FEDERAL ENERGY REGULATORY COMMISSION
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February 20, 2020

OFFICE OF ENERGY PROJECTS

Project No. 4678-052–New York
Crescent Hydroelectric Project

Project No. 4679-049–New York
Vischer Ferry Hydroelectric Project

New York Power Authority

VIA Electronic Mail

Mr. Robert Daly
Licensing Manager
New York Power Authority
Robert.Daly@NYPA.gov

**Reference: Study Plan Determination for the Crescent Hydroelectric Project and Vischer Ferry Hydroelectric Project**

Dear Mr. Daly:

Pursuant to 18 C.F.R. § 5.13(c) of the Commission's regulations, this letter contains the study plan determination for the Crescent Hydroelectric Project (Crescent Project) and Vischer Ferry Hydroelectric Project (Vischer Ferry Project), which are located on the Mohawk River, in Saratoga, Albany, and Schenectady Counties, New York (Crescent Project) and Saratoga and Schenectady Counties (Vischer Ferry Project), respectively. The determination is based on the study criteria set forth in section 5.9(b) of the Commission's regulations, applicable law, Commission policy and practice, and the record of information.

Background

On September 24, 2019, New York Power Authority (NYPA) filed its Proposed Study Plan (PSP) for seven studies on water quality, aquatic habitat and fishery resources, terrestrial resources, and recreation resources in support of its intent to relicense the projects.

NYPA held its Initial Study Plan Meeting on October 23, 2019. Comments on the PSP were filed by Commission staff, the New York State Department of Environmental Conservation (New York DEC), the U.S. Fish and Wildlife Service (FWS), the U.S. National Park Service (Park Service), Riverkeeper Inc. (Riverkeeper), Assemblyman Phil Steck, Russell Wege, John Cococcia, Carol Delamarter, Gloria Kishton, James Woidt, Melissa Cherubino, and James Duggan.

On January 21, 2020, NYPA filed a Revised Study Plan (RSP) that includes revisions to five of the seven studies included in the PSP. In its RSP, NYPA does not adopt an ice-jam flooding study requested by Commission staff.[1] Comments on the RSP were filed by FWS, New York DEC, Riverkeeper, Jasmine Roberts, Suzanne Unger, Russell Wege, Carol Delamarter, James Woidt, and James Duggan.

General Comments

Some of the comments on the RSP do not specifically address study plan issues. These include comments on protection, mitigation, and enhancement measures (e.g., suggested flood mitigation measures). This determination does not address such comments, but only addresses comments specific to the merits of the proposed studies submitted pursuant to section 5.13 of the Commission's regulations and comments received thereon.

Study Plan Determination

NYPA's RSP is approved with the staff-recommended modifications discussed in Appendix B. As indicated in Appendix A, of the seven studies proposed by NYPA, four are approved as filed and three are approved with staff-recommended modifications. This determination also addresses four additional studies requested by stakeholders and not adopted by NYPA, of which three are not required, and one is required (with modifications), by this determination (see Appendix A). The specific modifications and bases for modifying NYPA's RSP are explained in Appendix B. Although Commission staff considered all study plan criteria in section 5.9 of the Commission's regulations, staff only reference, in Appendix B, the specific study criteria that are particularly relevant to the determination.

As discussed in Appendix B, NYPA is required to file, in its Initial Study Report (ISR) the results of ongoing modeling efforts to quantify the effects of the Vischer Ferry

[1] Staff requested this study in its comments on the PSP issued on December 17, 2019. Accession No. 20191217-3096.

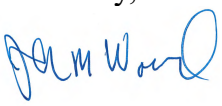
Project, if any, on ice-jam flooding and the effectiveness of various flood mitigation measures (including the potential addition of crest gates to the Vischer Ferry Dam).[2]

Studies for which no issues were raised in comments on the RSP are not discussed in this determination. Unless otherwise indicated, all components of the approved studies not modified in this determination must be completed as described in NYPA's RSP. Pursuant to section 5.15(c)(1) of the Commission's regulations, the ISR for all studies in the approved study plan must be filed by February 19, 2021.

Nothing in this study plan determination is intended, in any way, to limit any agency's proper exercise of its independent statutory authority to require additional studies. In addition, NYPA may choose to conduct any study not specifically required herein that it feels would add pertinent information to the record.

If you have any questions, please contact Jody Callihan at (202) 502-8278 or jody.callihan@ferc.gov.

Sincerely,



Terry L. Turpin
Director
Office of Energy Projects

Enclosures: Appendix A – Summary of determinations on proposed studies, requested study modifications, and studies requested but not adopted by NYPA

Appendix B – Staff's recommendations on proposed and requested study modifications, and studies requested

[2] These modeling efforts are part of the State of New York's *Reimagine the Canals* initiative. One objective of this initiative is to assess how the Erie Canal can help mitigate impacts from flooding and ice jams to improve resiliency and restore ecosystems in canal communities, including those along the Vischer Ferry impoundment. For more information see https://www.ny.gov/programs/reimagine-canals-initiative.

