

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, DC 20426
September 13, 2013

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.

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

Reference: Study Plan Determination for the Wilder, Bellows Falls and Vernon Hydroelectric Projects

Dear Mr. Ragonese:

Pursuant to 18 C.F.R. § 5.13(c) of the Commission's regulations, this letter contains the study plan determination for 33 studies for the Wilder Hydroelectric Project No. 1892 (Wilder Project), the Bellows Falls Hydroelectric Project No. 1855 (Bellows Falls Project), and the Vernon Hydroelectric Project No. 1904 (Vernon Project) located on the Connecticut River in the states of New Hampshire and Vermont. This determination is based on the study criteria set forth in section 5.9(b) of the Commission's regulations, applicable law, Commission policy and practice, and the record of information.

Background

On April 15, 2013, TransCanada Hydro Northeast Inc.'s (TransCanada) filed its proposed plan for 33 studies covering geologic and soil resources, water quality, geomorphology, hydrology, instream flow, fish and aquatic resources, wildlife resources, botanical resources, recreation and aesthetic resources, and cultural and paleontological resources in support of its intent to relicense the projects.

TransCanada held its initial Study Plan Meeting on May 13, 2013 and subsequently held resource-specific study plan meetings on May 16, 20, and 23, on June 6, 7, 18, 19, 20, and 21, and on August 6 and 9. On July 9, 2013, TransCanada filed an updated Proposed Study Plan for additional stakeholder review and comment. Following the conclusion of study plan meetings and receipt of comments on its updated Proposed Study Plan, TransCanada filed its Revised Study Plan on August 14, 2013.

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Comments on the 33 studies were filed by: the U.S. Fish and Wildlife Service (FWS); the National Park Service (NPS); the New Hampshire Department of Environmental Services (NHDES); the New Hampshire Fish and Game Department (NHFGD); the Vermont Agency of Natural Resources (VANR); the Vermont Division of Historic Preservation; the City of Lebanon, New Hampshire; the Connecticut River Watershed Council (Watershed Council); the Connecticut River Joint Commission (Joint Commission); the American Whitewater Association; New England FLOW; The Nature Conservancy; the Appalachian Mountain Club; the Vermont River Conservancy; the Friends of the Connecticut River Paddlers' Trails; the Narragansett Indian Tribal Historic Preservation Office; the Nolumbeka Project; Two Rivers-Ottawquechee Regional Commission (Two Rivers); and F. William and Jennifer Lipfert.

Aquatic Resource Studies

On August 27, 2013, Entergy announced that it plans to decommission its Vermont Yankee Nuclear Power Plant (Vermont Yankee) during the fourth quarter of 2014. Vermont Yankee withdraws its cooling water from and discharges it back to TransCanada's reservoir for the Vernon Project. The Vernon reservoir is located immediately upstream of FirstLight Hydro Generating Company's reservoir for the Turners Falls Hydroelectric Project No. 1889. Operation of Vermont Yankee has increased Connecticut River water temperatures within the Vernon reservoir and downstream through the Turners Falls Project since the plant went into operation in 1972. Because this will no longer be the case after 2014, TransCanada's proposed aquatic studies may produce unusable data if conducted during 2014 while Vermont Yankee is still operating. Because of this unusual circumstance, we are not issuing a determination on 20 of TransCanada's proposed aquatic resource studies at this time¹ but are addressing the 13 studies that are not likely to be influenced by the presence or absence of Vermont Yankee's operation.

We intend to hold a technical meeting to obtain more information on the proposed Vermont Yankee decommissioning and hear from the licensee and stakeholders on any necessary adjustments to the proposed and requested study designs and/or schedules. Additional detail on the technical meeting will be provided soon. Thereafter, we will issue a study plan determination on the aquatic resource studies.

General Comments

A number of the comments received do not address study plan issues. This determination does not address these comments, but rather addresses comments specific to the merits of the proposed studies submitted pursuant to section 5.13 of the Commission's regulations and comments received thereon.

¹ Appendix C includes a list of all proposed and requested studies that staff have identified as potentially affected by the decommissioning of Vermont Yankee.

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Study Plan Determination

Of the 13 studies proposed by TransCanada and addressed in this study plan determination, six are approved with staff-recommended modifications and seven are approved as filed by TransCanada (see Appendix A). No additional studies are being required. The specific modifications to the study plan and the basis for modifying TransCanada's study plan, and the reasons for not adopting the additional studies are discussed in Appendix B. Although Commission staff considered all study plan criteria in section 5.9 of the Commission's regulations, only the specific study criteria that are particularly relevant to the determination are referenced in Appendix B.

As discussed in Appendix B, of the six modified study plans TransCanada is required to file one for Commission approval (study 4 *Hydraulic Modeling Study*). TransCanada must file the modified study within 90 days from the date of this letter and allow at least 30 days for the identified stakeholders to comment on the proposed modifications. TransCanada must include in its filing copies of any comments, a discussion of how comments are addressed, and its reasons for not adopting any recommendations.

Nothing in this study plan determination is intended, in any way, to limit any agency's proper exercise of its independent statutory authority to require additional studies. In addition, TransCanada may choose to conduct any study not specifically required herein that it feels would add pertinent information to the record.

If you have any questions, please contact Ken Hogan at (202) 502-8434.

Sincerely,

Jeff C. Wright
Director
Office of Energy Projects

Enclosures: Appendix A -- Approved and modified studies subject to this determination
Appendix B -- Staff's recommendations on proposed and requested studies
Appendix C -- List of proposed and requested studies that we have identified as potentially affected by the decommissioning of Vermont Yankee

cc: Mailing List
Public Files

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APPENDIX A**SUMMARY OF DETERMINATIONS ON PROPOSED AND REQUESTED
STUDY MODIFICATIONS AND STUDIES REQUESTED BUT NOT ADOPTED
BY TRANSCANADA**

Study	Recommending Entity	Approved	Approved with Modifications	Not Required
1 -- Historical Riverbank Position and Erosion Study	TransCanada	X		
2 -- Riverbank Transect Study	TransCanada		X	
3 -- Riverbank Erosion Study	TransCanada		X	
4 -- Hydraulic Modeling Study	TransCanada		X	
5 -- Operations Modeling Study	TransCanada		X	
26 -- Cobblestone and Puritan Tiger Beetle	TransCanada	X		
27 -- Floodplain, Wetland, Riparian, and Littoral Habitats Study	TransCanada	X		
28 -- Fowler's Toad Survey	TransCanada	X		
29 -- Northeastern Bulrush Survey	TransCanada	X		
30 -- Recreation Facility Inventory, Use & Needs Assessment	TransCanada		X	

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Study	Recommending Entity	Approved	Approved with Modifications	Not Required
31 -- Whitewater Boating Flow Assessment: Bellows and Sumner Falls	TransCanada		X	
32 -- Bellows Falls Aesthetic Flow Study	TransCanada	X		
33 -- Cultural and Historic Resources Study	TransCanada	X		
Project Economic Impact Study	Joint Commission			X
Whitewater Park Feasibility Study	New England FLOW, American Whitewater, Appalachian Mountain Club, NPS, Vermont River Conservancy, Friends of the Connecticut River Paddlers' Trail			X
Contingent Valuation Study	New England FLOW, American Whitewater, Appalachian Mountain Club, Vermont River Conservancy, Friends of the Connecticut River Paddlers' Trail, Watershed Council			X
Climate Change and Continued Project Operations	FWS, VANR, NHDES, Joint Commission, Watershed Council			X

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APPENDIX B

STAFF'S RECOMMENDATIONS ON PROPOSED AND REQUESTED STUDY MODIFICATIONS AND STUDIES REQUESTED

The following discusses staff's recommendations on studies proposed by TransCanada and participants' requests for study modifications and additional studies. We base our recommendations on the study criteria outlined in the Commission's regulations [18 C.F.R. section 5.9(b)(1)-(7)]. Except as explained below, the revised study plan filed on August 14, 2013, as modified below, adequately addresses all study needs at this time.

