UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
55 Great Republic Drive
Gloucester, MA 01930-2276

July 15, 2013

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

RE: Comments on Firstlight's Proposed Study Plan dated June 28, 2013 for Turners Falls (P-1889) and Northfield Mountain Pumped Storage (P-2485)

Dear Ms. Bose:

We have reviewed the proposed study plan dated June 28, 2013, that Firstlight has developed for its two projects on the Connecticut River. We have coordinated our comments with the US Fish and Wildlife Service. Our detailed comments are attached to this letter.

Several public meetings were held at FirstLight's visitor center in Northfield, MA since the filing of the proposed study plan on April 15 that allowed stakeholders to have a discussion with FirstLight about the various proposed studies. Generally, the comments we are filing reflect areas that we believe either were not addressed or need continued clarification in the Updated Proposed Study Plan.

If you have any questions or need additional information, please contact Bill McDavitt (William.Mcdavitt@noaa.gov) or 978-675-2156.

Sincerely,

for Louis A. Chiarella
Assistant Regional Administrator
for Habitat Conservation

National Marine Fisheries Service Comments
of July 15, 2013, on Firstlight's UPDATED Proposed Study Plans
for Turners Falls (P-1889 and Northfield Mountain Pumped Storage (P-2485).
Version filed June 28, 2013

3.1.1. 2013 Full River Reconnaissance (FRR)

While we understand that FRR is primarily a rapid assessment at a point in time that will display bank conditions on a map, as a resource management goal, we see FRR as a tool to identify future areas in need of bank restoration. The assessment of how well previous restoration efforts have worked within the Turners Falls headpond will provide valuable guidance when decisions are made in terms of what techniques to use at future sites.

Task 1b: Geo-referenced video
Just as the land based observation data from task 1c will be used in study 3.1.2, we expect that to some degree, data from the geo-referenced video, particularly on the toe of slopes and lower banks, will also be used in study 3.1.2.

Task 4 Develop Maps, Summary Statistics, Evaluation of Conditions, and Analyze Changes in Condition since Implementation of ECP and from 2008 FRR.
We appreciate the proposed efforts to compile data from previous FRR's and to attempt to discern what features and factors were considered when identifying a potential or active erosion site. Given the large amounts of data to be collected, we suggest the data be made available through the use of online mapping services (e.g. ArcGIS.com) such that geospatial data can be used with a web browser.

Task 6: Develop Final Report, Mapping and Recommendations
Deliverable #14 mentions that recommendations of potential future stabilization sites will be mapped. The PSP does not mention the methods or factors used to determine these sites. Deliverable #16 mentions that existing stabilization projects will be evaluated but the PSP does not mention what data and what factors will be used to determine the success or failure of the techniques used at each restoration site.

Study Schedule
The Updated Proposed Study Plan (PSP) indicates that FirstLight is seeking permission from FERC to file the FRR in September 2014, approximately 6 months later than it normally would. FirstLight has filed a letter requesting permission to do this.

We are not in favor of pushing back the due date for the FRR for the following reasons

1) the FRR's main purpose is license compliance under the existing license,
2) the FRR is intended to generate a schedule and list of sites for riverbank restoration – the 2008 report lacked such a component; we see the scheduled development of potential sites as important to mitigating impacts and providing good habitat for trust species,
3) we think seeing the FRR before the report for study 3.1.2 (Northfield Mountain/Turners Falls Operation Impact on Erosion and Potential Bank Instability) makes logical sense because study

3.1.2 should build on the FRR,
4) FRR has its own schedule that allows for a staggered review with sufficient time for discussion and input from all parties. As such, it should continue to remain a compliance issue under the existing license and not be tied to the ILP license schedule.

3.1.2. Northfield Mountain/Turners Fall Operations Impact on Erosion and Potential Bank Instability

TransCanada has recently completed LiDAR surveys all the way down to the Holyoke Dam and the data in their impoundments will be used in TransCanada's Study 3. FirstLight could likely obtain/purchase the LiDAR data from TransCanada to include a beach formation analysis in this study.

Study Goals and Objectives
This section states "develop a comprehensive understanding of riverbank erosion". One of the most fundamental concepts of geomorphology is that of change over time. This section is devoid of any reference to time or a time period over which the "comprehensive understanding" is developed. Various data sets mentioned in this study (e.g monumented transects, water level recorders, bathymetric maps, previous FRR's, previous erosion studies) all provide data from different time periods. FirstLight should clearly state the period of time that will be encompassed for this study.

Task 3c. Existing Water Level Monitors – Evaluation of the Maximum Daily Fluctuations of Turners Falls Impoundment Elevation on a Monthly (and Annual) Basis
In addition to the development of a "delta" duration curve, we suggest that a histogram of the "delta" data also be developed. Such a graphic makes it visually easy to determine the "delta" bins that occur most frequently.

Task 3d. Proposed Water Level Monitors – Hydrographs of the Turners Falls Impoundment Elevation versus flow
We suggest that hydrologic routing times be factored in to the analysis. Given that high flow releases out of Vernon will route through the headpond more quickly than low flows, we realize that this adjustment can be tricky. Nevertheless, to line up water surface elevations from downstream water level recorders with the exact same time stamp as Vernon release time stamps does not make sense. Given the existing 1D and 2D hydraulic models for the Turners Falls headpond, it should be possible to generate reasonable estimates for routing times and subsequent offset times to compare flow with elevation.

