51(b). The information provided herein covers the specifics prescribed for Exhibit A and serves the purpose of providing a description of the project.

2 Project Description

The principal features of the B-G Project include a 399-acre Upper Reservoir and dike, a 413-acre Lower Reservoir and dam, conduits connecting the two reservoirs, an underground powerhouse, a spillway, and related facilities (Figure 2.0-1). The Upper Reservoir is located at the top of Brown Mountain and was created by constructing a dike to retain water. The Lower Reservoir was formed by constructing a 1,800-foot-long dam on Schoharie Creek. The B-G Project's four turbine generator units have a generating capacity of 290 megawatts (MW) each. Exhibit G provides a map of the B-G Project and facilities.

The B-G Project is a closed cycle system because water is recycled between the reservoirs during operation. The Upper Reservoir serves as a large energy-storage device allowing the B-G Project to start generating electricity within minutes by releasing water from the Upper Reservoir through the reversible pump turbines. Generation can occur at any time but generally occurs during day time, when the demand for electricity is high and other power resources are more expensive. During periods of low electrical demand and lower electricity prices, the turbines at the Lower Reservoir are used to pump water from the Lower Reservoir into the Upper Reservoir. The following sections describe the physical characteristics of the B-G Project in detail. Exhibit B describes the operation of the B-G Project.

Table 2.0-1 provides a summary of project components. A more detailed description of project components are provided in the sections below.



Blenheim-Gilboa Pumped Storage Power Project
FERC No. 2685

Draft License Application
Exhibit A

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Figure 2.0-1:
Project Features

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Table 2.0-1: Description of Facilities

Description	Number or Fact
General Information	
FERC Project Number	2685
License Issued	June 6, 1969
License Expiration Date	April 30, 2019
Licensed Capacity	1,160 MW
Project Location	Located in the towns of Blenheim and Gilboa on Schoharie Creek about 40 miles southwest of Albany, New York, in the northern Catskill Mountains.
Owner/Operator of Project	Power Authority of the State of New York
Total Area Encompassed by Existing Project Boundary	The FERC project boundary encompasses 2,893 acres of land, of which approximately 812 acres are reservoir.
Federal lands within project boundary	None
Upper Reservoir	
Water Surface Area	399 acres (full pool)
Water Surface Elevation	2,003 ft (full pool); 1,955 ft (minimum pool)
Average Depth	48 ft (full pool)
Drainage Area	0.7 square miles
Usable Storage	15,085 ac-ft
Total Storage Capacity	18,791 ac-ft 3,706 ac-ft (dead storage below elevation 1,955 ft)
Shoreline	3.5 miles
Maximum Depth (at full pool)	95 ft near intake structure, 80 ft in SW area of reservoir
Upper Dike	
Construction Type	Earth and rock fill
Dike Length	2.25 miles
Height at Top of Dike	110 ft above existing ground and 162 ft above bedrock
Dike Crest Width	30 ft wide
Dike Crest Elevation	2,008 ft
Emergency Spillway	
Spillway Length	655 ft with 25-ft-wide asphaltic concrete crest
Emergency Spillway Crest Elevation	2,005 ft
Emergency Spillway Capacity	10,200 cfs