I. Requests for Study Modifications

Study 2 - Riverbank Transect Study

Fluctuating water levels and flows due to project operations may cause riverbank erosion. TransCanada's plan is to monitor riverbank erosion at 20 transects with repeated cross-sections, ground photographs, and water-level monitoring. TransCanada's observations regarding changing water levels and the timing of bank erosion would provide information to establish whether water-level fluctuations and increased shear stresses caused by project operations correlate with erosion in project-affected areas.

Monitoring Frequency

Applicant's Proposed Study

TransCanada would conduct surveys a minimum of four times per year for two years. The schedule of the proposed annual surveys is immediately after high spring flows; in early summer, in late summer; and in late fall with additional surveys within 15 days of any significant high-water event.

Comments on the Study

The Watershed Council and VANR request bi-weekly surveys at the selected transects for a period of one full year. VANR states that more frequent monitoring would provide a look at changes in the stream banks in the absence of high-water events. The commenters explain that FirstLight should monitor more frequently because daily fluctuations cause erosion to occur slowly.

TransCanada states that there is no information on erosion rates that would support the significant effort associated with monitoring the sites on a bi-weekly interval. It explains that the study plan is intended as a starting point to gather information on

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existing erosion rates. TransCanada points out that its study plan includes consultation with interested stakeholders and suggests that it would consider increased monitoring based on the initial survey results.

Discussion and Staff Recommendation

Erosion can either occur at a slow rate over a long period, or suddenly as a result of a significant flow or geologic event. TransCanada's proposed survey schedule is sufficient to estimate the slower rate of erosion caused by daily operations. Higher rates of erosion caused by significant events would be documented by TransCanada's proposal to survey within 15 days of each high-flow event. In any case, the aftermath of mass-wasting events should be evident even under the proposed quarterly monitoring due to the large amount of soil loss generally associated with such events. The commenters' suggested bi-weekly monitoring would not definitively identify the circumstances that finally caused a mass-wasting event.

The proposed study frequency for resurveying each transect, a minimum of four times per year, is consistent with generally accepted scientific principles (section 5.9(b)(6)). The level of effort and costs required by the recommended bi-weekly monitoring would not necessarily result in additional useful information over the proposed study (section 5.9 (b)(7)).

As a result, we do not recommend incorporating the requested modification for bi-weekly monitoring in the study plan.

Finally, our review of TransCanada's study plan indicates that TransCanada did not specifically define the flow value that would trigger a high-flow event survey (section 5.9 (b)(6)). Therefore, for the purposes of this study, we recommend that TransCanada define a "high-flow event" as follows: a flow greater than 35,000 cfs at Wilder, 44,000 cfs at Bellows Falls, and 49,000 cfs at Vernon. These flow events approximate the annual flood flow, as calculated by a 1.5-year probability recurrence interval.

Transect Site Selection below Vernon Dam

Applicant's Proposed Study

TransCanada proposes to study erosion rates and causes at 20 transects in the project impoundments and downstream of at least two project dams. It would select the transect locations in consultation with a technical working group.

In its revised study plan, TransCanada proposes to include the 1.5-mile section below Vernon dam in the study scope because it has information for this site that it has

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obtained through ongoing monitoring. TransCanada added that it will include this information “in some manner” in the study.²

Discussion and Staff Recommendation

An extremely large area of erosion has developed immediately below the Vernon dam, especially on the eastern, New Hampshire side of the river. Recognizing the potential threat of erosion at this site to Vernon dam’s structural integrity, under the current license the Commission staff has required TransCanada to perform biennial surveys on the “east bank” site downstream of Vernon. The biennial survey tracks long-term trends and allows for an assessment of the need for remediation. Unlike the proposed relicensing study, the ongoing monitoring does not attempt to analyze the cause of the erosion.

The goals and objectives of the proposed relicensing study are to track changes on a finer scale than once every two years and attempt to correlate observed changes in erosion with specific project operation or hydrologic events. We are unclear what TransCanada means by stating it will use the information from the ongoing study “in some manner.” Because its proposed and ongoing studies have different purposes, just utilizing the existing information from TransCanada’s on-going biennial erosion monitoring would not provide the information needed to complete an erosion causation analysis (section 5.9(b)(7)).

Conducting the study at the existing Vernon dam transect location using the complete methodology outlined in the RSP, which includes analysis of hydraulic fluctuations and soils analysis, would provide information about erosion and Vernon project operation effects, and support a causation analysis that could inform license conditions (section 5.9(b)(5)). Existing photographic and topographic monitoring is on a less frequent basis than the proposed methodology. Therefore, we recommend that TransCanada modify the study plan to include one of the transect locations at the large erosion monitoring site that is currently the subject of biennial monitoring below Vernon dam. TransCanada should also use the results of past monitoring to analyze erosion at this site.

Adding the Vernon dam east bank site into the scope of this study would cost an additional \$20,000 annually for the extra additional field data collection and analysis required by the Transect Study (section 5.9(b)(7)).

² TransCanada’s current license requires erosion monitoring and reporting for active erosion sites downstream of Vernon since the mid 1990’s.

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Monitoring Survey Methods

Applicant's Proposed Study

TransCanada proposes to collect a minimum of 10 survey points along the riverbank slope to capture changes in grade. TransCanada proposes that the survey crew would select the vertical intervals between survey points in the field, based on observable grade changes.

Comments on the Study

NHDES and VANR state that the proposed method of monitoring the morphology of the slope by basing vertical survey points on changes in grade would involve some subjectivity from the field survey crew. The agencies requested that TransCanada modify the proposed field methods to collect data on a one-foot interval because a one-foot contour change would capture changes in grade even on high banks. The commenters wish to ensure that TransCanada collects data consistently and feel that this systematic approach would better capture grade breaks. Additionally, NHDES requested more information on survey methods to capture bank areas with notching and undercutting where the use of survey rods is not possible.

Discussion and Staff Recommendation

The reported average bank height of the lower Connecticut River is 10 to 15 feet.³ As such, TransCanada's proposed method for a minimum of 10 survey points would result in slope geometry data collected at 1- to 1.5-foot intervals for the average bank, an acceptable frequency to characterize slope geometry (section 5.9(b)(6)). It is standard practice to utilize additional survey points to accurately describe slope geometry for slopes greater than the average; however, requiring every monitored slope to be characterized with 1-foot survey intervals may not provide valuable data, but it would increase the cost of the field effort (section 5.9(b)(7)).

We do not recommend that TransCanada modify the study survey methods to specifically require that it collect riverbank slope geometry data at 1-foot intervals. However, to systematically define the shape of the transects, we recommend modifying the survey methods so that each transect contains a minimum of 10 equally spaced points, as well as any additional points required to capture grade breaks (section 5.9(b)(6)). We do not anticipate any increased costs because of the modification.

Regarding NHDES' request for more information on survey methods to capture bank areas with notching and undercutting, we note that a standard survey practice is to

³ Kleinschmidt, 2010. Lower Connecticut River Shoreline Survey Report.

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perform offsets from a point that can be collected, or to collect a survey shot directly on the ground with the survey prism. Both of these techniques would be appropriate for notched or undercut areas (section 5.9(b)(6)).

Duration of Water Level Logger (Transducer) deployment

Applicant's Proposed Study Plan

TransCanada proposes to use automatic data loggers and transducers to collect water level data for this study. TransCanada proposes to remove these water level loggers from the stilling wells for the winter period when they would be vulnerable to winter ice conditions.⁴ TransCanada also proposes to use the data from these water level loggers to calibrate the two hydraulic models discussed in study 4, Hydraulic Modeling Study.

Comments on the Study

NHDES requests that TransCanada deploy its proposed water level loggers for as long as possible during the winter, leave them in place until the river begins to freeze, and then replace them as soon as ice no longer poses a threat. NHDES comments that its review of the USGS Walpole gage record shows significant winter fluctuation in flow and stage during January 2013, and winter data collection would capture that operation.

Discussion and Staff Recommendation

To validate and calibrate the two hydraulic models, it is appropriate that the calibration data captured by the water level loggers represent a wide range of reservoir elevations and river flow conditions. However, for reasons discussed below, it is not critical that TransCanada calibrate the models with flows and river elevations from each of the four seasons.

