Franklin Regional Council of Governments

March 1, 2013

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

Re: Northfield Mountain Pumped Storage Project No. 2485-063
Turners Falls Project No. 1889-081
Comments on the Preliminary Application Document, Scoping Document 1, and Study Requests

Dear Secretary Bose:

The Franklin Regional Council of Governments (FRCOG) is the regional planning agency for Franklin County, Massachusetts. Two committees of the FRCOG, the Connecticut River Streambank Erosion Committee (CRSEC) and the Franklin Regional Planning Board (FRPB), have worked closely with the owner/operator of the Northfield Mountain and Turners Falls Projects for almost 20 years to develop and implement bank stabilization projects that address problems of significant streambank erosion occurring in the Turners Falls Pool on the Connecticut River (the Pool). This cooperative effort set aside differences over erosion causes and focused instead on working together to identify and achieve solutions that protect prime farmland, structures, and other natural resources.

Since the new licenses for these projects will be valid for 30 to 50 years, stakeholders have a "once in a lifetime" opportunity to participate in the process to identify, evaluate and mitigate the environmental impacts of these projects. We believe that it is vital for the residents and municipalities of Franklin County to be actively represented and engaged in the relicensing effort to ensure that the health and vitality of the river is sustained; to protect the region's treasured prime farmland, riparian and aquatic habitat for rare and endangered species; and to make sure that recreational areas and facilities are maintained. We hope that FERC will hold the owner of the hydroelectric projects to high standards and expectations.

We have been and continue to be concerned with the frequent and significant water level fluctuations associated with the operation of the Northfield Mountain Pumped Storage and Turners Falls projects, which result in streambank erosion and impacts to water quality, threatened and endangered species, fisheries, wetlands, and riparian and littoral habitat. In particular, we believe that the Northfield

Mountain Pumped Storage project and its operational use of the Connecticut River have been a long-term "experiment" that has resulted in significant adverse environmental impacts. We now have an opportunity to seriously consider the benefits of taking the river "off-line" and creating a closed-loop lower reservoir that would address most of the environmental impacts and specific resource concerns raised by Federal and state agencies and stakeholders.

Our regional economy benefits from the number and variety of recreational resources associated with the projects. We appreciate the applicant's efforts to maintain and enhance the projects' recreational opportunities over the years. We encourage the applicant to continue their stewardship and consider working with the local towns and regional groups to expand and enhance the recreational opportunities, which in turn will help to strengthen and grow the Franklin County economy. Tourism is important to the economy of Franklin County, which is one of the poorest counties in the state.

Representatives of the FRCOG attended the public scoping meetings held by FERC on January 30th and 31st in Turners Falls, Massachusetts. We understand from these meetings that it is FERC's intention to collectively review and consider the cumulative impacts of the five hydroelectric projects on the Connecticut River up for relicensing. The FRCOG strongly endorses this holistic and cumulative approach because we believe the river and these projects should be evaluated as a single, hydrologically-interconnected system. We recommend that the Vermont Yankee Atomic Power Station and water withdrawals also be evaluated in this review. It is imperative that FERC and the mandatory conditioning agencies have the information they need to better understand the individual and cumulative environmental impacts of all these projects and to balance power generation with environmental protection of the river.

The FRCOG believes that the magnitude of river alteration caused by these five projects and the complexity of issues involved, and the controversy of the best approaches to maintain power generation while not decimating aquatic communities and other natural resources, fully warrants an Environmental Impact Statement (EIS) under NEPA. We endorse FERC's approach to developing a single EIS for the five Connecticut River hydroelectric facilities to evaluate their individual and cumulative impacts on the river ecosystem. Now is the best opportunity in the near and long term to look at all these facilities holistically. We are committed to working with FERC and other stakeholders to implementing an Integrated Licensing Process for these projects that will positively affect the Connecticut River and its resources for present and future generations.

We recently received notification that FirstLight filed a Hydraulic Modeling Assessment of the Turners Falls Impoundment, Turners Falls Hydroelectric Project (No. 1889) and Northfield Mountain Pumped Storage Project (No. 2485) with FERC. FirstLight states in the report that "[t]he findings contained herein demonstrate that the TF Impoundment does not backwater to the base of the Vernon Dam and that the upstream influence of the TF Project is located approximately 9,000 feet downstream of Vernon

Dam, or just below Stebbins Island. The findings also show that hydraulic control of the river shifts from the TF Dam to the Gorge at a flow of approximately 30,000 cfs. Accordingly, FL intends to propose a geographic scope for its relicensing studies limited to the zone of impact of the TF Project. In addition FL will propose modifying both the width and upstream geographic extent of the Project Boundary as part of its relicensing proposal." Since the report was made available on February 22, 2013, we did not have adequate time to review the report and provide our comments as part of this letter. We respectfully request that we be given at least 90 days to provide FERC with our comments.

We appreciate the opportunity to submit our comments on the Preliminary Application Document (PAD), Scoping Document 1, and Study Requests for the projects. For ease of reference, our comments on the PAD and Scoping Document 1 are organized by the major sections in each document. The Study Requests that we are submitting to FERC are detailed in the Appendix to this letter.

Preliminary Application Document (PAD)

The purpose of the Preliminary Application Document (PAD) is to provide information on the existing environment, existing data, and studies relevant to the existing environment, and any known or potential effects of the Turners Falls Project and the Northfield Mountain Project on natural, recreational, cultural, aesthetic and socio-economic resources. The information in the PAD also helps stakeholders identify scoping issues and study needs for the FERC's National Environmental Policy Act (NEPA) document.

Section 3.4 Other Turners Falls Project and Northfield Mountain Project Information

3.4.1 Current License Requirements

We are concerned that the list of "key license requirements" for the two projects did not include Article 19 for the Turners Falls Dam (P-1889) and Article 20 for the Northfield Mountain Pumped Storage Project (P-2485). Given the amount of money the applicant has spent to address the severe and ongoing erosion in the Turners Falls Pool, we believe that the section on "key license requirements" should include Articles 19 and 20. Article 19 states, "[i]n the construction, maintenance, or operation of the project, the Licensee shall be responsible for, and shall take reasonable measures to prevent, soil erosion on lands adjacent to streams or other waters, stream sedimentation, and any form of water or air pollution. The Commission, upon request or upon its own motion, may order the Licensee to take such measures as the Commission finds to be necessary for these purposes, after notice and opportunity for hearing." Article 20 contains similar language, "[t]he Licensee shall be responsible for and shall minimize soil erosion and siltation on lands adjacent to the stream resulting from construction and operation of the project. The Commission upon request, or upon its own motion, may order the Licensee to construct and maintain such preventive works to accomplish this purpose and to revegetate exposed soil surface as the Commission may find to necessary after notice and opportunity for hearing."

The PAD does reference the 1999 Erosion Control Plan (ECP), which was developed by Simons & Associates (S&A) for the previous Licensee to address riverbank erosion in the Turners Falls impoundment. The ECP was developed in response to concerns over riverbank erosion and pursuant to Articles 19 and 20 of the FERC licenses for the Turners Falls Dam and Northfield Mountain Pumped Storage projects. The ECP was approved by FERC and includes a list of 20 riverbank segments where erosion was most severe. These sites were identified as priority sites to be considered for stabilization. Management measures for erosion control in the ECP included: restoration of eroded riverbank segments, preventative maintenance to minimize or prevent future erosion, and maintenance and monitoring of the restored sites. The ECP has been and is currently being implemented in cooperation with the Connecticut River Streambank Erosion Committee (CRSEC), of which the Licensee is a member. This ad hoc committee provides an established forum for the Licensee to coordinate with resource agencies and local landowners on erosion control projects and issues. One provision in the ECP requires the Licensee to periodically repeat the classification and prioritization process at 3- to 5-year intervals (Full River Reconnaissances) during the remaining term of the current FERC license.

3.4.3 Proposed Modifications

The applicant listed the following proposed project modifications in the PAD:

- Upgrading Station No. 1 with new or rehabilitated turbines.
- Closing Station No. 1 and adding a turbine generator at Cabot of similar hydraulic capacity to that at Station No. 1.
- Utilizing the full hydraulic capacity of the Cabot turbines including currently unused capacity.
- Utilizing more storage in the Northfield Mountain Project's upper reservoir.
- Increasing the unit and station capacity at the Northfield Mountain Project.

We are concerned that no specific information about these proposed modifications was included in the PAD. We request that FERC require the applicant to provide information to the public on the need and justification for these proposed modifications as soon as possible. Also, we request that any studies undertaken by the applicant to evaluate environmental impacts of the projects include the environmental impacts of the above proposed modifications to the project facilities and operations. We urge that these analyses be done early in the relicensing process so they can be fully understood and evaluated by all interested parties.

Section 4 Description of Existing Environment and Resource Impacts

4.2.4 Reservoir Shoreline and Streambanks

Although, as the applicant states, numerous studies have been conducted since 1979 to study erosion of streambanks along the Connecticut River, we caution that there has been a considerable amount of controversy over the findings and conclusions of several of the reports listed in this section. We are

concerned that the summary of the 1979 U.S. Army Corps of Engineers' (USACE) study provided in the PAD doesn't reference specific findings related to the Turners Falls Pool but instead includes general summary statements that are not informative or specific to this reach of the river. For example, we have excerpted general and specific findings in the 1979 USACE study, which are informative and specific to the Turners Falls Pool and should have been included in the PAD. These findings are listed below and include:

- *In the Executive Summary – "Note that forces exerted on the bank of a channel by the flowing water can be increased as much as 60 percent by such factors as flood stage variations, pool fluctuations, boat and wind waves, etc. Evaluation of forces causing bank erosion verifies the relative importance of causative factors. In descending order of importance they are: shear stress (velocity), pool fluctuations, boat waves, gravitational forces, seepage forces, natural stage variations, wind waves, ice, flood variations, and freeze-thaw."*
- *On page 21 of the report it states that the "Turners Falls Dam was raised by 5.5 feet in 1971 as a part of the Northfield Mountain Project. Prior to that time it operated similarly to the three upstream dams. Conditions have dramatically changed since completion of this project. Soils that were rarely wet are subject to frequent inundation. Pool fluctuations and variations in discharges and velocities have increased. In fact, the entire hydraulics of the system has changed."*
- *On page 51 – "Sediment and cross-sectional data are the two most important data gaps preventing a quantitative analysis of the Connecticut River."*
- *On pages 118-120 – "The impacts of hydropower development on bank stability in Turners Falls Pool have been and continue to be more severe than for the other pools. The increase in pool level, the larger pool fluctuations and flow reversals caused by the present hydropower operation all contribute to the documented bank instabilities in this part of the study reach. In analyzing the causes of bank erosion in Turners Falls Pool it is suggested that the erosion analysis presented in Table 2 and subsequent tables should be utilized. From this analysis coupled with consideration of adverse hydraulic conditions related to power generation it is concluded that:*

    1. *The maximum tractive forces that can be exerted on the banks of the river will occur during periods of moderate and major floods. Hence, power generation has not altered this condition.*
    2. *The flow reversals, turbulence and changes in river stage caused by present power generation methods have increased the tractive force sufficiently to induce bank erosion in those locations where the bank alignment and bank material causes the rate to be vulnerable to these forces.*
    3. *The increase in pool fluctuations on bank stability in Turners Falls Pool is a very significant factor. Pool fluctuations on the order of 5 feet are at least twice as destructive*

to banks or pool fluctuations of about 1-3 feet as experienced in the other hydropower pools.

