

FEDERAL ENERGY REGULATORY COMMISSION

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OFFICE OF ENERGY PROJECTS

Project No. 1892-026 – New Hampshire/Vermont
Project No. 1855-045 – New Hampshire/Vermont
Project No. 1904-073 – New Hampshire/Vermont
TransCanada Hydro Northeast Inc.

John L. Ragonese
Relicensing Project Manager
TransCanada Hydro Northeast Inc.
4 Park Street, Suite 402
Concord, NH 03301

Subject: Determination on Requests for Study Modifications and New Studies – Wilder, Bellows Falls, and Vernon Hydroelectric Projects

Dear Mr. Ragonese:

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 TransCanada Hydro Northeast Inc.'s (TransCanada) Wilder (Wilder Project), Bellows Falls (Bellows Falls Project), and Vernon hydroelectric projects (Vernon 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 TransCanada was issued on September 13, 2013. A subsequent study plan determination was issued on February 21, 2014, to address the proposed aquatic studies. TransCanada filed study reports for ongoing and finalized studies on September 15, 2014, September 14, 2015, March 1, 2016, and May 17, 2016, and Commission staff issued determinations on requested study modifications and new studies associated with these study reports on January 22, 2015, January 15, 2016, June 29, 2016, and September 12, 2016, respectively. On June 17 and August 1, 2016, TransCanada filed study reports for a combined 14 additional finalized studies.¹ As required in section 5.15 of the Commission's regulations, the study reports describe TransCanada's progress in

¹ The finalized studies include studies 2, 3, 5, 13, 14, 15, 16, 20, 21, 25, 26, 27, 28, and 29. In addition, TransCanada filed revised reports for studies 4, 6, 10, 12, and 32.

implementing the approved study plan, and an explanation of variances from the study plan and schedule. TransCanada held a study report meeting on August 25, 2016,² and filed a meeting summary on August 31, 2016.

Comments

Comments on the study reports and meeting summary, including requests for study modifications and new studies, were filed by: the U.S. Fish and Wildlife Service (FWS); the Vermont Agency of Natural Resources (Vermont ANR); the New Hampshire Fish and Game Department (New Hampshire FGD); the New Hampshire Department of Environmental Services (New Hampshire DES); the New Hampshire Division of Historical Resources; the Connecticut River Watershed Council (CRWC); the Connecticut River Joint Commissions (CRJC); the CRJC, Upper Valley Subcommittee (CRJC-UVS); John Mudge; Ross McIntyre; and John Bruno. TransCanada filed reply comments on October 31, 2016.

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; provide additional information; recommend protection, mitigation, and enhancement measures; address ongoing and future consultation; request information that was included in the study report; or request information that TransCanada has subsequently provided in its reply comments or agreed to provide in future filings;³ or request additional information collection contingent on the results of ongoing studies. In addition to the items listed 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

² In addition, TransCanada held an unofficial study report meeting on July 15, 2016.

³ In its reply comments, TransCanada states that it will file supplemental information for studies 10, 14, and 15 by November 30, 2016. In addition, TransCanada states that it will file revised reports for studies 6, 21, and 25 by December 15, 2016, and for studies 2 and 3 by January 15, 2017.

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 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 2 (*Riverbank Transect Study*), 3 (*Riverbank Erosion Study*), and 21 (*American Shad Telemetry Study*), including modifications to the study reports, are approved in part. The requested modifications to studies 14 (*Resident Fish Spawning in Impoundments Study*) and 15 (*Resident Fish Spawning in Riverine Sections Study*) and the new studies requested to determine the causes of erosion and evaluate riverbank restoration measures on the Connecticut River are not approved. The specific modifications to the studies and the bases for modifying or not modifying the study plan are explained in Appendix B (Requested Modifications to Approved Studies) and C (Requested New Studies). Commission staff considered all study plan criteria in section 5.9 of the Commission's regulations.

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.

To establish a schedule for resource agencies and other stakeholders to request modifications to the approved study plan for outstanding revised and final study reports, Commission staff will issue a revised process plan and schedule in the near future.

