



United States Department of the Interior

FISH AND WILDLIFE SERVICE

New England Field Office
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Concord, NH 03301-5087
<http://www.fws.gov/newengland>



July 19, 2017

Ms. Shannon Ames, Executive Director
Low Impact Hydropower Institute
329 Massachusetts Ave, Suite 2
Lexington, Massachusetts 02420

Dear Ms. Ames:

Re: Open Square LIHI Recertification

This responds to your request for information necessary for the Open Square hydroelectric facility (Open Square, Project) to complete its application for Low Impact Hydropower Institute (LIHI) recertification. The U.S. Fish and Wildlife Service has reviewed the project file and LIHI's original December 2011 hydropower certification and offers the following comments.

Background

The Open Square project is owned and operated by Open Square Properties, LLC and is located on the Holyoke Canal in Hampden County, Massachusetts. Open Square consists of two powerhouses, each with a single Leffel "Z" 33-inch vertical Francis turbine unit, referred to as the D-wheel and the G-wheel. These units receive flow from the Connecticut River by means of the First Level canal via two open raceways. All canal flows that feed the Project are controlled by the Holyoke Hydroelectric System owner, the Holyoke Gas and Electric Company (HG&E), from the gate house at the Holyoke Dam (FERC No. 2004). Canal flows are regulated under the Holyoke dam license; however, Open Square operations are governed by historic indentured water rights which permit primary operations Monday through Saturday from 6 a.m. to 10 p.m. According to the Open Square recertification application, under a separate agreement with HG&E, the Project typically runs 24 hours a day when flows at the Connecticut River exceed approximately 15,000 cfs.

Comments

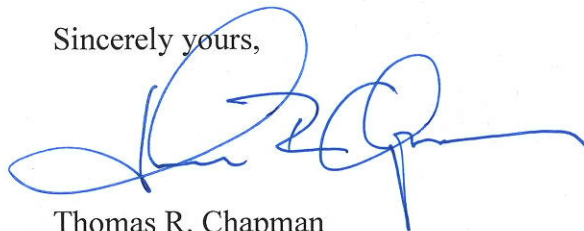
In 2016, HG&E submitted applications to relicense six hydroelectric projects within the canal: Holyoke No. 1, Holyoke No. 2, Holyoke No.3, Albion A, Albion D, and Nonotuck (FERC Nos. 2387, 2386, 2388, 2768, 2766, and 2771, respectively). As part of these proceedings, we

submitted a study request recommending HG&E assess the behavior and downstream movement patterns of emigrating American eels (*Anguilla rostrata*) at the canal entrance and inside the canal at the full depth louver located at the Holyoke dam. Previous studies pertaining to eels at Holyoke are not specific to the canal or louver (Normandeau 2007) and do not describe a route of passage, but rather the movement of 12 eels through the bypass at the entrance of the canal system and the movement of 12 eels through the louver (Electric Power Research Institute [EPRI] 2007). Using the telemetry data collected for the EPRI 2007 study, Don Pugh of Trout Unlimited was able to assign a route of passage to 57 of the 60 tagged eels and found that 54.4 percent were guided by the louver and bypassed to the tailrace, while 45.6 percent passed through the louver (Don Pugh, Trout Unlimited, personal communication). These results suggest that a substantial portion of eels enter the canal system. This, coupled with the general lack of canal-specific eel studies, initiates the need for an evaluation of the impacts of the canal projects on eels. HG&E has since proposed to evaluate eel entrainment, impingement, and turbine survival at the Holyoke No. 1, Holyoke No. 2, and Holyoke No. 3 projects via a desktop analysis (Attachment A). The Albion A, Albion D, and Nonotuck projects were not included in the proposed study because HG&E intends to surrender these projects.

Therefore, we recommend that any LIHI recertification issued for Open Square require that Open Square Properties, LLC evaluate eel entrainment, impingement, and turbine survival at their project so that State and Federal natural resource agencies can assess whether alternative management options may be needed to increase eel survival at the D-wheel and G-wheel units.

We appreciate the opportunity to provide information relative to fish and wildlife issues in the LIHI certification process, and thank you for your interest in these resources. If you have any questions, please contact Julianne Rosset of this office at 603-227-6436.

Sincerely yours,



Thomas R. Chapman
Supervisor
New England Field Office

Attachment

LITERATURE CITED

Electric Power Research Institute; D. Dixon. August 2007. Movement Behavior of American eel (*Anguilla rostrata*) on an Angled Louver Array at a Hydroelectric Project.

Normandeau Associates. April 2007. American Eel Emigration Approach and Downstream Passage Routes at the Holyoke Project, 2006.