The seasonal flow pattern in the Connecticut River is high flows in April and May, low flows from July through September, and increasing flows in the fall. Having data for calibration across the seasonal flow extremes and operational variations will produce a reliable model capable of reliably simulating the full range of flow and operating conditions (section 5.9(b)(6)).

TransCanada's proposal to deploy water level loggers from April through November would avoid harsh winter conditions that may damage equipment, and capture the necessary data on project operations across annual high and low flows of the river and, therefore, would support the calibration and verification of the two hydraulic models

⁴ We interpret this to mean December through March.

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outlined in study 4 (section 5.9(b)(6)). As such, it is not necessary that TransCanada deploy the water level logger data during the winter months and we do not recommend it.

Study 3 - Riverbank Erosion Study

Project operations may affect riverbank erosion due to fluctuating water levels and flows. The goal of the study is to provide baseline data relative to erosion in project-affected areas by determining the locations of erosion, comparing these locations with previously compiled maps, characterizing erosion processes, ascertaining likely causes of erosion, and identifying the effects of erosion on other resources. The study would map riverbank erosion throughout the project impoundments by using existing maps and conducting field surveys. TransCanada will ascertain causes of erosion by identifying the propensity of erosion to occur with certain conditions. TransCanada will use the results of the Hydraulic Modeling Study (study 4) and the Riverbank Transect Study (study 2) to establish these associations and to identify the major factors that contribute to erosion. The Riverbank Erosion Study includes periodic topographic and photographic surveying and detailed monitoring of soils and water level fluctuations at 20 specific transect sites selected for the Riverbank Transect Study.

Slope Stability Analysis

Applicant's Proposed Study

TransCanada does not propose to conduct a geotechnical slope stability analysis at each of the 20 riverbank transect sites.

Comments on the Study

The Joint Commission requests that the Riverbank Erosion Study include a geotechnical slope stability analysis at each of the 20 riverbank transect sites selected in study 2. The Joint Commission does not say how TransCanada would utilize the data. TransCanada has not adopted the request saying it is premature. TransCanada believes that its proposed periodic meetings with the Erosion Working Group to solicit comments to strengthen data collection and analysis of erosion causes would be sufficient to meet information needs.

Discussion and Staff Recommendation

A geotechnical slope stability analysis is an intensive design study involving soil borings, soil laboratory strength testing, soil moisture testing, and installation of piezometers. Engineers typically perform geotechnical slope stability analyses for specific critical locations when the embankment must meet certain safety factor criteria; for example, embankments above highways or embankments forming containment dikes.

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Such an analysis could be useful in designing an embankment for a site-specific mitigation measure. However, because mitigation proposals and designs are premature at this stage of the licensing process, it is unclear how the requested information would inform potential license conditions (section 5.9(b)(5)).

Comparison between water elevation fluctuations and visual indicators of erosion

Applicant's Proposed Study

TransCanada does not propose to compare water level fluctuations caused by project operations with streambank elevations where there are visual signs of erosion to determine if there is a correlation.

Comments on the Study

NHDES requests that the study compare the water level fluctuations caused by project operations with elevations along the riverbank where there is a lack of vegetation, undercutting, or other visual signs of erosion and determine if there is a correlation. NHDES requests that TransCanada correlate visible indicators of erosion with project-caused water level fluctuations. TransCanada did not adopt the requested study modification saying that the study objectives already responds to this request.

Discussion and Staff Recommendation

Study 2 - Riverbank Transect Survey - already includes detailed and repeated topographic and photographic surveys and water level measurements at 20 transect sites. NHDES requested the analysis where there is a lack of vegetation, undercutting, or other visual signs of erosion, which based on information in the Lower Connecticut River Shoreline Survey prepared by Kleinschmidt for TransCanada, could be as many as 170 sites. Implementing the request for every such location would be very costly and would only provide nominally better information than if applied to a sample population. However, the requested correlation would provide information and would be useful to identify the causes of erosion (section 5.9(b)(5) and (6)). Besides water level fluctuations, other causes of erosion include land use practices, ground water seeps, gullies, and high flows. A stated objective of the study is to ascertain the likely causes of erosion at various locations. Project operations would be a likely cause of erosion where visible signs of erosion closely track project-caused water level fluctuations and TransCanada's proposed study would identify those sites and correlations. The 20 transects selected for study pursuant to study 2 should be representative of known reaches susceptible to erosion. The data and photographs necessary to perform NHDES' requested comparative analysis would already be collected at these locations as proposed by TransCanada and, therefore, the additional analysis would result in negligible additional increased cost to the study (section 5.9(b)(7)).

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As a result, we recommend modifying study 3 to correlate visible indicators of erosion with project-caused water level fluctuations at the 20 transect locations established by study 2. We anticipate that conducting this additional analysis for the 20 transects would increase the costs of the study by \$2,000 (section 5.9(b)(7)).

Study 4 - Hydraulic Modeling Study

Project operation affects river flows, velocities, and water levels within the reach of the Connecticut River extending from the Wilder impoundment to downstream of Vernon dam. Therefore, TransCanada proposes to describe the relationship between water levels and flows throughout the project reservoirs and affected downstream reaches by developing a HEC-RAS hydraulic model, and to provide information regarding specific relationships at key points of interest (econodes) for the Operations Modeling Study (study 5). TransCanada proposes to use the results of this study to support the assessment of project effects on several study areas including erosion, aquatic resources, terrestrial resources, and recreation.

Velocity Measurements, Calibration, and Verification

Applicant's Proposed Study

TransCanada proposes to collect calibration flow data (i.e., velocity) at transects to verify and validate the HEC-RAS model results.

Comments on the Study

NHDES notes that TransCanada's proposal is vague because it does not indicate the number or location of transects at which TransCanada would actually measure velocity for comparison to predicted velocities. Additionally, FWS requests TransCanada explicitly define the range of proposed calibration flows so FWS can assess the applicability of the HEC-RAS model.

Discussion and Staff Recommendation

Hydraulic conditions can vary dramatically at a given transect over a range of flows. A series of comparisons between modeled results and measured observations are necessary to verify model results (section 5.9(b)(6)). Therefore, we recommend TransCanada consult with NHDES and FWS to determine the appropriate number and locations of the velocity transects and the appropriate range of calibration flows. TransCanada should file, within 90-days of the date of this letter, and for Commission approval, the proposed transect locations and calibration flows along with any comments

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on the proposal by NHDES and FWS. If TransCanada does not adopt a recommendation, that filing should include TransCanada's reasons based on project-specific information.

The level of effort and cost of performing this analysis is reasonable (section 5.9(b)(7)). We estimate that this recommended study modification would cost approximately \$8,000.

Scenario Alternatives

Applicant's Proposed Study

TransCanada proposes to use the results from resource-specific studies to identify the need for and which operational scenarios to consider (including ramping rates) for model runs.

Comments on the Study

NHDES recommends that TransCanada include an iterative process for model development and requests that TransCanada evaluate all additional operational scenarios that result from the initial operational scenario model runs and at the agencies' request. The Watershed Council requests that TransCanada evaluate a sufficient number of operational scenarios to evaluate potential ramping rates.

Discussion and Staff Recommendation

Requiring TransCanada to conduct all operational model scenarios requested by stakeholders could result in extraordinary costs and may not provide any significant information to inform the development of license conditions (section 5.9(b)(5) and (7)). We note that year one of the study (2014) involves model development and calibration. TransCanada will refine the model and conduct model runs based on specific areas of interest identified in other resource studies in year two. Section 5.15 of the Commission's regulations requires TransCanada to file an initial study report no later than one year after the Commission's approval of the plan and hold a study plan meeting with participants to discuss the study results and the participant's proposals. This process will allow the participants to recommend specific model runs. Therefore, we do not recommend that TransCanada be required to model all requested operational scenarios and/or ramping rates.

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Geographic Scope

Applicant's Proposed Study

TransCanada proposes to describe the relationships among water levels and flows throughout the project reservoirs and affected downstream reaches extending approximately 1.5 miles downstream of Vernon dam.