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

Sincerely,

Ann F. Miles
Director
Office of Energy Projects

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

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Appendix C – Staff’s Recommendations on Requested New Studies

cc: Mailing List, Public Files

APPENDIX A

SUMMARY OF DETERMINATIONS ON REQUESTED MODIFICATIONS TO APPROVED STUDIES AND NEW STUDIES

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

Study	Recommending Entity	Adopted	Adopted in part	Not Adopted
2 – Riverbank Transect Study	Vermont ANR, New Hampshire FGD, New Hampshire DES, CRWC, CRJC, CRJC-UVS, Ross McIntyre, John Bruno		X	
3 – Riverbank Erosion Study	Vermont ANR, New Hampshire FGD, New Hampshire DES, CRWC, CRJC, CRJC-UVS, Ross McIntyre, John Bruno		X	
14 – Resident Fish Spawning in Impoundments Study	Vermont ANR, New Hampshire FGD			X
15 – Resident Fish Spawning in Riverine Sections Study	Vermont ANR, New Hampshire FGD			X
21 – American Shad Telemetry Study	FWS, Vermont ANR, New Hampshire FGD, CRWC		X	

Requested New Studies (see Appendix C for discussion)

Study	Recommending Entity	Approved	Approved with Modifications	Not Required
Erosion and Riverbank Restoration Studies	John Mudge, John Bruno			X

APPENDIX B

STAFF'S RECOMMENDATIONS ON REQUESTED MODIFICATIONS TO APPROVED STUDIES

Studies 2 and 3 – Riverbank Transect and Riverbank Erosion Studies⁴

Background

The goals of studies 2 (*Riverbank Transect Study*) and 3 (*Riverbank Erosion Study*) were to: (1) monitor riverbank erosion at selected sites in the three project impoundments and riverine sections of the Connecticut River that are affected by project operation, (2) determine the location of erosion in areas affected by the projects and compare these locations with previously prepared erosion maps, (3) characterize the processes of erosion, (4) ascertain the likely causes of erosion, and (5) identify the effects of shoreline erosion on other resources. As part of these studies, TransCanada conducted two years of erosion monitoring at 21 sites in the study area. In addition, the results of study 1 (*Historical Riverbank Position and Erosion Study*) were incorporated into studies 2 and 3 to assist in evaluating the causes and extent of erosion within the project boundary.

Number of Monitoring Sites and Study Duration

Requested Study Modifications

The Connecticut River Watershed Council (CRWC), the Connecticut River Joint Commissions (CRJC), and Mr. John Bruno, an individual residing along the Connecticut River, suggest that the 21 erosion monitoring sites and two-year monitoring plan were inadequate to effectively characterize erosional processes within the study area. Mr. Bruno recommends expanding the number of erosion monitoring sites. CRWC recommends extending the study period to analyze the full “cycle of erosion”⁵ at each of the 21 erosion monitoring sites. The CRJC, Upper Valley Subcommittee (CRJC-UVS) supports CRWC’s request.

Comments on Requested Study Modifications

⁴ The results for studies 2 and 3 were combined into a single final report; therefore, they are addressed together in this appendix.

⁵ The “cycle of erosion,” as defined by TransCanada, is a sequence of events describing how a riverbank becomes destabilized. See pages 68 through 72 in the study report.

TransCanada indicates that the number of erosion monitoring sites and the duration of monitoring were conducted in accordance with the revised study plan (RSP) approved by the Commission on September 13, 2013. In addition, TransCanada states that although the monitoring results constitute only a snapshot in time, the results were used in conjunction with historical data to determine the rates of erosion occurring within the project area.

Discussion and Staff Recommendation

Based on staff's review of the study reports, the number of monitoring sites and the duration of the monitoring are consistent with what was required in the approved study plan. The information collected at the 21 sites during studies 2 and 3 is adequate to characterize ongoing erosion within the project areas, and while more sites and a longer study duration could provide additional information, the commenters have not described any anomalies or changes to environmental conditions that would warrant such modifications. In addition, encompassing the full "cycle of erosion" at each of the 21 monitoring sites would require extending the study period for an unknown period of time, which would be impractical for a relicensing proceeding and unnecessary because study 1 was conducted to identify and describe any long-term erosion patterns in the project areas.

TransCanada has indicated that it will file a revised report for studies 2 and 3 by January 15, 2017, that will include additional information on erosion monitoring at the 21 study sites. Based on the information available at this time, we anticipate that the results of studies 2 and 3 will be adequate for staff's analysis and to develop any necessary license requirements (section 5.9(b)(5)). Therefore, we do not recommend requiring TransCanada to monitor additional sites or extend the monitoring period for the 21 monitoring sites at this time.