Task 5c. Evaluation of Round 1 Field Evaluation
The study states "FirstLight will utilize the existing 22 transects so long as they are representative of the range of riverbank features and characteristics." However, to understand the data, this task does not state the types of categories or bins into which an existing transect could fall into in order to determine if the transects are indeed representative. Study 3.1.1. (2013 FRR) suggests some possible riverbank characteristics for upper and lower banks. Clarification on the types of categories that a transect must fall into would be helpful. With the exception of some transects around the Route 10 bridge, most of the 22 transects are bank to bank cross

sections. As such, there are well over 22 banks that have been repeatedly surveyed. The bank conditions on Stebbins Island and Kidds Island could also conceivably be used for analysis. We also note that no mention of stratigraphy or stratigraphic analysis of the banks is made in this section.

Task 6. Causes of Erosion

Given the varying driving forces acting on the banks (e.g. flowing water, boat wakes, ice debris), we suggest that it will be difficult to discern the exact cause of erosion. However, it might be possible to discern causes of bank erosion that are more likely than others for some locations based on the types of mass wasting and stages of erosion and location of these features on a given bank.

Hydraulic Shear Stress due to Flowing Water (Tractive Force)

The study states "Shield's criteria relates velocity to the particle size of sediment at the point of incipient motion." While this is indeed correct, Shield's 1936 paper was conducted on homogenous sediment in flumes. We recommend that critical dimensionless shear values be used that are appropriate for the specific bank material being modeled which may or may not be homogenous. In other words, uniformly applying a critical dimensionless shear value of the commonly used value 0.06 may or may not be appropriate. This modeling approach also requires an understanding of the Reynolds number and Shield's plot indicates that critical dimensionless shear varies as a function of the Reynolds number. As such, we ask that some discussion of the Reynolds number in terms of how smooth, transitional or rough the flow conditions are would provide helpful context in the analysis.

The bottom paragraph on page 3-34 has a sentence that states "Suspended sediment samples will also be collected over a range of flows to develop a relationship between sediment transport and hydraulic conditions." We understand that a positive relationship exists between discharge and sediment suspended in the water column. However, years of research in this field also indicate that many rivers have orders of magnitude more data in suspended sediment samples for a given discharge due to a variety of factors such as hysteresis and available supply of sediment from the watershed. Given the timeframe of this study, we believe that limited suspended sampling will yield limited useful information.

Geotechnical analysis of hydrodynamics of flow and water level fluctuations

Rather than rely on default values for cohesion for a given layer type (e.g silty sand) we are encouraged to see that the data collected in the field will be used to provide specific cohesion values for each layer in the model. Because the model computes factor of safety as the hydrograph varies, we expect that continued dialogue with FirstLight will allow us to focus on specific time periods in order to limit the amount of output provided by the model.

Task 7: Report

To the extent possible, we ask that geospatial datasets be made available to the public. Online map services that allow users to view data via a web browser are a helpful and complimentary way to view data in addition to static maps in a report.

Also, we recommend considering some of the approaches that TransCanada is proposing from Study 2 (Riverbank Transect Studies) for the Northfield Mountain Pumped Storage Project (NMPS). These methodologies may be applicable to the FirstLight studies.

"The work products provided as part of this study will include:

1) A GIS shapefile of monitoring sites and table of site characteristics;
2) drafted overlaid topographic cross sections showing changes at each site through time;
3) bar graphs showing estimated volumes of soil loss through time and segregated by bank features (e.g., composition, slope, height); and
4) line graphs showing variations in water stage through time overlaid with bar graphs showing volume of soil loss during the time between survey events;"

In addition, we find the approach taken in TransCanada's Study 3 (Riverbank Erosion Study) provides a logical and well-presented layout of the data they are collecting and analyzing:

"The work products to be completed as part of this study will include:

1) An annotated bibliography of local studies and published literature describing how a particular document relates to one or more of the study goals;
2) tables and figures documenting and illustrating how the character of the watershed (e.g., drainage area), valley (e.g., width), and channel (e.g., meander dimensions) vary in a downstream direction;
3) maps showing long-term trends in channel migration and bank erosion;
4) bathymetric contour maps and/or cross sections showing how the depth of the river varies across the river at selected sites;
5) surficial geology maps of the Connecticut River valley bottom within the study area presented on 7.5' topographic quadrangles;
6) GIS shapefiles and summary tables of channel conditions for more than 300 miles of shoreline;
7) figures and tables of the stratigraphic and soil descriptions of bank sediments;
8) topographic cross sections and plan maps illustrating important bank and channel conditions;
9) maps and cross sections illustrating how flow stage, velocity, and shear stress vary with discharge for various points along the river based on hydraulic modeling results; and
10) an interim and final study report synthesizing the above deliverables into a narrative that addresses the study goals and issues raised in various study requests."

3.2.2 Hydraulic Study of Turners Falls Impoundment, Bypass Reach and below Cabot Station

Under General Description of Proposed Study, we recommend adding NMPS pumping and generating cycles to the list of causes of water level fluctuations below Cabot Station.