Comments on the Study

The Joint Commission requests that TransCanada expand the study area out to the 500-year floodplain. The Joint Commission asserts that the proposed study is not capable of assessing the effects of the existing dams and their operations on a variety of floodplain resources.

TransCanada states that its proposed study would assess project operational effects on floodplain resources and inform various terrestrial studies where those resources exist in the project-affected area.

Discussion and Staff Recommendation

The Wilder, Bellows Falls, and Vernon Projects do not have a flood control storage capability and have no ability to alter the inundation area of large flood flows such as a 500-year flood. Therefore, there is no nexus between project operations and effects on the resource in question (section 5.9(b)(5)). Therefore, we do not recommend extending the scope of the study to the 500-year floodplain.

Study 5 - Operations Modeling Study

Project operations may affect river flows and water levels within the reach of the Connecticut River extending from the Wilder impoundment to downstream of Vernon dam. TransCanada would use the results of this study to assess project effects on several study aspects including erosion, aquatic resources, terrestrial resources, and recreation.

Inflow Dataset

Applicant's Proposed Study

TransCanada proposes to use a 5-year subset of a 30-year hydrologic record of inflows to evaluate hydrologic and hydraulic conditions under varying inflows and hydroelectric operations.

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Comments on the Study

NHDES, VANR, the Watershed Council, and The Nature Conservancy request that TransCanada conduct the operations modeling analysis using a longer-term hydrologic record than the proposed 5-year subset. At a minimum, NHDES, VANR, and The Nature Conservancy request that TransCanada provide an analysis to show that the 5-year subset of hydrologic inflows is representative of the longer-term period of record (30 years). Additionally, as part of that analysis, VANR and The Nature Conservancy request that TransCanada show why the operations model does not need to consider carry-over storage (multi-year droughts).

TransCanada states that a properly selected representative subset of the hydrology could provide the information on operational impacts and that its proposed 5-year subset provides a representative range of flow conditions both annually and seasonally. TransCanada believes the subset also represents a wide enough range of annual energy production and thus reflects its operational effects on the river regime. TransCanada states that any effects of annual differences or multi-year wet or dry conditions do not affect its three projects.

Discussion and Staff Recommendation

For some projects, a properly selected representative subset of the hydrology could provide information on operational effects. However, the study plan does not include an analysis that shows why TransCanada's 5-year representative hydrologic subset is appropriate for use in the model and how it is representative of the 30-year hydrologic record (section 5.9(b)(6)). The plan also lacks any analysis to show that annual differences or multi-year wet or dry conditions do not affect the operation of its three projects. Therefore, we recommend that TransCanada revise the study plan to include an analysis of the appropriateness of TransCanada's 5-year representative hydrologic subset (section 5.9(b)(6)). Along with showing how the selected years are representative of the longer hydrologic record, the analysis should document why carry-over storage does not need to be considered in the model. We estimate the cost of this analysis and updating the study plan to be \$5,000 to \$10,000 (section 5.9(b)(7)).

Study 27 - Floodplain, Wetland, Riparian, and Littoral Habitats Study

Project operations, including water level fluctuations and maintenance activities, may affect riparian, floodplain, wetland, and littoral habitats. Therefore, TransCanada proposes to provide baseline mapping and characterization of riparian, floodplain, wetland, and littoral vegetation and their habitats within the Wilder, Bellows Falls, and Vernon project-affected areas. In addition, to evaluate the potential effects of project operations (e.g., water level fluctuations) on these habitats, TransCanada proposes to use a combination of habitat mapping, field verification, analysis of wetland functions and

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values, and data obtained from other proposed studies of hydrology, erosion, and aquatic habitats.

Permanent Wetland Reference Sites

Applicant's Proposed Study

TransCanada does not propose to establish permanent wetland reference sites within and outside the zone influenced by the projects.

Comments on the Study

The Joint Commission requests that TransCanada establish permanent reference wetland sites in wetlands both within and outside the zone of influence of the project in various wetland classes (e.g., palustrine forested, scrub-shrub, and emergent) and that TransCanada delineate these areas according to the methodologies currently required by the U.S. Army Corps of Engineers (Corps). The Joint Commission suggests that TransCanada inventory species-richness and monitor changes in species-richness over time at these sites to assess whether project operations are degrading wetlands.

TransCanada does not agree with the Joint Commission that establishing permanent reference wetland sites is necessary in order to accomplish the goals of the study. TransCanada states that on a large system such as the Connecticut River, it is unrealistic to establish permanent reference wetland sites for several reasons: (1) few, if any, reaches of the river are not affected by water management; (2) the river changes character rapidly north and south of the project areas; and (3) the natural variability of any potential reference habitats would require a very large data set for effective comparisons to project habitats, which would be of limited value and at significant expense.

TransCanada notes that it does not need to delineate wetland boundaries as per the current Corps methodologies to verify cover types for baseline mapping, or for the effective evaluation of potential project effects. TransCanada also notes that much of the land is in private ownership, not TransCanada fee-owned land, and the cost of a jurisdictional delineation would be excessive relative to the minor additional information it would provide.

Discussion and Staff Recommendation

TransCanada could potentially use multiple, ecologically similar reference wetlands to compare changes in species-richness (i.e., the number of species in some area within a community) among project-affected and reference wetlands over time. It is

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unlikely, however, that TransCanada could identify suitable wetland reference sites that would allow the isolation of project-related effects from effects caused by other variables.

TransCanada's Floodplain, Wetland, Riparian, and Littoral Vegetation Habitats Study, in combination with the results of the Hydraulic Modeling (study 4) and Operations Modeling (study 5) studies, would provide adequate information to assess project effects, is consistent with generally accepted practice in the scientific community (section 5.9(b)(6)), would provide information regarding the existing environment that would inform the development of license requirements (section 5.9(b)(5)), and would provide an assessment of baseline conditions that could be used to monitor project-related effects in the future. Therefore, we do not recommend that TransCanada's Floodplain, Wetland, Riparian, and Littoral Vegetation Habitats Study include permanent wetland reference sites.

Study 28 - Fowler's Toad Survey

Water level fluctuations associated with project operations may affect the Fowler's toad (*Anaxyrus fowleri*) and its habitat. TransCanada proposes to conduct a survey to obtain baseline distribution and abundance data on Fowler's toad along the Connecticut River in the Bellows Falls and Vernon Project-affected areas. TransCanada proposes to obtain information regarding the distribution and condition of suitable habitat within the study area and assess whether project operations are likely to have an effect (positive or negative) on that habitat. TransCanada proposes to use standard call surveys supplemented with the use of wildlife acoustic recorders to identify and map the occurrence of Fowler's toad.

Inclusion of Wet Road Searches in Study Methods

Comments on the Study

VANR requests that TransCanada's study for Fowler's toad include wet road searches to increase the likelihood of detecting toads. VANR states that these wet road surveys would allow TransCanada to find Fowler's toads outside of their brief breeding period and away from breeding pools.

TransCanada does not agree that the study should use wet road surveys to increase the likelihood of detecting Fowler's toads. TransCanada indicates that it can conduct standard call surveys over a greater range of conditions and over a greater area more efficiently than wet road surveys.

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Discussion and Staff Recommendation

The use of wet road searches to increase the likelihood of detecting Fowler's toads in the survey area would expand the scope of the study but would not be necessary to meet study goals. Detections of toads along roads outside or distant from areas potentially affected by the project would not necessarily provide information that would help us understand how project operation and maintenance activities affects toads or inform license conditions (section 5.9(b)(5)). Surveying male breeding calls is an acceptable and accurate method to assess the presence of aggregating amphibian species, particularly those with distinctive, easy to detect calls like the Fowler's toad. The methodologies proposed by TransCanada to survey for Fowler's toads are consistent with generally accepted practice in the scientific community (section 5.9(b)(6))⁵ and would provide an adequate assessment of Fowler's toad distribution and condition of suitable habitat within the study area for purposes of our analysis of project effects. Therefore, we do not recommend that TransCanada's Fowler's Toad Study include wet road searches.

