FEDERAL ENERGY REGULATORY COMMISSION
Washington, DC 20426
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OFFICE OF ENERGY PROJECTS

Project No. 2485-071 – Massachusetts
Project No. 1889-085 – Massachusetts
FirstLight Hydro Generating Company

Gus Bakas
Director – Massachusetts Hydro
FirstLight Hydro Generating Company
Northfield Mountain Station
99 Millers Falls Road
Northfield, MA 01360

Subject: Determination on Requests for Study Modifications and New Studies – Turners Falls Hydroelectric Project and Northfield Mountain Pumped Storage Project

Dear Mr. Bakas:

Pursuant to 18 C.F.R. § 5.15 of the Commission's regulations, this letter contains the determination on requests for modifications to the approved study plan for the relicensing of FirstLight Hydro Generating Company's (FirstLight) Turners Falls Hydroelectric Project (Turners Falls Project) and Northfield Mountain Pumped Storage Project (Northfield Mountain Project). The determination is based on the study criteria set forth in sections 5.9(b), 5.15(d) and (e) of the Commission's regulations, applicable law, Commission policy and practice, and staff's review of the record of information.

Background

The study plan determination on non-aquatic studies for the projects as proposed by FirstLight was issued on September 13, 2013. A subsequent study plan determination was issued on February 21, 2014, to address the proposed aquatic studies. FirstLight filed study reports for ongoing and finalized studies on September 16, 2014, September 14, 2015, March 1 and 2, 2016, and October 14, 2016, and determinations on requested study modifications and new studies associated with these study reports were issued on January 22, 2015, January 15, 2016, June 29, 2016, and February 17, 2017, respectively.

On March 1, 2017, FirstLight filed a study report for three finalized studies.[1] As required in section 5.15 of the Commission's regulations, the study report describes FirstLight's progress in implementing the approved study plan, and an explanation of variances from the study plan and schedule. FirstLight held a study report meeting on March 16, 2017, and filed a meeting summary on March 31, 2017.

Comments

Comments on the study report and meeting summaries, including requests for study modifications, were filed by: the U.S. Fish and Wildlife Service (FWS), National Marine Fisheries Service, Massachusetts Division of Fisheries and Wildlife (Massachusetts DFW), and Connecticut River Conservancy (CRC). FirstLight filed reply comments on May 30, 2017.

A number of the comments received do not specifically request modifications to the approved studies, and are therefore not addressed herein. For example, some of the comments address the presentation of data and results; provide additional information; recommend protection, mitigation, and enhancement measures; and request information that FirstLight subsequently provided in its reply comments or agreed to provide in future filings.[2] In addition to the types of comments noted above, this determination does not address requests for study modifications or additional studies that have been addressed in previous Commission letters. This determination only addresses new comments and requests that would require study modifications or additional studies.

Study Plan Determination

Pursuant to section 5.15(d) of the Commission's regulations, any proposal to modify a required study must be accompanied by a showing of good cause, and must include a demonstration that: (1) the approved study was not conducted as provided for in the approved study plan, or (2) the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way. As specified in section 5.15(e), requests for new information gathering or studies must include a statement explaining: (1) any material change in law or regulations applicable to the information request, (2) why the goals and objectives of the approved study could not be met with the approved study methodology, (3) why the request was

[1] The finalized studies include studies 3.3.5, 3.3.19, and 3.8.1. In addition, FirstLight filed supplemental reports for studies 3.3.10 and 3.3.20 on December 28, 2016.

[2] In its reply comments, FirstLight states that it will develop a comprehensive study plan to repeat study 3.3.19 in 2018. In addition, FirstLight states that it will file an addendum to study 3.3.20 by July 28, 2017.

not made earlier, (4) significant changes in the project proposal or that significant new information material to the study objectives has become available, and (5) why the new study request satisfies the study criteria in section 5.9(b).

As indicated in Appendix A, the requested modifications to studies 3.3.10 (*Assess Operational Impacts on Emergence of State-Listed Odonates in the Connecticut River*) and 3.8.1 (*Evaluate the Impact of Current and Future Modes of Operation on Flow, Water Elevation, and Hydropower Generation*) are not approved. The bases for not modifying the study plan are explained in Appendix B (Requested Modifications to Approved Studies). Commission staff considered all study plan criteria in section 5.9 of the Commission's regulations; however, only the specific study criteria particularly relevant to the determination are referenced in Appendix B.

Please note that nothing in this determination is intended, in any way, to limit any agency's proper exercise of its independent statutory authority to require additional studies.