Task 1. Update Turners Falls Impoundment HEC-RAS model

Page 3-55 mentions that Firstlight will install "water level recorders from approximately August 2013 until approximately November 2013 to capture a range of low and high flows and to capture a range of operating conditions at Vernon, Northfield and Turners Falls hydropower facility." We wonder if there is a typological error that should have read November 2014. A four month period of operating in late summer through mid-Fall does not appear to fully capture all the range of natural and operational conditions that the Turners Falls headpond can experience. If the 2013 reference is indeed written as intended, we would ask the period of operation for the referenced water level recorders be lengthened to cover at least one full year of operation.

Task 7. Unsteady Flow Model

Table 3.2.2-3 summarizes the production run matrix. We ask that 'Max Gen' and 'Min-Gen" for the power canal be clarified given the two powerhouses Firstlight operates. It is not entirely clear what these terms mean with respect to Cabot Station and Station 1 operations. We suspect that the amount of time both projects are at maximum operational capacity or the amount of time both project are shut down is minimal. As such, we would like to understand what the hydrologic and hydraulic implications for some sort of interim operational scenario means.

3.3.1 Conduct Instream Flow Habitat Assessments in the Bypass Reach and below Cabot Station

With respect to ***Table 3.3.1-1: Target Species and Life Stages Proposed for the IFIM Study Reaches*** the description of shortnose sturgeon (*Acipenser brevirostrum*) lifestage criteria for Reach 4 should be described as "Young of year nursery, juvenile foraging and overwintering, adult foraging and overwintering." The ***Habitat Suitability Criteria References*** should reflect the following references:

Kieffer, M. and B. Kynard. 2012. Spawning and non-spawning migrations, spawning, and effects of river regulation on spawning success of Connecticut River shortnose sturgeon. Chapter 3 in Life history and behavior of Connecticut River shortnose sturgeon and other sturgeons. B. Kynard, P. Bronzi, and H. Rosenthal Editors. World Sturgeon Conservation Society: Special Publication #4. Norderstedt, Germany.

Kynard, B., D. Pugh, T. Parker and M. Kieffer, 2012b. Spawning of Connecticut River Shortnose Sturgeon in an Artificial Stream: Adult Behavior and Early Life History. Chapter 6 in Life history and behavior of Connecticut River shortnose sturgeon and other sturgeons. B. Kynard, P. Bronzi, and H. Rosenthal Editors. World Sturgeon Conservation Society: Special Publication #4. Norderstedt, Germany.

3.3.2 Evaluate Upstream and Downstream Passage of Adult American Shad

With respect to resource management goals, we would add that minimizing migration delay at hydro-electric projects is important for migrating diadromous species.

Task 2: Develop Study Design

Firstlight states that a detailed study design will be developed in consultation with the resource agencies. We are aware of the US Fish and Wildlife Service's (USFWS) recommended test flow configurations, sample size and receiver locations for this study. We are in full agreement with these recommendations. It is our expectation that the consultation with the resource agencies will indeed be in agreement with USFWS.

Task 3. Evaluation of Route Selection and Delay

The Updated PSP adds that mobile tracking will be conducted, but it does not provide any details as to the timing, frequency and duration of the mobile tracking efforts.

Task 4. Evaluation of Mortality

In some cases, significant delay can lead to mortality (Ted Castro-Santos, personal communication). As such, we ask that a results and discussion of delay be included in the final

report. We understand that motion sensor telemetry tags will be used to detect mortality, however, we seek clarification on the time interval that will be used to denote a dead fish.

Study Schedule
The last sentence indicates that the results of the 2014 study may indicate that there is no need for a second year of study. We disagree and request that this study be conducted for 2 years due to the large degree of variability in environmental conditions that can occur from one year to the next.

Receiver location in the power canal (Figures 3.3.2-2 and 3.3.2-3).
We ask that clarification be given in terms of what assumption is made if a fish is detected at the Cabot Station Forebay but is never detected again at this location, Station No. 1 or the Gatehouse Fish Ladder.

3.3.3 Evaluate Downstream Passage of Juvenile American Shad

Task 1: Evaluation of Timing, Duration and Magnitude of Migration
The proposed plan does not provide much detail on the flow conditions that could potentially occur during the study. The study should occur during a range of river flows and operational conditions such that the effect of NMPS is relatively large and relatively small compared to total river flow.

Task 2: Evaluate Route of Passage Choice and Delay
The Updated PSP does not specifically mention if the same receivers used for the upstream adult American shad (*Alosa sapidissima)* study will be used for this study.

The Updated PSP mentions that telemetry studies have had success when test fish are approximately 120mm in length. Given the ILP schedule, we recommend some initial testing occur in 2013 in order to confirm that test fish can indeed be detected. Such information could prove quite valuable as the 2014 field season approaches.

The proposed study also states “receivers will be set up above and below the Turners Falls Dam to determine spillage survival.” It is not clear how a radio receiver below the dam will determine whether a fish survived via spill. Task 3 indicates that fish will be recovered from tailrace and examined for injuries. We recommend that a similar approach be taken for fish that have passed via spill.