Study 30 - Recreation Facility Inventory and Use and Needs Assessment

TransCanada proposes to address recreation resource opportunities, uses, and needs for the project area using numerous approaches. These approaches include an inventory and condition assessment of existing project recreation areas, traffic counters and spot counts, on-site distribution of questionnaires to visitors, a mailed questionnaire to 2,400 residents of the seven counties adjacent to the projects, a needs assessment of providing additional public access, and a future-use assessment. On-site visitor monitoring (spot counts and questionnaire distribution) would occur from one-half hour after sunrise to one-half hour before sunset. TransCanada proposes to distribute questionnaires only to individuals at least 16 years of age.

⁵ Droege, S. and P. Eagle. 2005. Amphibian Calling Surveys. Pp. 314-319. In: Amphibian declines: the conservation status of United States species, M. Lannoo, ed. University of California Press.

Tupper, T.A., R.P. Cook, B.C. Timm, and A. Goodstine. 2007. Improving calling surveys for detecting Fowler's toad, *Bufo fowleri*, in southern New England, USA. *Applied Herpetology*. 4(3): 245-259.

North American Amphibian Monitoring Program. U.S. Geological Survey, Patuxent Wildlife Research Center.

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Survey Methodology

Applicant's Proposed Study

TransCanada proposes using on-site visitor questionnaires and a mailed questionnaire to 2,400 residents of the seven counties adjacent to the projects to assess recreation use and needs at the project.

Comments on the Study

NPS, New England FLOW, Appalachian Mountain Club, Vermont River Conservancy, Friends of the Connecticut Rivers Paddler's Trail, the Watershed Council, and American Whitewater state that there is a need to survey non-project recreationists using different methods than those proposed by TransCanada. The Watershed Council specifically mentions contacting retailers of outdoor recreation equipment. New England FLOW, Appalachian Mountain Club, Vermont River Conservancy, and Friends of the Connecticut Rivers Paddler's Trail suggest using focus groups and surveying members of non-governmental organizations (NGOs). NPS and American Whitewater also suggest surveying members of NGOs. Two Rivers recommends TransCanada offer an incentive, such as a gift (e.g., book or map providing information about recreating on the Connecticut River) to increase the number of returned mailed surveys.

TransCanada maintains that the objective of the study is to collect information for all types of recreational visitors and potential visitors by using the proposed methods. Specifically, TransCanada states that its proposed mail survey is an effort to extend sampling beyond the reach of interviews and spot counts as this survey could capture users that recreate during other times of the day or year when on-site sampling may not occur. TransCanada believes the mail survey eliminates potential bias compared to surveying a single user group. TransCanada believes that additional focus groups (outside of those conducted in the whitewater boating flow assessment [see study 31]) and contacts with canoe, rowing, and non-powerboat groups are not needed because the current methods are adequate to capture enough variety of project and non-project users.

Discussion and Staff Recommendation

The proposed study plan includes a reasonable methodology for sampling both on-site visitors and individuals whose use behavior and preferences are not likely to be captured by on-site sampling. The proposed method would consider a wider audience than on-site sampling alone, would survey members of the public that, due to proximity, are more likely to access the project, and would survey a wider group of users, including the non-users of TransCanada facilities of interest to the commenters. This method is consistent with generally accepted practices in the scientific community (section 5.9(b)(6)). Although offering an incentive such as a regional book or a map may

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encourage residents to return the mailed survey, we do not find it necessary. The proposed sample size should yield an appropriate number of returned surveys to inform decisions on recreation resource opportunities, uses, and needs for the project area.

While we may consider recreation and development plans from non-governmental agencies to use as existing information (section 5.9(b)(4)), we do not believe it is necessary to require additional direct surveying of non-governmental groups (section 5.9(b)(7)). However, stakeholder groups may distribute surveys to their own members and submit their findings and reports. Therefore, we do not recommend any additional sampling of on-site or non-project users not already included in TransCanada's revised study plan.

Recreation Demand Estimates

Applicant's Proposed Study

TransCanada proposes to study demand/future use for each project by assessing recreation activity trends and population trends to year 2050. The population trends would be at a local and regional scale, while recreation activity trends would be at a regional and national scale.

Comments on the Study

New England FLOW, Appalachian Mountain Club, Vermont River Conservancy, and Friends of the Connecticut Rivers Paddler's Trail question the use of national recreation trend data to estimate future use demand at the project. Specifically, commenters dispute the use of national recreation trend data to estimate future use at the project.

TransCanada states that its proposal reflects the most up-to-date literature on prediction of future use where available and cites its sources accordingly, including the Statewide Comprehensive Outdoor Recreation Plan. It also states that its method for projecting future use is consistent with current practices.

Discussion and Staff Recommendation

While the commenters question the proposed approach, these methods are a generally accepted practice for estimating recreational demand (section 5.9(b)(6)) and the sources TransCanada cites are appropriate sources of information on possible future use at the project. While this method would focus on national and regional trends, this information in conjunction with future study results in the revised study plan would give an understanding of both current and future regional and project-specific recreation trends. These methods and sources are a suitable basis for decisions when considering

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them in conjunction with other future study results in the revised study plan (section 5.9(b)(4)). This information would provide a broad understanding of the current recreational resources, the current recreational uses, possible future recreational uses, and possible area population growth. Therefore, we do not recommend modifications to future demand use methodology.

Whitewater Boating Demand Assessment Methodology

Applicant's Proposed Study

TransCanada proposes to collect information on whitewater recreational opportunities at the project by assessing the comparable quality of flows at both Sumner Falls/Hartland Rapids and the Bellows Falls bypassed reach (study 31) to other rivers in the region, distribute on-site questionnaires at Sumner Falls, and identify current whitewater recreation boating trends in the region using recreation trend data. TransCanada would also, in conjunction with the whitewater boating flow assessment (study 31), utilize existing information, such as guidebooks and the internet, to identify regional whitewater recreation opportunities.

Comments on the Study

American Whitewater states that onsite sampling at the project would not yield meaningful data on the extent of the public's interest in whitewater boating because existing conditions at the project(s) offer limited opportunities for whitewater boating. American Whitewater further states that one of the key objectives of this study – generally characterizing the whitewater-oriented recreational opportunities in the region – cannot be accomplished by the on-site and mailed survey because these methods would fail to target a sufficient number of whitewater boaters to draw any meaningful conclusion about the demand for whitewater boating at the project. Instead, American Whitewater and the Watershed Council request TransCanada sample nearby rivers with known popularity to capture use and preference information from whitewater boaters. In addition, American Whitewater requests that TransCanada reach out to boaters over the internet/social media, contact whitewater outfitters in the Northeast, and survey members of NGOs related to whitewater paddling.

TransCanada states the proposed study plan includes collecting survey data at Sumner Falls/Hartland Rapids during scheduled visits, but contends that the bulk of the relevant information on whitewater boating at the project would come from the whitewater boating flow assessment (study 31). Additionally, TransCanada states that it would be difficult to relate information obtained from users of other rivers to boating opportunities in the project- affected waters. However, TransCanada concurs with commenters that it is premature to assess demand for potential whitewater boating enhancements until defining the nature of the opportunity.

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Discussion and Staff Recommendation

Assessing demand for whitewater recreational opportunities when whitewater resources are limited is challenging. However, the information provided by the whitewater boating flow assessment (study 31), questionnaires distributed at Sumner Falls, current whitewater boating trends in the region, and regional whitewater recreation opportunities would provide a reasonable understanding of current recreational resources, the recreational potential of Sumner Falls/Hartland Rapids and the Bellows Falls bypassed reach, current recreational uses, and possible future recreational uses. Further, because the quality of Sumner Falls/Hartland Rapids and the Bellow Falls bypassed reach are unknown, surveying visitors at other rivers of known popularity and flow characteristics (e.g., Deerfield River) may not provide a viable comparison (section 5.9(b)(6)). Therefore, we do not recommend additional sampling at non-project facilities. We discuss other methods suggested by American Whitewater in the *Survey Methodology* section above.