Description	Number or Fact
Water Conveyance Structures	
Intake, Shaft, Power Tunnel	• Upper Reservoir is connected to powerhouse penstocks by a 28-ft-diameter, 1,042-ft-long vertical shaft and 906-ft power tunnel to 460-ft manifold • Bell-mouth intake is 50 ft in diameter at top and feeds into 45-ft-high conic section tapering from 38 ft at end of bell-mouth to 28 ft at vertical shaft • 125 ft hexagonal shaped, flat slab anti-vortex intake cover; 125 ft across points and supported 17 ft above surface by six vertical concrete piers spaced radially • Trashracks attached to outside of piers have a clear spacing of 5.25 in • Concrete intake structure used to reduce potential vortices
Penstocks	• Four penstocks, each controlled by 111-in-diameter spherical valve at powerhouse • 12-ft-diameter penstock to each unit • Total length of each penstock is 1,960 ft, 1,760 ft of which are steel-lined; remaining 200 ft made of concrete
Powerhouse	
Construction Type	Reinforced concrete gravity founded on bedrock
Location	Toe of Brown Mountain
Dimensions	526-ft-long by 172-ft-wide by 132-ft-high
Trashracks	• Bottom rack: Clear spacing of 5.625 in • Four upper racks: Clear spacing of 5.25 in
Other	Service bay and administration building at south end of structure
Turbines	
Manufacturer	Hitachi Limited, Tokyo
Type	Reversible modified Francis-type pump
Number	Four
Rating	290 MW each
Size	Seven 20-ft-diameter blades
Rotation Speed	257 RPM
Maximum Discharge	• 12,800 cfs (total during generation); 3,200 cfs (individual during generation) • 10,200 cfs (total during pumping); 2,550 cfs (individual during pumping)

Description	Number or Fact
Lower Reservoir	
Water Surface Area	413 acres (full pool)
Water Surface Elevation	900 ft (full pool) 860 ft (minimum pool)
Average Depth	40 ft (full pool)
Drainage Area	356 square miles
Length	Approximately 3 miles
Usable Storage	12,422 ac-ft
Total Storage Capacity	16,167 ac-ft 3,745 ac-ft (dead storage below elevation 860 ft)
Shoreline	9.4 miles
Maximum Depth	80 ft (full pool)
Lower Dam	
Construction Type	Central-core, rock-filled dam
Dam Length	1,800 ft
Dam Crest Elevation	911.1 ft
Embankment	Maximum height of 100 ft Average height of 80 ft Top width of 30 ft 2H:1V and 1.5H:1V above 892 ft
Foundation	Sealed by 1,200-ft-long slurry trench and 400-ft-long partial slurry trench seepage cutoff into impervious layer
Lower Reservoir Spillway	
Dimensions	• 425-ft-long, 134-ft-wide concrete-lined, side-chute spillway with design crest elevation of 855 ft • Three Tainter gates 38-ft-wide by 45.5-ft-high
Stilling Basin	
	238-ft-long, 68.5-ft-deep concrete
Low-Level Outlet	
	• Invert elevation of 813 ft located at east spillway abutment at Lower Dam and Intake • Four, low-level discharge valves of 4, 6, 8 and 10 inches for release of 5 to 25 cfs • Two hydraulically operated, 36-in-diameter, Howell-Bunger valves that can discharge a combined flow of 25 to 700 cfs; elevation of centerline of Howell-Bunger valves in 816.05 ft

Description	Number or Fact
Switchyard/Transmission Lines	
	Switchyard located within the B-G Project boundary on eastern bank of Schoharie Creek that uses the connecting circuits from the motor-generators to the high voltage bus to connect units to New York Independent System Operator (NYISO). The switchyard contains a robust breaker and a half configuration with five occupied stations and one station available for future use.
Access Roads	
	• North Access Road runs south from State Route 30 in North Blenheim • South Access Road runs along east side of Lower Reservoir from Valenti Road north to the powerhouse

2.1 Structures (18 CFR Section 4.51(b)(1))

The Power Authority is not proposing to install any new structures as part of the relicensing.

2.1.1 Upper Dike

A U-shaped, 2.25-mile-long embankment of earth and rock fill forms three sides of the Upper Reservoir; the slope of Brown Mountain is the fourth side. The dike rises a maximum height of 110 feet above ground and 162 feet above bedrock. The crest is 30-feet-wide at elevation 2,008 feet NGVD[1]. The dike is a homogenous, glacial till, and rolled fill structure with toe blanket or toe blanket and chimney drains. The dike has a seepage cut-off system that extends into bedrock to minimize seepage. The upstream slope of the dike is 3H:1V, and the downstream slope is 2.5H:1V. The upstream slope is armored with large stone (riprap), and the downstream slope is vegetated. The Power Authority mows and maintains the lowest 6 feet of the downstream slope.