Task 3: Turbine Survival
We support the addition of the balloon tag survival study to assess turbine mortality at both power stations. In order to assess overall project survival, we recommend that mortality for fish passing via spill is an important component of this study. Given the differing hydraulic flow conditions of the bascule gates and tainter gates, it is not clear to us what percent of juveniles pass via these gates. At a minimum, we recommend that spill mortality be evaluated through the four bascule gates and one of the tainter gates (unless Firstlight can provide certainty that these gates will not be used during the downstream juvenile shad migration period). A minimum of 25 test fish per gate should be tagged and released immediately upstream of each bascule gate to

determine spill survival.

3.3.4 Evaluate Upstream Passage of American Eel at the Turners Falls Project

Task 1. Systematic Surveys.
It is assumed that the American eel (*Anguilla rostrata*) surveys will be conducted on foot.

It is not clear why the Cabot Station log sluice survey site in the previous version of the proposed study plan is not mentioned in the Updated PSP. Given that this structure passes 200 cfs from June 1 to November 15, it could serve as a potential attraction point for upstream migrating eels.

Task 2. Trap Collections
It is not clear during this study, whether Cabot or Spillway attraction flows will be operating when the fishways are not operational. We recommend a minimum amount of attraction flow from the fishway attraction flow sluices to attract the eels during this study. The other aspect of this study that is unclear is how the traps will be operated when the fishways are operational. We think it might be possible that the attraction water from the fishways could indeed be providing too much water to attract an upstream migrating eel to the ramp.

3.3.5 Evaluate Downstream Passage of American Eel

Task 1. Evaluate Timing of Downstream Migratory Movements
The text states “acoustic targets can be filtered by size and supporting data used to apportion the number of fish by size class.” We find this sentence essential for discriminating eels from other species.

We appreciate that the licensee is willing to provide a monitoring report in February 2015 to have a discussion about the results. Nevertheless, given the variability that can occur from year to year with any downstream run, regardless of whether the 2014 study is deemed ‘typical’ or not, we request that an additional year of study be conducted in 2015.

We ask that the hydroacoustic data be coupled with the operational hydrologic conditions so that all reviewers can understand the flow conditions the eels experienced during the study. We support U.S. Geological Survey S.O. Conte Anadromous Fish Research Center biologist Dr. Alex Haro’s recommendation that the survey encompass 15-20 discrete events. We also recommend that hydroacoustic evaluations start one hour prior to NMPS pumping operations in order to assess fish that could be present within the zone of pumping influence.

Task 2: Assessment of Downstream Passage of American Eels
Overall, the study does not make mention of any methods or metric to assess delay.

We support Dr. Haro’s written comments to add a trap collection at the Cabot station spillway near the north abutment

Task 2a&b: Northfield Mountain and Turners Falls Dam Route Selection Study
We recommend that some of the receiver location identified in the adult shad telemetry study be

used for this study as well as one at the NMPS intake in order to provide full depth coverage.

It is our expectation that we will be included in discussion of sample sizes. We make the following minimum sample size recommendations based upon Dr. Haro's recommendations:

- Northfield entrainment: 50 eels per study year
- Turners route selection: 50 eels per study year
- Turners turbine mortality: 50 eels per study year for Station No. 1 and 50 eels per study year for Cabot Station

The study does not make reference to the percent of fish that will likely be detected.
With respect to sample size, we offer the following preliminary release protocol:

Location	**Release Date/Time**	**# Eels/release**
3 km u/s of TF Dam	Between Sept 15 and Nov 15, release eels at dusk on day prior to expecting the following flow conditions: 1. No spill at dam 2. Spill requiring use of bascule gate 3. Spill requiring use of taintor gate	10 per condition, for a total of 30 fish
Imm. d/s of Gatehouse	Between Sept 15 and Nov 15, release eels at dusk on day prior to expecting the following operational conditions: 1. Only Station 1 operating 2. Only Cabot operating 3. Both stations operating (if this ever occurs)	10 per condition, for a total of 30 fish (supplemented with fish from headpond releases)

In general, the receiver and antenna locations identified are acceptable. However, Dr. Haro had noted that it could be difficult to detect tagged fish using the Cabot log sluice. Dr. Haro had suggested that some assurance be provided that the radio method will have a high degree of detection/reliability in this location; otherwise, use of a PIT system to supplement telemetry data and increase confidence was recommended. Likewise, the plan should confirm that receivers will be configured to provide full-depth coverage at all intakes and other deep (>30 feet) locations.

If Holyoke Gas & Electric is willing to allow a receiver in the vicinity of the Holyoke project, we suggest that one is installed here to further confirm the viability of non-killed eels.

