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September 15, 2014

VIA ELECTRONIC FILING
Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

Re: TransCanada Hydro Northeast Inc.'s ILP Proposed Study Plan 34 – Vernon Hydroacoustic Study, Project No. 1904-073

Dear Secretary Bose:

TransCanada Hydro Northeast Inc. ("TransCanada") submits with this filing, its Proposed Study Plan 34 – Vernon Hydroacoustic Study, as required by the Federal Energy Regulatory Commission ("FERC" or "Commission")'s Study Plan Determination ("SPD") issued February 21, 2014.

TransCanada is the owner and licensee of the Wilder Hydroelectric Project (FERC No. 1892), the Bellows Falls Hydroelectric Project (FERC No. 1855), and the Vernon Hydroelectric Project (FERC No. 1904). The current licenses for these projects each expire on April 30, 2018. On October 31, 2012, TransCanada initiated the Integrated Licensing Process by filing with the Federal Energy Regulatory Commission ("FERC" or "Commission") its Notice of Intent to seek new licenses for each project, along with a separate Pre-Application Document ("PAD") for each project.

On April 16, 2013, based on study requests and stakeholder comments on the PAD, TransCanada filed its Proposed Study Plan pursuant to Section 5.11(a) of the Commission's regulations (18 C.F.R. § 5.11(a)), and on July 9, 2013, in response to comments on the Proposed Study Plan and study plan meetings, TransCanada filed an updated Proposed Study Plan. Both the Proposed Study Plan and the updated Proposed Study Plan included 33 individual studies. On August 14, 2013, TransCanada filed with the Commission its Revised Study Plan ("RSP"),

pursuant to Section 5.13(a) of the Commission's regulations, which reflected comments received during the study plan meetings and discussions, and the formal comments filed by stakeholders with the Commission. The RSP again included 33 individual studies and data collection efforts.

On February 21, 2014, FERC issued the SPD for aquatic studies[1] wherein it required a Vernon Hydroacoustic Study, a study that had not otherwise been requested under 18 C.F.R. § 5.9. The Director ordered TransCanada to develop a comprehensive hydroacoustic study for the Vernon Hydroelectric Project through consultation with U.S. Fish and Wildlife Service, Vermont Agency of Natural Resources, New Hampshire Fish and Game Department, and Commission staff, and to file the study with the Commission for approval when it files its initial study report in September 2014.

On March 24, 2014, TransCanada filed a Request for Rehearing challenging the inclusion of the new Vernon Hydroacoustic Study in the SPD. As stated more specifically in the Request for Rehearing, TransCanada has requested that the Commission remove the hydroacoustic study from the SPD because the inclusion of the study was in error, arbitrary and capricious, and unsupported by substantial evidence. TransCanada respectfully requested that the Commission on rehearing (i) find that the Vernon Hydroacoustic Study would not provide additional information useful to the Commission or state and federal mandatory conditioning agencies in order to craft license conditions for the Vernon Project, and (ii) because hydroacoustic technology is not a generally accepted practice within the scientific community to achieve the objectives stated in the SPD and because of the exponential increase in costs in exchange for limited information, eliminate the Vernon Hydroacoustic Study from the SPD.

On April 23, 2014 FERC issued an Order Granting Rehearing for Further Consideration. On June 19, 2014, TransCanada filed a motion for expedited action on its request for rehearing. On June 27, 2014, TransCanada filed a response to supplemental information placed into the record by FERC Staff regarding the use of hydroacoustic technology. On July 25, 2014, TransCanada filed a motion renewing its request for expedited action on its request for rehearing. TransCanada's Request for Rehearing is pending before the Commission.

[1] On August 27, 2013, Entergy announced 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. Operation of Vermont Yankee has influenced Connecticut River water temperatures within the Vernon reservoir and downstream since the plant went into operation in 1972. Because the baseline environmental condition will change after 2014, TransCanada's proposed aquatic studies may have produced data not reflective of baseline conditions if they were conducted while Vermont Yankee was still operating. Because of this unusual circumstance FERC issued two study plan determinations, one on September 13, 2013, for non-aquatic studies not impacted by the closure of Vermont Yankee and a second on February 21, 2014, for aquatic studies.

If there are any questions regarding the information provided in this filing or the process, please contact John Ragonese at 603-498-2851 or by emailing john_ragonese@transcanada.com.

Sincerely,

John L. Ragonese
FERC License Manager

Attachment: Proposed Study Plan 34 – Vernon Hydroacoustic Study

TRANSCANADA HYDRO NORTHEAST INC.

ILP Study 34

Vernon Hydroacoustic Study

Proposed Study Plan

September 15, 2014

In support of Federal Energy Regulatory Commission Relicensing of:

Vernon Hydroelectric Project (FERC Project No. 1904-073)

Prepared by:

Normandeau Associates, Inc.