4. *To stabilize the eroding banks in Turners Falls Pool will require special attention.*

In summary, if upper bank erosion is to be controlled it will be necessary to implement some measure of upper bank protection capable of withstanding the forces to which it will be subjected; also the means to provide lower bank protection to prevent failure of upper bank protection must be considered, and the cost of such bank stabilization treatments is large. Conversely, if upper bank protection is not provided where such erosion is in progress, erosion will continue until a stable terrace or bench is formed. It is estimated that upper bank erosion will slow down and in many cases stabilize within a 5-10 year period unless conditions for further upper bank erosion are set up by lower bank erosion. Furthermore, in the Turners Falls Pool upper bank erosion may extend landward on the order of 20-25 feet at vulnerable sites before some semblance of upper bank stability is achieved."

Our concerns with the methodology and findings and conclusions of the 2008 Full River Reconnaissance are well documented in our correspondence to FirstLight and FERC, yet have not been included in the PAD. We reiterate our concerns here that accurate data and a reproducible methodology are needed for documenting the type and stage of erosion in the pool and evaluating whether the pace of erosion control work is keeping up with the rate of erosion. We request that the relicensing record reflect our continuing objections to the findings of the 2008 FRR, and specifically, our objections to including statements in the PAD that reference the 2008 FRR, and all of the text on page 4-12 of the section *4.2.4.2 Shoreline and Streambank Characterization.*

4.2.4.3 Geomorphic Studies

We are pleased to see a reference to the 2007 Fluvial Geomorphology Study of the Turners Falls Pool on the Connecticut River between Turners Falls, MA and Vernon, VT prepared for FirstLight by Field Geology Services. We endorsed FirstLight's decision to undertake this study and enthusiastically supported its findings and encouraged FirstLight to implement the study's recommendations. We are disappointed to find the PAD does not accurately present the important findings and recommendations of this study that are specific to the Turners Falls Pool. Instead, the PAD includes a brief, generalized discussion of erosion.

In particular, the Executive Summary of the Field study is compelling and should have been included in the PAD. Dr. John Field also offered detailed recommendations for future work in the Turners Falls pool, which, if implemented, could provide for: a) an improved understanding of the causes of erosion; b) more accurate monitoring of erosion; and c) more successful bank stabilization efforts. Following are excerpts from the Executive Summary of the report that could have been used to inform the readers of the PAD:

"Four types of bank erosion are present in the Turners Falls Pool and occur together through time at any given location. Undercutting and notching at the base of the banks results in topples and slides as the stability of the upper bank is compromised. The slide and topple blocks are disassociated into flows and deliver loose sediment to the base of the bank. This loose sediment can be carried away from the bank by water currents generated by flood flows, boat waves, pool fluctuations, groundwater seeps, and overland flow. Where sediment is moved directly offshore, beaches can form that may promote the stabilization of the bank if the accumulated sediment is not removed or beach face inundated by flood flows. The monitoring of several cross sections since 1990 shows that bank recession rates are on the order of 1.0 ft/yr, but as much as 9.0 ft of erosion has occurred in a single year (i.e., Kendall Site). The average erosion rate of 1.0 ft/yr is corroborated by the measurement of bank recession adjacent to fixed bank points along sections of river armored with rock.

The raising of the Turners Falls Dam in 1970 destabilized previously stable portions of the bank by increasing the pore pressure in bank sediments higher up the bank. An increase in pool fluctuations with the opening of the Northfield Mountain Pumped Storage Project in 1972 and an increase in boat waves accompanying greater recreational use of the Turners Falls Pool could have played a role in the increase in erosion documented by mapping in 1978 and 1990. The lack of a riparian buffer in a few localities makes the banks more susceptible to erosion due to a lack of roots to bind the soil together and an increase in runoff over the bank that can cause gullying. An increase in overall bank stability between 1990 and 2001, as documented by erosion maps, may be related to the development of beaches observed throughout much of the Turners Falls Pool.

Comparisons of erosion maps from different years must account for variations in mapping season, mapping methods, and mapping personnel. Comparisons of two different erosion maps completed in 1990 reveal several discrepancies in the location and amount of erosion. The minor increases in erosion between 2001 and 2004 are less than the discrepancies between the 1990 maps. Consequently, policy decisions based on the erosion mapping data should be carefully reviewed, because apparent differences in erosion from year to year may simply be an artifact of the mapping process. Currently 20 percent of the bank length has been protected with rock armor. As bank stabilization efforts proceed, new approaches should be considered, because the continued reliance on armoring at the base of the bank with rock, in both riprap and bioengineering projects, could lead to increased erosion elsewhere. While the development of beaches is an indication of increasing bank stability, erosion is likely to persist as natural flood flows rework beach deposits and inundate the beach face.

However, promoting the development and preservation of beaches through the addition of large woody debris could improve bank stability by buttressing the banks against erosion and by further

trapping fine sediment on the beaches. Given the complexity of issues surrounding erosion in the Turners Falls Pool the results of this study should be considered preliminary in nature. Many areas of additional study are necessary including surveys of erosion using a systematic and explicit method for mapping the types of erosion present in order to eliminate artifacts in the mapping process. Experimentation with large woody debris placements on beach faces should also begin to determine their value in improving bank stability. Only with a thorough understanding of the character and causes of erosion can effective and sustainable bank stabilization efforts be implemented throughout the Turners Falls Pool."

The final report listed in section 4.2.4.3 is the 2012 Riverbank Erosion Comparison along the Connecticut River prepared for FirstLight by Simons & Associates (S&A). We strenuously object to the findings and conclusions stated in this report and repeated in the PAD. Unlike the USACE reports and the Field Geology Services report, the S&A report does not include a documented methodology, the analysis lacks a robust data set, and the analysis itself is qualitative and subjective.

We specifically object to the conclusion that the Turners Falls Impoundment is in better condition than all other reaches of the river studied. This conclusion is drawn solely from an analysis of a few erosion sites in the Holyoke, Turners Falls, Vernon and Bellows Falls impoundments, documented photographically in 1998 and again in 2008, the results of the 2008 FRR, and the findings of a fluvial geomorphic study that focused on the free-flowing reach of the Connecticut River farther upstream of these four impoundments (Field Geology Services, 2005). The S&A report notes that erosion was continuing in all but one of the 23 sites evaluated in the Holyoke, Vernon, and Bellow Falls impoundments. In contrast, the report claims that in the Turners Falls impoundment, most of the eroded sites were either stabilized, in the process of stabilization through erosion control measures, or experiencing some degree of natural stabilization. We note that this conclusion is based on the results of the 2008 Full River Reconnaissance, which we dispute. The 2012 S&A report goes on to state that the segment of the river with the greatest extent of eroding riverbanks is the free-flowing reach of the Connecticut River farther upstream of these four impoundments. However, we are not convinced that such a direct comparison can be made based on the paucity of data in the S&A report and dissimilar methodologies used between the S&A report and the 2005 Field Geology Services report.

4.3.1.4 Water Withdrawals

We are concerned that this section did not include information about FirstLight's requirement that irrigation withdrawals obtain a permit from FirstLight. We request information about the fee structure, permit language and time-frame, need for requiring the permits, and the legal authority under which FirstLight is requiring these permits. The PAD states that for the Four Star Farms' withdrawal, "[c]ompared to the Connecticut River flow at this location, this withdrawal volume is negligible. We would anticipate that this is the case for the remaining four irrigation withdrawals in this reach of the river. Uninterrupted access to irrigation water is critical to the economic viability of these farms. The

need for and legality of the permits required by FirstLight is not clear. Further, the climate of uncertainty created by the need for the farmers to obtain a permit from a private corporation to use a public resource, when this permit can be at any time and for any reason revoked, is a burden that interferes with the economic viability of these farms.

Section 5 Preliminary Issues and Studies List

5.1 Issues Pertaining to the Identified Resources

We would like to add the following issues:

5.1.2 Water Resources - Effects on water quantity, particularly the availability of water to the downstream reach of the river, below the Turners Falls dam, known as the bypass channel.

5.1.3 Water Quality – Effects of the projects' operations on the levels of turbidity, total suspended solids, and nutrients in the water. Effect of project operations on water quality, which results in the river being listed as impaired by the MA DEP (Category 5 – Waters Requiring a TMDL). The entire length of the river within the projects' boundary is listed for the following impairments.

- Segment MA34-01 (3.5 miles) for "other flow regime alternations" and "alteration in stream-side or littoral vegetative covers"
- Segment MA34-02 (10.9 miles) for "alteration in stream-side or littoral vegetative covers"
- Segment MA34-03 (3 miles) for total suspended solids, "low flow alterations" and "other flow regime alternations"
- Segment 34-04 (34.4 miles) for *E.coli* bacteria
- Barton Cove is listed as impaired for non-native aquatic plants (Eurasian water milfoil).

5.2 Potential Studies or Information Gathering

5.2.1 Geology and Soils. In the PAD, the applicant states that information from previous studies will be used to assess the effects of the project operations on streambank erosion. At the Scoping Meeting, the applicant updated the list of proposed studies for this resource category to include the following:

- 2013 Full River Reconnaissance (FRR) study and development of a QAPP for the Turners Falls Impoundment.
- Hydrologic, Hydraulic and Geomorphic Analysis of Erosion in Turners Falls Impoundment.
- Analysis of Erosion in Vicinity of Route 10 Bridge Spanning the Connecticut River (completed 2012).

- Riverbank Erosion Comparison along the Connecticut River (completed 2012).

First, for the reasons articulated above and in previous correspondence with FERC, we are concerned with the applicant's plan to use information from the earlier Full River Reconnaissance (FRR) studies (2001, 2004 and 2008) and the Riverbank Erosion Comparison along the Connecticut River (2012) report. We are currently working with the applicant to develop a suitable Quality Assurance Project Plan (QAPP) and appropriate methodology for the 2013 FRR. At this point, an outline for the proposed Hydrologic, Hydraulic and Geomorphic Analysis of Erosion in the Turners Falls Impoundment has not been shared with us so we aren't able to provide specific comments other than our hope that the findings and recommendations for further study found in the 2007 Field Geology Services report are reflected in the proposed study.

