

Franklin Conservation District

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Greenfield, MA 01301

413-772-0384 ext. 110

February 28, 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 Conservation District (District) was established in the 1940's under Massachusetts General Law, Chapter 21, Sections 18-25 as a quasi-state agency for the purpose of delivering conservation programs at the county level. The purposes of Conservation Districts in Massachusetts are: to focus attention on land, water and related resource problems; to develop programs to solve them; to enlist and coordinate help from all public and private sources that can contribute to accomplishing the District's goals; and to make citizens aware of the interrelationships between human activities and the natural environment.

The Conservation District has been intimately involved with efforts to address erosion on the reach of the Connecticut River from the Turners Falls dam to the Vernon dam, also known as the Turners Falls Pool, since the 1980s. In fact, it was the work of the District in conjunction with the former Franklin County Planning Board that led the Franklin County Commission to form the Connecticut River Streambank Erosion Committee (CRSEC) that has been working with the various utility companies that have owned and operated the Northfield Mountain Pumped Storage Project, with affected landowners and state and federal resource agencies, and with the FERC to address the long-term and ongoing exacerbated erosion of riverbanks in the Pool.

The District appreciates the opportunity to submit comments on the Preliminary Application Document (PAD) and Scoping Document 1, and to submit Study Requests for the projects. The comments on the PAD and Scoping Document 1 are organized by the major sections in each document. We describe some of the Study Requests that we support at the end of this letter. The specific study requests that the District is asking to be undertaken are contained in the Appendix to this letter. Finally, we note an additional issue to draw it to the attention of the FERC.

Comments on Pre-Application Document

Section 3.4.1

It is important to note the omission of the erosion articles in the licenses, Articles 19 of P-1889 and 20 of P-2485. Given the severity of bank erosion and the continuing struggle over license compliance related to these articles, they are critically important current license requirements.

Section 4.2.4

The PAD provides an incomplete and inaccurate portrayal of the conclusions of the 1979 ACOE report regarding the Turners Falls Pool. That report found this was the most hydrodynamically active stretch of the Connecticut River and that water level fluctuations caused by hydropower project operations were the largest contributor, after tractive force, to the exacerbated erosion.

The discussion of the 1991 ACOE follow up study and report omits mention of the fact that it documented a dramatic increase in the extent of eroded riverbank since the 1979 report.

The discussion of the Full River Reconnaissance Studies states that 2008 FRR reports that erosion is decreasing; it should be noted that the report and the methodology employed have been widely criticized and the conclusion vigorously disputed.

Section 4.3.1.4

This section fails to mention that the Licensee is forcing farmers to apply to the Licensee for a permit to withdraw irrigation water from the Connecticut River, saying it is a requirement of their FERC license. That is an arguable contention. This issue merits attention and resolution.

Comments on Scoping Document 1

The District offered detailed comments on the Scoping Document at the January 31, 2013 Joint Evening Scoping meeting in Turners Falls. Rather than repeat them here, the District notes and incorporates by reference the issues cited in that testimony and offers one additional comment.

Section 3.0

The District urges consideration of an alternative to the applicant's proposed action, specifically taking Northfield Mountain Pumped Storage Project off-stream, entirely or at least partially. This would be accomplished by creating and using a lower reservoir other than the Connecticut River.

Study Requests

The District supports many of the study requests of which it is aware and is making three, which are included in full in Appendix 1. In general terms they are:

- Study shoreline erosion caused by Northfield Mountain Pumped Storage (NMPS) operations
- Study the impacts of NMPS and Turners Falls dam on sedimentation in Connecticut River
- Study the feasibility of converting NMPS to a closed-loop or partially closed-loop system

Additional Issue

Administrative support for Connecticut River Streambank Erosion Committee (CRSEC)

Given the amount of time and resources necessary for the CRSEC to keep regional, state, and federal governmental entities, non-governmental organizations, and citizens adequately informed of and involved with addressing the erosion issue, it is reasonable that the licensee, benefitting economically from its use of a valuable public resource, provide annual funding to help support the administrative functions of the CRSEC, e.g. organizing and staffing meetings, etc.

Thank you for the opportunity to comment on these documents and important issues.