Task 2c: Mobile Tracking

A 50 day battery life may not be suitably long enough for motion-sensing tags. For example, an eel released and killed in late August would have the tag's battery life end in mid to late October which could reduce the chance that the tag could be detected by an additional mobile survey after mid-October. FirstLight plans to manually track tagged eels via boat, vehicle or by foot between release sites to several kilometers downstream of Cabot Station. We recommend including the following additional details in this section of the plan:

- Manual tracking will be performed up to 5 km downstream of Cabot Station
- Manual tracking will occur on a weekly basis, beginning after the first release date and

ending in mid-December (or when all viable tagged eels have been detected at the Route 116 Bridge, whichever occurs first)

Task 4: Turbine Survival

In response to stakeholder comments conveyed at the June 4, 2013, study plan meeting, FirstLight has revised the study plan to confirm that a balloon tag survival study will be conducted to assess turbine mortality at Station 1 and Cabot Station. We support this proposal, but we also recommend the need to assess spill mortality. Depending on which gates are being used, spill can discharge at various locations along the dam's apron, including areas of ledge that could result in mortality to outmigrating adult eels. While it is possible to infer spill survival with data collected from motion sensor radio telemetered eels, there is no guarantee that radio tagged eels will use the gates during a spill condition.

We recommend that at a minimum, spill mortality be evaluated through the four bascule gates (unless FirstLight can provide certainty that these gates will not be used during the downstream adult eel migration period). A minimum of 25 test fish per gate should be tagged and released immediately upstream of each bascule gate to determine spill survival. We also recommend that survival through the tainter gates be assessed as well.

At Station 1, FirstLight proposes to evaluate one of the four double runner Francis units as well as the smaller, faster exciter unit. We have no objection to this proposal. In total, three turbines will be evaluated (two at Station 1 and one at Cabot Station). The overall number of test fish proposed for the Turners Falls Project is 150, which would allow 50 test fish per turbine if distributed equally. Fish would be injected into the turbines while at or near full hydraulic capacity. We support the USFWS concerns it expressed at the June 4, 2013, study plan meeting that if the units typically operate at less than full hydraulic capacity then that condition needs to be evaluated. For example, if the units are always operated at peak efficiency, then that is the condition that should be evaluated. If the units are operated at varying efficiencies then each of those conditions should be evaluated (e.g., maximum gate, peak efficiency, and minimum gate).

FirstLight provides no description of data analysis for this task. Survival through each turbine/gate setting tested should be calculated based on the number of tagged fish injected into a given turbine or bascule gate that are alive immediately and after 48 hours, adjusting for survival of control fish. Any injuries of recaptured fish should be reported. Total through-project survival should be calculated based on results of this study, other related studies (i.e., hydroacoustics and telemetry data), as well as historical operations data.

Study Schedule

The section should specify that an additional study year may be necessary due to circumstances such as (1) unfavorable environmental conditions, (2) equipment malfunction, and (3) inability to secure sufficient test fish.

3.3.6 Impact of Project Operations on Shad Spawning, Spawning Habitat and Egg Deposition in the Area of the Northfield Mountain and turners Falls Projects

Task 2: Examination of Known Spawning Areas Downstream of Turners Falls Dam

FirstLight's plan states that surveys will concentrate on the five known spawning locations downstream of the Deerfield River confluence. In fact, Kuzmeskus (1977) identifies nine historical spawning sites between the Route 116 Bridge and the Turners Falls Dam. All of these sites should be surveyed, in addition to any sites identified through mobile tracking of adult shad as part of the radio telemetry study (Study Plan 3.3.2). In addition, as survey crews are moving among historical sites, they should monitor for additional (previously undocumented) spawning sites.

In Phase 2 of the Updated PSP, FirstLight states that the impacts of flow fluctuation on spawning shad will be investigated at locations identified in Phase 1 "that may become dewatered when water elevations decrease due to operational changes at Cabot Station…" While we agree that those sites should be assessed, the investigation should not be limited to only those sites; there likely are spawning sites that would not become dewatered, but still would be susceptible to large flow/elevation fluctuations which could impact spawning behavior or success. Therefore, the proposed observational and physical habitat data should be collected at all identified spawning sites between Cabot Station and the Route 116 Bridge in Sunderland and various operational scenarios.

In order to determine if project operation impacts spawning behavior, FirstLight would test several discharge manipulations and compare behavior during the manipulations to "baseline" spawning behavior. If one scenario is to evaluate full discharge and then a minimum flow release, it is unclear when observations would be made relative to the discharge manipulations. We recommend that field crews observe and count spawning splashes before the flow changes, during the change, and after the change has occurred, as spawning behavior could be altered during both increases and decreases in flow. In addition, at times of test manipulation, a dedicated field crew should be tasked with tracking any radio tagged fish that may be on spawning sites so that their behavior can be evaluated relative to fluctuations in flow.

Task 3: Identification of Spawning Areas Upstream of Turners Falls Dam

The protocol for identifying spawning sites within the Turners Falls impoundment (to the base of Vernon Dam) requires more detail. For instance, surveys for shad downstream of the Turners Falls Dam will occur once 10,000 fish have passed the Holyoke Dam. A similar trigger for initiating surveys upstream of the Turners Falls Dam should be specified.

FirstLight states that upstream surveys will target areas of suitable habitat, including those containing flowing waters over coarse substrates. These terms are somewhat vague and undefined and may be overly restrictive. Given how little we know about shad spawning in the Turners Pool, we recommend that surveys occur in all waters of suitable depth (as identified in HSI curves).

Study Schedule

The first bullet in this section likely should read "October 2013 through December 2013" rather than "December 2014."

Given that temperature and water flows are intrinsically variable, the timeframe for conducting the field studies should be expanded to include all of May and June (and refined based on

passage numbers).