## APPENDIX A

## SUMMARY OF DETERMINATIONS ON PROPOSED STUDIES, REQUESTED STUDY MODIFICATIONS, AND STUDIES REQUESTED BUT NOT ADOPTED BY NYPA

| Study | Recommending Entity | Approved | Approved with Modifications | Not Required |
|---|---|---|---|---|
| Water Quality Study | NYPA | | X | |
| Fish Entrainment Study | NYPA | | X | |
| Blueback Herring Migration (desktop) Study | NYPA | | X | |
| Fish Community Study | NYPA | X | | |
| Aquatic Mesohabitat Study | NYPA | X | | |
| Bald Eagle Study | NYPA | X | | |
| Recreation Study | NYPA | X | | |
| Ice-Jam Flooding Study | FERC | | | X |
| American Eel Study | New York DEC, FWS | | X | |
| Blueback Herring Migration and Routing (field) Study | FWS | | | X |
| Run-of-River Compliance Study | FWS | | | X |

## APPENDIX B

## STAFF'S RECOMMENDATIONS ON PROPOSED AND REQUESTED STUDY MODIFICATIONS, AND STUDIES REQUESTED

The following discusses staff recommendations on studies proposed by NYPA, requests for study modifications, and requests for additional studies. We base our recommendations on the study criteria outlined in the Commission's regulations [18 C.F.R. section 5.9(b)(1)-(7)].

### I. General Issues

### Flooding during Free-Flow Conditions

Comments

Several commenters (Jasmine Roberts, Suzanne Unger, Russell Wege, Carol Delamarter, and James Duggan) request that NYPA address how operation of the project affects flooding in the Vischer Ferry Project impoundment area, especially in the Stockade Historic District in Schenectady, New York. Carol Delamarter states that other efforts to address flooding in the area described by NYPA in its RSP would not inform the Commission's licensing requirements. None of these commenters requested a specific study or addressed the study criteria found in section 5.9(b) of the Commission's regulations. Therefore, we address their concerns, generally, below.

Discussion and Staff Recommendation

On August 9, 2019, NYPA filed copies of a flooding study prepared by New York DEC in 1979, and a flooding study conducted by Gomez and Sullivan for NYPA in 2018. The 1979 flooding study included modeling and evaluated the effect the Vischer Ferry Dam has on flooding conditions under various river flows and under existing and modified conditions (i.e., installing an 800-foot-long gated weir with a sill elevation lower than the crest of the dam and keeping it open during floods) at the dam. The study concluded that Vischer Ferry Dam has no significant effect on flooding in Schenectady, New York. The 2018 flooding study used the Mohawk River Mike 11 hydraulic model[3] for the New York State Canal Corporations' Flood Warning and Optimization System and included modeling analyses of several Vischer Ferry Dam crest modification options (i.e., lowering crest) and their effects on flooding in Schenectady, New York under a range of flow conditions. The 2018 flooding study concluded that installing a variable crest control apparatus at the dam under the most extreme option (i.e., dam crest reduced

[3] Mike 11 is a 1-dimensional hydraulic river model developed by DHI, Inc.

by 6 feet) would result in minor changes in water surface elevation in the Stockade Historic District under the 10-year flood flow and no significant changes to the water surface elevation or the depth of flooding under the 100-year and 150 percent of 100-year flood.

In the RSP, NYPA included a Reimagine the Canals Task Force Report prepared by the New York Governor's Reimagine the Canals Task Force. The report describes a flooding study conducted by Bergmann Associates (2019)[4] as part of the Reimagine the Canals initiative. The study included a modeling analysis of the Mohawk River using the Mike 11 model and evaluated a series of potential interventions for flood mitigation, including potential modifications at the Vischer Ferry Dam. The options considered ranged from removing the entire dam to lowering the dam crest by 6 feet for the 100-year and 500-year flood events. The study also included a cost-benefit analysis.

NYPA believes that the existing information on flooding is sufficient, and therefore does not propose a new study on flooding during free-flow conditions (i.e., flooding not caused by ice-jams or debris).

Based on our review of the studies and the alternatives analyzed, existing information appears to be adequate for staff to assess the effects of project impoundment on upstream flooding. Therefore, a new flooding study for free-flow conditions is not recommended.

## II. Required Studies

### Water Quality Study

Applicant's Proposed Study

NYPA proposes to conduct a water quality study to evaluate current water quality conditions for parameters potentially affected by the operation of the projects. Hydrolab datasondes or other self-contained data loggers would be deployed at mid-depth in each project's forebay and tailrace (see figures 2-1 and 2-2 of the RSP) to continuously monitor (defined as acquiring data at 30-minute intervals) water temperature and dissolved oxygen (DO) from May through October of 2020. NYPA notes that the tailrace loggers would be deployed in a well-mixed location to ensure that representative water quality data are collected across the entire range of possible turbine operation scenarios (i.e., from one to four units operating). In addition, at each of the continuous

[4] Bergmann Associates (2019), Mohawk Flood Assessment Report, submitted to Mohawk Subcommittee Task Force Members, October 8, 2019. http://www.canals.ny.gov/reimagine/Technical_Reports/Mohawk_Flood_Assessment.pdf

water quality monitoring locations, water quality profiles (using 1-meter intervals from the surface to the bottom) would be collected on a bi-weekly basis to measure temperature, DO, pH, turbidity, and conductivity.

*Water Quality Monitoring Locations*

Comments on the Study

New York DEC suggests that two continuous water quality monitoring locations be added downstream of each project's spillway due to the large size of the Mohawk River and the potential for water quality conditions in these areas to differ from those in the tailraces and impoundments. FWS expresses concern that a single data logger is not adequate for sampling the full outflow from the projects' turbines (up to four units operating at each project), and recommends that two 'floating downstream monitors' be deployed in each project's tailrace to ensure the water quality data collected are representative of the full extent of turbine discharges at each project.

