UNITED STATES OF AMERICA

BEFORE THE FEDERAL ENERGY REGULATORY COMMISSION

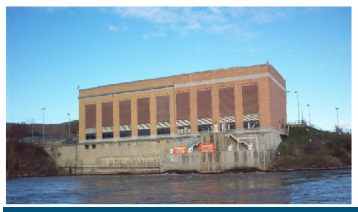
FINAL APPLICATION FOR NEW LICENSE FOR MAJOR PROJECT - EXISTING DAM

EXHIBIT A – PROJECT DESCRIPTION

Prepared by: Kleinschmidt

May 2022

CRESCENT HYDROELECTRIC PROJECT RELICENSING FERC NO. 4678




NEW YORK STATE OF OPPORTUNITY. | NY Power Authority

Table of Contents

1 Introduction 1
2 Project Description 2
2.1 Structures (18 CFR Section 4.51(b)(1)) 6
2.1.1 Project Dam 6
2.1.2 Powerhouse 6
2.1.3 Impoundment 8
2.1.4 Transmission Facilities 8
2.1.5 Single Line Diagram 9
2.1.6 Canal Locks 9
3 Lands of the United States 10

List of Figures

Figure 2-1 Major Project Facilities of the Crescent Project 3

List of Tables

Table 2-1 Description of Crescent Project Facilities 4
Table 2-2 Crescent Project Turbine and Generator Nameplate Data 8

1 Introduction

The Crescent Hydroelectric Project (Project) (FERC No. 4678) is an 11.8 MW conventional hydroelectric project located on the Mohawk River, approximately 4 miles upstream from its confluence with the Hudson River. The Crescent Project is located in Saratoga, Albany, and Schenectady Counties, New York, and in the Towns of Waterford, Colonie, Halfmoon, Clifton Park, and Niskayuna. It is located approximately two miles upstream of the School Street Hydroelectric Project (FERC No. 2539) owned by Erie Boulevard Hydropower, L.P. The Crescent impoundment is approximately 10 miles long and the upstream terminus of the impoundment is located at the Vischer Ferry Project dam (FERC No. 4679). The Project is owned and operated by the Power Authority of the State of New York (d/b/a "New York Power Authority" and referred to as the "Power Authority").

The Crescent Project dam was originally constructed as part of the New York State Barge Canal System[1] (Barge Canal System[2]) to 'canalize' the Mohawk River from Scotia to Crescent, providing navigable conditions for barges and vessels and facilitating water level control and lock operations.

This exhibit is required under the Federal Energy Regulatory Commission (FERC) regulations which can be found in Title 18 of the Code of Federal Regulations (CFR), Sections 4.51(b) and 5.18(a)(5)(iii). The information provided herein covers the specifics prescribed for Exhibit A and serves the purpose of providing a description of the Project.

[1] The existing Barge Canal System was created following the passage of the Barge Canal Act in 1903. However, some portion of the original Erie Canal built between 1817 and 1825 still exists. For the purposes of this document, the Licensee will consistently refer to the portions of the Barge Canal or Erie Canal adjacent to the Projects as the Barge Canal System.

[2] The Barge Canal System is owned by the People of the State of New York and operated by the New York State Canal Corporation (NYSCC), which was created by the New York State Legislature in 1992 as a subsidiary of the New York State Thruway Authority (NYSTA). Prior to 1992, the operations of the Barge Canal System fell under the New York State Department of Transportation. On January 1, 2017, the NYSCC became a subsidiary of the Power Authority (N.Y. Public Authorities Law § 1005-b).

2 Project Description

The principal features of the Crescent Project are the dam, powerhouse, impoundment, and appurtenant facilities. The Crescent Dam consists of two independent concrete gravity overflow sections which link each river bank to a rock island in the middle of the Mohawk River. The powerhouse is located adjacent to the dam on the western bank of the river (Figure 2-1). The powerhouse contains four generating units. Table 2-1 provides a summary of Project components. A more detailed description of Project components is provided in the sections below.