3.3.7 Fish Entrainment and Turbine Passage Mortality Study

Task 2: Quantification of Shad and Eel Entrainment

FirstLight proposes to perform a quantitative assessment of shad entrainment at NMPS based on the tagging and hydroacoustic monitoring that will occur under studies 3.3.2 and 3.3.3. We have no objection to using data from those studies to estimate entrainment for adult shad and outmigrating juvenile shad. However, this would leave a data gap with respect to entrainment of younger life stages of shad (i.e., larvae and pre-migrants) that reside in the Turners Falls Pool, potentially within areas of the river susceptible to multiple pump-back events at NMPS.

We recommend that entrainment of Young of Year shad at NMPS be quantified as goal of this study. The USFWS has pointed out that previous entrainment studies focusing on early life stages of shad (egg, yolk-sac larvae, post yolk-sac larvae, and juveniles) have been conducted at NMPS. Since those early 1990s studies, operations at NMPS have changed and may change further as a result of this relicensing. Likewise, ongoing passage improvements at the Turners Falls Dam will lead to more adult shad moving through and spawning in the Turners Falls Pool. Therefore, more early life stages will be prone to entrainment. The impact this may have on the shad population and achievement of restoration goals needs to be determined.

We recommend that a similar methodology to that used in the 1992 Northeast Utilities Service Company study (LMS 1993) be used by FirstLight to quantify entrainment of early life stages of shad at the NMPS Project. The sampling should begin July 1 and should continue through October.

Task 3: Estimation of Turbine Mortality

FirstLight proposes to use existing literature along with the site-specific design characteristics of the Turners Falls Project turbines to estimate mortality of resident fish entrained at Station 1 and Cabot Station. We agree with the concerns that the USFWS has voiced over using this methodology for the following reasons:

- While there is a database of turbine passage survival studies, the actual number of sites with similar design characteristics (e.g., turbine size, type, runner diameter, head, etc.) where similar target species were evaluated is quite small. Once the evaluated species are compared with potential species of interest at Turners Falls, it becomes apparent that any mortality estimates derived from the literature would be based on a very limited data set.
- As mentioned at the June 4, 2013 study plan meeting, a recent report by Kleinschmidt (2007) that used a similar methodology at the Holtwood Project (FERC No. 1881) to what is being proposed in the current study plan found that the average predicted survival values derived from the Advanced Hydro Turbine Model (Franke *et al.* 1997) were higher than actual empirical studies conducted at the Holtwood Project for juvenile alosids. Where empirical data were taken from other projects, results showed a higher survival for some species/life stages evaluated than from the modeled results (for adult river herring and adult eels). Where empirical studies showed lower survival than modeled results, Kleinschmidt appears to attribute the discrepancies to flaws in the field studies, while results showing higher survival

in the field studies are attributed to differences in turbine specifications (rather than to any inherent flaws in the Franke *at al*. model). We acknowledge that field studies rarely are conducted under perfect conditions, however, it is equally plausible that the Franke *et al*. (1997) model requires further refinement which additional empirical studies may help inform.

We recommend that the results of the empirical mortality studies that will be conducted on adult and juvenile shad and adult eels be compared to estimates derived using the Franke *et al.* (1997) model. This comparison should allow further insight into the appropriateness of using a model versus empirical study to calculate turbine mortality at a project.

3.3.8 Computational Fluid Dynamics Modeling in the Vicinity of the Fishway Entrances and Powerhouse Forebays

Study Goals and Objectives

Objective number 5 states that the computational fluid dynamics (CFD) modeling will be coupled with the telemetry study and passage counts to understand conditions preferable for guiding fish to entrances. We note that fish movements are also influenced by other variables, therefore FirstLight should also record and evaluate influences of river temperatures and flows on movements and passage information.

Project Nexus

FirstLight states that existing information indicates that substantial numbers of down migrating fish use the log sluice/bypass. Given the research that has been done at the USGS S.O. Conte Anadromous Fish Laboratory, this statement is not accurate with respect to eels and should be clarified accordingly.

Task 3: Construct Three-Dimensional Model

The description of the model does not identify grid size to be used in the model. Without some idea of the size of the grid to be used, it is impossible to know if the CFD modeling will mean anything. For example, a 2-foot grid cell will not provide fine enough resolution to tell us anything about sweeping velocities at the intake rack or the capture velocities in front of the downstream bypass. The final study plan should define the grid size and provide justification for the proposed grid size.

Task 4. Execute Model Production Runs

We understand that executing a production run is not an insignificant effort and that output options with 3D hydraulic models are vast. Nevertheless, we would like to gain a better understanding of the proposed 9 production runs. Namely, we would like to know what operating condition the licensee will be simulating.

Since tailwater conditions greatly affect the functionality of both ladder entrances, FirstLight should run the model for different tailwater conditions based on the normal range of tailwater levels.