Discussion and Staff Recommendation

As staff observed during the site visits, there is considerable spill, via leakage through the project's flashboards, which, according to NYPA staff is on the order of 700 cubic feet per second (cfs) on a continual basis. This spill causes re-aeration and provides a continuous supply of water to those areas (immediately downstream of the spillways) in which New York DEC recommends additional water quality monitors be deployed. Given the frequent spillage at the projects, the poorest water quality conditions, particularly for DO, would be expected in the tailraces because if the impoundments stratify, low DO water from the impoundments would be released into the tailraces through the projects' powerhouses. NYPA already proposes to continuously monitor water quality in the project's tailraces, where DO would be expected to be lowest; therefore, the additional monitoring locations (downstream of each spillway) recommended by New York DEC are not needed to discern project effects on water quality. Nor is there a need to deploy a second data logger in each project's tailrace because a single data logger should be sufficient to sample the well-mixed outflow from the turbines in the relatively narrow tailraces (180 feet to 200 feet wide). Therefore, we do not recommend modifying NYPA's proposed water quality monitoring study to include the additional water quality monitoring locations suggested by New York DEC and FWS.

*Additional Water Quality Parameters to be Measured*

Comments on the Study

Riverkeeper recommends that chlorophyll-a and nutrient levels be measured to understand their potential role in the development of harmful algal blooms that may affect drinking water in the project areas. Riverkeeper recommends that these additional water quality parameters be measured at sites throughout the projects' impoundments near any wastewater treatment plant outfalls and other pollution sources in the projects' areas. FWS also recommends that chlorophyll-a be monitored as part of NYPA's proposed water quality study because the slow moving, warmer waters in the projects' impoundments can increase algal productivity above levels that occur in naturally flowing rivers.

Discussion and Staff Recommendation

The projects are operated in a run-of-river mode with project outflows approximating project inflows. As such, the projects would not be expected to increase the residence time of project waters in a manner that would exacerbate algal (chlorophyll-a), nutrient, or pollutant levels [section 5.9(b)(5)]. Therefore, we do not recommend that NYPA be required to monitor chlorophyll-a and nutrient levels.

*Sampling Interval for Continuous Water Quality Monitoring*

Comments on the Study

Both New York DEC and FWS recommend a 15-minute sampling interval for continuous water quality monitoring (temperature and DO), rather than the 30-minute interval proposed by NYPA. The agencies state that a 15-minute sampling interval for water quality is the standard used in many hydroelectric relicensing studies, including those in New York. The agencies also state that while NYPA has indicated that battery limitations may prevent the use of a 15-minute sampling interval, the record across many other projects has shown this is not the case.

Discussion and Staff Recommendation

A 15-minute sampling interval is the industry standard [section 5.9(b)(6)] for continuous water quality monitoring at hydroelectric projects. Therefore, we recommend that a 15-minute sampling interval be used for continuous monitoring of water temperature and DO at the projects.

*Water Quality Study Duration*

Comments on the Study

Riverkeeper recommends that NYPA conduct its water quality study for 2 years (rather than 1 year, as proposed in the RSP) to provide information about interannual variability and to maximize the opportunity of capturing significantly different weather conditions.

Discussion and Staff Recommendation

The need for a potential second study season will be evaluated based on a review of the water quality study results to be presented in the ISR due on February 19, 2021. Therefore, at this time, it is premature to recommend a second study season for the water quality study.

**Fish Entrainment Study**

Applicant's Proposed Study

NYPA proposes to conduct a literature-based assessment of the potential for fish entrainment and impingement at the projects, and to use existing databases, tools, and models to evaluate potential turbine survival rates for representative resident and migratory fish species and life stages present at the projects. NYPA also proposes to measure water velocity and depth at each project's intakes using an Acoustic Doppler Current Profiler. This velocity information will be used in conjunction with fish size and swimming speeds in relation to trash rack spacing, to evaluate the impingement and entrainment potential of selected fish species. NYPA plans to conduct its analysis for those fish species it believes are most likely to be present near the projects' intakes based on the life history characteristics and habitat preferences of fish species known to be present in the projects' impoundments. Estimates of turbine survival would be based on: (1) prior survival studies on the selected species that have been conducted at other hydropower projects with similar turbine types and hydraulic capacities as Crescent and Vischer Ferry, and (2) blade strike models developed for each turbine type (Kaplan and Francis) installed at the projects.

*Fish Species to be Analyzed*

Comments on Study

FWS recommends that American eel be included in NYPA's proposed Fish Entrainment Study.

Discussion and Staff Recommendation

Commission staff's initial study request for an entrainment and impingement study, issued on August 9, 2019, specified that the following target species should be analyzed in the study: (1) blueback herring, (2) American eel, (3) smallmouth bass, (4) walleye, an (5) yellow perch. These species are known to occur upstream of the projects[5] and are therefore susceptible to entrainment and are either resident game fish (smallmouth bass, walleye, and yellow perch) or obligate migrants (juvenile and adult blueback herring and adult silver[6] eels) that must migrate downstream, possibly through the projects' turbines, to complete their life cycle. As such, NYPA's proposal to include in its analysis only those fish species and life stages it believes would be 'near the project's intakes' is inconsistent with staff's study request and FWS's comments on the RSP and would not provide sufficient data to assess project effects (i.e., impingement and entrainment) of important resident and migratory fish that occur in the vicinity of the projects. Therefore, we recommend that, at a minimum, NYPA's Fish Entrainment Study assess the impingement, entrainment, and turbine survival of the five target species listed above.

**Blueback Herring Migration (desktop) Study**

Applicant's Proposed Study

An acoustic deterrent system is deployed in each project's impoundment (Crescent and Vischer Ferry) during the spring. This system operates throughout the barge canal navigation season (mid-May through mid-October) to reduce entrainment of post-spawning adult and juvenile blueback herring as they migrate downstream through the project areas. The system uses a high-frequency sound field to behaviorally guide migrating fish away from the projects' powerhouses and towards a non-turbine route of passage (e.g., through the navigation locks, spillage, or flashboard openings intended for fish passage).