June 1, 2017

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

**Subject: Holyoke Gas and Electric Department
Supplemental Information for Enhanced Desktop Study**
Holyoke No. 1 Project, FERC Project No. 2386
Holyoke No. 2 Project, FERC Project No. 2387
Holyoke No. 3 Project, FERC Project No. 2388

Dear Secretary Bose,

On May 9, 2017, the City of Holyoke Gas and Electric Department ("HG&E") filed a request for further extension of time to submit additional information requested by the FERC Staff and by United States Fish and Wildlife Service ("USFWS") with respect to the relicensing proceedings for the Holyoke No. 1, 2 and 3 Hydroelectric Projects (FERC Project Nos. 2386, 2387 and 2388, respectively, and collectively referred to as the "City Units"). This additional information is intended to respond to the FERC Staff's December 2, 2016 letter and the USFWS' March 22, 2017 letter in these proceedings. Follow-up to HG&E's May 9th filing, FERC Staff, HG&E and USFWS representatives participated on a conference call on May 18th, to discuss further the additional information that HG&E intends to file in these relicensing proceedings. That conference call has been documented in a May 24, 2017, Memo submitted into the record in these proceedings by FERC Staff. This letter summarizes the additional information that HG&E will be providing in these proceedings as discussed on the May 18th conference call.

As requested during the May 18th conference call, the 2006 Resident Fish Survey was reviewed to obtain additional information not originally included in that report. Both River and Canal flow data were available for the collection dates at the louver bypass and are included as an Attachment A to this letter; this information is submitted as a supplement to the record in the relicensing proceedings. However, data for Canal louver velocity on the collection dates and fish length and size were not collected at the time of sampling and, therefore, are not available.

Subsequent to the call, HG&E has undertaken a further review of data that may be available and provide some additional information about the fish assemblage within the Connecticut River, which fish might enter the Canal System. HG&E has located information from a study conducted by the Midwest Biodiversity Institute (MBI) entitled "Connecticut River Fish Species Turners Falls to Head of Tide, 2009." This 2009 MBI study addresses the FERC Staff's inquiry on "fishery resources present" within the First Level of the Canal System, as requested in the December 2016 Additional Information Request. Presentations and raw data from this study have been acquired by HG&E's consultant (Alden) from MBI and will be attached to the Enhanced Desktop Study report.

As also discussed on the May 18th conference call and to confirm HG&E's plan, the Enhanced Desktop Study will evaluate entrainment, impingement, and turbine survival at the Holyoke No. 1, 2 and 3 Hydroelectric Projects (FERC Project Nos. 2386, 2387 and 2388, respectively, and collectively referred to as the "City Units") for resident fish and silver phase American eels. The evaluation of resident fish will include any species and life stages that are small enough to pass through the 2-inch clear slot spacing of the louver array and which could potentially enter the Canal. Therefore, the Enhanced Desktop Study addresses the FERC Staff's request to have the study cover resident fish as well as American eels. The planned scope of the Enhanced Desktop Study is further amplified below:

Entrainment Assessment – The potential for entrainment through turbines at the City Units will be assessed for fish that are physically small enough to pass through the 2" louver slot spacing and could potentially enter the Canal System. The proportion of fish that are entrained at each of the City Units will be developed for the current flow allocation and unit prioritization used for the range of flow rates entering the Canal. The proportion of time that specified Canal flows occur will be determined based on the flow duration curve for the Connecticut River at the Hadley Falls Station and the allocation of river discharge to the Canal, pursuant to the Holyoke Project License, FERC Project No. 2004.

Impingement Assessment – The clear spacing of the bar racks on the intakes at the City Units is 3 inches. Because the louver array at the head of the First Level Canal has a 2-inch clear spacing, fish impingement is not expected to occur at the Canal unit intakes. However, after passing through the louvers, some resident species may reside in the Canal System for extended periods of time and could reach larger sizes at which they would be too large to pass through the rack spacing of the City Units and, consequently, potentially could become susceptible to impingement. To address the potential impingement risk for any such fish, the potential for impingement at the City Units intakes will be evaluated by comparing approach velocities at each intake to available swimming speed data for species and size classes that could reach an impingeable size. It is expected that no diadromous species, including American eel, will reach a size that would expose them to impingement.

Turbine Survival – Alden will estimate turbine survival for resident fish (species composition will be determined as part of the entrainment assessment) and migratory species, including silver American eel, using an established theoretical model similar to the method reported by Franke et al. 1997¹. Turbine survival estimates will be generated in 50-mm increments for the length ranges of each species expected to be susceptible to entrainment through the City Units. The model used by Alden will provide an estimate of blade strike probability based on fish length and turbine design parameters that influence the likelihood strike for a fish passing between two blades. For fish struck by a blade, survival will be estimated using laboratory data from blade strike studies^{2,3} conducted with rainbow trout and white sturgeon, multiple fish lengths, blade leading edge thicknesses, and strike velocities. Predictive blade strike survival models are considered appropriate means for estimating turbine survival at low head projects (< 100 ft) because other injury mechanisms (e.g.,

¹ Franke, G. F., D. R. Webb, R. K. Fisher, D. Mathur, P. N. Hopping, P. A. March, M. R. Headrick, I. T. Laczo, Y. Ventikos, F. Sotiropoulos. 1997. Development of Environmentally Advanced Hydropower Turbine System Design Concepts. Prepared for the U.S. Department of Energy, Report No. INEEL/EXT-97-00639.

