



United States Department of the Interior



FISH AND WILDLIFE SERVICE

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In Reply Refer To: FERC Nos. 1889 and 2485
FirstLight Power Resources/GDF Suez
Connecticut River
NOTICE OF STUDY DISPUTE

March 13, 2014

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E., Room 1A
Washington, DC 20426

Dear Secretary Bose:

The U.S. Fish and Wildlife Service (Service) hereby requests formal study dispute resolution pursuant to 18 C.F.R. §5.14 in the above-noted relicensing proceeding. The series of studies described in the Study Plan Determination issued by staff of the Federal Energy Regulatory Commission (Commission) will not provide specific information about effects of the Northfield Mountain Pumped Storage Project (NMPS) on certain migratory fish species. Failure to provide this information will compromise the Commission's ability to establish license conditions and the Service's ability to set mandatory conditions under Section 18 of the Federal Power Act (FPA).

The Service presented study requests in its letter of March 1, 2013 (attached as Appendix A). These study requests were developed in compliance with the Commission's regulations at 18 C.F.R. §5.9. The Service provided additional comment and information to FirstLight Power Resources (FirstLight) in a meeting held on June 4, 2013 and in comment letters to the Commission dated July 15, 2013, August 29, 2013, and September 13, 2013. Throughout the process, the Service has worked with the Applicant (FirstLight) and the Commission to develop studies that it believes are consistent with all seven criteria of 18 C.F.R. §5.9. Many of the concerns of the Service have been met through this process. However, there remains one aspect of the Service's study requests which has not been satisfactorily resolved, related to the establishment of a full record upon which to base possible prescriptions for fishways following the Service's authority as described in Section 18 of the FPA. This issue is addressed below under the heading given it in the Service's original study request of March 1, 2013.

Service Study Request No. 12: Entrainment of Migratory and Riverine Fish from the Connecticut River into the Northfield Mountain Pumped Storage Project

The Service requested FirstLight to conduct ichthyoplankton sampling in the vicinity of the NMPS intake to quantitatively determine the level of entrainment of early life stages of American shad. The Study Plan Determination did not include this component of the study. In justifying the exclusion of ichthyoplankton sampling, Commission staff reasoned that in situ studies of entrainment survival of fish eggs and larvae are rare, expensive, challenging, and have shown mixed results. The Determination does however note that an empirical study of juvenile shad entrainment will be conducted (Study 3.3.3) and recommends that FirstLight consult with stakeholders after those study results are available to assess whether further investigation into potential effects of entrainment of earlier life stages of American shad at NMPS should be considered. Outlined below, we (1) address both Commission staff's reasons for excluding ichthyoplankton sampling and its recommendation for revisiting the need for such sampling in the second study year; (2) identify how the requested entrainment assessment meets study plan criteria; and (3) designate a panel member of the Study Dispute Panel.

1. RESPONSE TO DETERMINATION JUSTIFICATION

Reasons for Excluding the Sampling

Commission staff state that in situ studies of entrainment survival of fish eggs and larvae are rare, expensive, challenging, and have shown mixed results. The Service was not requesting an evaluation of egg and larval survival through the NMPS Project because there is no need for one, given that FirstLight has acknowledged that all fish entrained at NMPS are considered lost to the Connecticut River. Therefore, survival is assumed to be zero for all entrained individuals. The intent of the sampling is to quantify the level of entrainment—a methodology that is well known, is accepted, and was used previously at this site.

Even if FirstLight were to change their position relative to survival of fish entrained at NMPS, the Service does not believe the studies cited by Commission staff in the Determination represent the full body of information on entrainment mortality of early life stages of fish. While it is generally accepted that injury and death to fish from blade strike is lower for younger life stages than older life stages (because of their smaller size), other aspects of turbine passage appear to have the opposite relationship.

For example, a number of studies have documented high mortality to lake sturgeon larvae (Killgore *et al.* 2001) and striped bass and white perch eggs and larvae (Morgan *et al.* 1976) from shear stress. Further, Turnpenny *et al.* (1992) found clupeids to be much more susceptible to shear stresses relative to other species tested.