5.2.3 Water Quality. Add the following to the *Study Objectives* section:

- Collect data on the levels of turbidity, total suspended solids, and nutrients in the water.
- Collect data on the effect of project operations that result in the river being listed as impaired by the MA DEP (Category 5 – Waters Requiring a TMDL) for the following impairments:
  - "other flow regime alternations"
  - "alteration in stream-side or littoral vegetative covers"
  - total suspended solids
  - "low flow alterations"
  - *E.coli* bacteria
  - non-native aquatic plants (Eurasian water milfoil).

Scoping Document 1

We have several comments to offer on the Scoping Document 1 issued on December 2012 by FERC. Our comments are arranged by the sections in the document.

3.5 Alternatives to the Proposed Action

On page 8 of the Scoping Document, the text reads that "[i]n accordance with NEPA, the environmental analysis will consider the following alternatives, at a minimum: (1) the no-action alternative, (2) the applicant's proposed action, and (3) alternatives to the proposed action." We strongly urge the FERC staff to consider a closed-loop alternative for the lower reservoir serving the pumped storage project and request that the applicant complete a feasibility study of this alternative to the proposed action.

4.0 Scope of Cumulative Effects and Site-Specific Resource Issues

We concur with the list of resources listed in Scoping Document 1 that could be cumulatively affected by the proposed operation and maintenance of the five hydroelectric projects on the Connecticut River. The Connecticut River is a public resource that is used as fuel for these hydroelectric projects, which not only generate electricity for public use (at a cost) but generate profits for the projects' owners. This is the public's first opportunity to evaluate environmental data and operational information and to suggest modifications to the way the projects operate, both individually and collectively, to avoid or mitigate the environmental impacts. We respectfully request that all project resource issues be analyzed for both cumulative and individual project effects. The geographical scope of the cumulative impacts analysis should include the main stem of the Connecticut River from the Wilder Project downstream to the Holyoke Dam.

4.3 FirstLight's Turners Falls and Northfield Mountain Pumped Storage Project Resource Issues

Our comments on this section are the same as the comments we provided on the PAD, above, for Section 5 Preliminary Issues and Studies List, 5.1 Issues Pertaining to the Identified Resources. Rather than repeating our comments here, we request that our comments on the PAD be noted as comments on Section 4.3.1 Geology and Soil Resources and 4.3.2 Water Resources of the Scoping Document 1.

6.0 Request for Information and Studies

We are aware of at least 18 Study Requests that have been drafted by Federal and state resource agencies, with the assistance of various NGOs and other stakeholders for the Turners Falls and Northfield Mountain Pumped Storage projects. The sheer number of requests indicates how little we know about the environmental impacts these projects have had and will have in the future. Further, we believe that the wide range and severity of the environmental impacts provides additional support for a closed-loop alternative to using the Connecticut River as the lower reservoir for the Northfield Mountain project. We support these Study Requests and encourage FERC to require the applicant to undertake these studies. FRCOG staff reviewed and provided comments during the drafting of these study requests. FRCOG endorses and submits the following study requests as its own in support of the resource agencies and a complete relicensing process.

1. Study of shoreline erosion caused by Northfield Mountain Pump Storage (NMPS) operations.
2. Study of feasibility for converting Northfield Mountain Pump Storage (NMPS) station to a closed-loop or partially closed-loop system.
3. Study of Northfield Mountain/Turners Falls Operations Impact on Sedimentation and Sediment Transport.
4. Water Quality Study.

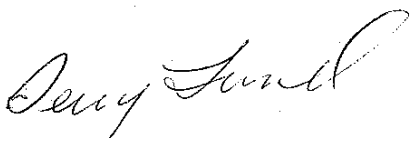
5. Impacts of Water Level Fluctuations on Aquatic Vegetation Including Invasive Species and their Associated Habitats in the Project Impoundment.
6. Model River Flows and Water Levels Upstream and Downstream from the Turners Falls Project Dam Generating Stations and Integration of Project Modeling with Upstream and Downstream Project Operations.
7. Develop A Comprehensive And Predictive Model Of The Electrical Generation System Consisting Of Five Generation Projects Along The Connecticut River To Study The Impact and Feasibility Of Various Changes In Operations On Environmental Resources

Detailed discussion of these Study Requests is included as an appendix to this letter. It should be noted that no fishery study requests are included. While FRCOG supports those requests as relevant and important to understanding the impact of the hydroelectric projects on the Connecticut River, fisheries are outside of its purview. We encourage FERC to accept the study recommendations of the Federal and state fishery agencies.

We appreciate the opportunity to provide comments on the PAD, Scoping Document 1 and the Study Requests. We look forward to continuing our active engagement in the relicensing of the Connecticut River hydroelectric projects.

Sincerely,

Bill Perlman, Vice-Chair
FRCOG Executive Committee



Jerry Lund, Chair
Franklin Regional Planning Board Executive Committee

Tom Miner, Chair
Connecticut River Streambank Erosion Committee

cc: Franklin County Legislative Delegation
US Fish & Wildlife Service
Massachusetts Department of Environmental Protection
Massachusetts Department of Conservation and Recreation
Congressman James McGovern
Town of Gill, MA
Town of Northfield, MA
Town of Montague, MA
Franklin Conservation District
Connecticut River Watershed Council
Nathan L'Etoile, Four Star Farms
John Howard, FirstLight Power

Attachment: Appendix 1 – Franklin Regional Council of Governments' Study Requests

Appendix 1
Franklin Regional Council of Governments' Study Requests

Study Request 1 - Study of Shoreline Erosion Caused by Northfield Mountain Pumped Storage (NMPS) Operations

Development of the current configuration of the Northfield Mountain Pumped Storage project included raising the dam height at Turners Falls by 5.9 feet in 1970 in preparation for NMPS operations. Operations began in 1972; since then all project operations have operated under this raised dam environment. The additional 5.9 foot in elevation changed the elevation of the Turners Falls impoundment, which extends some 20 miles upstream. The increase in river elevation also resulted in motorized boat traffic becoming more popular and makes the use of larger boats more possible. The presence of motorized recreational boats increases wake energy that can accelerate bank erosion rates.

The operation of NMPS causes alterations to the river as a direct feature of plant functionality. The alterations include: 1) daily fluctuating pond levels which at times in some places can exceed six feet (the license allows fluctuations up to 9 feet measured at an undisclosed location near and upstream of the Turners Falls dam); 2) altered flow and velocity profiles of river; 3) reversal of river flow direction; and 4) changes to the downstream hydrograph. Elevation data for the river in Appendix E of the PAD indicate that stage changes of 2 to 3 feet during the summer of 2012 were not uncommon.

Raising the level of the river can saturate bank soils. These same soils can quickly become dewatered when the river is lowered by the NMPS pumping cycle. Repeated saturation and dewatering of banks can lead to bank instability which in turn can lead to bank failure and eroded material entering the river. See Field (2007)[1] for an extended discussion on bank erosion and failure mechanics. Elevated levels of turbidity and suspended solids in the water column can diminish spawning, rearing and migratory habitat for fish. When too much fine grain material is deposited on channel bed substrates, particularly those substrates used for spawning, spawning success of resident and migratory fish is compromised, potentially reducing recruitment and carrying capacity.

Goals and Objectives

The goals of this study request would be to determine the environmental effects of the presence and operation of the licensed facilities on river bank stability, shoreline habitat, agricultural farmland, wetland resources, bed substrate, and water quality in the Turners Falls impoundment. We recognize that data from other studies will be made available and we think that the data from these other studies could be used to help meet the objectives of this study request.

Objectives of the study include the following:

1. Calculate the total volume of eroded material, calculate resulting nutrient loading of eroded material, and document and describe the three dimensional changes to the bank, including lateral bank recession, changes to bank slope, and the presence and subsequent inundation of pre-

[1] Field Geology Services. (2007). *Fluvial geomorphology study of the Turners Falls Pool on the Connecticut River between Turners Falls, MA and Vernon, VT*. Prepared for Northfield Mountain Pumped Storage Project. Farmington, ME: Field Geology Services.

project beaches and shoreline since the Turners Falls Dam was raised and the Northfield Mountain Pumped Storage facility came on-line.
2. Document and describe the changes to banks upstream and downstream of riverbank restoration projects, including bank recession.
3. Identify the changes that have occurred to bed substrate as a result of fine grain material being eroded from the banks and being deposited on the channel bed.

Relevant Resource Management Goals and Public Interest Considerations

Our management goal is to ensure high quality habitat for migratory diadromous fish. Shortnose sturgeon, American shad and American eel all require suitable spawning, rearing, migratory and foraging habitat. Eroding banks and subsequent increases in turbidity and deposition of fine grained material onto bed substrates in the Turners Falls impoundment, the bypass reach and downstream of the Turners Falls project reduces the quality of habitat for these species. Elevated levels of suspended sediment are associated with a diminution in water quality which also affects the quality of habitat for native, rare and endangered fish and other aquatic and riparian species.

In addition to habitat effects, soil erosion contributes to nutrient loading. In 2001, the U.S. EPA approved New York and Connecticut's Long Island Sound (LIS) dissolved oxygen TMDL. As a result, the New England Interstate Water Pollution Control Commission (NEIWPCC) established the Connecticut River Workgroup and the Connecticut River Nitrogen Project. This project is a cooperative effort involving staff from NEIWPCC, the states of Connecticut, Massachusetts, New Hampshire, and Vermont, and EPA's Region 1 and Long Island Sound (LIS) offices. All are working together to develop scientifically-defensible nitrogen load allocations, as well as an implementation strategy, for the Connecticut River Basin in Massachusetts, New Hampshire, and Vermont that are consistent with TMDL allocations established for LIS. Since its inception, the Connecticut River Workgroup has participated in a number of projects to better understand nitrogen loading, transport, and reductions in erosion.

Public Interest Considerations if Requester is not a Resource Agency.

The Franklin Regional Council of Governments (FRCOG) is a regional organization that offers diverse programming, products and services, both on the municipal and regional level, to our 26 member towns. The FRCOG is also the Regional Planning Agency for Franklin County, Massachusetts, which is the most rural county in the state. The FRCOG serves the town governments, municipal boards and committees, businesses, and our citizens. In the early 1990's, the FERC recognized the creation of an ad hoc committee, the Connecticut River Streambank Erosion Committee, convened by the FRCOG and FRPB to bring together the NMPS operator, state and municipal entities, landowners, and NGOs to carry out bioengineering projects to stabilize and repair areas of bank erosion. We advocate on behalf of our communities and the county at the federal, state and regional levels. We work together to advocate for legislative action, social policy, and governmental programming that recognize the unique character and conditions of our rural area.

Existing Information and Need for Additional Information

The PAD makes reference to several studies in section 4.2.4 including the Erosion Control Plan (Simons & Associates, 1999), previous Full River Reconnaissance studies (1998, 2001 – maps but no report generated, 2004, and 2008), Field Geology Services' 2007 fluvial geomorphic investigation of the Turners Fall impoundment, and 2012 investigations by Simons & Associates.