Bank Stability Characterization

Requested Study Modifications

The New Hampshire Department of Environmental Services (New Hampshire DES) suggests that the results of the study are skewed because riverbanks with notches or overhangs (with no other erosion types or failures present) were characterized as stable. New Hampshire DES recommends that additional analysis and discussion be provided that considers all banks with observed notches or overhangs as unstable. The New Hampshire Fish and Game Department (New Hampshire FGD) supports New Hampshire DES's request.

Comments on Requested Study Modifications

TransCanada agrees that the study results would be significantly altered if all riverbanks with notches or overhangs were considered unstable. However, TransCanada indicates that a notch or overhang on the lower bank does not indicate that the upper bank will fail (i.e., topple, slide, or fall) and represents only a portion of the “cycle of erosion.”⁶ TransCanada also states that classifying a riverbank as unstable or eroding based on the type and extent of erosion in the upper bank is consistent with historical erosion mapping efforts conducted within the project areas and on nearby sections of the Connecticut River.

Discussion and Staff Recommendation

The methods and techniques used to characterize bank stability in studies 2 and 3 are consistent with the methods used to characterize bank stability in historical erosion mapping conducted in 1958 and 1974.⁷ Characterizing all notches and overhangs as unstable would eliminate the ability to compare the current study results with historical mapping conducted in 1958 and 1974. Because the modification requested by the New Hampshire DES would eliminate comparisons with historical data, we do not recommend requiring TransCanada to reclassify all notches and overhangs as unstable.

River 2D Modeling

Requested Study Modifications

The Vermont Agency of Natural Resources (Vermont ANR) recommends that TransCanada utilize two-dimensional (River2D) modeling at the 21 erosion monitoring sites in their analysis for determining the likely causes of erosion within the project boundary. New Hampshire FGD supports Vermont ANR’s request.

Comments on Requested Study Modifications

TransCanada indicates that it will conduct shear-stress and velocity analyses using the one-dimensional Hydrologic Engineering Center's River Analysis System (HEC-

⁶ Riverbanks are classified as either upper or lower banks based on multiple characteristics (e.g., bank height, position, and slope). The lower riverbank is the portion of the bank that has a generally flat slope and is regularly underwater. The upper riverbank is the portion of the bank that is regularly above water, but may become inundated under high flows.

⁷ Simons, D.B., Andrews, J.W., Li, R.M., and Alawady, M.A. 1979. Connecticut River Streambank Erosion Study Massachusetts, New Hampshire, and Vermont. Prepared for USACE, New England Division.

RAS) model in the revised report for studies 2 and 3. TransCanada states that the results of the HEC-RAS modeling and a logistic regression statistical analysis that it proposes to conduct will be sufficient to identify the likely causes of erosion at the 21 erosion monitoring sites; therefore, there is no need to use the River2D model.

Discussion and Staff Recommendation

Using HEC-RAS modeling in combination with logistic regression statistical analysis may be adequate to identify and describe the likely causes of erosion at the 21 monitoring sites. When TransCanada files its revised study report in January 2017, we will review the results, including the proposed HEC-RAS modeling and regression analysis, and as appropriate, consider the need for additional analysis, including use of the River2D model. Based on the information available at this time, we expect that the revised report will be adequate for staff's analysis and to develop any necessary license requirements (section 5.9(b)(5)). Therefore, we do not recommend requiring TransCanada to conduct any River2D modeling at this time.

Hydraulic Gradient between Impoundment Water Surface Elevations and Groundwater

Requested Study Modifications

CRWC recommends that TransCanada conduct additional analyses of the effects of project operation on the hydraulic gradient between impoundment water surface elevations and groundwater elevations along the shoreline. CRWC suggests that this analysis is necessary to describe erosion associated with groundwater seepage (naturally occurring or project-related) and increases in the vertical range of shoreline exposed to boat wakes and ice jams. CRJC, CRJC-UVS, and Mr. Bruno support CRWC's request.