In addition to blade strike and shear stress, pressure is another factor that influences survival through a hydropower project. According to the Fish Entrainment and Impingement Assessment Report submitted by Exelon for the Muddy Run Project relicensing (Normandeau Associates Inc. and Gomez and Sullivan Engineers, P.C. 2012), "During the pumping phase of a pump-storage

project, a fish would experience a slight increase in pressure approaching the runner; a rapid pressure decrease through the runner, and then an increase while traveling to the upper reservoir before returning to near atmospheric pressure when the fish surfaces in the storage reservoir.”

The report noted a number of controlled laboratory studies testing the effects of pressure on fish in pressure chambers, but a lack of field-based studies. In one of the laboratory studies, Tsvetkov *et al.* (1972) examined pressure effects on a number of species and determined that larvae and fingerlings of physostomous fish were killed by relatively lower absolute pressure decreases and lower rates of decompression than older fish because they released swim bladder gases with greater difficulty than older fish (American shad are physostomes).

The Exelon report (2012) identified one study (Snyder 1975) that attempted to determine turbine-induced mortality of eggs and larvae collected during entrainment studies. Results of that study showed that larval carp suffered higher mortality during the pumping phase (after adjusting for control mortality and water velocities) than during generation at the Muddy Run Project.

The existing literature indicates that early life stages of fish may be at risk of being injured or killed if entrained. Very few entrainment studies have been done at pump storage facilities and studies at only three of those facilities assessed entrainment of early life stages (Jocassee, Muddy Run and NMPS). Jocassee and Muddy Run did not evaluate the species of interest (American shad); therefore, NMPS appears to be the only project to have determined entrainment level of early life stages of shad (Lawler, Matusky and Skelly Engineers [LMS] 1993). There was no mortality component to that study, as all entrainment was assumed to result in mortality. A new study at NMPS is needed because operations at the project have changed since the last study was conducted and FirstLight is considering additional changes to project operation as part of relicensing that could increase the potential for entrainment at NMPS station. With anticipated improvements to fish passage facilities as part of the relicensing process for the Turners Falls Project, those numbers could increase into the hundreds of thousands.

Revisiting the Need for Sampling in Study Year 2

In the Determination, Commission staff note that an empirical study of juvenile shad entrainment will be conducted (Study 3.3.3) and that if the results show high rates of entrainment and/or low abundance of juveniles in relation to the adult returns, that could indicate potentially high egg and larval entrainment which may justify conducting the requested evaluation.

The Service appreciates the opportunity Commission staff have provided for potentially requiring the early life stage entrainment assessment in Study Year 2 based on results of Study 3.3.3. However, we believe that, irrespective of the results that may be obtained from Study 3.3.3, the requested evaluation is warranted and necessary for the following reasons.

Basing the need for an early life stage evaluation on entrainment rates of juvenile shad does not provide a comprehensive picture of the overall impact entrainment has at NMPS on American shad. The juvenile assessment will rely on radiotelemetry (for migrants) and hydroacoustic (for both rearing juveniles and outmigrants) technology to collect data on entrainment at NMPS. The radiotelemetry component would not be expected to provide any information on the abundance

of juveniles either residing or traveling through the project area. Hydroacoustic monitoring would collect data on abundance of juveniles (if targets can be identified as juvenile shad), but only in the vicinity of the NMPS intake.

If abundance of juveniles at the intake is found to be low relative to adult returns, that does not necessarily indicate that early life stage entrainment was high; it could also mean that few juveniles were attracted to the NMPS intake (and therefore picked up by the hydroacoustic receivers). Further, without assessing early life stage entrainment, we do not know how much potential productivity has been lost (i.e., how many juveniles would have been produced but for early life stage entrainment).

FirstLight argues that, due to the high fecundity of American shad, near 100 percent entrainment would still not impact the shad population. The Service has addressed this argument previously in letters dated August 29, 2013 and September 13, 2013. In addition to information we already submitted, another important point is the finding by Crecco and Savoy (1985) that shad year class strength is established before the juvenile stage. In that study, the authors determined that the failure of the 1982 Connecticut River year class was associated with high June river flows, low temperatures, and high larval mortality (Crecco and Savoy 1985).

To reiterate, without knowing what the early life stage entrainment rate at NMPS is, and in particular, knowing what stages of larvae are being entrained, it is not possible to determine what the overall impact of that entrainment is to the shad population. This information relates both directly and indirectly to the Service's statutory responsibilities under Section 18 of the FPA; it would directly inform the need for measures to reduce or offset entrainment mortality at NMPS, and it would indirectly inform the level of downstream passage protection required at the Turners Falls Project (e.g., if early life stage and/or juvenile entrainment were found to be high at NMPS, it may mean a higher level of protection is needed at Turners Falls to support the restriction of the species to the Connecticut River).