Field Geology Services' 2007 investigation provided several good recommendations for future work in section 9.3 of its report which, if implemented, could provide for: a) an improved understanding of the causes of erosion; b) more accurate monitoring of erosion; and c) more successful bank stabilization efforts. This document is a good point of reference. The Simons & Associates' (2012) documents are qualitative and based on several unstated assumptions that may not be valid. Full River Reconnaissance efforts have been undertaken using varying methodologies, making for difficult comparisons from one report to the other.

We believe that these existing studies do have data that can be useful if certain new analyses are undertaken. These analyses of existing data would help fill in our gaps of understanding of bank erosion in the Turners Fall impoundment. We are also asking for the collection of additional field data. With the existing and additional information, it should be possible to better display what changes have occurred to streambanks over time. Current Geographic Information System (GIS) software allows for various types of data to be assembled into a map and into a database such that change over time analysis can be conducted fairly easily. The change over time analysis is a critical analysis that is needed, and was already started under Field (2007).

Photos that have been taken at or near the same location but at different times exist. For example, the last three Full River Reconnaissance efforts have included continuous videotaping of the river banks with locational information. With these data, "snapshots" of the bank at various locations could be extracted and compared over time. Field (2007) photo locations could be re-shot as well. This existing information should be presented such that it is easy to discern where the photo was taken and what changes have occurred over time. A comparison of the bank every 100 ft could be compared over the years.

Historic aerial photography for the Turners Fall impoundment should be gathered and analyzed. Examples of good photographic datasets include the Field 2007 appendices and 1929 aerials. The location of the shoreline over time should be noted such that it is easy to discern where bank retreat has been most severe and where the river has been relatively stable since the earliest aerial photograph was taken.

Very little turbidity data for the Turners Falls impoundment, the bypass reach or stretches of the Connecticut River downstream of the Turners Fall project exist. Thus far, implementation of the *Northfield Mountain Pumped Storage Project Sediment Management Plan* (revised February 15, 2012) has yielded few results, and many technological difficulties (see *2012 Sediment Management Plan – 2012 Summary of Annual Monitoring* dated November 30, 2012). Suspended sediment monitoring equipment is installed at the Route 10 Bridge upstream of the project and inside the powerhouse, theoretically taking readings representative of pumping and discharging through the turbines. An

analysis of how turbidity might change relative to rapidly changing impoundment levels would be very useful information.

Nexus to Project Operations and Effects

The construction of the NMPS project was contingent upon the Turners Falls project raising the dam crest elevation by 5.9 feet. The NMPS project operations rely on the Turners Falls impoundment as the source of water to be pumped up and then discharged back into the river through turbines. The importance of this river reach to the NMPS operation is made clear by FirstLight's reference to this portion of the river as the "lower reservoir." Daily pumping and discharging changes the ponded elevation of the Connecticut River which in turn leads to bank material that repeatedly becomes saturated and then dewatered. Weakened bank material can then become eroded and the fine grain material from the banks can enter the water column and be transported in suspension in the river and eventually settle onto bed material. The raising of the Turners Falls impoundment also made recreational boating more popular, including the introduction of large, high-horsepower powerboats that were not previously present. Because of the fluctuating water levels, boat wakes impact the shoreline to a much greater extent than would occur if levels were more constant, thus exacerbating both the effects of the wakes and the fluctuating levels. For these reasons, erosion caused or contributed by NMPS project operation can negatively affect spawning, rearing and migratory habitat for rare and endangered species, including the endangered shortnose sturgeon. The requested study will help inform the mandatory conditioning agencies and stakeholders when contemplating mitigation measures and or operational modifications.

Proposed Methodology

1. This study should determine the net soil loss in cubic yards between 1970 and the present; a density estimate of the eroded material should also be provided. Provide an analysis of where the greatest loss has occurred, location of proximity to the tailrace, soil type, riparian land use, and vegetative cover in that area. Calculate nutrient loadings (nitrogen and phosphorus compounds) to the river system based on soil loss.
2. Obtain copies of the original survey plans for the project, and complete a new survey using the same landmarks used previously. The Field (2007) report states on page 11 that the original survey plans of the river are still retained by Ainsworth and Associates, Inc. of Greenfield MA. Use pre-operation aerial photos and current aerial photos to complete a 10-foot topographic map of the section of river between Turners Falls Dam and Vernon Dam and the 200-foot buffer regulated under the Massachusetts Rivers Protection Act. The Field (2007) report on page 11 states that Eastern Topographics, Inc. determined that sufficient information is known about the 1961 aerial photos (e.g., height of airplane) to create a 10-foot topographic map of that time period, and that 1961 aerial photos could be accurately overlaid with recent aerial photos. Field (2007) states that this analysis would enable a more reliable determination of small-scale shifts in channel position and changes in bank height that may have resulted from the erosion of a low bench that previously existed along portions of the river. Among other things, create a single map showing areas of erosion and deposition, and also overlay the Field report's hydraulic modeling analysis of the river channel.
3. With respect to the January 22, 2013 submittal from FirstLight to FERC regarding its long term monitoring transects in the Turners Fall impoundment, we ask that any data errors (as discussed

in Field, 2007) and problems that have occurred over the years at each site be mentioned. We also ask that an analysis for each cross section extending to the top of the bank and including a portion of the floodplain be provided.

4. Take the information presented in Figure 4.2.3-1 "Soils in the vicinity of Turners Falls and Northfield Mountain projects" in the PAD and convert from 63 categories to just a few that are defined in a key that will allow readers to understand which soils are easily erodible, which aren't, and where there is bedrock along the banks.
5. Complete detailed surficial mapping (topographic map or LIDAR) to identify the various geomorphic surfaces, height of benches/terraces above the river level, and types of sediments underlying the surfaces. This will allow one to determine how erosion varies with geomorphic conditions. One could then normalize the amount of erosion to a specific type of bank material/geomorphic surface/terrace.
6. Another information request covers the range of daily water level fluctuations. In this study request, we ask for an analysis on the degree to which boat wakes increase that fluctuation range. The task would be to observe boat wakes under a range of boat sizes and flow rates on the river. We recommend implementation of the 2007 Field report recommendation that states, "A more thorough study of boat waves is merited to better document how many boats use the Turners Falls Pool, how fast they travel, the type and size of waves they produce, and their impact on shoreline erosion."

A component of this study request is not necessarily for new data, but for existing data to be presented in a more clear, coherent and comprehensive manner. All existing photographs of banks that have been collected either by FirstLight, on behalf of FirstLight or on behalf of the FRCOG Connecticut River Streambank Erosion Committee should be geo-referenced in such a way that it is easy to discern where the photograph was taken and the date should be easily discernible as well. These photos should be presented in a manner that makes it easy to visualize how a particular section of bank has changed over time. Providing geographic context for photographic data of river banks and making these photos comparable over time should be standard practice. The 2007 Field report contains the following recommendation on page 47: "An attempt should be made to overlay the 1961 aerial photographs with a current flight and to create a topographic map from the 1961 flight. The feasibility of this effort has been confirmed by Eastern Topographics, Inc. This effort will identify the previous extent of the low bench and identify areas of the most significant bank recession the past 45 years." Given that this statement was written in 2007, we request that that the analysis is extended to current conditions.

Given the complexity of this study request and the expertise necessary to implement it, we request that we and the mandatory conditioning agencies be involved with the selection of the hired consultant.

Level of Effort and Cost

The level of effort to compile existing information and to make the data available in a map and searching for existing bed substrate material data should not take more than a few days. The level of effort for the bed sampling work will vary based upon how much existing historic information exists. Much of the effort of this study request is essentially office work that compiles and better presents existing data. While an estimate on the amount of field time required, including a current flight for aerial photography (LIDAR) or a topographic map survey, is difficult to make, we estimate that up to

two weeks of field work could be required and that some of the data collection could be done while other field studies are occurring.

Study Request 2 – Study the Impact of Operations of the Northfield Mountain Pumped Storage Project and Turners Falls Dam on Sedimentation and Sediment Transport in the Connecticut River

Goals and Objectives

The goal of this study request is to provide hydraulic and sediment transport modeling of both the intake and discharge conditions (current and proposed) at the Northfield Mountain Pumped Storage Project. The results of the study should provide information sufficient to enable mandatory conditioning agencies and stakeholders to understand current and proposed effects on water level fluctuations and relate them to potential increase in sedimentation to the Connecticut River. Mandatory conditioning agencies and stakeholders should be able to identify techniques that could be used to mitigate the effects of project operations or other mitigation techniques that could be developed to reduce riverbank erosion within the impoundment. In addition, an assessment of means to minimize the sediment load passing through the Turners Falls Canal during and after maintenance drawdowns should be conducted.

The specific objectives of this study are as follows:

1. Assess hydraulic and sediment dynamics in the Connecticut River from Vernon Dam to Turners Falls Dam, the upper reservoir at Northfield Mountain, and downstream of the Turners Falls Dam.
2. Identify management measures to minimize erosion and sedimentation.
3. Determine areas of sediment deposition and beach formation in the Project Area and 1 km downstream of Cabot Station and describe habitat features of these areas, recreational uses and effects on invasive species, if any. Habitat areas include but are not limited to coves (e.g. Barton Cove), back channels, islands, wetland habitats, shorelines, shoals, deep water areas and channels.
4. Identify management measures to mitigate for substrate (habitat) impacts and recreational impacts in sediment-starved areas below the dam and sediment accumulation areas upstream of the dam.

Relevant Resource Management Goals and Public Interest Considerations

The resource management goal is to ensure that the Connecticut River, which is designated as a Class B river for its entire length in Massachusetts, meets its designated uses of habitat for fish, other aquatic life and wildlife, and for primary and secondary contact recreation. Class B waters must also have consistently good aesthetic value and meet minimum criteria for numerous water quality indicators to achieve compliance with the standards set forth in the regulations. The other resource management goal is to protect prime farmland soils, which are eroding, and riparian habitat. Eco-based tourism and agricultural operations are important to the economy of Franklin County so maintaining the water quality of the river and protecting scenic landscapes and productive farmland along the river from erosion are important.

Public Interest Considerations if Requester is not a Resource Agency

The Franklin Regional Council of Governments (FRCOG) is a regional organization that offers diverse programming, products and services, both on the municipal and regional level, to our 26 member towns. The FRCOG is also the Regional Planning Agency for Franklin County, Massachusetts, which is the most rural county in the state. The FRCOG serves the town governments, municipal boards and committees, businesses, and our citizens. In the early 1990's, the FERC recognized the creation of an ad hoc committee, the Connecticut River Streambank Erosion Committee, convened by the FRCOG and FRPB to bring together the NMPS operator, state and municipal entities, landowners, and NGOs to carry out bioengineering projects to stabilize and repair areas of bank erosion. We advocate on behalf of our communities and the county at the federal, state and regional levels. We work together to advocate for legislative action, social policy, and governmental programming that recognize the unique character and conditions of our rural area.