In its RSP, NYPA states that the acoustic deterrent system deployed at the Crescent Project in 2019 experienced 'operational abnormalities' due to issues with an

[5] Pre-Application Document (PAD) at 4-40 to 4-42.

[6] When immature eels mature into adults (a process referred to as 'silvering') they undergo morphological changes that prepare them for their extensive spawning migration from inland freshwater habitats to the Sargasso Sea; during this final life stage (eels die after spawning) they are referred to as 'silver eels.'

underwater power cable, which compromised the power needs of the system's sound projectors. NYPA states it is in the process of resolving this issue, and the tentative date for installing a new power cable is the 'summer of 2020'. NYPA still plans to deploy the system at the Crescent Project this spring (2020) but notes that any field studies of fish migration conducted before a new power cable is installed, such as that requested by FWS,[7] would not be representative of normal operating conditions.

Given the current issues with its acoustic deterrent system, NYPA proposes to conduct a desktop assessment, in lieu of field studies, to address resource agency and stakeholder concerns regarding blueback herring passage and survival through the projects. NYPA proposes to estimate whole-station-survival[8] of juvenile and adult blueback herring at each project. This assessment would use existing data from fish passage and turbine survival studies conducted previously at the projects (when the acoustic deterrent systems were operating), and to supplement this existing (empirical) information with theoretical survival rates for passage routes where empirical data are unavailable and/or deemed insufficient. NYPA proposes to estimate downstream passage survival of both juvenile and adult blueback herring through each potential passage route at the projects (i.e., turbines, sluiceways, spillways, flashboard openings, and canal locks). In addition, NYPA would develop a model that evaluates whole-station-survival at each project as a function of downstream migrant distribution scenarios (i.e., passage probabilities and associated survival through each passage route would be evaluated at different river flows and project operation scenarios).

Comments on the Study

FWS states that NYPA's proposed desktop study would only partially meet the goal of its requested field study, and that site-specific data are necessary for a proper evaluation of the projects' impacts. As such, FWS re-iterates its request for the Blueback Herring Routing and Migration (field) Study to fully evaluate project effects on blueback herring.

New York DEC states that a study is needed to evaluate the movement of adult blueback herring through the projects during both their upstream and downstream

[7] Blueback Herring Migration and Routing (field) Study, described in section III below.

[8] NYPA does not define this term in the RSP. However, we interpret "whole-station-survival" as the proportion of downstream migrants expected to successfully pass through a respective project (Crescent or Vischer Ferry) that are able to continue their seaward downstream migration.

migration that includes a measure of their survivability. New York DEC further states that NYPA's proposed desktop study will only be acceptable if it also has the goal of informing a field study that would be conducted during the second study season (2021).

Discussion and Staff Recommendation

There have been no efforts to date to consolidate and synthesize the results from previous studies on the effectiveness of the acoustic deterrent system in guiding blueback herring away from the projects' turbines. Nor have there been any efforts to integrate this information on the efficiency of the acoustic deterrent system and route selection of migrants with empirical and/or theoretical survival estimates for each passage route in order to estimate whole-station-survival, as proposed by NYPA. Therefore, NYPA's proposed desktop study would aid staff's environmental analysis of project effects on blueback herring and we recommend requiring the study with the following modifications.

With the exception of eels, most fish, such as blueback herring, have a body shape that results in higher turbine mortality through Francis than Kaplan units.[9,10] At the Crescent and Vischer Ferry projects, the Kaplan units are preferentially operated first and Francis units are brought online as additional flows allow. Therefore, NYPA's desktop study should estimate, and report, the percentage of time each of the four units would be expected to operate during the downstream migration season for both adult and juvenile blueback herring based on historical hydrology data. Unlike the Pre-Application Document (PAD), which used only an 8-year period of record to calculate flow statistics, this analysis should be based on a hydrologic period of record of at least 30 years—such data are available from the nearby United States Geological Survey (USGS) gage No. 01357500 at Cohoes, New York.

NYPA proposes to model whole-station-survival across a range of downstream migrant distribution scenarios. Staff recommends that one of the scenarios modeled represent a 'worst-case scenario' for blueback herring mortality. This 'worst-case

[9] Pracheil, B.M., DeRolph, C.R., Schramm, M.P., and M.S. Bevelhimer. 2016. A fish-eye view of riverine hydropower systems: the current understanding of the biological response to turbine passage. Reviews in Fish Biology and Fisheries 26:153-167.

[10] Heisey, P.G., Mathur, D., Phipps, J.L., Christopher Avalos, J., Hoffman, C.E., Adams, S.W., and E. De-Oliveira. 2019. Passage survival of European and American eels at Francis and propeller turbines. Journal of Fish Biology 95:1172-1183.

scenario' would be expected to occur when flows are such that the Francis units are operating (higher mortality expected through the Francis than the Kaplan units, as described above) and most downstream migrants (juvenile or adult blueback herring) pass through the projects' powerhouses. Under this scenario: (1) river flows would approximate the maximum hydraulic capacity of each project (6,640 cfs) such that all four units (two Kaplan, two Francis) would be operating; (2) there would be minimal spill; and (3) the proportion of downstream migrants entrained[11] through the powerhouse would be in direct proportion to the amount of flow going through the powerhouse channel[12] (i.e., migrants would be assumed to follow the bulk flow and the effect of the acoustic deterrent system would be assumed to be negligible).

