



# United States Department of the Interior



## FISH AND WILDLIFE SERVICE

New England Field Office  
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In Reply Refer To: FERC Nos. 1889 and 2485  
FirstLight Power Resources/GDF Suez  
Connecticut River  
NORTHFIELD MOUNTAIN PUMPED STORAGE PROJECT STUDY  
DISPUTE: PROPOSED REVISED STUDY PLAN

May 2, 2014

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

Dear Secretary Bose:

By letter dated March 14, 2014, the U.S. Fish and Wildlife Service (Service) requested formal study dispute resolution pursuant to 18 C.F.R. §5.14 in the above-noted relicensing proceeding. The disputed study relates to entrainment of early life history stages of American shad at the Northfield Mountain Pumped Storage Project (NMPS). In response to our request, the Federal Energy Regulatory Commission (FERC) convened a dispute resolution panel on March 28, 2014 and issued a March 31, 2014 notice that the panel would hold a technical conference on April 8, 2014.

Prior to the technical conference, FERC staff held two conference calls with stakeholders involved in the dispute: FERC, the Service, and FirstLight Power Resources (FL). The conference calls, which took place on March 26, 2014 and April 1, 2014, were intended to determine if the parties could come to agreement on the study dispute prior to the panel's technical conference. These calls did not result in resolving the dispute, and the dispute resolution panel held the technical conference on April 8, 2014.

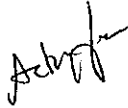
Based on the discussion that took place at the technical conference, the parties in dispute agreed to continue to meet with the goal of developing a mutually agreeable study plan. The parties met via teleconference on April 22, 2014 and April 28, 2014. In addition, information was exchanged via electronic mail. Based on those efforts, the Service hereby submits the attached conceptual framework for an ichthyoplankton entrainment assessment at NMPS facility. We request that FERC consider the framework in its review of the dispute and in developing its final determination.

Kimberly D. Bose, Secretary  
May 2, 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,



Thomas R. Chapman  
Supervisor  
New England Field Office

Attachment

Kimberly D. Bose, Secretary  
May 2, 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:5-2-14:(603)223-2541

CONCEPTUAL FRAMEWORK FOR  
NORTHFIELD MOUNTAIN PUMPED STORAGE PROJECT  
ICHTHYOPLANKTON ENTRAINMENT ASSESSMENT

U.S. FISH AND WILDLIFE SERVICE  
MAY 2, 2014

Goal and Objectives

§5.9(b)(1) – *Describe the goals and objectives of each study proposal and the information to be obtained.*

Goal: Quantify entrainment of ichthyoplankton into NMPS during pump-back operation in a manner that will allow evaluation of diurnal differences in larval density and the effects of the number of units pumping on entrainment rate.

Objectives:

- Calculate the number of American shad eggs and larvae entrained at Northfield;
- Estimate the loss of adult and juvenile shad equivalents based on shad egg and larvae entrainment at Northfield;
- Compare entrainment rates with one through four units pumping; and
- Determine the temporal distribution of entrainment within the prevailing pumping period.

§5.9(b)(2) – *If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied.*

The Connecticut River Atlantic Salmon Commission (CRASC) developed *A Management Plan for American Shad in the Connecticut River* in 1992. Management objectives in the 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 if and what measures may be appropriate to minimize entrainment mortality at the project.

§5.9(b)(3) – *If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study.*

The requester is a resource agency.

#### Background and Existing Information

§5.9(b)(4) – *Describe existing information concerning the subject of the study proposal, and the need for additional information*

Prior entrainment studies conducted at the Northfield Mountain Project include an entrainment study targeting juvenile (including egg and larvae) American shad in 1992 (LMS, 1993), a strobe light exclusion efficiency study (Cook, et al., 1994), and a guide net exclusion efficiency study (NUSCO, 1999). These studies were conducted to evaluate the impacts of the Project operation on anadromous fish species in the Connecticut River. Specific methods used in these studies included radio telemetry, entrainment netting, and mark/recapture to investigate the probability of entrainment.

Results demonstrated seasonally-influenced entrainment rates of pre-juvenile life stages of American shad. The LMS (1993) study also suggested the possibility of a diurnal component regarding rates of entrainment; however the study methodology was not designed to produce reliable inferences regarding sub-daily variations in entrainment rates. Additionally, the LMS (1993) study made certain assumptions that may have resulted in higher than actual entrainment rates (e.g., shad eggs and larvae in the river channel are evenly mixed throughout the water column and the Northfield Mountain intakes draw water evenly from the water column). A study that would directly sample the intake water, rather than the river channel, multiple times during a 24-hour cycle could be used to evaluate varying entrainment rates on a sub-daily basis.

#### Project Nexus

§5.9(b)(5) – *Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements.*

Factors that influence entrainment at a hydroelectric projects include the size and depth of the intakes, the hydraulic capacity and configuration of the turbines, the velocity of water as it enters the intake relative to fish swim speeds, the location of the intake relative to fish habitat, and the characteristics of fish species present in the study area.

American shad broadcast spawn in congregations and fertilized eggs drift downstream until hatching. Shad are known to spawn upstream and downstream of the Northfield Mountain Project. Because early life stages of shad are non- or barely-motile, they are unable to avoid project intakes, and thus are susceptible to entrainment.

The economic feasibility of pumped storage projects is highly dependent upon the daily timing of operations. Therefore, an entrainment study that allows for a more comprehensive evaluation of diel variations of shad larval/egg entrainment is will be useful to better understand if and how within-day operations of the project affect shad larval/egg entrainment rates.