Sincerely,

A handwritten signature in cursive script that reads "Carolyn Shores Hess".

Franklin Conservation District

Vice Chair

Appendix 1

Franklin Conservation District's 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 and 3) 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 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

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.

inundation of pre-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

Among our management goals 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 encountered by trust resource 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 Conservation District (District) was established in the 1940's under Massachusetts General Law, Chapter 21, Sections 18-25 as a quasi-state agency for the purpose of delivering conservation programs at the county level. The purposes of Conservation Districts in Massachusetts are: to focus attention on land, water and related resource problems; to develop programs to solve them; to enlist and coordinate help from all public and private sources that can contribute to accomplishing the District's goals; and to make citizens aware of the interrelationships between human activities and the natural environment.

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 some additional field collected data. With the existing 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 trust species and the endangered shortnose sturgeon. The requested study will help inform the Commission 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 Streambank Erosion Committee should be georeferenced 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 visually see 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 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 MA DEP staff and stakeholders to understand current and proposed effects on water level fluctuations and relate to potential increase in sedimentation to the Connecticut River. MA DEP staff 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:

- 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.
- Identify management measures to minimize erosion and sedimentation.
- 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.
- 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 is important to the economy of Franklin County so maintaining the water quality of the river and protecting scenic landscapes along the river from erosion are important.

Public Interest Considerations if Requester is not a Resource Agency.

The Franklin Conservation District (District) was established in the 1940's under Massachusetts General Law, Chapter 21, Sections 18-25 as a quasi-state agency for the purpose of delivering conservation programs at the county level. The purposes of Conservation Districts in Massachusetts are: to focus attention on land, water and related resource problems; to develop

programs to solve them; to enlist and coordinate help from all public and private sources that can contribute to accomplishing the District's goals; and to make citizens aware of the interrelationships between human activities and the natural environment.

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 as such. 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, 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

- FirstLight to 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.

- Provide data on the daily water level fluctuation changes from the past five years from stations listed in the PAD, and estimate fluctuations within Turners Pool assuming proposed operations and hydraulic conditions.
- Identify the most appropriate techniques for bank stabilization given the existing and proposed hydraulic conditions.

Determine areas of sediment deposition in the Project Area

- 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.
- Identify recreational uses and impacts in areas known to be impacted by accumulated sediment, such as Barton Cove.
- 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.
 - 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 operation of NMPS.
 - Evaluate management strategies to address the release of accumulated sediment through Northfield Mountain 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 designed to prevent the migration of sediment during future drawdowns of the upper reservoir
- Evaluate management strategies to minimize flow fluctuations within Turners Pool including coordination with upstream users.
- 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.
- Identify a prioritized list of locations for bank stabilization projects in the Project Area
- 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.

- 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 the historic data exist.

- Identify measures that could be taken to mitigate impacts to recreational use, habitat, or invasive species from sedimentation.
- 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 disrupt 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:

- Candidate locations for placement of a lower reservoir
- Costs and logistics of construction and modification of the current facility to convert to a closed-loop or partially closed-loop system
- 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.
- 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 Conservation District (District) was established in the 1940's under Massachusetts General Law, Chapter 21, Sections 18-25 as a quasi-state agency for the purpose of delivering conservation programs at the county level. The purposes of Conservation Districts in Massachusetts are: to focus attention on land, water and related resource problems; to develop programs to solve them; to enlist and coordinate help from all public and private sources that can contribute to accomplishing the District's goals; and to make citizens aware of the interrelationships between human activities and the natural environment.

Existing Information and Need for Additional Information

Some data on environmental effects of NMPS and facilities that use fresh or salt water for generation and/or cooling are widely available and consistently point to these types of facilities as damaging to 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 request 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 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

- Collate existing geological and hydrologic information of 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.
- Provide an engineering analysis of structural modifications necessary to accommodate a full or partial lower reservoir in an alternate nearby location.
- 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.
- 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.
- Identify and make available any similar studies conducted during the planning phase of the existing facility in the 1960's or any other time.
- Provide a cost estimate of each option considered and evaluated.
- Provide an itemized cost estimate of how taking the project off-stream 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.

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.

Document Content(s)

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