If you have any questions, please contact Brandon Cherry at (202) 502-8328, or via e-mail at brandon.cherry@ferc.gov.

Sincerely,

Terry L. Turpin
Director
Office of Energy Projects

Enclosures: Appendix A – Summary of Determinations on Requested Modifications to Approved Studies
Appendix B – Staff's Recommendations on Requested Modifications to Approved Studies

cc: Mailing List, Public Files

APPENDIX A

SUMMARY OF DETERMINATIONS ON REQUESTED MODIFICATIONS TO APPROVED STUDIES

Requested Modifications to Approved Studies (see Appendix B for discussion)

Study	Recommending Entity	Adopted	Adopted in part	Not Adopted
3.3.10 – Assess Operational Impacts on Emergence of State-Listed Odonates in the Connecticut River	Massachusetts DFW, FWS, and CRC			X
3.8.1 – Evaluate the Impact of Current and Future Modes of Operation on Flow, Water Elevation, and Hydropower Generation	CRC			X

APPENDIX B

STAFF'S RECOMMENDATIONS ON REQUESTED MODIFICATIONS TO APPROVED STUDIES

Study 3.3.10 - Assess Operational Impacts on Emergence of State-Listed Odonates in the Connecticut River

Background

The objectives of study 3.3.10 included: (1) synthesizing existing data, supplemented with field data, to characterize the assemblage structure and emergence/eclosure behavior of odonates in the project area, and (2) assessing the potential effects of project operation, especially changes in water surface elevation, on the emergence, eclosure, and habitat of state-listed odonate species and the odonate community.[3] In conducting the study, FirstLight collected field data on the odonate assemblage, including crawl heights and distances, and emergence and eclosure speed over three summers (2014-2016). FirstLight utilized the field data to determine critical heights and critical protective rates of water level rise that would protect odonates from being inundated during the eclosure process. To evaluate project effects, FirstLight used the hydraulic models from study 3.2.2 (*Hydraulic Study of Turners Falls Impoundment, Bypass Reach, and Below Cabot*) to compare the critical protective rates to the 95th percentile of the maximum hourly rates of water level rise near each site where odonates were collected. In addition, FirstLight evaluated the potential cumulative effect of water level rise and boat wakes on odonates in the Turners Falls impoundment.

Species Group Statistics

Requested Study Modifications

The Massachusetts Division of Fisheries and Wildlife (Massachusetts DFW) states that the calculations of crawl height statistics (mean, median, and critical height percentiles) for the Gomphus Group (*G. abbreviatus*, *G. vastus*, and *Dromogomphus spinosus*) and the Stylurus Group (*S. amnicola* and *S. spiniceps*) are skewed because FirstLight pooled the observations for each group prior to its calculations, thereby giving undue weight to the more abundant species. Massachusetts DFW requests that FirstLight recalculate the group crawl height statistics by averaging the species-specific crawl height values across species within each group, recalculate critical protective rates for each group, and reassess project effects.

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[3] Emergence is the process of larval odonates crawling out of the water prior to eclosure. Eclosure is the process in which a larval insect transforms into an adult.

Comments on Requested Study Modifications

In its reply comments, FirstLight states that the larger sample size (n = 348) for *G. vastus* increases confidence in the crawl height statistics for the Gomphus Group and that the *G. abbreviatus* (n = 20) statistics are nearly identical to those for *G. vastus*. FirstLight also notes that *Dromogomphus spinosus* (n = 21) is not in the genus Gomphus, and therefore, should be excluded from the Gomphus Group.

Discussion and Staff Recommendation

Pooling crawl height data for species groups is a reasonable and appropriate method if there are few observations of unique species or insignificant differences between crawl heights for each species within the group. Calculating species-specific statistics and then averaging these values by species in the group could prevent bias of the abundant species, but this method assumes that sample sizes are large enough to have confidence in the species-specific statistics. Considering the crawl height variation observed between species and the low sample sizes of the less abundant species within each group, FirstLight's calculations of crawl height statistics for each species group are reasonable and provide adequate information for staff's analysis. Further, the report provides the data necessary to determine crawl height statistics and critical protective rates of any species or group of species as needed. Therefore, we do not recommend requiring FirstLight to recalculate species group statistics or reassess project effects.

Crawl Height Statistics for S. amnicola

Requested Study Modifications

Massachusetts DFW indicates that the use of crawl height measurements collected at exuviae[4] biased the crawl height statistics for *S. amnicola* towards individuals that climb high enough to avoid effects of rising water levels. Therefore, Massachusetts DFW recommends that FirstLight recalculate crawl height statistics and critical protective rates for *S. amnicola* using only data collected from live individuals observed during the eclosure process. FWS also expresses concern that data collected at exuviae could have biased the study results and suggests that more conservative estimates of crawl height statistics only using data from live individuals are warranted.