Assessing Use, Preferences, and Demand for Through Paddlers

Applicant's Proposed Study

TransCanada proposes to distribute surveys at boating access points on the Connecticut River and at campsites used by through paddlers. TransCanada also proposes to inventory and assess the condition of campsites and portage trails as well as investigate the feasibility of providing a safer and shorter portage at Bellows Falls.

Comments on the Study

American Whitewater states that the licensee has no plans to survey through paddlers on the adequacy of the boat launch and portage trail at Bellow Falls.

Discussion and Staff Recommendation

By assessing the conditions of campsites and access points as well as distributing questionnaires at these locations, we believe the proposed methods represent a reasonable level of effort and cost (section 5.9(b)(7)) to adequately capture the use, demand, and preferences of through paddlers. Additionally, TransCanada proposes to investigate the feasibility of providing a safer and shorter portage at Bellows Falls. Therefore, we do not recommend modifications to the proposed study.

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Extend Sampling to a Two-Year Study

Applicant's Proposed Study

TransCanada proposes to conduct all recreation studies during the year 2014.

Comments on the Study

NPS states that the study data collection phase should extend to two years to allow for unique events (weather or economic conditions) that change from year to year.

Discussion and Staff Recommendation

The current method for sampling, which totals more than 50 days per zone (a total of five zones across the three projects) during the peak season alone, should be enough to account for variations that occur over the year (section 5.9(b)(6)). If anomalous conditions occur during the first year of study, then additional years of study could be required (section 5.15(d)(2)). Therefore, at this time, we do not recommend that TransCanada modify its study plan to be extended to two years.

Extend Hours of Sampling

Applicant's Proposed Study

TransCanada proposes to conduct survey sampling from one hour after sunrise to one hour before sunset.

Comments on the Study

NPS believes the on-site survey should be extended to one-half hour before sunrise and one-half hour after sunset to account for anglers who tend to put their boats in the water before sunrise and/or take out their boats after sunset.

TransCanada believes the study as proposed would capture anglers who are on the water before sunrise and come off the water after sunset. TransCanada further states that administering the questionnaire is preferable during or after the anglers' recreation experience is complete.

Discussion and Staff Recommendation

The questionnaire is designed as an exit survey, making surveying one-half hour before sunrise, as requested by NPS, less important. However, in the evenings after sunset, if anglers are actively recreating in a boat, administering the questionnaire prior to

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sunset as proposed, would not sample these recreationists. Therefore, to capture the visitor opinions of anglers that may be taking their boats out of the water at sunset or later, we recommend TransCanada extend sampling to one-half hour after sunset (section 5.9(b)(6)).

Accounting for Minors

Applicant's Proposed Study

TransCanada proposes to sample individuals as young as 16 years of age in their on-site survey.

Comments on the Study

NPS states that survey methods should better account for minors.

Discussion and Staff Recommendation

Directly sampling individuals below the age of 16 would not be necessary, as adults with children or chaperoning minors would naturally consider their opinions when responding to the questionnaire, regardless of any specific survey type or method. However, TransCanada should modify their Attachment 30-D, question 36 by changing the age ranges from 18-24 to 16-24 to account for individuals age 16 and 17 years of age.

Recommendations for Questionnaires

Applicant's Proposed Study

TransCanada attached the questionnaires for both the on-site and mailed survey as part of their revised study plan. The questionnaires access demographics, preferences, and user group types of visitors.

Comments on the Study

Appalachian Mountain Club, Vermont River Conservancy, and Friends of the Connecticut Rivers Paddler's Trail recommend adding questions to the mailed questionnaire about improvements that might result in more annual visits by recreation users. Further, they believe that the term "PROJECT," which is used when referencing the impoundments and TransCanada facilities for the on-site questionnaire, may be unclear to visitors.

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Discussion and Staff Recommendation

Question 3 in the mailed questionnaire is an open-ended question designed to capture a range of reasons participants may not visit the projects. If lack of facilities or improvement of facilities are reasons for participants not visiting the project, this question should capture that information. Additionally, TransCanada proposes to replace the term 'PROJECT' in the on-site questionnaire (a placeholder) with the name of the impoundment in question.

We note, however, based on our review of TransCanada's study plans, that the scales for all Likert-type questions are inconsistent between surveys. For some questions, higher levels of satisfaction do not correspond to higher numbers on Likert-type questions. To reduce confusion on the questionnaires, we recommend reversing the anchors for all Likert-type questions for both the on-site and mailed questionnaire, so that higher levels of satisfaction/ safety/appeal correspond to higher numbers. This would improve the accuracy for questionnaire respondents as well as be consistent with other project-specific surveys, making it easier to interpret the results (section 5.9(b)(6)).

Recreational Site Inventory Form

Applicant's Proposed Study

TransCanada attached the inventory form for inventorying and assessing facilities as part of their revised study plan. The inventory form catalogs the type and amount of amenities at a site, such as parking spaces and boat ramps.

Comments on the Study

Two Rivers recommends the recreational site inventory form include documentation of how many formal and informal campsites are located at a particular facility.

Discussion and Staff Recommendation

Although TransCanada proposes to inventory all project facilities, including campsites, and conduct a condition assessment of those facilities and recreation areas, we agree that documenting how many formal and informal campsites are located at a particular facility would inform future recreation management decisions at the project and potential license requirements (section 5.9(b)(6)). Therefore, we recommend TransCanada include the number and type (informal and formal) of campsites at each recreation facility, where appropriate.

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Spot Count Data Collection Form

Applicant's Proposed Study

TransCanada attached the spot count form for an assessment of the current use at the project as part of their revised study plan. The form catalogs how many people are recreating at the site and their recreational pursuit, vehicle license plate State, and number of vehicles and boat trailers.

Comments on the Study

Two Rivers recommends that TransCanada document the number of cars that are double-parked and/or not parked in a designated parking spot when performing spot counts in order to determine if parking is adequate to accommodate the number of users at the facility.

Discussion and Staff Recommendation

Documenting the number of cars double-parked and/or not in a designated parking spot at each facility will not only inform the need for additional access (i.e., parking spaces or a parking area) but will also help to inform whether or not a recreation facility is at, above, or below capacity (section 5.9(b)(6)). Therefore, we agree with Two Rivers and recommend that TransCanada document the number of cars double-parked and/or not in a designated spot due to overflow during the spot counts.

Facility Site Condition Evaluation Categories and Criteria

Applicant's Proposed Study

TransCanada attached the inventory form for inventorying and assessing facilities as part of their revised study plan. The form includes a quantitative assessment of the condition of facilities' amenities and characteristics, such as parking and building conditions.

Comments on the Study

Two Rivers recommends refining the facility site condition evaluation categories and criteria to determine which variables are the most important at each facility and which types of infrastructure (roads, building, amenities, etc.) should be repaired or replaced first. It further recommends that the scale used to determine the conditions of a particular site and the amount of rehabilitation or maintenance required be expanded to include "does not apply" or "not applicable" and a lengthier list of examples for each

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variable category (poor, fair, and good) in order for the facility assessment to be less subjective.

Discussion and Staff Recommendation

The variables listed in TransCanada's facility site condition evaluation categories are variables that are important for nearly all recreation sites. Identifying the most important variables at each facility and which types of infrastructure should be repaired or replaced first is more appropriate for a future general recreation management plan and beyond the scope of this study. The proposed study would gather information including the amount, types, and conditions of amenities, to inform this recreation management plan. The scale used to determine the conditions of each site allows for enough variation in scores per variable and composite scores to inform the overall condition of each site. Lengthening the scale would not make the assessment less subjective. However, every site may not contain all the variables listed in the facility site condition evaluation, and therefore, having a column to include "does not apply" or "not applicable" would be appropriate. Therefore, we recommend adding a "not applicable" column (section 5.9(b)(6)).

As mentioned above, with the Likert-type questions, the scoring scales for the condition assessment are also inconsistent. We also recommend that anchors for the condition assessment score for both the facility sites and visitor use impact monitoring be modified so that higher scores reflect better conditions.