3.3.9 Two-Dimensional Modeling of the Northfield Mountain Pumped Storage Project Intake/Tailrace Chanel and Connecticut River Upstream and downstream of the Intake/Tailrace

Methodology

FirstLight proposes to develop a 2-D model of the NMPS intake/discharge area in order to evaluate potential impacts to fishes and bank erosion. In the initial study plan, this assessment was to occur from the NMPS project to 1 km upstream and downstream of the intake/discharge area. At the May 21, 2013 study plan meeting, stakeholders commented that the distance should be expanded from 1 km to 5 km; however, the Updated PSP does not incorporate this change.

The proposed River2D model is steady-state model. Based on some estimates of hydrograph speed and wave celerity, it may take 30 minutes before changes in intake/discharge conditions at the pumps are propagated throughout the extent of the 2-km-long proposed model (or longer with a more extended model we recommended). Given the diurnal nature of both shad movement and pumped storage operations, a transient River2D model seems warranted to assess NMPS effects on fish and to inform agency management decisions. The existing steady-state Woodlot model (2007) may be adapted to transient set-up and we recommend this be done.

Task 3: Build and Calibrate 2D model

The study states that the River2D model will be calibrated against field-collected velocity profiles. Some additional clarification on how these profiles will be measured such as at what depth and with what equipment would be helpful.

FirstLight indicates that in the proposed model, the "initial uniform gridded base mesh will be generated on an approximately 50-75 foot spacing" and refined where necessary. This initial grid size may have been appropriate for the original Woodlot model, but this proposed model is focusing in part on the intake/discharge structure which is approximately 75 feet across. That means the entire intake is only one grid cell. The baseline for grid size should be based on getting ten or more cells laterally across the intake/discharge structure and refined moving out. Without this level of resolution, the FirstLight model will not be very accurate or helpful in the proximity of the structure.

Task 4: Conduct and Analyze Production Runs

At the May 21, 2013 study plan meeting, there were at least two comments made by stakeholders relative to velocities. The first (made by the USFWS Connecticut River Coordinator) concerned velocity measurements at the NMPS intake. Because only mean column velocity will be used in the model, we recommend that FirstLight develop separate velocity profiles for the intake. FirstLight's consultant indicated that it would be possible to provide those data, as an acoustic doppler current profiler (ADCP) unit will be used to collect velocity measurements at the intake while gathering calibration data. This effort should be included in the study plan. These data are important because differential velocities across the intake area relate directly to potential for entrainment based on, among other variables, where a fish tends to reside in the water column (e.g., alosids tend to be surface oriented, whereas eels tend to be bottom oriented).

The second comment related to deliverables. While the Updated PSP states that model run results will include 2-D water depths and velocities, FERC's consultant had requested that the study plan include more details regarding how the results would be presented (e.g., vector plots, pseudo-color maps, etc.). It does not appear that FirstLight has addressed this issue.

3.3.11 Fish Assemblage Assessment

As discussed at the May 30, 2013 study plan meeting and in a follow-up conference call with FERC staff on June 18, 2013, endangered shortnose sturgeon occur in the area where the electrofishing transects are proposed. Shortnose sturgeon may be affected if exposed to electric current generated during these activities. Due to the sensitivities of spawning adults and early life stages present in Transect 5 and the presence of juveniles and adults year round in Transect 6, we recommend that the study be modified to eliminate the potential for effects or that FERC initiate formal consultation pursuant to section 7 of the Endangered Species Act (ESA) with NMFS to assess effects of this study.

Our preliminary assessment is that to avoid effects to shortnose sturgeon, electrofishing in Transect 6 would need to be removed from the study and a seasonal restriction would be required for transect 5 to ensure that no electrofishing is carried out when shortnose sturgeon may be present (April 15-June 30). We have discussed the possibility of a seasonal restriction for Transect 5 with staff from the State of Massachusetts (MA) and the U.S. Fish and Wildlife Service (USFWS) and it is our understanding that they would not object to this change. However, based on preliminary discussions with MA and USFWS staff, it is NMFS' understanding that the goals and objectives of this study would be negatively impacted if Transect 6 was removed from the study. If electrofishing occurs in Transect 6, adverse effects to shortnose sturgeon may occur.

We believe that a Biological Opinion, with an appropriate Incidental Take Statement, is necessary if electrofishing will take place as it is currently proposed for Transect 5 and 6. Because any take of shortnose sturgeon would be incidental to the proposed action, and this study can not be considered to be "directed research" on shortnose sturgeon, authorization under Section 10(a) (1)(A) of the ESA is not appropriate. An example of a Biological Opinion we have produced for similar electrofishing studies is available on our website (http://www.nero.noaa.gov/protected/section7/bo/oldbiops/epa_ct_and_merrimack_ibi_2009_web_archive.pdf

3.3.12 Evaluate Frequency and Impact of Emergency Water Control Gate Discharge Events and Bypass Flume Events on Shortnose Sturgeon Spawning and rearing Habitat in the Tailrace and Downstream from Cabot Station

Task 2: Scenario Development

This section states "Emergency scenarios will not be evaluated in this study because changes in emergency protocols are not anticipated by FirstLight." Despite that emergency protocols will remain unchanged; it was NMFS understanding that information on emergency operations would be included in the analysis of existing operations data that will be provided to the Service. NMFS would recommend this sentence be changed to reflect that all operations data will be

analyzed and provided to NMFS for review, including the emergency operations and protocols. Regardless of whether emergency operations and protocols change, NMFS needs this information to understand all of the impacts on shortnose sturgeon as a result of these operations.