Comments on Requested Study Modifications

In its reply comments, FirstLight states that the potential error for the crawl height of exuviae is bidirectional because the water level at the time of eclosure could have been

[4] An exuvia is the exoskeleton that is shed during eclosure.

higher or lower than when it was measured. In addition, FirstLight notes that a low sample size for *S. amnicola* (n = 8), large climbing height variability, and inherent sampling variability precludes confidence in an analysis using only live individuals.

Discussion and Staff Recommendation

Water level changes have the potential to bias survey results because rising water levels could wash away exuviae of individuals that eclose near the water surface. Additionally, bidirectional measurement error could influence the results. However, based on FirstLight's comparison of crawl heights from live individuals and exuviae provided in its reply comments (table on page 11), there is no apparent trend across species to suggest that water level changes have a strong influence on the crawl heights measured at exuviae. Further, the low sample size of live individuals and climbing height variability within *S. amnicola* warrant using crawl height measurements from both exuviae and live individuals to determine crawl height statistics. Nevertheless, FirstLight's report provides the data necessary to determine crawl height statistics and critical protective rates of water level rise for live individuals as needed. Therefore, we do not recommend requiring FirstLight to recalculate crawl height statistics or critical protective rates for *S. amnicola*.

Summary and Assessment of Existing Data

Requested Study Modifications

The Connecticut River Conservancy (CRC) states that the study was not conducted as approved in the study plan because a synthesis of existing data was not prepared. Therefore, CRC recommends that FirstLight prepare a summary of existing data and compare the existing information to the risk assessment results of the study.

Comments on Requested Study Modifications

In response, FirstLight states that it made best use of existing data on the ecology and life history of the target species and notes that the most critical parameters of this study, such as crawl distance, crawl height, and eclosure speed/timing, are not well documented in scientific literature or previous studies on the Connecticut River.

Discussion and Staff Recommendation

Although FirstLight does not provide an extensive summary of existing information in the study report, it is clear that FirstLight utilized existing information (page 4-1 of the report) to help characterize the assemblage structure and emergence/eclosure behavior of odonates in the project area and meet the objectives of the study. In the report, FirstLight compared travel distance to results from other

published studies, but noted that crawl height, a critical parameter to evaluate potential effects of rising water levels, was not reported in any previous studies of odonates on the Connecticut River. FirstLight also conducted an additional phase of data collection in order to develop reliable estimates of eclosure speed because this information was not well documented in previous studies or the 2015 data. Further, the report indicates that previous studies described similar eclosure speeds to those observed in this study. As such, a comparison of the risk assessment in this study to information from previous studies is not needed. The study report provides adequate site-specific information for staff's analysis and to develop any necessary license requirements, and therefore, we do not recommend requiring FirstLight to provide an additional summary or analysis of previous studies.

Risk Assessment Presentation and Methodology

Requested Study Modifications

CRC states that the risk assessment is flawed because it compares various critical protective rates of water level rise against the 95th percentile of maximum hourly rate of water level rise. Therefore, CRC requests that FirstLight revise the risk assessment methodology to assess potential effects by comparing critical crawl heights to the maximum water level rise during the eclosure time period of 2 hours, instead of comparing rates of change.

Comments on Requested Study Modifications

In its reply comments, FirstLight states that the analysis was performed in accordance with recommendations from Massachusetts DFW and does not propose to conduct the analysis as suggested by CRC.

Discussion and Staff Recommendation

CRC's request to directly compare crawl heights to water level rise over a 2-hour period would alter the presentation of the data, but it would not fundamentally change the analysis or conclusions in the report. Comparing the critical protective rates to rates of water level rise provides accurate and adequate information for staff's analysis. In addition, FirstLight provided the maximum hourly rates of water level rise (page 12) in response to comments filed by Massachusetts DFW. Therefore, all information necessary to evaluate potential effects of maximum water level rise on odonates is available, and we do not recommend requiring FirstLight to alter the presentation of the data or provide additional analyses for maximum rates of water level rise.

Boat Wake Assessment

Requested Study Modifications

CRC states that the analysis of boat wakes is not based on the results of study 3.1.2 (*Northfield Mountain/Turners Falls Operations Impact on Existing Erosion and Potential Bank Instability*), underestimates the size of boat wakes, and does not consider the instantaneous impact of boat wakes. As such, CRC requests that FirstLight determine boat wake size from existing studies and consider instantaneous water level changes in the analysis, opposed to changes averaged over an hour.