Figure 2-1 Major Project Facilities of the Crescent Project

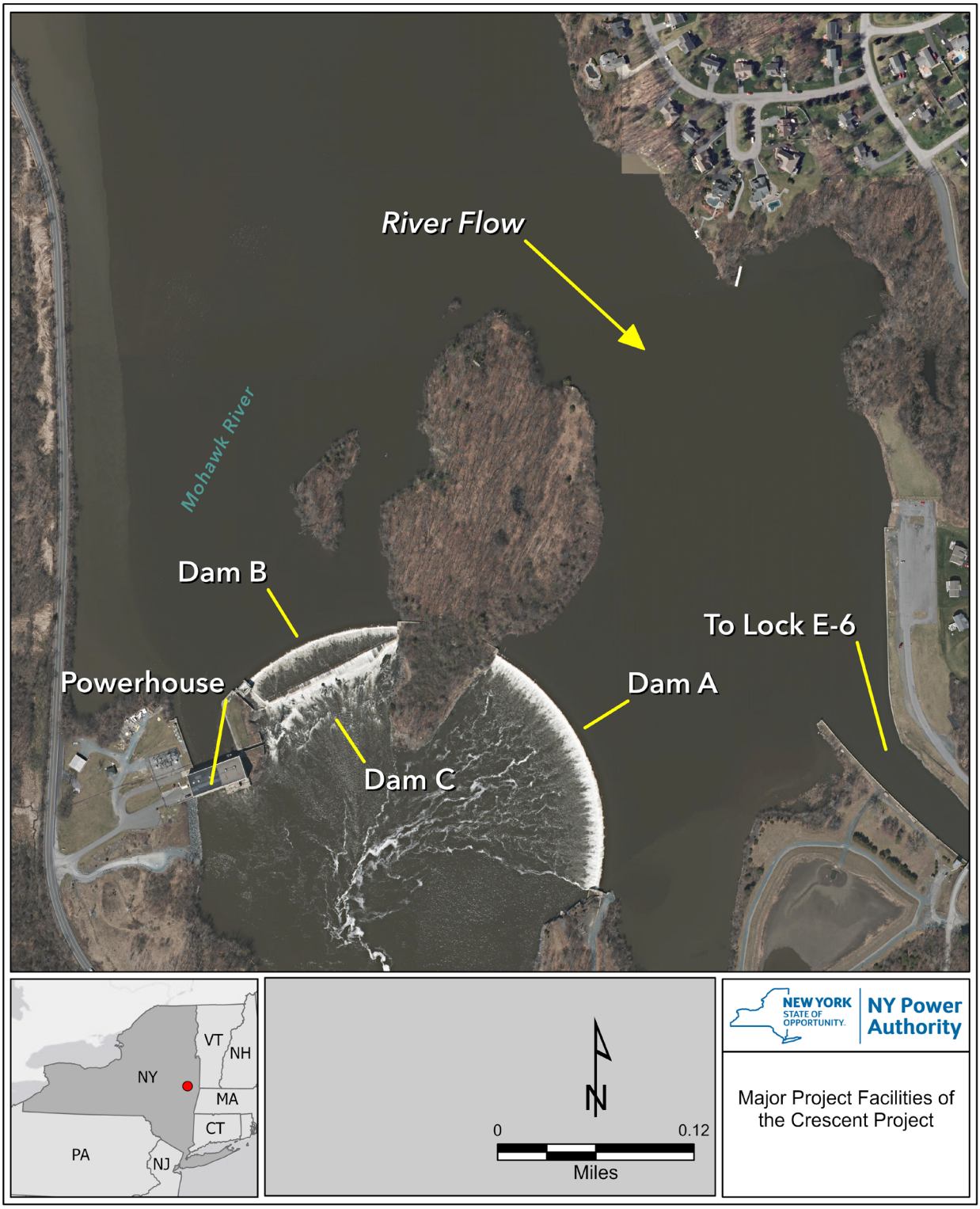


Table 2-1 Description of Crescent Project Facilities

Description	Number or Fact
General Information	
FERC Project Number	4678
License Issued	June 26, 1984
License Expiration Date	May 31, 2024
Licensed Capacity	11.8 MW
Project Location	Located on the Mohawk River in the counties of Saratoga, Albany, and Schenectady, NY in the towns of Waterford, Colonie, Halfmoon, Clifton Park, and Niskayuna.
Owner/Operator of Project	New York Power Authority
Total Area Encompassed by Existing Project	2,283 acres
Federal lands within the Project boundary	None
Impoundment	
Water Surface Elevation	Elevation (El.) 184' BCD (flashboards down) El. 185' BCD (12 inch flashboards up)
Water Surface Area	2,250 acres at elevation 185' BCD (12 inch flashboards up)
Average Depth	23.7 feet
Drainage Area	3,460 square miles
Usable Storage	None – operated run-of-river
Gross Storage Capacity	50,000 acre ft.
Shoreline	~20 miles
Maximum Depth	30 feet
Dam	
Construction Type	Concrete gravity dam
Length	Dam A – 901 ft. Dam B – 534 ft. Dam C – 530 ft.
Height at Top	Dam A – 52 ft. Dam B – 32 ft. Dam C – 16 ft. at crest El. 171 ft.
Crest Elevation	Dam A crest El. 184 ft. Dam B crest El. 184 ft. Dam C crest El. 171 ft.
Water Conveyance Structures	
Headrace/Forebay	175-foot-long headrace channel
Intake	The powerhouse includes an intake structure with trashracks, a rake, stoplogs, and gates.