Existing Information and Need for Additional Information

The PAD provides a summary of the work that has been done to characterize streambank conditions of the Turners Falls Impoundment, to understand the causes of erosion, and to identify the most appropriate approaches for bank stabilization. There has been no work undertaken to gather and assess the data that this study request would provide. Implementation of the *Northfield Mountain Pumped Storage Project Sediment Management Plan* (revised February 15, 2012) was begun in 2011 and is scheduled to end in 2014. This is a limited study related to sediment problems in the upper reservoir, not the entire river.

Nexus to Project Operations and Effects

The Turners Falls and Northfield Mountain Pumped Storage projects operate in a peaking mode, with allowable impoundment fluctuations of up to 9 feet, with the intent to continue these fluctuations. It is proposed to evaluate increasing the volume of flow from the Northfield Mountain Pumped Storage Project through increased use of the upper reservoir, which is expected to result in additional water level fluctuations. Upstream hydroelectric facilities also operate in a peaking mode of operation. Periodically, the upper reservoir at Northfield Mountain and the power canal at the Turners Falls dam need to be dewatered for maintenance purposes. Historically, both procedures have resulted in the discharge of large quantities of sediment. Sediment from shoreline erosion and riverbank failure is one of the major contributors that negatively affect water quality and habitat by increasing the turbidity and sedimentation, and smothering aquatic habitat. Repetitive water level fluctuations and flow alterations caused by hydroelectric peaking operations are known to be a major contributor to shoreline erosion.

The Proposed Massachusetts Year 2012 Integrated List of Waters shows two river segments, from the VT/NH state line to the Turners Falls dam (MA34-01 & MA34-02) impaired and considered a "Water Requiring a TMDL" due to "Other flow regime alterations", "Alteration in stream-side or littoral vegetative covers" and "PCB in Fish Tissue". In addition, the segment below the Turners Falls dam to the confluence with the Deerfield River (MA34-03) is impaired by these causes as well as total suspended solids.

Proposed Methodology

We concur with the proposed methodology developed by the MA Department of Environmental Protection, which is consistent with accepted practices:

Assess hydraulic and sediment dynamics

1. FirstLight should continue implementing the Northfield Mountain Pumped Storage Project Sedimentation Management Plan over the full range of river flows and pumping/generating cycles. An unfulfilled task in the Plan is to develop a correlation over the full range of flow conditions between the overall suspended sediment transport through the entire cross section of the river compared to the continuous sampling at the single fixed location. Environmental Protection Agency approval of a Quality Assurance Project Plan is required for valid data acquisition.
2. Provide data on the daily water level fluctuation changes for the past five years from stations listed in the PAD, and estimate fluctuations within Turners Pool assuming proposed operations and hydraulic conditions.
3. Identify the most appropriate techniques for bank stabilization given the existing and proposed hydraulic conditions.

Determine areas of sediment deposition in the Project Area

1. Field (2007) conducted a bathymetric study as part of his report. Use previous bathymetric data, if available (Field 2007 recommends putting additional effort into finding a bathymetric survey from 1913 that was partially shown in Reid 1990), and current bathymetric information to look at areas of sediment accumulation. Determine areas of sediment deposition in the Project Area and 1 km downstream of Cabot Station and describe habitat features of these areas. Habitat areas include but are not limited to coves (e.g., Barton Cove), back channels, islands, wetland habitats, shorelines, shoals, deep water areas and channels.
2. Identify recreational uses and impacts in areas known to be impacted by accumulated sediment, such as Barton Cove.
3. Identify invasive species (plant or animal) present in the reaches and determine if erosion and sedimentation in any way contributes to the establishment and/or proliferation of these species.
    a. Investigate the formation of beaches using remote sensing, LIDAR at low pool levels or some other mapping technique to understand the processes of beach deposition the distribution of beaches in the pool, the impact of beach deposition on habitat and species, and how can this be related to the operation of NMPS.
    b. Evaluate management strategies to address the release of accumulated sediment through the Northfield Mountain Pumped Storage Project works during upper reservoir drawdown or dewatering activities. FirstLight should specifically evaluate the feasibility of the installation of a physical barrier across the bottom of the intake channel of the upper reservoir that is designed to prevent the migration of sediment during future drawdowns of the upper reservoir
4. Evaluate management strategies to minimize flow fluctuations within Turners Pool including coordination with upstream users.

5. Evaluate management strategies to minimize sediment released through spillway gates and the log sluice located near the bottom of the forebay adjacent to the Cabot Powerhouse during canal dewatering activities.
6. Identify a prioritized list of locations for bank stabilization projects in the Project Area.
7. Develop a map of land owned by FirstLight within 200 feet of the Connecticut River with an overlay of land use and vegetation cover. Provide land use options aimed at reducing bank erosion.

Management measures to change sediment flow below and above the dam.

1. Any historic information of existing bed substrate material in the Turners Falls impoundment, bypass reach or downstream of the project should be collected and assembled. To the extent possible, the location of each sample should be made available on a map. The request for new data would stem from being able to make any valid comparison to changes in bed substrate at a given location, assuming that historic data exists.
2. Identify measures that could be taken to mitigate impacts to recreational use, habitat, or invasive species from sedimentation.
3. Identify measures that could be taken to change or mitigate sediment starved reaches below the Turners Falls dam.

Level of Effort and Cost

Many erosion studies have already been conducted and the cost of expanding the scope of some should be reasonable. A Full River Reconnaissance under the *Erosion Control Plan for the Turners Falls Pool of the Connecticut River* (Simons & Associates, Inc. dated June 15, 1999) is scheduled for 2013 and could accomplish many of the objectives listed above.

Study Request 3 - Study the Feasibility of Converting the Northfield Mountain Pumped Storage (NMPS) Facility to a Closed-loop or Partially Closed-loop System

Building and operating the Northfield Mountain Pumped Storage project required the Turners Falls Dam be raised 5.9 feet. The Turners Falls impoundment of the Connecticut River acts as the lower reservoir and is subject to large sub-daily fluctuations in water level. The collateral environmental consequences of using the Connecticut River during the pumping and generation cycles for the last 40 years are not fully understood, but have likely contributed to extensive erosion of streambanks, downstream sedimentation, entrainment of large numbers of resident and migratory fishes, and destruction of important spawning and nursery habitat, both within the Turners Falls Pool and downstream. Intrinsic consequences include radical fluctuations in the hydrograph at a sub-daily level, which also negatively impact recreation, habitat, and likely disrupts key life history stages of resident and migratory fishes, benthic invertebrates, and macrophytes. The vast majority of proposed new pumped storage projects currently being considered by FERC are closed-loop because of a growing consensus that open-cycle pumped storage causes unacceptable environmental damage.

Resource agencies have identified restoration of a more natural hydrograph to the Connecticut River as a key management goal, and view the current relicensing process for five projects on the Connecticut River mainstem as an opportunity to achieve this. Converting to closed-loop or partial closed-loop would allow the restoration of ecological flows to the Connecticut River, and provide much greater flexibility in operational guidance for both NMPS and the other hydropower stations on the Connecticut River. It will also eliminate or partially eliminate many of the environmental concerns expressed by Federal and state agencies and other stakeholders, which are outlined in the numerous study requests and comment letters that FERC will receive on the NMPS project and the other four hydropower projects.

Goals and Objectives

The goal of this study request is to provide resource managers, stakeholders, and the licensee with an analysis of possible options for converting the plant to a close-loop or partially closed-loop system.

The objectives of this study request would be to determine:

1. Candidate locations for placement of a lower reservoir.
2. Costs and logistics of construction and modification of the current facility to convert to a closed-loop or partially closed-loop system.
3. Projected savings associated with eliminating need for ongoing mitigation measures, both for stabilizing river banks as well as likely modification to operations that the facility that will be required to implement in order to protect habitat and native fauna.
4. Other ancillary costs or savings, such as eliminating requested studies, operational changes, or mitigation measures.

Relevant Resource Management Goals and Public Interest Considerations

The resource management goal is to ensure high quality habitat for migratory diadromous fish. Shortnose sturgeon, American shad, blueback herring, and American eel all require suitable spawning, rearing, migratory and foraging habitat. Eroding banks and subsequent increases in turbidity and

deposition of fine grained material onto bed substrates in the Turners Falls impoundment, the bypass reach and downstream of the Turners Falls project reduces the quality of habitat for these species. Elevated levels of suspended sediment are associated with a diminution in water quality that also affects the quality of habitat encountered by endangered species. Entrainment into the facility could be lethal to any of these fish. Juvenile and larval stages of resident and migratory species, including rare, threatened, and endangered species of vertebrates and invertebrates are particularly vulnerable to entrainment. This damage is aggravated by the repeated cycling of the facility—unlike standard hydro, where organisms are likely only exposed to passage events a single time and may bypass the system safely, NMPS continuously recycles river water, and therefore increases the risk of exposure to entrainment and death.

Public Interest Considerations if Requester is not a Resource Agency

The Franklin Regional Council of Governments (FRCOG) is a regional organization that offers diverse programming, products and services, both on the municipal and regional level, to our 26 member towns. The FRCOG is also the Regional Planning Agency for Franklin County, Massachusetts, which is the most rural county in the state. The FRCOG serves the town governments, municipal boards and committees, businesses, and our citizens. In the early 1990's, the FERC recognized the creation of an ad hoc committee, the Connecticut River Streambank Erosion Committee, convened by the FRCOG and FRPB to bring together the NMPS operator, state and municipal entities, landowners, and NGOs to carry out bioengineering projects to stabilize and repair areas of bank erosion. We advocate on behalf of our communities and the county at the federal, state and regional levels. We work together to advocate for legislative action, social policy, and governmental programming that recognize the unique character and conditions of our rural area.

Existing Information and Need for Additional Information

Data on environmental effects of NMPS and facilities that use fresh or salt water for generation and/or cooling are widely available and consistently indicated that these types of hydroelectric facilities damage native and migratory fauna. Once plentiful populations of blueback herring have been entirely eliminated from this portion of the Connecticut River. Populations of American eel are in steep decline throughout this reach, and American shad that initially used fish passage facilities downstream of NMPS have experienced dramatic reductions above Turners Falls Dam.

Section 4.4.6 of the PAD (page 4-146) discusses entrainment at Northfield Mountain of migratory fish species. Previous studies estimated 28.6% of Atlantic salmon entrained, which was reduced to 6.7% after the installation of a guide net only during upstream passage season. LMS Engineers estimated in 1993 that the facility impacted 0 to 12.4% of adult American shad passing the water intake. No studies have looked at impacts to resident fish or other migratory fish or other times of the year, but several study requests address this information gap.

Other facilities in the region (Brayton Point Power Station, a coal plant in Mt. Hope Bay) have been required by EPA to switch from open- to closed cycle at very significant cost because of the extensive damage done to fragile habitats by open-cycle pumping.