Comments on Requested Study Modifications

In its reply comments, FirstLight clarifies that the average maximum wave height determined in study 3.1.2 is 0.23 feet and states that this value was added to the hourly water level rate of change values per the recommendation of Massachusetts DFW.

Discussion and Staff Recommendation

As specified in the February 21, 2014, study plan determination, FirstLight utilized study 3.1.2 to determine a reasonable estimate of boat wake size that might affect the eclosure success of odonates, which is adequate for staff's analysis. If analyses of additional boat wake sizes are desired, this study provides the necessary data to perform these analyses. Therefore, we do not recommend requiring FirstLight to repeat the boat wake analysis using wave heights from other existing studies.

As for the evaluation of boat wakes, it appears that CRC misinterprets the boat wake analysis and assumes that the effect of boat wakes is assessed as a slow change in water level over an hour rather than an instantaneous change in water level. In the analysis, FirstLight compares critical protective rates to hourly rates of water level rise, both of which are expressed in units of feet per hour. As such, the 1-hour period over which the change occurs is irrelevant and only the magnitude of change is important to determine project effects. In other words, the boat wake analysis simply compares the total magnitude of water level change, including a boat wake of 0.23 feet, to the magnitude of water level change that would protect certain percentages of the odonate population from inundation.

Study No. 3.8.1– Evaluate the Impact of Current and Future Modes of Operation on Flow, Water Elevation, and Hydropower Generation

Background

The goal of study 3.8.1 was to develop an operations model of the Northfield Mountain and Turners Falls projects that can evaluate hydrologic and hydraulic conditions on the mainstem Connecticut River under varying conditions and determine

the impact of potential alternative modes of operation on hydropower generation and project economics. Study results will be used to inform other studies including the hydraulic model and instream flow studies. Key tasks of the study included: (1) compiling input datasets from various sources (the United States Army Corps of Engineers, the United States Geologic Survey (USGS), and TransCanada); (2) modifying an existing basin-wide model of the Connecticut River watershed to include only the reach from the Wilder Dam to the downstream Holyoke Project; (3) calibrating and verifying the modified model; and (4) evaluating hydrologic and hydraulic conditions under potential alternative operations scenarios.

Requested Study Modifications

CRC expresses concern that the model may not accurately predict hydrologic conditions in the Connecticut River. Specifically, CRC states that comparisons of flow, generation, and water levels show large deviations between the model output values and field observations. CRC also states that the time period used for comparing model output values to the field observations is too short. CRC requests an addendum that would include a comparison of model output values and the field observations on a month-to-month basis to give stakeholders a sense of the model's ability to accurately predict hydrologic conditions in the study area.

Comments on Requested Study Modifications

FirstLight states that figures 5.1.5 and 5.2.4 in the study report were provided as examples to show that the model does a reasonable job of providing peaking flows of the same general magnitude and frequency as observed during 2002 and is not intended to match hourly observations during that time period. FirstLight further explains that differences between the model output and flows measured at the USGS Montague Gage are expected because the model output is based on the long-term period of record (1975-2015) versus the short-term period CRC referenced in its comments (i.e., field observations from July 19 to July 26, 2002, at the USGS Montague Gage). FirstLight states that the model uses various reservoir-imbalance adjustments from the period of record to estimate how the projects would generally be operated from hour to hour throughout the year and the output is intended to predict short-term field observations at the USGS Montague Gage.

Discussion and Staff Recommendation

In regard to accuracy, FirstLight's calibration analysis demonstrates that the model does a reasonable job of predicting water level, flows, and generation on a daily timeframe, which is adequate for staff's analysis of the effects of alternative project operations on generation and economics. In addition, FirstLight has indicated that the task for evaluating hydrologic and hydraulic conditions under potential alternative

operations scenarios, including incremental changes to flow, generation, and water levels, is not yet completed, and completing this task may include additional model calibration.

In regard to the length of the timeframe used to compare model output to field observations, FirstLight indicates that the model was calibrated using data from the entire 2002 calendar year, not just the July 19 to July 26, 2002, time period shown in figures 5.1.5 and 5.2.4. Figures 4.1-4 to 4.1-5 and 5.1-1 to 5.1-2 include observations from the entire 2002 calibration period.

Based on the information in the final study report, we conclude that FirstLight conducted the study as required by the Commission's September 13, 2013, study plan determination, and the results are adequate for staff's analysis. Therefore, we do not recommend requiring FirstLight to modify the model or conduct any additional calibration analyses at this time.