Description	Number or Fact
Powerhouse	
Construction Type	Masonry
Location	Western end of dam
Dimensions	180 ft. long and 73 ft. wide
Trashracks	Trashrack bar spacing width is 3 7/8 inches
Turbines	
Type	2 Francis; 2 Vertical Kaplan
Number	4
Rating	Two 2.8 MW rated Francis turbines; Two 3.0 MW rated Kaplan turbines
Maximum Discharge	Two Francis turbines max discharge of 1,500 cubic feet per second (cfs) each; Two Kaplan turbines max discharge of 1,820 cfs each
Design Head	28 ft. at headpond elevation 184 ft.
Switchyard/Transmission Lines	
Switchyard	96 ft. by 67 ft. switchyard
Primary Transmission	The power plant ties to the switchyard from Switchgear 1 at 2.4 kV through underground feeders to a 2.4 kV bus and from Switchgear 2 from a 4.16 kV bus.

* All elevations refer to Barge Canal Datum (BCD) unless stated otherwise. BCD= NAVD88 -1.67 feet or USGS Datum +0.99 feet.

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

The following existing components are included as part of the Project. The Power Authority is not proposing to install any new structures as part of the relicensing.

2.1.1 Project Dam

The Crescent Dam consists of two independent concrete gravity overflow sections which link each river bank to a rock island in the middle of the Mohawk River (Figure 2-1). Both sections are curved in plan and have a crest at elevation (El.) 184 ft. BCD.[3] The total length of the dams is 1,435 ft. The eastern overflow section (Dam A) is 901 ft. long and 52 ft. in height. The western section (Dam B) is 534 ft. long and 32 ft. in height; providing 1,435 feet of spillway crest at El. 184 ft. BCD. A smaller overflow section, Dam C, is 530 ft. long and is located immediately downstream of Dam B. The maximum structural height of this dam is approximately 16 ft., and it has a crest elevation of El. 171 ft. BCD. In order to aid canal navigation, one-foot-high (12 inch) wooden flashboards are installed along the crests of both spillways (Dams A and B) seasonally in Spring (generally in April based on seasonal conditions) and removed in the Fall (generally in November based on seasonal conditions). When the flashboards are installed, the spillway crest is El. 185 ft. BCD.

The regulating section is located at the western end of Dam B. It is constructed of reinforced concrete and consists of an 8-foot-wide sluiceway and a 30-foot-wide Tainter gate bay. The sill of the sluiceway is at El. 182 ft. BCD. The sluiceway is equipped with stoplog slots. The sill of the Tainter gate is at El. 176 ft. BCD; in the closed position, the top of the gate is at El. 188.5 ft. BCD. The gate is operated electrically from a local control panel.

Water is directed to the powerhouse through a 175-foot-long headrace channel. The bottom of the headrace channel is cut rock, and the sides are formed by two mass concrete retaining walls. The channel is rectangular in plan and is approximately 123 ft. wide at the powerhouse. The elevation of the channel bottom varies from El. 171 ft. BCD at the upstream end of the headrace to El. 161 ft. BCD at the powerhouse. The substrate of the headrace channel is a combination of bedrock and concrete.

2.1.2 Powerhouse

The Crescent Project powerhouse is located on the western bank of the Mohawk River, is constructed of brick, concrete block, and concrete, and is approximately 180 ft. long and 73 ft. wide. The powerhouse houses four turbine/generator units: two 2.8 MW rated Francis turbines and two 3.0 MW vertical Kaplan turbines. The original portion of the powerhouse contains the two original Francis units (Units 1 and 2). In 1990, the powerhouse was expanded to include the two Kaplan units (Units 3 and 4), which are located riverward of the original powerhouse (Figure 2-1 and Table 2-2).

The powerhouse includes an intake structure with trashracks, rake, stoplogs, and gates. The intake area contains two sections, one that draws water to the Kaplan units and another that draws water to the older Francis units. The intake section leading to the Francis units has four 15-foot-wide openings separated by

[3] All elevations refer to Barge Canal Datum (BCD) unless stated otherwise. BCD= NAVD88 -1.67 feet or USGS Datum +0.99 feet.

three 4-foot-wide piers. The intake section for the Kaplan units has four 12-foot-wide openings separated by an 18-foot-wide concrete pier in the center (14-foot concrete block with two-foot rounded supports on each side), and two 4-foot-wide piers separating the outer sections. The intake section leading to the Kaplan units is hereafter referred to as the Kaplan intake section.

Vertically, the trashracks span the entire water column and rise roughly 3.5 feet above the water surface when the flashboards are installed, and are made up of three sections that span 30 ft. Two 1.75-foot-tall concrete supports span the length of the trashracks horizontally along both sections. The trashrack bar spacing width is 3-7/8 inches.