### Requested Methodology

§5.8(b)(6) – *Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge.*

Sampling of Ichthyoplankton entrainment at Northfield Mountain would be implemented by sampling water within the cooling water system of the Northfield Mountain Project and as described below. The sampling of power plant cooling water intakes is an accepted sampling approach, to determine entrainment rates of ichthyoplankton.

### Ichthyoplankton Sampling

1. Cooling Water System Sampling
  - a. Sample period is from May 15 through July 31. Biological Triggers (e.g., number of shad passed Turners Gatehouse) will be developed in consultation with the FWS and Commission Staff to establish when sampling will begin and end within the sample period.
  - b. Weekly samples every 2 hrs. during a pumping cycle. Sample collection to be initiated 30 minutes after pumping cycle begins.
    - i. Collect samples during any daytime pumping and uncommon nighttime hours to the extent possible given pumping scheduling decision lead time
    - ii. At a minimum, take samples once each during the following periods; 1am to 4am; 5am to 8am
  - c. In addition, manipulate pumpback operations to specifically sample operations with 1, 2, 3, and if possible, 4 pumps running (sampling scenario). Each of the four sampling scenarios would occur once during the 4 week period of peak shad spawning (between May 23 and July 5, 2015), as follows:

Scenario 1: 1 pump operational (Unit 2)

Scenario 2: 2 pumps operational (Unit 2 and one other)

Scenario 3: 3 pumps operational (Unit 2 and two others)

Scenario 4: All 4 pumps operational<sup>1</sup>

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<sup>1</sup> A potential Unit 1 outage, which is anticipated, may prevent Scenario 4 from occurring, in which case, an analytical analysis of entrainment rates with 4 pumps operating will be performed provided sample scenarios 1-3 indicated a linear relationship of the entrainment rates between those sampling scenarios. In the event there is no linear relationship, follow-up sampling may be appropriate pending review of study results.

The timing of this sampling can be one scenario in each week or multiple scenarios within a week, dependent on available storage. Sampling will be randomized or scheduled if possible such that scenarios are not run in a sequence of an increasing or decreasing number of pumps (e.g., evaluate 2 then 4 then 1 then 3 pumps or 1, then 3 then 2 then 4 pumps)

- d. Identify the appropriate netting mesh size sufficient to effectively capture eggs, Yolk Sac Larvae and Post Yolk Sac Larvae
- e. Develop in consultation with the Fish and Wildlife Service, MADFW, the Connecticut River Watershed Council and Commission Staff, methods to measure flow during sampling in order to determine ichthyoplankton density
- f. Develop in consultation with Fish and Wildlife Service, MADFW, the Connecticut River Watershed Council and Commission Staff, appropriate protocols for processing samples and QA/QC procedures

## 2. Pipe Sample Validation

- a. Validate that larval densities in cooling water pipe are representative of densities in the intake tunnel through:
  - i. Paired sampling of both cooling water pipe and intake tunnel/channel at the start of the study period (Minimum of 3 replicates), or computational fluid dynamic modeling, or other methods deemed appropriate and developed in consultation with the Fish and Wildlife Service, MADFW and Commission Staff.
  - ii. If differences found, develop, a correction coefficient for entrainment calculations.

## 3. Entrainment Calculation

- a. Use standard methods to calculate ichthyoplankton densities
  - i. by life stage: egg, YSL, PYSL
  - ii. by date/time
- b. Ancillary data that should be collected include:
  - i. NMPS Project operation: # units operating, which units, at what output
  - ii. TF Project operation: headpond level
  - iii. Environ. Info: river flow, precipitation, etc.

### Acknowledgement of the Potential Need for Additional Study

Pending 2015 study plan results, modeling of juvenile shad abundance estimates in 2016 may be appropriate. Additionally, upon review of this study's results and the results of Study 3.3.9 *Two-Dimensional Modeling of the Northfield Mountain Pumped Storage Project Intake/Tailrace Channel and Connecticut River Upstream and Downstream of the Intake/Tailrace*, it may be appropriate to study the vertical distribution and abundance of early life stage shad (eggs and larvae) in the vicinity of the Northfield Mountain intake in 2016.

Level of Effort and Cost

§5.9(b)(7) – *Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.*

The estimated cost for this study is \$55,000.



### Literature Cited

- Atlantic States Marine Fisheries Commission. 2010. Amendment #3 to the Interstate Fishery Management Plan for Shad and River Herring (American Shad Management). Washington, D.C.
- Cook, T.C., E.P. Taft, S.V. Amaral, F.C. Winchell & R.A. Marks. 1994. Strobe Light Demonstration: Northfield Mountain Pump Storage Project. Alden Research Laboratories. Report to Northeast Utilities Service Company.
- Connecticut River Atlantic Salmon Commission. 1992. A Management Plan for American Shad in the Connecticut River. Sunderland, MA
- Lawler, Matusky, and Skelly Engineers (LMS). (1993). *Northfield Mountain Pumped Storage Facility: 1992 American shad studies*. Prepared for the Northeast Utilities Service Company, Berlin, CT: Author.
- Northeast Utilities Service Company (NUSCO). (1999). The Effect of a Guide Net on the Movement of Radiotagged Atlantic Salmon (*Salmo salar*) Smolts at the Intake of the Northfield Mountain Pump Storage Facility, Connecticut River, 1998. Report.

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