The orientation of the acoustic sound field was altered at the Crescent Project in 2010 in an attempt to divert more juveniles away from the powerhouse channel. Studies of juvenile blueback herring passage were conducted before (2008) and after (2012) this operational change.[13, 14] However, adult passage was only evaluated *prior* to this change, during a radio-telemetry study in 2009.[15] Therefore, in its study report, NYPA should discuss whether it believes the results of this adult telemetry study are still applicable to the current project (acoustic deterrent system) configuration following re-alignment of the sound field. If additional information is needed to determine project effects on

[11] The trash racks at each project have a clear-spacing of 3.875 inches and therefore cannot physically exclude adult blueback herring, which have a maximum size of 15.7 inches, which corresponds to a body width of about 1.4 inches.

[12] This is mainly applicable to the Crescent Project, where the incoming channel splits (an island is present) upstream of the project, and most of the flow (generally around 85 percent) goes down the powerhouse channel, with the remainder (around 15 percent) going down the non-powerhouse channel. There is a single channel at the Vischer Ferry Project.

[13] Dunning, D.J. and C.W.D. Gurshin. 2012. Downriver passage of juvenile blueback herring near an ultrasonic field in the Mohawk River. North American Journal of Fisheries Management 32:365-380.

[14] Gurshin, C.W.D., Balge, M.P., M.M. Taylor, and B.E. Lenz. 2014. Importance of ultrasonic field direction for guiding juvenile blueback herring past hydroelectric turbines. North American Journal of Fisheries Management 34:1242-1258.

[15] Effect of an ultrasonic system on adult blueback herring at the Crescent Hydroelectric Project: data report. Filed on March 15, 2010. Accession No. 20100315-5011.

blueback herring that can only be obtained through additional field studies, staff recommend that a study similar to that requested by FWS be considered for the second study season and based on a review of the study results presented in the ISR due on February 19, 2021.

## III. Studies Requested but not Adopted by NYPA

### Ice-Jam Flooding Study

Study Request

The Vischer Ferry Project impoundment extends 10.3 miles from the dam upstream to Lock E-8 in Schenectady, New York. Ice-jam flooding occurs in the low-lying areas along the Mohawk River, particularly in the vicinity of the Stockade Historic District in Schenectady. Comments concerning this issue were filed with the Commission by several stakeholders. In its comments on the PSP, Commission staff requested that NYPA conduct an ice-jam induced flooding study to evaluate any project effects on flooding due to the formation of ice-jams in the river reaches upstream of the Vischer Ferry Dam.

NYPA states that the Ice Jam Mitigation Panel of the New York Governor's Reimagine the Canals initiative has developed an ice-jam model to better understand the causes of ice-jams in the Mohawk River and effects of potential solutions, and describes a report prepared for the panel by BuroHappold (2019)[16] on this effort. NYPA states that this study or effort is currently underway and therefore, is not proposing an ice-jam flooding study.

Several commenters (Jasmine Roberts, Suzanne Unger, Russell Wege, Carol Delamarter, and James Woidt) request an ice-jam flooding study to evaluate project effects, if any, on upstream flooding. Carol Delamarter states that other studies or possible future actions to address flooding in the area would not inform the Commission's licensing requirements. James Woidt notes that the Reimagine the Canals initiative may not yield any ice jam mitigation actions and requests that ice-jam flooding be studied as part of the Commission's relicensing process.

[16] BuroHappold (2019), Ice Jams in the Mohawk River Valley, Report to the Reimagine the Canals Task Force, October 8, 2019. http://www.canals.ny.gov/reimagine/Technical_Reports/Mohawk_Ice_Jam_Study.pdf

Discussion and Staff Recommendation

The ice-jam flooding study report (BuroHappold (2019)) cited by NYPA describes an ice-jam model that has been developed as part of the Reimagine the Canals initiative and was used to replicate the 2018 ice-jam formation and breakup events in the river to establish a baseline.[17] The ice-jam study considered nine measures for preliminary evaluation and recommended several measures for further evaluation that includes the use of ice breakers/cutters, modification of the Vischer Ferry Dam (i.e., installing crest gates), and the deployment of an early monitoring and warning system to better predict ice jam formation and flooding.

On February 7, 2020, NYPA filed additional information on the scope of the ongoing ice-jam study. The filing states that this study will continue through 2020 and include further analysis of ice-jam flooding and potential mitigation, including: (a) assessing structural and non-structural options to determine if additional mitigation can be achieved by physical modifications at the Vischer Ferry Project, and (b) assessing a variety of interventions including the use of an ice breaker, channel modifications, and an early warning system to identify if they would provide appropriate mitigation in the vicinity of the project. NYPA states that the objectives of the FERC staff requested study are being addressed through the ongoing ice-jam study, and therefore, no additional study of ice-jams in the vicinity of the project is needed.

Although the BuroHappold (2019) study report included a preliminary evaluation of several measures, it did not include a modeling evaluation of the Vischer Ferry Project's effects on ice-jam formation and ice-jam induced flooding. However, NYPA outlines the scope of the ice-jam study currently underway in its February 7, 2020 filing and notes that the modeling team has developed and is refining an ice-jam model to evaluate the effects, if any, of the Vischer Ferry Project on ice jam formation and related flooding. Additionally, it states that the objectives of the FERC staff requested study would be addressed through that study. Considering the scope of the ongoing study (i.e., modeling various options for ice-jam induced flooding mitigation, including options for physical modification at the Vischer Ferry Project), it appears that the ongoing study would provide the information needed by staff for its environmental analysis, and therefore, requiring NYPA to conduct a separate study at the same time would not be justified. Therefore, we recommend NYPA provide an update of the ongoing ice-jam flooding study, including modeling results when it files its ISR. However, if information provided by NYPA at that time is insufficient for staff to conduct its environmental analysis, staff may recommend an additional study.