Identification of Informal Access Areas

Applicant's Proposed Study

TransCanada attached the questionnaires for each survey type as part of their revised study plan. The questionnaire accesses demographics, preferences, and user group type of visitors.

Comments on the Study

Appalachian Mountain Club, Vermont River Conservancy, and Friends of the Connecticut Rivers Paddler's Trail recommend the on-site survey include a question asking visitors if they have ever used informal facilities along the river such as unimproved campsites or access points across private land that are not part of a recreation facility. This information could be used to identify locations for new campsites and access points.

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Discussion and Staff Recommendation

Question 18 of the on-site survey asks visitors about their satisfaction with the number of recreation facilities, without the label “formal” or “informal,” and with an open-ended, follow-up asking “*what additions, changes, or improvements would make you more satisfied?*” for specific details. Thus, question 18 addresses the concerns raised by stakeholders, and, therefore, we do not recommend adding an additional question.

Study 31 - Whitewater Boating Flow Assessment Bellows and Sumner Falls

TransCanada proposes to conduct a whitewater boating flow assessment for both the Bellows Falls bypassed reach and Sumner Falls⁶ by examining a set number of controlled releases, the magnitude of which would be based on interviews with boaters. The goal of the study is to assess the presence, quality, access, flow information, and flow ratings for paddling opportunities at both segments of the river. The study would proceed in a phased or step-wise manner. Each phase is designed to identify additional information with respect to study goals as well as inform the need for and direction of the next step. Interaction between stakeholders and TransCanada at each decision level is incorporated within the study.

TransCanada’s proposed assessment would also include a visual assessment of the bypassed reach under whitewater boating flow conditions and would evaluate how the fish barrier dam (and other potential hazards) may affect the bypassed reach as a recreational resource.

Fish Barrier Dam

Applicant's Proposed Study

This fish barrier dam is approximately .4 miles down the .7 mile bypassed reach at Bellow Falls. The fish barrier dam is a feature in the bypassed reach that may affect multiple resources including recreation and aquatic resources. TransCanada proposes several studies that are designed (both directly and indirectly) to consider the effects of the fish barrier dam on these resources. Once TransCanada completes its initial visual assessments of whitewater flows(study 31), they will progress in a step-wise manner and may assess whether or not the fish barrier dam is boatable at certain flows or determine that the fish barrier dam presents a danger to recreational boaters.

⁶ Sumner Falls is seven miles downstream of Wilder dam.

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Comments on the Study

American Whitewater, Appalachian Mountain Club, Vermont River Conservancy, and Friends of the Connecticut River Paddlers' Trail are concerned with the existing fish barrier dam in the Bellow Falls bypassed reach and its effect on potential recreational boating flows. These commenters recommend that TransCanada research and compile existing information about the purpose of the fish barrier dam. Appalachian Mountain Club, Vermont River Conservancy, and Friends of the Connecticut River Paddlers' Trail also suggest TransCanada create a subgroup to examine the possible benefits of removal, modification, and future uses of the fish barrier dam. American Whitewater requests that TransCanada investigate the feasibility of breaching or removing the dam.

TransCanada believes that the benefits and drawbacks, as well as feasibility (e.g., methods of removal, permits required) of removing the fish barrier dam should be considered only after the biological and recreational attributes of the bypassed reach have been examined. TransCanada does not believe a subgroup is needed to examine the benefits and drawbacks of removing the dam, because at this time there is no plan to remove the dam.

Discussion and Staff Recommendation

In addition to the method proposed in this study, TransCanada has proposed other studies that will directly or indirectly consider the existing effects of the fish barrier dam. These studies include aquatic habitat mapping of the bypassed reach (study 7), instream flow study (study 9), and telemetry shad monitoring below the fish barrier dam (study 21). TransCanada should compile all of the recreational and biological study information before it can address options for the fish barrier dam. Therefore, we conclude that examining any existing information about the original purpose of the fish barrier dam and developing a subgroup to examine the feasibility of removing or otherwise modifying the barrier dam is unnecessary at this time (section 5.9(b)(7)).

Number of Controlled Whitewater Releases Sumner Falls

Applicant's Proposed Study

TransCanada's proposal recommends three controlled releases at Sumner Falls.

Comments on the Study

Appalachian Mountain Club, Vermont River Conservancy, Friends of the Connecticut River Paddlers' Trail, and New England FLOW state that the number of controlled releases at Sumner Falls should be adjusted from the proposed three releases to

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a minimum of four or more, with the exact number of flows determined through interviews with local paddlers and study participants.

Discussion and Staff Recommendation

We agree with commenters that the exact number of controlled releases should be based on paddler interviews and not necessarily fixed at only three as proposed.

Therefore, it is premature to assess an exact number of controlled releases to be studied and thus we recommend the study assess at least three releases unless the interviews suggest the need for more (section 5.9(b)(6)).

Number of Controlled Whitewater Releases Bellows Falls

Applicant's Proposed Study

TransCanada proposes four controlled releases at Bellow Falls. The first of these flows is part of the 'single flow' release utilizing only two to four boaters, to be followed by (if necessary) the three flows in the 'flow comparison' phase of the study.

Comments on the Study

Appalachian Mountain Club, Vermont River Conservancy, Friends of the Connecticut River Paddlers' Trail, and New England FLOW state that TransCanada's three proposed controlled releases are not enough to determine acceptable and optimal release levels for recreational boating in the Bellows Falls bypassed reach. Commenters state that because there is no existing information on boating within the bypassed reach, three controlled flows would not inform the range of possible flow alternatives, including variable releases for different levels of expertise.

Discussion and Staff Recommendation

TransCanada is proposing four, not three, controlled releases as part of assessing the Bellow Falls bypassed reach for boating suitability.

As stated above, the exact number of controlled releases should be based on paddler interviews and not fixed now (section 5.9(b)(6)). Therefore, we recommend the study assess at least four controlled releases, as proposed, unless the interviews suggest the need for more.

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Number of Participants for Controlled Whitewater Releases

Applicant's Proposed Study

TransCanada's proposal recommends that 8-12 boaters will be used for the comparative flow study.

Comments on the Study

New England FLOW indicates that the number of proposed participants (8-12) is insufficient to cover the range of skill levels and types of craft that could be used to assess the minimum and optimal ranges of flow for both Sumner Falls and Bellows Falls. New England FLOW recommends a minimum of 12-15 participants.

Discussion and Staff Recommendation

The nature of the Sumner Falls and Bellows Falls reaches limits the type of watercraft that need to be assessed (e.g., rafts). Sumner Falls is a single rapid leading to a 'park and play' area. Bellows Falls is also short, difficult to access, may have additional resource concerns (i.e., cultural resources), and includes the fish barrier dam. Under these circumstances, a smaller number of boaters are appropriate to identify minimum and optimal flow ranges for both Sumner Falls and Bellow Falls. However, because minimum and optimal flow ranges are calculated using mean acceptability scores and may differ between types of crafts and level of experience as well as the possibility of participant attrition, it is important to have a viable sample size (section 5.9(b)(6)).

As a result, we recommend that TransCanada have at least 12 participants, which is in the range of TransCanada's proposal and New England FLOW's recommended range.

Whitewater Demand Assessment Methodology

A number of commenters, and TransCanada in response, made statements about assessing current and future demand for whitewater paddling. We address these comments above in the recreation facility inventory, use, and needs assessment (study 30): issue *Whitewater Boating Demand Assessment Methodology*.

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II. Studies Requested but not Adopted by TransCanada

In this section, we discuss our findings on studies requested by stakeholders that were not adopted by TransCanada. We base our findings on the study criteria outlined in the Commission's regulations [18 C.F.R. section 5.9(b)(1)-(7)].

Project Economic Impact Study

Study Request

The Joint Commissions requested a broad assessment of the economic benefits and costs of project operations on landowners, private businesses, municipalities, states, and TransCanada's shareholders including an analysis of the following: how project operations affect outdoor recreation, turbidity effects from erosion, and water quality. The Joint Commission says the study should also include project effects on property taxes, property valuation, and infrastructure along with the environmental effects.