Comments on Requested Study Modifications

TransCanada indicates that the rate of groundwater seepage depends on the hydraulic gradient between impoundment water surface elevations and groundwater elevations along the shoreline. However, TransCanada states that impoundment water surface elevations for more than 75% of the project areas fluctuate less than two feet under normal project operation. TransCanada suggests that this two-foot fluctuation has a minimal effect on the hydraulic gradient between impoundment water surface elevations and groundwater elevations along the shoreline. In addition, TransCanada states that erosion rates were not higher in locations within the project areas where the

magnitude of water surface elevation fluctuations is the greatest.⁸ TransCanada indicates that additional analysis of hydraulic gradients would not provide any appreciable information and this analysis is beyond the scope of the approved study plan.

Discussion and Staff Recommendation

It is unclear how or if TransCanada determined the hydraulic gradient between impoundment water surface elevations and groundwater elevations along the shoreline (i.e., the report for studies 2 and 3 does not include any groundwater elevation data). Therefore, Commission staff recommends that the revised report that will be filed in January 2017 include additional information that describes how the hydraulic gradients were calculated and the resulting potential for riverbank erosion (e.g., naturally occurring seepage and project-related seepage). The discussion should include any observations of groundwater seeps or seepage-related erosion at the 21 erosion monitoring sites and any groundwater elevation data that was collected during the studies.

Effects of Shoreline Erosion on Other Resources

Requested Study Modifications

CRWC indicates that the effects of shoreline erosion on other resources were not fully analyzed in accordance with the approved study plan. CRWC recommends that the effects on riparian areas and shoreline wetlands, rare plant and animal populations, water quality, and aquatic and terrestrial habitat be further evaluated in the study report. Regarding the effects on spawning sites, CRWC recommends that additional data be collected to quantify the effect of fine-grained riverbank materials on increased embeddedness of coarse-grained spawning substrates within the project impoundments. CRJC, CRJC-UVS, and Mr. Bruno support CRWC's request.

Comments on Requested Study Modifications

TransCanada states that the effects of shoreline erosion on other resources will be reviewed, and revised accordingly based on its proposed shear-stress analysis at the 21 erosion monitoring sites. However, TransCanada states that determining the effects of project operation on the loss of aquatic habitat is outside the scope of studies 2 and 3.

Discussion and Staff Recommendation

⁸ Hydraulic modeling was used to determine the magnitude of water surface elevation fluctuations at the 21 erosion monitoring sites under normal project operation. Because the impoundments are generally riverine in nature, fluctuations in water surface elevations are typically the greatest immediately upstream of the dam.

An objective of study 3 (see the fourth bullet on page 27 of the approved RSP) was to “identify the effects of shoreline erosion on other resources (e.g., riparian areas and shoreline wetlands, rare plant and animal populations, water quality, and aquatic and terrestrial wildlife habitat).” TransCanada proposed to conduct this analysis partly by using “maps showing the location of different bank conditions and features along the river [...] to investigate whether bank erosion has the potential to effect other resources.” The report for studies 2 and 3 provides a limited analysis of other resources and suggests that other studies (i.e., studies 6, 8, 14, 15, 24, 25, 27, and 30) determined erosion is “unlikely to have measureable negative effects on those resources.” The report for studies 2 and 3 does not include any maps comparing areas with documented erosion to the maps created for other studies.

A quantitative analysis of the effects of shoreline erosion on each resource is beyond the scope of this study and not necessary for staff’s analysis (section 5.9(b)(5)); therefore, we do not recommend any additional field data collection efforts to describe these effects. However, the discussion of existing information should be expanded to provide a more detailed description of the effects of ongoing erosion within the project boundary on other resources. Therefore, we recommend that the revised study report that will be filed in January 2017 include a detailed qualitative discussion of the potential effects of ongoing erosion within the project areas on riparian areas and shoreline wetlands, rare plant and animal populations, water quality, aquatic habitat, and terrestrial habitat. Where possible, this discussion should include comparative maps and site-specific observations.

Study Methodology

Requested Study Modifications

Mr. Ross McIntyre, an individual residing along the Connecticut River, states that the methodology used for evaluating erosion within the project areas potentially excludes sites with known erosion. In addition, Mr. McIntyre states that the study should have been completed by an unaffiliated third party to ensure that study conclusions are not biased. Mr. McIntyre requests that the Commission revise the study methodology and resulting conclusions accordingly.

Comments on Requested Study Modifications

In its reply comments, TransCanada does not respond to Mr. McIntyre’s letter.⁹

⁹ In its letter dated October 31, 2016, TransCanada did not respond to any of the comments submitted by Mr. McIntyre on September 19, 2016. We recommend that TransCanada review and respond to Mr. McIntyre’s letter in an appendix to its revised study report that will be filed in January 2017.