[17] The 2018 ice-jam was one of the significant ice-jam events and caused severe flooding in the Schenectady area.

**American Eel Study**

Study Request

Both New York DEC and FWS request field studies of American eel at the projects. However, New York DEC's request is more specific and subsumes all elements of FWS's requested study. Therefore, we focus herein on New York DEC's study request.

New York DEC requests a study to assess the presence and relative abundance of American eel elvers[18] at the projects to inform the need for eel ladders to enhance upstream passage for this species. New York DEC states there have been limited to no concentrated efforts to sample American eel in the Mohawk River. As such, it requests that eel ramp pass traps (eel traps)[19] and eel mops[20] be deployed at the projects by late April and removed in September to determine the staging of upstream migration and relative abundance of elvers at the projects. New York DEC suggests that NYPA consult with New York DEC and FWS regarding the number, size, and placement of the eel traps and eel mops. New York DEC specifies that the traps be checked at regular intervals—once a week at numbers less than 50 and daily at more than 50 individuals; and that the eel mops should be checked daily and removed during high-flow conditions to prevent

[18] When American eels enter estuaries from the Atlantic Ocean they are small and transparent, with fins, and are referred to as 'glass eels'. As glass eels continue their upstream migration through estuaries and into riverine habitats, they become pigmented and more robust and are referred to as 'elvers', which are generally a few inches long and around 1 year old.

[19] New York DEC proposes to use eel ramp pass traps similar to those deployed during American eel studies at the Parr Hydroelectric Project (FERC No. 1894). These traps are deployed at the base of dams to sample elvers that are attempting to move upstream. For more information see: http://parrfairfieldrelicense.com/documents/STUDY_REPORTS/16_06_07_Final_Revised_American_Eel_Abundance_Report_for_Parr.pdf

[20] Eel mops are a type of mat device deployed on the riverbed and are meant to mimic habitat that young eels use for shelter; this gear has been used to sample glass eels and elvers. For a more detailed description, see: https://www.dec.ny.gov/docs/remediation_hudson_pdf/eelmop.pdf https://www.hudsonriver.org/wp-content/uploads/2017/10/Camhi_001_15A_final_report.pdf

gear loss. New York DEC states that collected eels should be enumerated, their length and life stage recorded, and that all elvers should be released upstream of the project dam (Crescent or Vischer Ferry) at which they were captured, whereas any larger yellow- or silver-phase eels[21] should be released downstream of their capture dam.

NYPA does not propose to conduct these field studies. In lieu of field studies, NYPA proposes to compile, as part of its desktop Fish Community Study,[22] a summary of American eel data collected during previous fish surveys on the Mohawk River and also incorporate into its desktop study, the results of an ongoing pilot study by USGS of American eel environmental DNA (eDNA)[23] in the Mohawk River (preliminary results from this pilot study are expected by the fall of 2021). NYPA states that existing survey data indicate that American eel are present in very small numbers at the projects, and if the results of its desktop (Fish Community) study demonstrate that eels occur more frequently than indicated in the current record that it may propose an additional study or data collection in the second study season (2021).

Riverkeeper states that a scientifically robust survey technique is needed to accurately determine the actual abundance of American eel populations in the project areas. Riverkeeper believes NYPA's desktop approach is insufficient in scope, scale, and sampling design with regard to American eel. Riverkeeper also states that eDNA studies could be used to supplement, but not necessarily replace, targeted eel (field) surveys at the projects.

[21] The 'yellow' phase of American eel is their primary growth phase and longest lasting life stage—up to 30 years depending on sex (males mature earlier, and at smaller sizes, than females). Yellow eels are thought to establish home ranges in estuaries and rivers and exhibit more limited movements than glass eels and elvers.

[22] RSP at 23-32.

[23] During their lives, organisms shed biological materials (waste products, gametes, skin, etc.) that contain traces of their DNA. The technique of testing for these DNA traces in the environment to infer the presence of (often rare or cryptic) species that are otherwise difficult to sample for, is called environmental DNA (eDNA) analysis.

Discussion and Staff Recommendation

Recent surveys using boat and backpack electrofishing—gear types that are scientifically accepted[24,25] for sampling yellow and silver eels [section 5.9(b)(6)]—suggest that eels are present in very low numbers in the Mohawk River upstream of the projects. Electrofishing surveys were conducted in 2014, 2015, and 2016, across 112 river miles of the Mohawk River from the Crescent impoundment to near Rome, New York.[26,27] Despite the intensive sampling effort associated with these surveys—24 mainstem sites were sampled by boat electrofishing in May and June, with 15 to 30 minutes of shocking time per site, and 35 tributary sites were sampled during summer by backpack electrofishing, with 10 to 20 minutes of shocking time per site—no eels were captured. In a separate, smaller-scale survey in which 8.9 hours of boat electrofishing was conducted in the Crescent impoundment during June 2018, only one eel was captured.[28]

Numerous factors could contribute to the apparent low abundance of eels above the projects. These include multiple downstream barriers on the lower Mohawk River, including three hydropower dams (below the Crescent Project) and a series of navigation locks that operate primarily during the day (eels are nocturnal and mainly move at

[24] Goodwin, K.R., and P.L. Angermeier. 2003. Demographic characteristics of American eel in the Potomac River drainage, Virginia. Transactions of the American Fisheries Society 132:524-535.

[25] Machut, L.S., Limburg, K.E., Schmidt, R.E., and D. Dittman. 2007. Anthropogenic impacts on American eel demographics in Hudson River tributaries, New York. Transactions of the American Fisheries Society 136:1699-1713.