Streambank erosion has been a major concern since NMPS began operation in 1972. Section 4.2.4 of the PAD summarizes the extensive work that has been done to study and mitigate erosion along the river banks. Significant loss of agricultural land has resulted from unnatural river fluctuations and increased boat wakes from a raised impoundment, and in some cases poor mitigation efforts like helicopter removal of trees along the banks. Since 1996, the licensee has reportedly spent $750,000 - $1,000,000 annually on erosion control measures. In some cases, these projects will need to be re-done in the future. Converting the plant to closed-loop operation could provide significant cost savings over the life of the upcoming license, eliminating erosion control projects, proposed studies related to use of the Connecticut River as a lower reservoir, and any mitigation or operational changes to protect fisheries and other natural resources that may be contemplated as a result of relicensing.

Nexus to Project Operations and Effects

In conjunction with other study requests, parties to the relicensing process will be reviewing data and considering operation and facility conditions that will best achieve the balance between natural resource protection, property and infrastructure protection, and power generation. Making the plant closed-loop or partially closed-loop is one important consideration to the scenario and would eliminate any operation changes that might result from concerns about fishery resources, water quality effects, and farmland losses.

Proposed Methodology

1. Collate existing geological and hydrologic information for areas surrounding Northfield Mountain, including preliminary design plans for suitable facilities able to accommodate the existing and proposed discharge. These plans should include any and all possible locations, including modifications to infrastructure near the current outfall, and any other locations that could accommodate the necessary volume of water.
2. Provide an engineering analysis of structural modifications necessary to accommodate a full or partial lower reservoir in an alternate nearby location.
3. Provide information on whether and how a smaller lower reservoir, with ties to the Connecticut River, would act as a buffer to river level fluctuations and change the hydrologic pattern of flow on the Connecticut River in the Turners Falls pool (fluctuations), the water quality effects, and decrease the possibility of entrainment.
4. Provide an analysis on water losses from evaporation and leakage and how much make-up water would be needed during normal operations by season or month.
5. Identify and make available any similar studies conducted during the planning phase of the existing facility in the 1960's or any other time.
6. Provide a cost estimate of each option considered and evaluated.
7. Provide an itemized cost estimate of how taking the river off-line (not using it as the lower reservoir) would affect other costs, such as eliminating the erosion control program, any ancillary changes to generation at Turners Falls Dam and NMPS, and fish protection measures.
8. Provide a summary of available information on the costs of converting existing open-loop pumped storage systems to a closed-loop system and a description of the environmental benefits of other closed-loop pumped storage facilities.

These methods are consistent with accepted practice for weighing costs and benefits of environmental impacts.

Level of Effort and Cost

The level of effort to compile existing information and to make the data available in a map should be low. Development of contingency scenarios would be low. The majority of the effort of this study request is essentially office work, with some engineering and design work required to scope likely costs of various scenarios.

Study Request 4 - Water Quality Monitoring in the Turners Falls Impoundment and Downstream of the Turners Falls Project

Goals and Objectives

Determine the current water quality of the Connecticut River within the Turners Falls impoundment. The results of the study should provide information sufficient to enable mandatory conditioning agency staff to understand water quality conditions at the project. The study plan for the water quality monitoring should be developed in consultation with the U.S. Fish and Wildlife Service (USFWS) and the Massachusetts Department of Environmental Protection (MA DEP).

The specific objectives of this study are as follows:

1. Characterize water quality in the Turners Falls impoundment, bypass reach, canal and below the confluence of the bypass reach and canal discharge.
2. Evaluate the potential effects of project operation on water quality parameters such as temperature, dissolved oxygen, total suspended sediment and turbidity in conjunction with various other water uses.
3. Determine the level of contamination in sediment impeded by Turners Falls dam.
4. Collect continuous temperature, dissolved oxygen, total suspended sediment and turbidity data during the summer period and under various hydropower operating conditions at the Northfield Mountain Project.

Relevant Resource Management Goals and Public Interest Considerations

The resource management goal is to ensure that the Connecticut River, which is designated as a Class B river for its entire length in Massachusetts, meets its designated uses of habitat for fish, other aquatic life and wildlife, and for primary and secondary contact recreation. Class B waters must also have consistently good aesthetic value and meet minimum criteria for numerous water quality indicators to achieve compliance with the standards set forth in the regulations. The other resource management goal is to protect prime farmland soils, which are eroding, and riparian habitat. Eco-based tourism is important to the economy of Franklin County so maintaining the water quality of the river for boaters and kayakers is important, too.

Public Interest Considerations if Requester is not a Resource Agency.

The Franklin Regional Council of Governments (FRCOG) is a regional organization that offers diverse programming, products and services, both on the municipal and regional level, to our 26 member towns. The FRCOG is also the Regional Planning Agency for Franklin County, Massachusetts, which is the most rural county in the state. The FRCOG serves the town governments, municipal boards and committees, businesses, and our citizens. In the early 1990's, the FERC recognized the creation of an ad hoc committee, the Connecticut River Streambank Erosion Committee, convened by the FRCOG and FRPB to bring together the NMPS operator, state and municipal entities, landowners, and NGOs to carry out bioengineering projects to stabilize and repair areas of bank erosion. We advocate on behalf of our communities and the county at the federal, state and regional levels. We work together to advocate for

legislative action, social policy, and governmental programming that recognize the unique character and conditions of our rural area.

Existing Information and Need for Additional Information

The PAD provides a summary of existing water quality data. While a number of monitoring efforts have taken place and include sample sites within the project boundary, none of those studies was designed to comprehensively investigate whether all relevant project areas currently meet Class B standards: The Massachusetts DEP's Connecticut River watershed assessment monitoring occurred in 2003, it had only two stations located within the project area (both upstream of the Turners Falls dam) and only collected five to six samples from late April to early October. The Connecticut River Watershed Council's volunteer monitoring program only had one sample site within the project area (at Barton's Cove in the Turners Falls impoundment) and while those data are more recent, only three samples were collected in 2007 and only six samples in 2008 (over the course of three to four months each year). The U.S. Geological Survey's long-term water quality monitoring station located downstream of the Cabot Station tailrace only collects information roughly once per month (and no dissolved oxygen data are provided).

No directed, site-specific surveys have been conducted to determine whether waters within the Project area meet state standards. This information gap needs to be filled so that resource agencies can evaluate properly the potential impact of project operations on water quality.

Nexus to Project Operations and Effects

The project creates a 20-mile-long impoundment where there would naturally be a free-flowing river. It currently operates in a peaking mode, with allowable river fluctuations of up to 9 feet, with proposals to continue with river fluctuations. Portions of the impoundment are nearly 100 feet-deep. There is a 2.7 mile-long reach of river bypassed by the Turners Falls power canal with only a nominal seasonal release required (equal to 0.05 cfsm). The below-project flow requirement is equal to 0.20 cfm (1,433 cfs). Water quality is directly affected by the operating mode of a hydropower project. Impoundments can stratify, resulting in a near-hypoxic hympolimnion. If the project intake draws off of these deep waters then it could cause low dissolved oxygen levels downstream from the project discharge.

The FRCOG requests that the applicant conduct a water quality survey of the impoundment, bypass reach and tailrace reach in order to determine whether state water quality standards are being met under all currently-licensed operating conditions (i.e., during periods of generation and non-generation). Results of the survey would be used, in conjunction with other studies requested herein, to determine an appropriate below-project flow prescription, bypass reach flow(s), and to recommend an appropriate water level management protocol for the impoundment (e.g., limiting impoundment fluctuations to protect water quality). Operation of upstream hydroelectric projects as well as the Turners Falls Project and Northfield Mountain Project may impact water quality through the use of water for hydropower generation.

Methodology Consistent with Accepted Practice

Turners Falls: Water quality samples should be collected from a minimum of six locations: upstream of the impoundment, at a deep location within the impoundment, in the forebay near the intake, in the bypass reach, in the canal near Cabot Station and downstream of the confluence of the Cabot Station discharge and the bypass reach but upstream of the confluence with the Deerfield River. In order to ensure that data are collected under "worst case" conditions (low flow, high temperature, antecedent of any significant rainfall event), we recommend deploying continuous data loggers at all six locations, with biweekly vertical profiles taken at the deep impoundment location from June 1 through September 30. Results should include date, time of sampling, sunrise time, GPS location, generation status (estimated flow through canal and bypass reach), precipitation data, water temperature, DO concentration and percent saturation.

In addition, impoundment sediment adjacent to the Turners Falls dam should be analyzed for metals and polychlorinated biphenyls (PCBs).

A proposed water quality sampling plan should be submitted to USFWS and MADEP for approval. A section on quality assurance and quality control must be included.

If river flow and temperature conditions are representative of an "average" or "low" water year, then one year of data collection should be sufficient to perform the study. If conditions are not representative (i.e., a "wet" or cool year) then a second year of data collection may be necessary.

Northfield Mountain: The water quality study will include two components: a) continuous dissolved oxygen and temperature monitoring at specific locations in the Northfield Mountain Project area and b) monthly *in-situ* dissolved oxygen, temperature profiles, total suspended solids and turbidity within the Northfield Mountain Upper Reservoir. It is anticipated that the study will be conducted from approximately June 1 through September 30.

Level of Effort and Cost

Cost would depend on the specific methodology chosen. If continuous data loggers are installed at all six locations and biweekly vertical profiles taken at the deep impoundment location from June 1 through September 30 then the estimated cost of the water quality study is approximately $55,000, including at least one full year of data collection. It is expected to take two technicians approximately one day to deploy the loggers, eight days to collect the vertical profiles, one day to remove the loggers, one day to download the data, and five days to write the report.

In the PAD, the applicant proposes to assess the effects of the Turners Falls and NFMPS project operations on dissolved oxygen and temperature by continuously monitoring DO and temperature at locations within the project areas and gathering vertical profiles within the TF impoundment and NFMPS upper reservoir.

Study Request 5 – Quantify the Impacts of Water Level Fluctuations on Riparian and Aquatic Vegetation Including Invasive Species and their Associated Habitats in the Turners Falls Dam Project Impoundment

Conduct a study to quantify the impacts of river level fluctuations due to project operations on riparian, wetland, Emergent Aquatic Vegetation (EAV), Submerged Aquatic Vegetation (SAV), littoral zone and shallow water aquatic habitats in the Turners Falls Dam impoundment.

Goals and Objectives

The goal of this study is to obtain baseline information on riparian, wetland, emergent and submerged aquatic vegetation, and associated shallow water aquatic habitats (subject to operational inundation and exposure to near exposure) known to occur in the project area. Information would be used to determine whether riparian, wetland, EAV and SAV, littoral, and shallow water (e.g., mid river bars and shoals) habitats are impacted by current water level fluctuations permitted under the Turners Falls and Northfield projects' licenses and whether these vegetation types and shallow water habitats can be protected and restored by modifications to project operations or other mitigation measures. This analysis needs to take into account existing and potential future limits on river level fluctuations intended to limit recreation impacts, and the interactions of any changes in river level fluctuation range or frequency and discharge changes under a new licenses of the Turners Falls and upstream projects. This information is needed to determine whether the projects' operation affects plants, habitat, and wildlife in the project area, whether aquatic vegetation and its habitats can be enhanced by modifications to project operations or other mitigative measures, and whether there is any unique or important shoreline or aquatic habitats that should be protected.