Discussion and Staff Recommendation

The pre-filing portion of relicensing under the Integrated Licensing Process (ILP) includes steps for identifying and requiring studies (i.e., sections 5.9 to 5.13 of the Commission's regulations) that are conducted by licensees or their designees. When the required studies have been completed and filed with the Commission, staff conducts an independent review of the results. If the results are not valid or additional study is needed, Commission staff can require licensees to repeat the study, conduct an additional year of study, or conduct a new study. Commission staff has reviewed the report for studies 2 and 3 and TransCanada's proposed revisions that will be filed in the revised study report, and anticipates that the information will be adequate for staff's analysis and to develop any necessary license requirements (section 5.9(b)(5)). Therefore, at this time, we do not recommend requiring additional analyses conducted by a third party that would be selected by the Commission.

Studies 14 and 15 – Resident Fish Spawning in Impoundments and Riverine Sections Studies

Background

The goal of studies 14 and 15 was to assess project effects on resident fish spawning in the impoundments and riverine portions of the project areas. The target species for this study were smallmouth bass, largemouth bass, yellow perch, black crappie, pumpkinseed, bluegill, chain pickerel, northern pike, golden shiner, white sucker, spottail shiner, walleye, and fallfish in the impoundments and smallmouth bass, walleye, white sucker, and fallfish in the riverine sections. In 2015, TransCanada conducted field surveys assessing the timing and locations of fish spawning under existing conditions and the potential effects of impoundment fluctuations and generation-related flow releases on nest abandonment, spawning fish displacement, and egg dewatering.

Requested Study Modifications

Vermont ANR recommends that TransCanada revise the final reports for studies 14 and 15 to include an analysis of project effects on resident fish spawning that is based on the information collected during studies 14 and 15; existing literature; and the habitat, water level fluctuation, and water surface elevation data that has been collected as part of TransCanada's other studies. New Hampshire FGD supports Vermont ANR's request.

Comments on Requested Study Modifications

In its reply comments, TransCanada states that the goals and objectives of studies 14 and 15 have been achieved. TransCanada also states that the ongoing instream flow study will provide additional information for evaluating potential project effects on riverine species.

Discussion and Staff Recommendation

Section 5.18(b)(5)(ii)(B) of the Commission's regulations describes the environmental analysis that is required in any license application developed using the ILP. Specifically, the regulations state that Exhibit E must describe the beneficial and adverse effects of the proposed project on each resource using existing information and the results of any studies that have been conducted by the applicant. Because the regulations require the analysis requested by Vermont ANR to be included in Exhibit E of TransCanada's license application, there is no need to require TransCanada to include this analysis in revised reports for studies 14 and 15.

Study 21 – American Shad Telemetry Study

Background

The objectives of study 21 included: (1) quantifying the upstream passage efficiency of the Vernon fishway for adult American shad; (2) evaluating downstream passage route selection, passage efficiency, and survival for adult shad at the Vernon Project; and (3) evaluating the effects of project operation on shad spawning upstream and downstream of Vernon dam. TransCanada used passive integrated transponder tags¹⁰ (PIT tags) and radio tags to track the upstream movement of adult shad, used radio tags to track the downstream movement of adult shad, and conducted mobile radio-tracking and plankton-netting surveys to identify potential spawning locations upstream and downstream of Vernon dam.¹¹

TransCanada's study report provides the travel times for shad moving between monitoring stations downstream of Vernon dam and within the upstream fishway, the number of passage attempts (i.e., "forays") tagged shad made into the Vernon upstream

¹⁰ PIT tags are very small tags that respond to radio-specific radio frequencies at close range (two feet or less) to transmit the tag identification number. TransCanada used PIT-tag receivers to track PIT-tagged shad within the Vernon upstream fishway.

¹¹ As part of a relicensing study for the Turners Falls Project (P-1889), FirstLight Hydro Generating Company tagged and released adult shad downstream of the Turners Falls Project, and some of these fish were documented using the Vernon Project fishway.

fishway,¹² and the number of tagged shad that successfully ascended and exited the fishway. The study report also summarizes information about project operation (e.g., number of turbines operating, project discharge) when fish entered the upstream fishway. For the downstream passage study component, the study report includes information about residency time in the impoundment and forebay, downstream passage route selection, and project operation and discharge at time of passage. Lastly, the study report includes descriptions of the habitat characteristics and the number of shad eggs and larvae collected at each sampled location.