Table 2-2 Crescent Project Turbine and Generator Nameplate Data

Turbines				
Number of Units	4 units			
	Unit 1	**Unit 2**	**Unit 3**	**Unit 4**
Type	Vertical Francis	Vertical Francis	Vertical Kaplan	Vertical Kaplan
Design Head	26.9' (wo FB)[1] 27.9' w FB[1]	26.9' (wo FB) 27.9' w FB	26.9' (wo FB) 27.9' w FB	26.9' (wo FB) 27.9' w FB
Rated Capacity	4,000 hp[2]	4,000 hp	4,000 hp	4,000 hp
Minimum Discharge	400 cfs[3] per unit	400 cfs per unit	350 cfs per unit	350 cfs per unit
Maximum Discharge	1,500 cfs per unit	1,500 cfs per unit	1,820 cfs per unit	1,820 cfs per unit
Operating Speed	90 rpm[4]	90 rpm	144 rpm	144 rpm
Generators				
Type	Vertical configuration	Vertical configuration	Vertical configuration	Vertical configuration
Rated Capacity	2,800 kW[5]	2,800 kW	3,000 kW	3,000 kW
Power Factor	0.80	0.80	0.80	0.80
Phase	3 Phase	3 Phase	3 Phase	3 Phase
Voltage	2,300 V[6]	2,300 V	4,160 V	4,160 V
Frequency	60 Hz[7]	60 Hz	60 Hz	60 Hz
Synchronous Speed	90 rpm	90 rpm	144 rpm	144 rpm

[1] without flashboards (wo FB), with flashboards (w FB), [2] horsepower (hp), [3] cubic feet per second (cfs), [4] revolutions per minute (rpm), [5] kilowatt (kW), [6] volt (V), [7] hertz (Hz)

The powerhouse tailrace is an open, unlined rock cut approximately 145 ft. wide and 65 ft. long. Elbow-type draft tubes discharge water directly into the excavated tailrace channel. The tailwater is approximate El. 157 ft. BCD, and is controlled by Erie Boulevard's School Street Station, located approximately 2 miles downstream of the Crescent Project.

2.1.3 Impoundment

The Crescent impoundment extends upstream approximately 10 miles to the Vischer Ferry Project Dam. At El. 185 ft. BCD (with 12 inch boards up), the surface area of the impoundment is approximately 2,250 acres. At El. 184 ft. BCD (with boards down) the surface area of the impoundment is approximately 2,108 acres and impounds approximately 50,000 acre-feet of water. Installation of the flashboards increases the normal full pool elevation of the impoundment by 1 foot, and the impoundment retains an additional 2,000 acre-feet of water.

2.1.4 Transmission Facilities

Primary transmission from the powerplant is to a switchyard located within the Project boundary. The switchyard dimensions are 96 ft. by 67 ft. The switchyard is protected by an 8 ft. chain link fence with three access gates. The switchyard ground elevation is 193.65 ft. The power plant ties to the switchyard from Switchgear 1 at 2.4 kV through underground feeders to a 2.4 kV bus and from Switchgear 2 from a 4.16 kV bus.

2.1.5 Single Line Diagram

The Crescent Project Single Line Diagram is filed separately with FERC as Critical Energy Infrastructure Information (CEII), pursuant to 18 CFR § 388.113.

2.1.6 Canal Locks

The Crescent Project includes one of the Erie Canal locks, Lock E-6, as well as the two lock guard gates. Canal Lock E-6 is located approximately 3,700 feet east of the confluence of the Mohawk River and Erie Canal junction, which is approximately 900 feet upstream of Cohoes Dam East/Left Abutment and is operated by the New York State Canal Corporation (NYSCC). Lock E-6 is a single lift lock with a chamber approximately 340 ft. long and 45 ft. wide. Guide walls are located upstream and downstream of the lock to facilitate navigation.

The canal and Lock E-6 are protected from high water levels on the Mohawk River by two guard gates. Each guard gate is operated with a counter weighted cable system to raise and lower the approximately 60 ft. by 60 ft. steel guard gate body. Guard Gate 1 is located 1,700 feet west of Lock E-6 and Guard Gate 2 is located 3,100 feet west of Lock E-6. Each of the guard gates has two adjacent 9 ft. wide x 12 ft. tall sluice gates that are utilized to control flow diverted from the Mohawk River to the Waterford Flight portion of the Erie Canal.

An approximately 240 ft. long, 33 ft high earthen embankment dam impounds the water adjacent to Lock E-6. An approximately 10 ft x 10 ft sluice gate located along the E-6 embankment dam controls water releases downstream through a concrete outlet conduit to the Erie Canal Waterford flight of locks E-5, E-4, E-3, and E-2 at the confluence of the Erie Canal with the Hudson River.

Lock E-6, its two associated guard gates and the remainder of the Waterford Flight locks and gates are all operated and maintained by NYSCC.

3 Lands of the United States

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