2.1.2 Emergency Spillway

The Upper Reservoir has an emergency spillway at the northeastern corner of the dike to pass flows in the unlikely event of over pumping. In such an event, flows would be discharged over the emergency spillway and down a slope of natural terrain before entering Schoharie Creek downstream of the Lower Dam. The 655-foot-long spillway has a 25-foot-wide asphaltic concrete crest and is armored with riprap on the upstream and downstream slopes. The crest elevation of the emergency spillway is 2,005 feet, which is 3 feet lower than the rest of the dike.

2.1.3 Water Conveyance Structures

A vertical shaft 28 feet in diameter and 1,042-feet-long inside Brown Mountain connects the Upper Reservoir to the powerhouse penstocks, where the shaft joins at a right angle to a horizontal, 906-foot-long power tunnel leading to a 460-foot-long manifold. The manifold divides the flow into four 12-foot-diameter penstocks. Each penstock is 1,960 feet long; 1,760 feet of that length are lined with steel, and the remaining 200 feet are made of concrete. Each penstock delivers water to a pump-generating unit at the powerhouse.

In the northwestern corner of the reservoir, at the head of the vertical shaft, is a concrete morning-glory intake structure. The bell-mouth intake is 50 feet in diameter at its top surface and feeds into a 45-foot-tall conic section tapering from 38 feet in diameter at the end of the bell mouth to 28 feet in diameter at the vertical shaft. The anti-vortex intake cover is a hexagonal, flat slab 125 feet across that is supported 17 feet above the surface of the intake by six vertical concrete piers spaced radially about the intake. Fixed steel trash racks are attached to the outside of the piers to provide for self-cleaning of debris. The trash racks have clear spacing of 5.25 inches.

2.1.4 Lower Dam

The Lower Reservoir is formed by a 1,800-foot-long, central-core, rock-filled dam. To minimize seepage from the upstream side to the downstream side of the dam, the foundation is secured by a 1,200-foot-long slurry trench cutoff to bedrock and a 400-foot-long partial slurry trench seepage cutoff into an impervious layer. The crest elevation of the dam is 911.1 feet. The dam has a maximum height of 100 feet and an

[1] All elevations are referenced to National Geodetic Vertical Datum (NGVD) 1929.

average height of 80 feet; the top width is 30 feet. The slope of the dam is 2H:1V on the upstream and downstream faces, except for the portion above elevation 892 feet, which is has a slope of 1.5H:1V. The dam is armored with stone on both the upstream and downstream slopes.

2.1.5 Lower Reservoir Spillway

The 425-foot-long, 134-foot-wide, concrete-lined, side-chute spillway has a design crest elevation of 855 feet and is electrically controlled by three 38-foot-wide, 45.5-foot-tall Tainter gates. A buried power line approximately 6,336-feet-long follows the north access roadway and on the north side of the spillway bridge crossing to provide power as well as backup sources of power to the three spillway Tainter gates. The normal power source is a 7.2-kilovolt (kV) feed that extends from the B-G Project powerhouse.

2.1.6 Stilling Basin

Outflows from the Lower Reservoir spillway are discharged to a 238-foot-long, 68.5-foot-deep concrete stilling basin at the bottom of the spillway. The stilling basin reduces the turbulence and velocity of the water before it returns to Schoharie Creek. The stilling basin is designed to dissipate the energy up to the amount of water expected under a PMF of 174,099 cfs.