The specific objectives of the field study, at a minimum, include:

1. Quantitatively describe and map wetland types within 200 feet of the shoreline, and describe associated wildlife;
2. Delineate, quantitatively describe, and map all wetland types including invasive species and wildlife observed (e.g., bald eagle nesting, water fowl nesting) within 200 feet of the shoreline, and the extent of this habitat if it extends beyond 200 feet; and
3. Quantitatively describe (e.g., substrate composition, vegetation type and abundance) and map shallow water aquatic habitat types subject to project operation inundation and exposure, noting and describing additional areas where water depths at lowest operational range are wetted to a depth less than one foot (flats, near shore areas, gravel bars, with very slight bathymetric change).

A second year of study may be required should river discharge in the first year prove to be atypical (outside of 25-75th percentile of average weekly flow values) during the study period.

The field study should produce a habitat inventory report that includes:

1. The results of the field study in the form of maps and descriptions;

2. An assessment of project effects on wetland, riparian, littoral zone vegetation and shallow water habitats, invasive plant species, and wildlife habitat at the project; and
3. Recommendations for any necessary plant, habitat type, or wildlife, protection and/or invasive species control measures.

Relevant Resource Management Goals and Public Interest Considerations

Protect and restore native riparian, wetland, EAV, SAV, littoral and shallow water habitat (i.e., spawning and or nursery areas for aquatic organisms) in the Turners Falls impoundment.

Public Interest Considerations if Requester is not a Resource Agency

The Franklin Regional Council of Governments (FRCOG) is a regional organization that offers diverse programming, products and services, both on the municipal and regional level, to our 26 member towns. The FRCOG is also the Regional Planning Agency for Franklin County, Massachusetts, which is the most rural county in the state. The FRCOG serves the town governments, municipal boards and committees, businesses, and our citizens. In the early 1990's, the FERC recognized the creation of an ad hoc committee, the Connecticut River Streambank Erosion Committee, convened by the FRCOG and FRPB to bring together the NMPS operator, state and municipal entities, landowners, and NGOs to carry out bioengineering projects to stabilize and repair areas of bank erosion. We advocate on behalf of our communities and the county at the federal, state and regional levels. We work together to advocate for legislative action, social policy, and governmental programming that recognize the unique character and conditions of our rural area.

Existing Information and Need for Additional Information

Existing information in the PAD does not quantify EAV and SAV in this area, or other shallow aquatic habitat types and physical features (e.g., depths, substrates, wood structure) that are the environment for aquatic biota in the project area. The PAD does provide some limited monitoring data for 2012 (2 locations) on water surface elevations that show daily fluctuations, in the upper third of this impoundment, that varied over 4 feet on a daily cycling frequency, with fluctuations generally in the 2 foot range in low flow months for the data provided in the PAD. The current license does permit a greater pool elevation operational fluctuation, up to a 9 foot change in elevation, based on the Turners Falls Dam water elevation. In the PAD it is noted these operational fluctuations under most circumstances at the Turners Falls Dam are within 3.5 feet.

In the PAD it is noted that FirstLight would like to expand its NMPS upper reservoir capacity (by up to 24%). How this may affect project operations and the habitats noted in this request is unknown. It is also noted that water is typically pumped to the upper reservoir in evening and generation back to the river occurs once to twice daily, in daytime hours, based upon power needs and power value. Under current license conditions, and provided that set thresholds for minimum flow and Turners Dam current license elevations are met, the NMPS may operate with no restriction in timing, frequency, or magnitude for pumping or generation. No data were provided on the operation of the NMPS plant over time relative to data on pumping and generation on an hourly basis, only averaged values were provided over monthly periods. It is unclear what the actual timing, frequency and magnitude of these NMPS operations are over the course of a year and how that relates to: aquatic plant species establishment,

growth, survival, littoral zone or other shallow water habitat fish spawning periods and their effects on these fishes (reproduction success and subsequent recruitment, e.g., bass and fall fish nests) based on the available and utilized habitat, and how the quantity and quality of these shallow water habitats are affected by project operational manipulation/alteration, as currently permitted or proposed.

The PAD provides lists of plant and wildlife species whose native ranges overlap with the project area, but it does not provide any baseline information on known occurrences of these species in the wetlands, riparian, littoral and shallow water habitats, within or adjacent to, the project area. Plant and wildlife occurring in these habitats may benefit from protection, mitigation, and enhancement (PMEs) measures, given the potential effects of continuing the current semiautomatic peaking operating regime. In addition, a large scale sediment discharge from NMPS resulted in regulatory actions by FERC, the EPA and MADEP in 2010. Continuing and as yet unresolved management plan measures relative to sediment and NMPS project operations are further concerns for shallow water, littoral zone, and wetland habitats.

The Atlantic States Marine Fisheries Commission, Atlantic Coast Diadromous Fish Habitat: A Review of utilization, threats, recommendations for conservation, and research needs (ASMFC 2009)[2], contains a review of habitat information for these species. Recommendations in this report include: maintain water quality and suitable habitat for all life stages of diadromous species in all rivers with populations of diadromous species.

Nexus to Project Operations and Effects

Water level fluctuations due to project operations could likely affect EAV and SAV habitat as well as the quantity and quality of littoral and shallow water habitat. These operational water level fluctuation effects are expected to impact fish species' use of these habitats and may affect spawning fishes reproductive success and subsequent population recruitment including but not limited to American shad, blueback herring, sea lamprey, fall fish, and bluegill, which spawn in mid to late spring through early summer in areas subject to daily or more frequent water level fluctuations.

The current operating mode, as well as the unknowns with the proposed upper reservoir expansion, may affect wetland riparian, littoral and other shallow water habitats and promote the introduction and expansion of invasive plant species through fluctuating water levels. A study that explains the relationship between the proposed mode of operation and the type and quantity of wetland, riparian, littoral, shallow water habitats, and invasive species affected would help inform a decision on the need for protection and/or control of these resources in the license.

Methodology Consistent with Accepted Practice

The PAD currently contains maps portraying general wetland types from the Cabot Station tailrace upstream to the Vernon Dam. In addition, we understand that recent bathymetry exists for the Turners Falls impoundment (Field, 2007). The proposed study should utilize this existing information in conjunction with field surveys designed to describe the characteristics of each mapped wetland, riparian, littoral and shallow water habitat including plant species composition, relative abundance/density, habitat quality, and land use. These surveys should be conducted to describe these habitats at the lowest

[2] Atlantic States Marine Fisheries Commission. 2009. Atlantic coast diadromous fish habitat: A review of utilization, threats, recommendations, for conservation, and research needs. Habitat Management Series #9. Washington, D.C.

water level operational range permitted on a daily operation schedule, under low flow conditions. Information collected should include:

1. Plant species composition, and their relative abundance/density and condition/structure (e.g., seedlings);
2. Structured data, including estimates of average heights and aerial cover of each vegetation layer (specifically denoting invasive species);
3. Aquatic habitat substrate composition, quantity (i.e., percent types and area), wood structure (relative abundance measure applied by area), water depths (inundated, exposed, and water less than one foot);
4. Predominate land use(s) associated with each cover type;
5. Wildlife sightings should be noted;
6. Field-verified wetland, riparian, and littoral and shallow water habitats and invasive species occurrences, should be geo-referenced as polygons and overlain on orthophoto at a suitable scale.

Level of Effort and Cost

In the PAD, First Light identified impacts of the project operations on wetlands, riparian and littoral zone habitat as a potential issue to be addressed in relicensing, and proposed wetland vegetation mapping. However, additional analysis as described above is needed to understand the impacts of the project on these resources and habitats.

A wetlands, riparian, littoral/shallow water, invasive species inventory, of the scope envisioned, would likely require 6-8 months to complete and cost an estimated $40,000 to $50,000.

Study Request 6 - Model River Flows and Water Levels Upstream and Downstream from the Turners Falls Project Dam Generating Stations and Integration of Project Modeling with Upstream and Downstream Project Operations.

Develop a river flow model(s) that is designed to evaluate the hydrologic changes to the river caused by the physical presence and operation of the Turners Falls Hydroelectric Project and the Northfield Mountain Pumped Storage Project and the interrelationships between the operation of all five hydroelectric projects up for relicensing (i.e., P-1889 Turners Falls Hydroelectric Project, P-2485 Northfield Mountain Pumped Storage, P-1904 Vernon Hydroelectric Project, P-1855 Bellows Hydroelectric Project, P-1892 Wilder Hydroelectric Project) and river inflows. The river flow model(s) and analyses should include the following components:

1. A quantitative hydrologic modeling of the hydrologic influences and interactions that exist between the water surface elevations of the Turners Falls Project impoundment and discharges from the Turners Falls Dam and generating facilities and the upstream and downstream hydroelectric projects.

   Data inputs to and outputs from the model(s) should be sorted and analyzed by monthly, weekly, daily and sub-daily increments and include:
   i. Withdrawals from the Turners Falls impoundment by the Northfield Mountain Pumped Storage Project, FERC No. 2485,
   ii. Discharges to the Turners Falls impoundment by the Northfield Mountain Pumped Storage Project,
   iii. Discharges into the Turners Falls impoundment from the Vernon Project, FERC No. 1904 and other sources.
   iv. Existing and potential discharges from the Turners Falls Project generating facilities and spill flows.
   v. Existing and potential water level fluctuation restrictions (maximum and minimum pond levels) of the Turners Falls impoundment and downstream flows from the project
   vi. Existing and potential required minimum flows and/or other operation requirements at each of the four upstream projects.
   vii. Minimum discharge flows ranging between 2,500 and 6,300 cfs in the bypass reach from April 15th through June 22nd to support spawning, rearing, and outmigration of shortnose sturgeon at Rock Dam.

2. Document how the existing and potential outflow characteristics from the four upstream projects affect the operation of the Turners Falls Project including downstream flow releases and Turners Falls impoundment levels.
3. Assess how the operation of the existing Turners Falls Project and upstream projects affect Holyoke Project (P-2004) operations including:
   i. How Turners Falls Project flow fluctuations affect Holyoke impoundment water levels, with emphasis on the influence on the water levels on listed

Puritan tiger beetle habitat at Rainbow Beach in Northampton, MA and assess what changes would be needed in Turners Falls operations to stabilize water levels at Rainbow Beach.

ii. How Turners Falls Project operations affect Holyoke Project discharges and what changes in Turners Falls operations would be needed to reduce fluctuations in the discharges from the Holyoke Project.

iii. To the extent predictable and practical, incorporate the potential effects of climate change on project operations over the course of the license.