[26] George, S.D., Baldigo, B.P., and S.M. Wells. 2016. Effects of seasonal drawdowns on fish assemblages in sections of an impounded river-canal system in upstate New York. Transactions of the American Fisheries Society 145:1348-1357.

[27] RSP at 66-68.

[28] https://www.dec.ny.gov/docs/fish_marine_pdf/crescentlktb2018040.pdf

night),[29,30] all of which may limit the number of eels reaching, and seeking upstream passage past the projects.

Comparisons of the relative abundance of eels immediately upstream and downstream of each project dam (using the same gear type) are needed to properly assess the ability of the eels to migrate upstream past each dam. However, the desktop approach proposed by NYPA appears limited in its ability to infer such site-specific differences for several reasons. First, the existing data that NYPA would use in its assessment are mostly from existing surveys conducted *upstream* of the Crescent Project. Only two of the data sources (surveys) that NYPA lists in the RSP, both of which are rather dated and occurred more than 26 years ago,[31,32] were conducted downstream of the Crescent Project in the Mohawk River. As such, this lack of data from the lower Mohawk River (downstream of Crescent) limits the extent to which existing survey data can be used to compare relative eel abundances upstream versus downstream of each project. Second, while eDNA is a promising tool for studying the presence and distribution of rare aquatic species at large (i.e., river-wide) spatial scales, the ability of this technique to determine finer-scale differences in relative abundance (e.g., above and below specific barriers)

[29] Sorensen, P.W., Bianchini, M.L., and H.E. Winn. 1986. Diel foraging activity of American eels, *Anguilla rostrata* (LeSueur), in a Rhode Island estuary. Fishery Bulletin 84(3):746-747.

[30] Shepard, S.L. 2015. American eel biological species report. U.S. Fish and Wildlife Service, Hadley, Massachusetts. xii +120 pages.

[31] McBride, N.D. 1985. Distribution and relative abundance of fish in the lower Mohawk River. New York State Department of Environmental Conservation, Region 4 Fisheries Office, Stamford, New York.

[32] School Street Project (FERC No. 2539). Response to Schedule B Additional Information Request No. 4, Fish Resources Baseline Study. July 1994. Filed with the RSP (Appendix D).

currently appears limited, especially in lotic systems.[33,34] Thus, it is unclear how the results from the pilot eDNA study that NYPA refers to could be used to assess the ability of the eels to migrate upstream past each dam. Therefore, given the existing information that NYPA would rely on in its desktop approach appears inadequate for assessing the upstream migration of American eel past the dams [section 5.9(b)(4)], we recommend that NYPA conduct the American eel (field) studies requested by New York DEC and FWS, with the following modifications.

New York DEC does not specify the number, size, and placement of the eel traps and mops that would be used to sample American eel elvers; instead suggesting that NYPA consult with the resource agencies regarding these elements of the study. While we agree the study design would benefit from consultation with the resource agencies, sampling gears of the same type must be deployed both upstream and downstream of each project dam in a manner that allows staff to assess the degree to which the eels can migrate upstream past the dams. While the eel traps New York DEC recommends would aid in determining whether appreciable numbers of elvers reach the projects and are attempting to ascend the dams, they are designed to sample in downstream areas only, near the base of a dam, as they are essentially a small-scale eel ramp that lacks an upstream exit. This leaves the eel mops as the only gear type that would be deployed both upstream and downstream of each dam. Therefore, if the eel mops are found to be ineffective during the first study season, staff may recommend that additional sampling gears, such as fyke nets (which are commonly used to sample elvers in rivers)[35, 36] be deployed during the second study season (upstream and downstream of each project dam) to provide the information needed for its environmental analysis.

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[33] Itakura, H., Wakiya, R., Yamamoto, S., Kaifu, K., Sato, T., and T. Minamoto. 2019. Environmental DNA analysis reveals the spatial distribution, abundance, and biomass of Japanese eels at the river-basin scale. Aquatic Conservation: Marine Freshwater Ecosystems 29(3):361-373.

[34] Rees, H.C., Maddison, B.C., Middleditch, D.J., Patmore, J.R.M., and K.C. Gough. 2014. The detection of aquatic animal species using environmental DNA – a review of eDNA as a survey tool in ecology. Journal of Applied Ecology 51:1450-1459.

[35] http://www.asmfc.org/uploads/file/yoyEelSamplingProtocol.pdf

[36] Schmidt, R.E., R. Peterson, and T.R. Lane. 2006. Hudson River tributaries in the lives of fishes with emphasis on the American eel. American Fisheries Society Symposium 51:317-330.

New York DEC states that it would release all elvers upstream of the project dam at which they were collected. However, this approach could confound study results (e.g., if elvers collected downstream of a dam are released upstream of that dam and are captured again in upstream areas, this could artificially inflate estimates of upstream abundance and passage success). Therefore, to avoid this potential bias, all captured eels (regardless of their life stage) should be released as close as possible to their capture location and upstream-downstream transfers of all eels should be avoided during the study.

**Blueback Herring Migration and Routing (field) Study**

Study Request

FWS requests a field study to evaluate the downstream migration and routing of adult and juvenile blueback herring in relation to the dams, powerhouses, fish bypasses (flashboard openings), and lock facilities at the projects. FWS states there are no existing studies that provide data on the routing and timing of the migration of blueback herring through both projects sequentially under current license conditions, fish passage design, lockage frequency, and shortened navigation season. FWS requests that NYPA use a variety of radio telemetry, hydroacoustic, and mortality studies (e.g., balloon tagging) to evaluate movement and mortality of blueback herring as they migrate downstream past the projects.