Otherwise NMFS is satisfied with the revisions that have been incorporated into the study and are reflected in Firstlight's Proposed Study Plan dated June 28, 2013 for Turners Falls (P-1889) and Northfield Mountain Pumped Storage (P-2485).

3.3.15 Assessment of Adult Sea Lamprey Spawning with the Turners Falls Project and Northfield Mountain Project Area

Task 1: Field Data Collection

The last paragraph of this section states "Shear stresses for dominant substrate types at each of the 30 nests will be determined…." Shear stress is determined through collected field observations and subsequent calculations; typically this is considered analysis, not data collection. Additionally, this sentence is not clear as rivers exert a shear stress on the bed and its particles. It is not clear if the idea is to determine how much shear stress is required to mobilize the dominant particle size in a nest, or if it to simply report the shear stress that river exerts on the dominant substrate at a given nest. Given that depth is a key component of shear stress, and that "the information will be used to determine the likelihood of bed load mobilization or scour" it seems as though the analysis is to determine at what flow the dominant particle size in the nest gets mobilized. Given the complexities of sediment transport with spatial and temporal variability, embeddedness, grain size shapes, roughness within the nest and around the nest, and field measurement limitations, we ask that FirstLight use caution and explicitly state all the hydraulic assumptions being made when conducting this analysis.

We would also like to point out that TransCanada is performing a fairly similar study related to sea lamprey (*Petromyzon marinus*) spawning (Updated Study 16 Sea Lamprey Spawning Assessment). TransCanada's approach includes tracking lamprey that are tagged at the Vernon project. TransCanada states that it is willing to share its radio frequency information with FirstLight and expects that FirstLight will share its frequencies as well. This approach differs significantly to the methods that FirstLight proposes. Rather than spending time at the three locations FirstLight mentions (below Vernon, mainstem gravel bar and shallow water habitats and, in the vicinity of Rawson Island) tracking tagged lamprey could conceivably reduce the amount of time spent in the field looking for redds. Some of the other methods that TransCanada proposes in its sea lamprey assessment study include the following:

- Weighing and measuring tagged fish
- Tracking tagged fish by boat, car or possibly aircraft
- Deeming project affected areas as suitable, then characterizing substrate, depth. Water quality variables such as temperature, dissolved oxygen, turbidity, pH, and conductivity will be collected.
- Collecting velocity and depth data over a range of flows
- Photographing redds
- Observing redds from the time of lamprey arrival to the time of lamprey departure
- Monitoring of embeddedness and percent sand over the life of the active redd

Analysis includes presenting a map of each located redd, characterizing the success of each redd based upon larvae emergence and degree of project effect (e.g none, moderate, large and severe). The methods that TransCanada present in their proposed study appear to directly relate to the forth bullet point that FirstLight presents in its Updated PSP which states "Collect the information to assess whether operations of the Turners Falls Project and Northfield Mountain Project are adversely affecting spawning areas." As such, we recommend that an approach that is far more similar to TransCanada's methods and analysis be adopted for this study.

3.3.18 Impacts of the Turners Falls Canal Drawdown on Fish Migration and Aquatic Organisms

The goal and objectives of this require a clear understanding of the methods that will be used. The Updated PSP correctly notes that complimentary juvenile shad and American eel studies will provide useful information from hydroacoustic monitoring and tagging of fish to examine the question of delay in the canal.

A standard level of effort, such as a single back-pack operator with dip net and single or pair of people also netting, can be utilized as the habitat conditions permit among the zones (as a standardized level of effort) for a set period of time (500 seconds on-meter). This will allow repeated measures and comparisons among areas. Back-pack shocking will not effectively sample ponded areas where seine nets may be employed. Standardized methods may be developed, single sweep, using bridle/rope. The varied substrates may not permit this net gear. Additionally, assessment of sea lamprey ammocetes should be conducted and may include a sampling quadrats among strata using some basic criteria (substrate type and exposed, wetted, submerged), which can be applied to existing aerial images, from a qualitative visual assessment, that can be described with some digital images of these areas for support. Fishes may be sampled by electrofishing wetted or ponded/flowing areas. Catches may be reported in units of standardized time of effort and also by unit area (quadrats). Quadrat sizes should be determined based on observed densities one sampling can begin (i.e., 1 m^2, or 10 m^2). A starting figure may be 10 replicates among strata type which may include 5 types (i.e., exposed, damp/wetted, submerged, flowing and substrate type – fines, gravel, rock). Sampling, as noted, should begin as quickly as possible following the drawdown.

The Updated PSP states that the fate of juvenile sea lamprey in the canal remains unknown and additional efforts to fill in this information gap will be included. It is unclear how this will be done. The study can be designed to obtain information on relative abundance, distribution, sizes of juvenile lamprey with this survey and document occurrences of exposed/desiccated juveniles. A follow-up repeat of the survey targeting sea lamprey may be conducted prior to re-watering, allowing several days of time since the initial surveys to compare observed data and thus potential infer losses with any detected declines. This will be difficult given the potential movement to ponded areas of some size in the area of Cabot intake as an example.

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