TransCanada says that existing socioeconomics are described in the pre-application document and that there are no proposed changes to existing operations. Additionally, TransCanada says that in the event of any future proposed operation changes, economic impacts would be evaluated similarly to the effects on other environmental and public resources.

Discussion and Staff Recommendation

The proposed studies will assess direct project effects on a variety of resources to include recreation, erosion, and water quality. However, while we recognize that the existence and operation of the project has influenced the economy in the area, it is unclear to what extent the project's effects on the resources being studied can specifically be attributed to the much broader scope of the area's economy, nor has the Joint Commission proposed a methodology that would enable such as assessment (section 5.9(b)(1) and (6)).

In addition, the Joint Commission did not draw a connection between any proposed or likely changes in project operation and effects on local economies or how the study results would inform the development of license requirements (section 5.9(b)(5)).

Lastly, the Joint Commission estimates a moderate cost for the study yet the Joint Commission's proposed study includes several resources and would address many economic sectors--landowners, private businesses, municipalities, states, and TransCanada's shareholders – which could be an extremely costly study (section 5.9(b)(7)).

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In previous licensing decisions, the Commission has not favored cost benefit studies that attempt to compare changes in hydropower operations to both developmental and environmental resources in dollars. For developmental resources—power, irrigation, water supply, and flood control—we can usually calculate the economic cost of resource effects in dollars. However, for environmental resources, such as aquatic habitat, fish and wildlife, cultural, and aesthetic values, we have not attempted to assess potential effects in dollars and cents. For environmental resources, our approach is to qualitatively describe the effects of any hydropower proposal on both the resource and the public.

For the reasons discussed above, we do not recommend that TransCanada be required to develop the requested Project Economic Impact Study.

Whitewater Park Feasibility Study

Study Request

New England FLOW, American Whitewater, the Appalachian Mountain Club, NPS, Vermont River Conservancy, and Friends of the Connecticut River Paddlers' Trail request that TransCanada undertake a study of the feasibility of developing a whitewater park in the bypassed reach at Bellows Falls. American Whitewater asserts that this feasibility study should be conducted in conjunction with the whitewater boating flow assessment (study 31), because any river bed alterations would affect flow needs and preferences.

In response, TransCanada states that the concept of a whitewater park is a form of mitigation, not a study request, lacks a nexus between project operations and effects, and would not inform license conditions.

Discussion and Staff Recommendation

At this time, recreational boating flows, potential project effects, and the regional demand for whitewater recreation resources are not well understood. TransCanada's revised study plan includes studies to address these information gaps.⁷

It would be premature to devote resources (effort and cost) to assess the feasibility of a whitewater park without first understanding the need for flow-related license conditions that will be informed by TransCanada's proposed recreational studies (section 5.9(b)(4), (5), and (7)). It would be more appropriate to consider such a feasibility study

⁷ These studies include the recreation facility inventory, use, and needs assessment (study 30) and the whitewater boating flow assessment (study 31).

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after a need for the enhancement has been established and other options have been assessed.

Contingent Valuation Study

Study Request

American Whitewater, Appalachian Mountain Club, Vermont River Conservancy, Friends of the Connecticut River Paddlers' Trail, the Watershed Council, and New England FLOW request a contingent valuation (i.e., willingness to pay) study. The requesters, generally, argue that this study is needed to adequately assess the societal values of non-power social goods in contrast to the economics of power generation on an equal footing. While the stakeholders mainly address their concerns toward whitewater recreation, other issues including general recreation, aquatic resources, and aesthetic values are also mentioned.

TransCanada states that its proposed recreation facility inventory, use, and needs assessment (study 30) and whitewater boating flow assessment (study 31) will adequately define existing and potential opportunities for recreation. Additionally, TransCanada believes the contingent valuation study request lacks the required study methodology, level of effort, and cost, and the nexus for the study is based on pre-project conditions rather than existing project operations.

Discussion and Staff Recommendation

In general, non-power resources such as recreation, aquatic habitat, fish and wildlife, and aesthetics cannot be adequately evaluated by dollars and cents. Instead, we expect to take a more qualitative approach using the information from TransCanada's proposed recreation studies.⁸ Thus, the additional level of effort and cost needed to conduct a contingent valuation study is not needed as it would likely not inform a licensing decision.

⁸ See *Great Northern Paper, Inc.*, 85 FERC ¶ 61,316 (1998), *reconsideration_denied*, 86 FERC ¶ 61,184 (1999), *aff'd*, *CLF v. FERC*, 216 F.3d 41 (D.C. Cir. 2000); *Joseph M. Keating*, 42 FERC ¶ 61,030 (1988), *citing Namekegon Hydro Co.*, 12 FPC 203, 206 (1954), *aff'd*, *Namekegon Hydro Co. v. FPC*, 216 F.2d 509 (7th Cir. 1954) (when unique recreational or other environmental values are present such as here, the public interest cannot be evaluated adequately only by dollars and cents).

Project Numbers: 1892-026, 1855-045, 1904-073

B-31

Climate Change and Continued Project Operations

Study Request

The VANR, the Watershed Council, the Joint Commission, NHDES, and the FWS (requesting parties) requested that TransCanada study climate change as it relates to continued operation of the projects. The requesting parties state that the study would provide information on how any change in climate over the next 30-50 years would affect river temperature under both existing and any modified operation. The requesting parties also suggest that the study include climate effects on future high-flow events and the management of those events.

TransCanada states that such a study would not necessarily inform potential mitigation measures and would be cost prohibitive. Additionally, TransCanada says that the proposed study is unlikely to produce any additional information beyond the licensee's proposed studies.

Discussion and Staff Recommendation

The requesting parties seek a climate change study but do not propose a specific study methodology (section 5.9(b)(6)). We consider global climate models as too uncertain to rely upon for the development of license requirements, in accordance with section 5.9(b)(5), which requires a nexus between project operations and effects on the resource to be studied, and how the study results would inform the development of license requirements.

With regard to any future changes to the Connecticut River watershed, conventional hydrologic studies, monitoring techniques, and predictive models can effectively study and evaluate effects on environmental resources, and the Commission may address any unanticipated environmental effects through the Commission's standard reopener articles.

For the reasons discussed above, we do not recommend that TransCanada adopt the requested Climate Change and Continued Project Operations Study.

Project Numbers: 1892-026, 1855-045, 1904-073

APPENDIX C**LIST OF PROPOSED AND REQUESTED STUDIES THAT WE HAVE IDENTIFIED AS POTENTIALLY AFFECTED BY THE DECOMMISSIONING OF VERMONT YANKEE**

Study	Recommending Entities
6 -- Water Quality Monitoring and Continuous Temperature Monitoring	TransCanada
7 -- Aquatic Habitat Mapping	TransCanada
8 -- Channel Morphology and Benthic Habitat Study	TransCanada
9 -- Instream Flow Study	TransCanada
10 -- Fish Assemblage Study	TransCanada
11 -- American Eel Survey	TransCanada
12 -- Tessellated Darter Survey	TransCanada
13 -- Tributary and Backwater Area Fish Access and Habitats Study	TransCanada
14 -- Resident Fish Spawning in Impoundments Study	TransCanada
15 -- Resident Fish Spawning in Riverine Sections Study	TransCanada
16 -- Sea Lamprey Spawning Assessment	TransCanada
17 -- Upstream Passage of Riverine Fish Species Assessment	TransCanada
18 -- American Eel Upstream Passage Assessment	TransCanada
19 -- American Eel Downstream Passage Assessment	TransCanada
20 -- American Eel Downstream Migration Timing Assessment	TransCanada
21 -- American Shad Telemetry Study – Vernon	TransCanada
22 -- Downstream Migration of Juvenile American Shad - Vernon	TransCanada
23 -- Fish Impingement, Entrainment, and Survival Study	TransCanada
24 - Dwarf Wedgemussel (<i>Alasmidonta heterodon</i>) and Co-Occurring Mussel Study	TransCanada
25 -- Dragonfly and Damselfly Inventory and Assessment	TransCanada
New -- Vernon Hydroacoustic Study	FWS, NHFGD, VANR

Document Content(s)

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