Goals and Objectives

The goal of this study request is to determine the extent of alteration of river hydrology caused by operation of the project and the interactions between upstream project operations, Turners Falls operations and downstream operations at the Holyoke Project. The objectives of this study request are as follows:

1. Determine what changes can be made to each of the five project's flow releases and/or water levels restrictions, and how those changes affect downstream resources. For example, for the Turners Falls Project continuous minimum discharge flows in the Turners Falls bypass reach need to be no less than 2,500 cfs during shortnose sturgeon spawning, rearing, and outmigration (April 15th – June 22nd). Incorporating these parameters into the model will inform what changes, if any, need to be made to operations of upstream projects to accommodate such flows.
2. As other specific modifications of the operations of each of the projects are identified based on results of other requested studies, these desired conditions will need to be input into the models to assess how each change affects that project and other project operations and the implications of those changes on other resources and/or the ability to achieve desired operational changes at other projects.

Relevant Resource Management Goals and Public Interest Considerations

The resource management goal and public interest consideration is to provide adequate information to mandatory conditioning agencies to ensure that the mitigation, protection and enhancement measures for the projects are commensurate with project effects and help conserve, protect, and enhance the habitats for fish, wildlife, and plants, including rare and endangered species.

Public Interest Considerations if Requester is not a Resource Agency

The Franklin Regional Council of Governments (FRCOG) is a regional organization that offers diverse programming, products and services, both on the municipal and regional level, to our 26 member towns. The FRCOG is also the Regional Planning Agency for Franklin County, Massachusetts, which is the most rural county in the state. The FRCOG serves the town governments, municipal boards and committees, businesses, and our citizens. In the early 1990's, the FERC recognized the creation of an ad hoc committee, the Connecticut River Streambank Erosion Committee, convened by the FRCOG and FRPB to bring together the NMPS operator, state and municipal entities, landowners, and NGOs to carry out bioengineering projects to stabilize and repair areas of bank erosion. We advocate on behalf of our communities and the county at the federal, state and regional levels. We work together to advocate for

legislative action, social policy, and governmental programming that recognize the unique character and conditions of our rural area.

Existing Information and Need for Additional Information

Available information in the PAD does not indicate how project operations have altered downstream hydrology, which may affect resident and migratory fish, macroinvertebrates, rare, threatened, and endangered species, aquatic plants and other biota and natural processes in the Connecticut River from below the Vernon Dam downstream to the Holyoke Dam.

Information in the PAD also does not reflect data analyzed in Kynard et al. 2012, which identifies minimum discharge thresholds for shortnose sturgeon spawning and rearing at the Rock Dam spawning site. Spawning success was observed at Rock Dam when discharge was between 2,500 cfs and 22,000 cfs during the spawning period (April 27–May 22nd) (Kynard et al. 2012, chapter 3). In 1995 at the Cabot spawning area, the greatest level of spawning and spawning success occurred (i.e., 21 late stage females present, 342 ELS captured, spawning period was 17 days) even though no spawning was detected at Rock Dam (Kynard et al. 2012, chapter 3). Discharges in 1995 at Rock Dam had dropped below 2,500 cfs by March 26th (Kynard et al. 2012, chapter 3), showing that even though 1995 saw the largest number of pre-spawning adults, none spawned at Rock Dam. This may indicate the need to have adequate flow well in advanced of spawning. Discharge reductions at the Rock Dam site that occurred during spawning caused females to leave the spawning site and not return even if flow increased to acceptable levels later during the spawning period. Researchers observed that substrate did not change during fluctuating flows and thus cessation of spawning is likely due to velocities falling below the range preferred by females. Given the current flow dynamics at Rock Dam, spawning does not occur most years (Kynard et al. 2012, chapter 3). These data represent the best available scientific information and indicates that the current minimum flow thresholds at the project are not adequate for the protection of endangered shortnose sturgeon. All modeling efforts described above must incorporate the identified minimum flow and temporal parameters.

Nexus to Project Operations and Effects

The Turners Falls Project is currently operated with a seasonally-varying minimum bypass flow (400 cfs from 5/1 through 7/15, then 120 cfs through the winter until river temperature rises to ≥ 7°C) and year-round minimum flow below the projects of 1,433 cfs. The project operates as a daily peaking project, often with large, rapid, daily flow fluctuations between the minimum and project capacity (15,928 cfs) and fluctuations in impoundment elevation (175’ to 186’ MSL). These changes affect biotic habitat and biota upstream and downstream of the project. Project operations and potential changes to operations to mitigate impacts are influenced by inflows and operations of upstream hydroelectric projects and the Northfield Mountain Pumped Storage Project operations. Potential changes in operations of each project could affect the ability to achieve desired operational changes at other projects. Results of river flow analyses will be used to develop flow-related license requirements and/or other mitigation measures.

Methodology Consistent with Accepted Practice

River hydrology statistics and modeling are commonly employed at hydroelectric projects to assess implications of project operations on the river environment.

Level of Effort and Cost

Level of effort and cost of model development are expected to be moderate. To be valuable in developing license conditions, the model(s) will need to be run under various scenarios throughout the relicensing process to assess the implications of changes to the operations of each project on other projects and other resources. Therefore, ongoing consultation and re-running of the model(s) are likely to be needed throughout the relicensing process. The modeling exercise will also require coordination and cooperation between First Light and the upstream licensee to assure that the model inputs and outputs can be accurately related.

We would anticipate that the expected level of effort and anticipated costs will be comparable to that experienced on similar FERC relicensing projects of this size (e.g., Conowingo, FERC No. 405).

Study Request 7 – Develop A Comprehensive And Predictive Model Of The Electrical Generation System Consisting Of Five Generation Projects Along The Connecticut River To Study The Impact and Feasibility Of Various Changes In Operations On Environmental Resources

If the five generation facilities (i.e., P-1889 Turners Falls Hydroelectric Project, P-2485 Northfield Mountain Pumped Storage, P-1904 Vernon Hydroelectric Project, P-1855 Bellows Hydroelectric Project, P-1892 Wilder Hydroelectric Project) were to be viewed as a single system, rather than separate entities, and if those five systems could work in concert with each other, it is possible that many of the environmental concerns could be addressed by choreographing operational parameters.

Developing a tool which could simulate the interactions among all generation entities, and report the condition of a variety of parameters would be of great help in evaluating the feasibility and effectiveness of different scenarios.

1) Inputs would be:
   a) Normal flow and height of the river entering the system around a median point
   b) Start time and duration of discharge into the river from each generation facility and dam within the project area
   c) discharge rate into the river by the stations of each generation facility and dam within the project area
   d) Operation of Northfield Mountain Pumped Storage (P-2485):
      i) Start time and duration of filling
      ii) Intake rate
      iii) Start time and duration of discharge
      iv) Discharge rate
   e) Event to effect lag times, both spatial and temporal
2) Constraints on the system
   a) Maximum and minimum on river heights
   b) Maximum and minimum on discharge rates
   c) Maximum and minimum depth of upper reservoir at P-2485 Pump Storage
3) Other parameters of interest could be overlaid
   a) Demand curves for electricity generation
   b) Cost of electricity
   c) Availability of excess generation capability
   d) Abnormal conditions i.e. Vernon Nuclear off line, spring freshet or other weather related emergencies like floods
4) Outputs of the model would be:
   a) River height at any number of locations
   b) Flow rate at any number of locations
   c) Rate of change of river height and flow
   d) Alarms when limits are exceeded

Goals and Objectives

Determine whether operating the system as a whole under a single set of operation parameters can serve to mitigate the environmental shortcomings of the current method of operation. Specifically, the model will be able to predict whether necessary modifications in timing of releases and rates, can maintain the required stability of river height, minimum and maximum flow while making sure that electrical demand is met and business concerns are taken into consideration. The model will also be able to identify the contribution to fluctuations in output by each facility, thereby determining what kind of modification will have the greatest effect.

Another specific goal would be to help inform the analysis conducted as part of Study Request 3 – Study the Feasibility of Converting the Northfield Mountain Pumped Storage (NMPS) Facility to a Closed-loop or Partially Closed-loop System. If a majority of the environmental concerns can be met by coordinating operating parameters of the installations along the river, the need becomes less. However, if the environmental concerns cannot be met, the need for a closed loop system increases in importance.

Relevant Resource Management Goals and Public Interest Considerations

1. Determine the need and extent of protective and mitigating projects to aid in the protection of the ecology of the system area.
2. Assist FERC and the operational management of the system after the relicensing project is complete. This model will be able to instruct what day by day adjustments need to be made to maintain stability of the system.
3. Long-term changes in conditions based on climate change or changes in operation further upstream can be tracked and adjusted for by modifying the input conditions. Annual measurements of normal flow can be made and the model can easily be adjusted.
4. Catastrophic events can be simulated and preparedness and emergency management plans can be based on outputs of the model.

Public Interest Considerations if Requester is not a Resource Agency

The Franklin Regional Council of Governments (FRCOG) is a regional organization that offers diverse programming, products and services, both on the municipal and regional level, to our 26 member towns. The FRCOG is also the Regional Planning Agency for Franklin County, Massachusetts, which is the most rural county in the state. The FRCOG serves the town governments, municipal boards and committees, businesses, and our citizens. In the early 1990's, the FERC recognized the creation of an ad hoc committee, the Connecticut River Streambank Erosion Committee, convened by the FRCOG and FRPB to bring together the NMPS operator, state and municipal entities, landowners, and NGOs to carry out bioengineering projects to stabilize and repair areas of bank erosion. We advocate on behalf of our communities and the county at the federal, state and regional levels. We work together to advocate for legislative action, social policy, and governmental programming that recognize the unique character and conditions of our rural area.

Existing Information and Need for Additional Information

None of the existing information attempts to coordinate the operations of all five installations as a system. Most of the information available tells of parameters of individual locations and consequences of single events around a single location. There does not seem to be information of larger interactions among various events and time-lines of events are not shown with enough information to draw conclusions on overall effects in the entire project area.

Nexus to Project Operations and Effects

This study and resultant model will show the advantages of coordinated operation of the facilities along the river. This, then, can be accomplished by coordinated license requirements mandating the level of cooperation, communication, and coordination of the system. Initial use of the model will help dictate the license requirements to achieve the most protective and most efficient operation of the system. Ongoing use of the model will help to maintain the protective and efficient practices.

Methodology Consistent with Accepted Practice

Computer modeling is standard practice in many fields. The predictive model analyzing interactions, over time is also used extensively. Many standard templates for this kind of modeling are readily available in the scientific community.

Level of Effort and Cost

The level of effort and cost is expected to be moderate. Virtually all of the input data is available in one place or another. Much of the effort will be in locating and obtaining the data, and making sure that the units used will be compatible.

The model will have to be run numerous times to help analyze multiple scenarios as submitted by other commenters. Input parameters will have to be changed prior to each run to reflect the scenario being tested, and a variety of reports must be produced depending on what variables are of interest.

The project will require the cooperation of FirstLight and TransCanada, the owners of the facilities in the project area.

Document Content(s)

FRCOG Comment Letter Final to FERC 3-1-13.PDF.....1-41