2. HOW ENTRAINMENT ASSESSMENT MEETS STUDY PLAN CRITERIA

Goals and Objectives

The goal of the Service's original study request (Appendix A) was to determine the impact of NMPS during the pumping cycle on entrainment of American shad (including early life stages). The objective was to quantify the number of fish entrained, in order to evaluate potential impacts to riverine and migratory fish, using various gear types to quantify and identify species of different life stages.

Ichthyoplankton sampling is needed in order to meet the study objective of collecting data to quantify entrainment at the project.

Resource Management Goals

The Service identified a number of relevant management plans in its initial study request, including A Management Plan for American Shad in the Connecticut River (CRASC 1992).

Management objectives contained in that plan that relate to the requested study include: (1) achieving and sustaining an adult population of 1.5 to 2 million individuals entering the mouth of the Connecticut River annually; and (2) maximizing outmigrant survival for juvenile shad.

In addition, the Atlantic States Marine Fisheries Commission's Amendment 3 to the Interstate Fishery Management Plan for Shad and River Herring (ASMFC 2010) has a stated objective of maximizing the number of juvenile recruits emigrating from freshwater stock complexes.

One way to maximize outmigrant survival of juvenile shad is to minimize anthropomorphic sources of mortality on early life stages in order to maximize recruitment to the juvenile phase. The ichthyoplankton sampling will collect data needed to quantify entrainment at NMPS. This information will be used to determine what measures, if any, may be necessary to minimize entrainment mortality at the project.

Public Interest

The U.S. Fish and Wildlife Service is a resource agency.

Existing Information

In its original study request, the Service noted that, while a number of studies had been conducted over the years, only one study attempted to quantitatively determine the number of shad entrained at NMPS. That study, conducted in 1992 (LMS 1993), used several gear types to quantify egg larval and juvenile shad densities in different areas of the project. Results were used to estimate entrainment rates.

The ichthyoplankton sampling requested by the Service would follow the methodology used in the 1992 study. Existing information is not sufficient to use in the relicensing proceeding because operations at the project have changed since the last study was conducted and FirstLight is considering additional changes to project operation as part of relicensing that could increase the potential for entrainment at NMPS station.

Nexus to Project Operations and Effects

NMPS is a pumped storage facility that draws water from the Connecticut River up to an upper reservoir where it is later used to generate electricity. The facility has a pumpback rate of up to 15,000 cfs which, based on long-term stream gauging records at the downstream U.S. Geological Survey gage 01170500 (Connecticut River at Montague City, MA), exceeds the mean daily discharge rate for nearly all of June and all of July.

Thousands to tens of thousands of American shad utilize the Connecticut River in the vicinity of the project on a seasonal basis for spawning and rearing and as a migration corridor. With anticipated improvements to fish passage facilities as part of the relicensing process for the Turners Falls Project, those numbers could increase into the hundreds of thousands. Juvenile life stages of shad residing in (or moving through) the vicinity of the NMPS Connecticut River

intake potentially are exposed to multiple pump back operations during the rearing and migration seasons.

Past studies (LMS 1993) have documented entrainment of shad eggs, larvae and (post-metamorphosed) juveniles. Both the previous licensee (Northeast Utilities Services Company) and FirstLight assume that all fish entrained are lost to the Connecticut River system (i.e., 100% mortality). Without quantification of entrainment of all life stages of American shad, it is not possible to determine what the overall impact of that entrainment is to the shad population. This information relates both directly and indirectly to the Service's statutory responsibilities under Section 18 of the FPA; it would directly inform the need for measures to reduce or offset entrainment mortality at NMPS and it would indirectly inform the level of downstream passage protection required at the Turners Falls Project (e.g., if early life stage and/or juvenile entrainment were found to be high at NMPS, it may mean a higher level of protection is needed at Turners Falls to support the restriction of the species to the Connecticut River).

Methodology Consistent with Accepted Practice

The Service's initial study request referenced the study methodology utilized by LMS (1993) to sample ichthyoplankton. The Service believes that both the study design and entrainment analysis used in that study (with minor modifications) would be acceptable to use at NMPS. This type of sampling for early life stage entrainment has been used at other pumped storage facilities (Muddy Run, Jocassee) and is commonly used at power plants with cooling water intake structures.