Enumeration of “Forays”

Requested Study Modifications

The U.S. Fish and Wildlife Service (FWS) states that TransCanada’s definition of “foray” is unclear and may be too broad to allow for meaningful interpretation of the study results. FWS requests that TransCanada include each entrance attempt in the analysis to evaluate the effect of project operation on how shad enter the fishway. FWS further states that multiple passage attempts may indicate a problem within the fishway that should be identified and corrected. Vermont ANR, New Hampshire FGD, and CRWC support FWS’s request.

Comments on Requested Study Modifications

In its study report meeting summary filed August 31, 2016, TransCanada acknowledges that the definition of “foray” provided in the report was unclear and states that it will provide a clarified or modified definition. In addition, TransCanada states that it will provide information about generation, spill, attraction flows, bypass flows, and water temperature at the time of each “foray.” In its reply comments, TransCanada states that it will provide a clear definition of what constitutes a “foray” and recalculated fishway performance metrics in a revised study report that will be filed by December 15, 2016.

Discussion and Staff Recommendation

TransCanada’s definition of “foray” is unclear, and there does not appear to be any justification for selecting a four-hour window. While a modified definition presented in TransCanada’s revised study report may clarify the definition and provide a basis for the

¹² On page 26 of the study report, TransCanada defined a “foray” as “a maximum 4-hour period in which a fish passed the entrance or first bay receivers and either dropped back into the tailrace from there or continued up in the fishway and then dropped back to the tailrace; if the foray exceeded four hours without the fish backing out of the fishway, it was counted as a single foray.”

four-hour period, we recommend that TransCanada also provide the following information in its revised study report for each shad that entered the upstream fishway: (1) the time of entry, time of exit, and total time inside the fishway for each passage attempt; (2) the operation and spill conditions during each passage attempt; (3) whether the attempt was successful (i.e., the shad exited the fishway into the impoundment) or unsuccessful (i.e., the shad exited the fishway through the fishway entrance); (4) whether fallback occurred (i.e., the shad entered the impoundment and returned to the fishway or passed over the spillway back into the tailrace area); and (5) the total number of passage attempts. In addition, TransCanada should provide the mean number of unsuccessful passage attempts per fish, mean duration of successful passage attempts, mean duration of unsuccessful passage attempts, and associated 95 percent confidence intervals using pooled data for all shad that entered the upstream fishway. Providing this additional information would have minimal additional cost (section 5.9(b)(7)) and could inform staff's analysis (section 5.9(b)(5)).

Time-to-Event Analysis

Requested Study Modifications

FWS and Vermont ANR indicate that TransCanada's analyses of the upstream and downstream passage data are simplistic, potentially biased, and inadequate for evaluating project effects on the upstream and downstream migration of adult shad. FWS requests that TransCanada conduct a time-to-event analysis (Castro-Santos and Perry, 2012) of the telemetry and PIT tag data.¹³ FWS suggests that a time-to-event analysis could help identify conditions or locations associated with successful and unsuccessful passage attempts. New Hampshire FGD and CRWC support FWS's request.

Comments on Requested Study Modifications

In its reply comments, TransCanada indicates that FWS did not request a time-to-event analysis during the study request period and that FWS stated that the analyses described in the proposed study plan appeared appropriate.¹⁴ TransCanada further states that the receiver system was not set up to collect the data needed for a time-to-event

¹³ Time-to-event analysis is based on a statistical survival analysis used by insurance companies and medical researchers. A time-to-event analysis for shad could include continuous telemetry, project operation, and environmental data to quantify the effect of project operation and environmental conditions on passage rates and route selection.