2.1.7 Low Level Outlet

In addition to the three Tainter gates, the Lower Reservoir has a low-level outlet with an invert elevation of 813.0 feet. The outlet is located in the east spillway abutment at the dam and the intake. Protected with a steel trash rack, the outlet draws water from the northwestern portion of the dam, near the spillway. The outlet has four, low-level discharge valves of 4, 6, 8, and 10 inches for releasing 5 to 25 cfs and two hydraulically operated, 36-inch-diameter, Howell-Bunger valves that can discharge a combined flow of 25 to 700 cfs. The elevation of the centerline of the Howell-Bunger valves is 816.05 feet. Discharge from the low-level discharge valves and Howell-Bunger valves is free-flowing into the air.

2.1.8 Access Roads

Two roads provide access to the B-G Project. The north access road runs south from State Route 30 in North Blenheim on the west side of Schoharie Creek. The north access road crosses the Lower Dam and then traverses on the east side of the Lower Reservoir to the powerhouse. The south access road runs along the east side of the Lower Reservoir from Valenti Road north to the powerhouse.

2.2 Reservoirs (18 CFR Section 4.51(b)(2))

2.2.1 Lower Reservoir

The Lower Dam impounds the waters of Schoharie Creek creating the Lower Reservoir, which is about 3-miles-long and has a surface area of 413 acres at a full pool elevation of 900 feet. The Lower Reservoir operates at normal maximum and minimum elevations of 900 feet and 860 feet, respectively. The total storage is 16,167 acre-feet, which comprises 12,422 acre-feet of usable storage between the two operating levels and 3,745 acre-feet of dead storage below elevation 860 feet. The average depth of the Lower Reservoir is 40 feet.

2.2.2 Upper Reservoir

At full pool elevation of 2,003 feet, the Upper Reservoir has a water surface area of 399 acres and a total drainage area of approximately 0.7 square mile. The total storage capacity of 18,791 acre-feet comprises 15,085 acre-feet of usable storage between operating levels of 1,955 feet and 2,003 feet, and dead storage of 3,706 acre-feet below elevation 1,955 feet. The average depth at the full pool elevation is 48 feet.

2.3 Powerhouse (18 CFR Section 4.51(b)(1)(3))

The powerhouse is a reinforced concrete-gravity structure founded on bedrock situated at the toe of Brown Mountain. The building is 526-feet-long, 172-feet-wide, and 132-feet-tall and contains four Hitachi, reversible, modified, vertical Francis-type pump turbines. The units have a total maximum discharge of 12,800 cfs during generation and 10,200 cfs during pumping. Each unit has a maximum discharge of 3,200 cfs during generation and 2,550 cfs during pumping. More than three-quarters of the powerhouse is underground. The authorized generating capacity of the project is 1,160 MW.

All four of the original pump turbine generating units and spherical valves were refurbished between 2006 and 2010 as part of the $135-million life extension and modernization (LEM) authorized by a license amendment issued in 2006. Each spherical valve controls the flow of water into the respective pump turbine generator. Other work involved with the LEM amendment included replacing main power transformers, circuit breakers, exciters, and related equipment.

Water flows through the turbines and enters the Lower Reservoir through draft tubes that have invert elevations of 784 feet and provisions for stoplogs. The draft tubes are equipped with trash racks to protect the tubes and units when they are in pumping mode. Each draft tube has upper and lower trash racks. The upper trash rack has a clear spacing of 5.25 inches, and the lower one has a clear spacing of 5.625 inches. Approach velocity at the draft tubes is approximately 1.38 feet per second when the units are operated in pumping mode.

2.4 Switchyard/Transmission Lines (18 CFR Section 4.51(b)(4)(5))

A switchyard located within the B-G Project boundary on eastern bank of Schoharie Creek uses the connecting circuits from the motor-generators to the high voltage bus to connect units to New York Independent System Operator (NYISO). The switchyard contains a robust breaker and a half configuration with five occupied stations and one station available for future use.

3 Lands of the United States (18 CFR Section 4.51(b)(6))

There are no Federal lands or facilities within the B-G Project boundary.