² EPRI (Electric Power Research Institute). 2008. Evaluation of the Effects of Turbine Blade Leading Edge Design on Fish Survival. Prepared by Alden Research Laboratory, Inc., EPRI Report No. 1014937.

³ EPRI (Electric Power Research Institute). 2011. Additional Tests Examining Survival of Fish Struck by Turbine Blades. Prepared by Alden Research Laboratory, Inc., EPRI Report No. 1024684.

damaging pressure regimes and shear and turbulence) are considered to be inconsequential or expected to produce very low injury and mortality rates. Alden has used this theoretical model to estimate turbine survival of shortnose sturgeon entrained through the units at the Hadley Falls Station under FERC Project No. 2004 and for Atlantic salmon and kelts entrained at 15 projects in the Penobscot River basin in Maine. The resource agencies have accepted the results from these models and NMFS has used the data in their BO for Penobscot River projects.

Although the theoretical strike model will provide a relative measure of eel survival among different turbine types and designs, it typically under-predicts survival rates because eels often exhibit less mortality than would be expected based on their total length. Therefore, in addition to the theoretical blade strike model, Alden will include in its analysis an estimate of turbine survival of silver American eels passing through the propeller turbines at City Units 2 and 3 (which have Kaplan turbines) using a multiple linear regression model developed from field studies conducted at more than 50 hydro projects with Kaplan or fixed-blade propeller units in Europe and North America. However, there is no similar dataset of eel survival studies for Francis turbines (which is the type of turbine at City Unit 1), but recent field evaluations conducted with silver eels at three projects (Wilder [P-1892], Bellows Falls [P-1855], and Turners Falls [P-1889] hydroelectric projects) upstream of Holyoke will provide data that can be used to compare between the theoretical model estimates and field estimates in order to determine if the application of the theoretical model to the City 1 Francis turbines produces estimates that either over or under-predict survival.

Further, as requested by USFWS the final Enhanced Desktop Study report HG&E will also include information on HG&E's other units on the Canal that are not involved in these relicensing proceedings (*i.e.*, turbine type, runner speed and size/diameter).

HG&E believes that this additional information, including the final Enhanced Desktop Study report to be submitted by August 15, 2017, will provide the fisheries and other information needed to support environmental review as requested by the FERC Staff in its December 2, 2016, letter, particularly given the very high level of efficiency of the full-depth louvers in preventing fish entering the Canal System. As affirmed by the USFWS on the May 18th conference call, HG&E understands that this additional information (including the final Enhanced Desktop Study report) will fulfill the USFWS's March 22, 2017, additional information request.

Please contact me at (413) 536-9340 if you have any questions regarding this matter.

Sincerely,



Paul S. Ducheneay
Superintendent – Electric Production

Attachment

cc: Kyle Olcott, FERC (w/ Attach.)
Jennifer Ambler, FERC (w/ Attach.)
John Warner, USFWS (w/ Attach.)
Julianne Rosset, USFWS (w/ Attach.)
James Lavelle, HG&E (w/ Attach.)

Holyoke Gas and Electric Department
 FERC Project Nos. 2386, 2387 and 2388
 Supplemental Information – June 1, 2017
 Attachment A

Table 1. Collection Dates conducted at the Holyoke canal bypass, 2006

Canal Bypass Counts	River Flows (CFS)	Canal Flows (CFS)	Canal Velocities	Fish Length
Wednesday 19-Jul	14,358	4,250		
Monday 24-Jul	22,829	5,500		
Wednesday 26-Jul	13,273	3,775		
Monday 31-Jul	13,175	4,125		
Wednesday 2-Aug	7,829	1,000		
Monday 7-Aug	13,025	2,583		
Wednesday 9-Aug	7,666	542		
Monday 14-Aug	6,233	400		
Wednesday 16-Aug	3,854	400		
Monday 21-Aug	11,366	3,288		
Wednesday 23-Aug	12,366	4,013		
Monday 28-Aug	6,429	400		
Wednesday 30-Aug	10,370	1,550		
Monday 4-Sep	9,075	3,000		
Wednesday 6-Sep	8,683	3,000		
Monday 11-Sep	3,963	3,000		
Wednesday 13-Sep	4,117	3,000		
Monday 2-Oct	12,287	1,846		
Wednesday 4-Oct	10,645	2,200		
Monday 9-Oct	5,692	3,000		
Wednesday 11-Oct	5,463	1,583		
Monday 16-Oct	6,650	3,000		
Wednesday 18-Oct	11,234	3,000		
Monday 23-Oct	35,679	3,700		
Wednesday 25-Oct	28,862	4,100		
Wednesday 1-Nov	37,685	3,625		
Monday 6-Nov	19,662	4,600		
Wednesday 8-Nov	17,675	4,600		
Monday 13-Nov	35,029	4,600		
Wednesday 15-Nov	39,537	4,600		