¹⁴ See FWS's letter filed July 15, 2013.

analysis.¹⁵ However, in response to the agencies' comments on the analyses of the upstream and downstream passage data, TransCanada states that the revised study report that will be filed in December 2016 will discuss the implications of the radio receiver settings used during the study on data analysis. In addition, TransCanada indicates that it will provide additional information, in lieu of conducting upstream and downstream time-to-event analyses, on residency time in the tailrace and forebay, transit times between detection points, and project discharge data for the residency periods.¹⁶

Discussion and Staff Recommendation

Time-to-event analysis has been used to evaluate fish passage delays at other hydropower projects (section 5.9(b)(6)) (NAI, 2016) and could be useful for identifying locations associated with migratory delays at the Vernon Project. However, based on the available information, it is unclear if a time-to-event analysis can be performed with the existing data. TransCanada indicates that its revised study report will address its ability to conduct a time-to-event analysis, including additional information about the radio-receiver settings. In addition, TransCanada indicates that its revised study report will provide information on transit times, residency times, and project discharge, which could provide information similar to a time-to-event analysis. Therefore, we are not recommending that TransCanada be required to conduct a time-to-event analysis of the upstream and downstream shad passage data at this time.

Anomalous Environmental Conditions

Requested Study Modifications

FWS states that the frequency of flows exceeding the project's hydraulic capacity during June and July 2015 were five and seven times greater, respectively, than the long-term statistics cited in its pre-application document for those months. FWS states that the results of the upstream passage, downstream passage, and spawning components of the study may not represent typical conditions because of the higher frequency of spill events, which could influence residency times prior to passage and spawning locations. However, FWS indicates that a more complete analysis of the available data is necessary

¹⁵ The Lotek radio receivers TransCanada used at some monitoring locations have a "continuous record time out" setting (CRTO). Instead of recording the data for each detection of a tagged fish in the monitoring area, receivers using the CRTO setting provide a single record summary containing only the time of the first and last detection, the total number of detections, and the average signal strength of the detections.

¹⁶ See Attachment 1 of TransCanada's study report meeting summary filed August 31, 2016.

before it can determine if additional data collection is necessary. Vermont ANR, New Hampshire FGD, and CRWC support FWS's comments.

Comments on Requested Study Modifications

In its reply comments, TransCanada acknowledges that river flows during June and July 2015 were higher than average, but some upstream and downstream passage events occurred during periods with more typical flow. TransCanada states that the revised study report will compare periods of high flows and typical flows for residency times prior to upstream passage, residency times prior to downstream passage, and downstream passage route selection. In addition, TransCanada states that it will provide the operation and spill data for the shad egg and larvae collection periods.

Discussion and Staff Recommendation

The study report indicates that upstream and downstream shad passage occurred under a variety of flow conditions, including periods when river flow both exceeded and did not exceed the project's hydraulic capacity; however, the report does not compare residency times or route selection during high- and normal-flow periods or report project operation data during shad egg and larvae sampling. TransCanada indicates that it will provide this information in its revised study report and this information may adequately describe the effects of the higher flows on the study results and inform the need for any additional data collection. Therefore, we do not recommend requiring TransCanada to conduct additional data collection at this time.

APPENDIX C

STAFF'S RECOMMENDATIONS ON REQUESTED NEW STUDIES

New Study Request: Erosion and Riverbank Restoration Studies

Requested New Studies

Mr. John Mudge and Mr. John Bruno, individuals residing along the Connecticut River, request that TransCanada conduct additional erosion studies, including geotechnical, hydrogeological, and/or modeling studies, and a study evaluating methods for repairing eroded riverbanks and restoring riparian buffers. Mr. Mudge and Mr. Bruno did not address several of the criteria for requesting new studies in their requests. Specifically, they did not explain how the new studies would inform the development of license requirements (section 5.9(b)(5)), describe the methodologies used in the new studies (section 5.9(b)(6)), or describe the level of effort or cost of the new studies (section 5.9(b)(7)).

Comments on Requested New Studies

In its reply comments, TransCanada does not propose any additional erosion studies and does not respond to Mr. Mudge's letter.¹⁷

Discussion and Staff Recommendation

Based on the information available at this time, we anticipate that the results of studies 2 and 3, including the additional information required to be filed in the revised study report (see Appendix B), will be adequate for staff's analysis and to develop any necessary license requirements (section 5.9(b)(5)). Therefore, we do not recommend requiring TransCanada to conduct any additional erosion-related studies at this time.

¹⁷ In its letter dated October 31, 2016, TransCanada did not respond to any of the comments submitted by Mr. Mudge on September 26, 2016. We recommend that TransCanada review and respond to Mr. Mudge's letter in an appendix to its revised study report that will be filed in January 2017.

Project Nos. 1892-026, 1855-045, 1904-073

LITERATURE CITED

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