In general, the study design would consist of nine sample stations (three upstream of the intake, three aligned with the intake, and three downstream of the intake). Weekly samples would be collected from each station, using a plankton tow net (benthic sleds were used in the LMS 1993 study). Sampling would start in early May (once spawning activity has been documented as part of Study 3.3.6) and continue through July. One modification to the LMS 1993 study design we recommend is to take both day and night samples throughout the study period. This will provide information on diurnal variability in entrainment and would inform potential measures to minimize entrainment.

Samples would be sorted and contents identified by life stage (egg, yolk sac larvae, post-yolk sac larvae) and species. Quality control procedures should be followed. Entrainment of eggs and larvae should be estimated on a weekly basis (calculated by multiplying the density by the total volume of water pumped by the plant each week). Densities should be averaged by life stage over all nine sampling stations for each sampling event.

Results from this study would be used in conjunction with results from studies 3.3.2 (Adult Shad Telemetry Study), 3.3.3 (Downstream Passage of Juvenile Shad) and 3.3.6 (Shad Spawning Survey) to gain a comprehensive understanding of the impact NMPS and Turners Falls projects have on American shad in the Connecticut River.

Level of Effort/Cost and Why Alternative Studies Will Not Suffice

Cost

In the Service's initial study request, we estimated the cost and level of effort of the entire study to be high; however, that was to assess riverine and migratory fish. The Service expects that limiting the assessment to early life stage entrainment of American shad would reduce the cost and effort down to a low to moderate level. The study design would be similar to that used in the 1992 NUSCO study (LMS 1993) for both the ichthyoplankton sampling and entrainment analysis. The field sampling would require two biologists working approximately two hours per sampling event (day and night weekly from May through July). Laboratory analysis would take one to two biologists three to five days to complete. We estimate that including this component in Study 3.3.7 will increase the total study cost by \$20,000 to \$30,000.

Why Alternative Studies Will Not Suffice

FirstLight's objective of Study 3.3.7 is to "Conduct a quantitative assessment of the potential impact of entrainment and turbine mortality of American shad...." and the objective of the Service's initial study request was to "quantify the number of migratory fishes entrained at the NMPS intake..."

FirstLight proposes to use the hydroacoustic and radiotelemetry data to assess American shad entrainment. While these methods are suitable for juvenile and adult shad, they will not be adequate for early life stages (which are too small to be tagged or to be picked up as targets by hydroacoustic receivers). Without conducting empirical ichthyoplankton sampling at NMPS, there will be no way of quantifying entrainment of early life stages.

3. DESIGNATION OF PANEL MEMBER

As required by the Commission's regulations at 18 C.F.R. §5.14(d)(2), the Service is designating Mr. John Nagle as its panel member for the Dispute Resolution Panel. Mr. Nagle's contact information is:

John Nagle
U.S. Environmental Protection Agency
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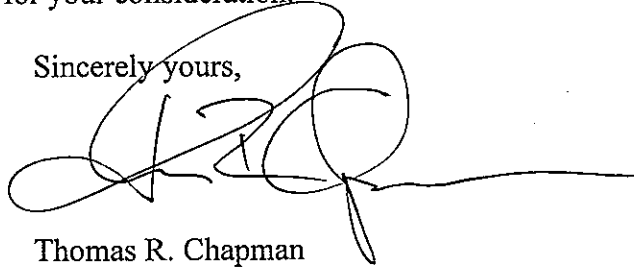
Mr. Nagle is not otherwise involved in this proceeding.

Kimberly D. Bose, Secretary
March 13, 2014

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If there are any questions about this letter or about the study dispute, please contact John Warner of this office at 603-223-2541. Thank you for your consideration.

Sincerely yours,

A handwritten signature in black ink, appearing to read 'TRC', with a long horizontal line extending to the right.

Thomas R. Chapman
Supervisor
New England Field Office

Attachment

Kimberly D. Bose, Secretary
March 13, 2014

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cc: John Howard
FirstLight Power Resources
CRC, Ken Sprankle
NMFS, Bill McDavitt
MA DFW, Caleb Slater
MA DEP, Bob Kubit
TU, Don Pugh
CRWC, Andrea Donlon
TNC, Katie Kennedy
Reading File
ES: JWarner:3-13-14:(603)223-2541

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Document Content(s)

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