Discussion and Staff Recommendation

As discussed above, the acoustic deterrent system at the Crescent Project is currently inoperable and is not expected to be repaired and operational until sometime in the summer of 2020. By the time this repair work is completed, most adult blueback herring will have likely left the system, as spawning generally peaks in May, after which time adults leave the river and are generally absent by late June or early July.[37,38,39] Given this constraint, a field study of adult and juvenile downstream migration and

[37] Final Report on Testing of the Acoustic Deterrence System at the Vischer Ferry and Crescent Projects. Filed on March 15, 1999. Accession No. 19990316-0337.

[38] Limburg, K. and N. Ringler. 2012. Relative abundance of blueback herring (*Alosa aestivalis*) in relation to permanent and removable dams on the Mohawk River. Final Report to Cornell Water Resources Institute. April 2012.

[39] Wells, S.M., Limburg, K.E., and C.D. Legard. Tracking blueback herring in the lower Mohawk River. AFS New York Chapter Meeting. January 30-February 1, 2013.

routing through both projects, as requested by FWS, is not possible at this time. Therefore, we do not recommend FWS's Blueback Herring Migration and Routing (field) Study. Nevertheless, if staff determine, based on the results of NYPA's Blueback Herring Migration (desktop) Study described above in section II, that there is a need for additional information concerning project effects on blueback herring that can only be obtained through additional field studies, then staff may recommend a study similar to that requested by FWS be required during the second study season (2021) when the acoustic deterrent systems at both projects should be operational.

**Run-of-River Compliance Study**

Study Request

FWS requests a run-of-river compliance study to evaluate how project operation affects downstream flows. FWS states that in its view, project operations, including unit trips, unit start-ups, and flashboard condition could have "notable impacts" on downstream flows and the aquatic communities in the Mohawk River. The goal of the study would be to evaluate run-of-river compliance at the projects and to determine what effects the projects may have on downstream flows. FWS states that the objectives of the study would be to: (1) record generation, operations, impoundment levels, and flows at the projects; and (2) produce "figures of these projects" and flow data for evaluation of run-of-river compliance.

FWS believes the study is needed because:

> downstream fluctuations are occurring on the Mohawk River that do not appear to [FWS] be solely the cause of the operation of upstream projects. Project operations need to be evaluated to determine the source of these fluctuations. In rivers with multiple hydroelectric projects attempting to operate in a ROR fashion, there is often a difficulty in maintaining river flows depending on how each project is operated. Fluctuations downstream decrease the value of the habitat for fish and other aquatic organisms.[40]

FWS further states that: (1) the PAD provides no information regarding fluctuations at the USGS Cohoes gauge located downstream of the projects or whether or not alleged fluctuations may be a result of the operations of the projects; (2) the methods the applicant utilizes to achieve run-of-river are not defined in the PAD; and (3) the project's Francis turbines are generally operated at full gate and the ramping up and down of these units could in FWS's view, "dramatically affect" downstream flows.

[40] FWS's Comments on PAD, Scoping Document 1, and Study Requests at 14 (filed on August 9, 2019).

In the RSP, NYPA responds that it declines to conduct the requested study because the USGS Cohoes gage is located downstream of the School Street Project No. 2539, and therefore, any fluctuations in flow observed at the gage are, in its view, a direct result of the operation of the School Street Project rather than of the Crescent and Vischer Ferry Projects. NYPA adds that all of the information that FWS recommends be collected, including generation, headpond, and project discharge data is either publicly available via the internet (e.g., Cohoes gage data) or will be provided in the license application in accordance with the Commission's regulations.

Discussion and Staff Recommendation

FWS has filed no accompanying Cohoes gage record information for us to consider and to support its contention that the projects could be the source of flow fluctuations that FWS says it observed in the Cohoes gage record. In addition, FWS did not identify the specific fluctuation events that it contends could be caused by the projects. Therefore, we have no basis for establishing a nexus between the Crescent and Visher Ferry Projects and any flow fluctuations that occur at the downstream Cohoes gage [section 5.9(b)(5)]. Moreover, there is no project-specific justification for requiring NYPA to answer the question of what caused the unspecified flow fluctuations that FWS observed in the Cohoes gage record.

Nevertheless, as NYPA correctly notes, the Commission's regulations require NYPA to provide in its license application, much of the information requested by the FWS including, but not limited to:[41]

(1) a statement whether operation of the powerplant will be manual or automatic, an estimate of the annual plant factor, a statement of how the project will be operated during adverse, mean, and high water years;

(2) the minimum, mean, and maximum recorded flows in cubic feet per second of the stream or other body of water at the powerplant intake or point of diversion, with a specification of any adjustments made for evaporation, leakage, minimum flow releases (including duration of releases), or other reductions in available flow;

(3) monthly flow duration curves indicating the period of record and the gauging stations used in deriving the curves;

(4) an area-capacity curve showing the gross storage capacity and usable storage capacity of the impoundment, with a rule curve showing the proposed

[41] See e.g., 18 C.F.R. § 4.51(c) (2019).

operation of the impoundment and how the usable storage capacity is to be utilized;

(5) the estimated hydraulic capacity of the powerplant (minimum and maximum flow through the powerplant) in cubic feet per second; and

(6) a tailwater rating curve; and a curve showing powerplant capability versus head and specifying maximum, normal, and minimum heads.

In addition, the Cohoes gage data is readily available online [section 5.9(b)(4)].[42] For these reasons, we do not recommend the requested run-of-river study.

[42] See https://waterdata.usgs.gov/usa/nwis/uv?site_no=01357500.