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STUDY 34

PROPOSED VERNON HYDROACOUSTIC STUDY PLAN

RELEVANT STUDY REQUESTS

In its February 21, 2014, Study Plan Determination (SPD), the Federal Energy Regulatory Commission (FERC) requested TransCanada develop a 2-year hydroacoustic study (HA Study) through consultation with U.S. Fish and Wildlife Service (FWS), Vermont Agency of Natural Resources (VANR), New Hampshire Fish and Game Department (NHFGD), and FERC Staff to determine the timing, duration, and magnitude of the downstream migration of juvenile American shad and adult silver American eels at the Vernon Hydroelectric Project (FERC Project No. 1904-073) (Vernon Project). The SPD required TransCanada to consult with stakeholders and to develop a proposed study plan for implementation during the 2015 and 2016 field seasons. This proposed study plan is provided in response to the SPD. The consultation record includes materials presented at the meeting, a summary of the consultation meeting notes, and communication from FERC Staff related to the meeting (Attachment A). A responsiveness summary to written comments received from FWS following the consultation meeting, along with a copy of the comments are included in Attachment B.

The HA Study is the subject of a Request for Rehearing filed by TransCanada on March 24, 2014 (Attachment C). TransCanada maintains its objections to the HA Study for the reasons specified in its Request for Rehearing; the Request for Rehearing is attached for reference. Additional information was provided by TransCanada in its June 27, 2014, Response to Supplemental Information (Attachment D). Further communication with FERC relating to the Request for Rehearing is included in in Attachment E. FERC has not yet acted on the Request for Rehearing.

FERC describes its request for the HA Study as follows (page B-34 in the SPD):

> Project operations and facilities may affect downstream migrating silver phase American eel and adult and juvenile American shad populations in the Connecticut River. These potential effects include entrainment and turbine mortality, migratory delay, and passage route selection (section 5.9(b)(5)). FWS, NHFGD, VANR, and Trout Unlimited filed the same study request (*Impact of Vernon Project Operations on Downstream Migration of Juvenile American Shad)* to utilize hydroacoustic monitoring [emphasis added] of the juvenile shad outmigration, at the Vernon dam. As discussed above in section I [in Appendix B of the SPD], VANR also notes that the implementation of hydroacoustic monitoring could inform study 11- *American Eel Survey*, and VANR and NHFGD recommended a field component to support study 20 – *American Eel Downstream Migration Timing Assessment.*

In the SPD (page B-28 discussion of Study 22) FERC states:

> The request for the installation of a comprehensive hydroacoustic system at Vernon dam is also related to studies 11- *American Eel Survey*, 19 – *American Eel Downstream Passage Assessment*, and 20 – *American Eel Downstream Migration Timing Assessment*; as a result, we consider the requested study modification to be tantamount to a study request [emphasis added] that was not adopted by TransCanada..."

On page B-35 in the SPD, FERC further states:

> TransCanada's proposed study 22 to monitor juvenile shad out-migration would provide nearly all the information FWS requested with one exception: the project's effect on downstream migratory delay. Because the source of the radio-tagged shad is unknown and stresses associated with tagging, holding, and transport will occur, the radio-tagged shad may not be representative of their wild, untagged counterparts, and, therefore, may not be suitable to evaluate migratory delay as TransCanada asserts.

On page B-36 in the SPD, FERC concludes its discussion with this summary of the required HA Study:

> Therefore, TransCanada should develop a two-year hydroacoustic study through consultation with FWS, VANR, NHFGD, and Commission staff to determine the timing, duration, and magnitude of the downstream migration of juvenile American shad and adult silver American eels at the Vernon Project for implementation during the 2015 and 2016 field seasons.

TransCanada notes that stakeholders requested the use of hydroacoustic technology in Study 22 - Downstream Migration of Juvenile Shad at Vernon as a component of that study, which also includes passage route selection and turbine survival of tagged juvenile shad. No stakeholders submitted a request for a separate, comprehensive hydroacoustic study during the study request period that complied with the study criteria requirements in 18 Code of Federal Regulations (C.F.R.) § 5.9.

STUDY GOALS AND OBJECTIVES

FERC's stated study goals and objectives for the HA Study are to:

- Determine the timing, duration, and magnitude of the downstream migration of juvenile American shad and adult silver American eels at the Vernon Project.
- The study should assess the Project's effect on downstream migratory delay of juvenile shad.

RELEVANT JURISDICTIONAL AGENCY RESOURCE MANAGEMENT GOALS

As a separate study, this study was requested by FERC alone. As such, there are no relevant resource management goals of agencies or Indian Tribes with jurisdiction over the subject resources directly applicable to this study.

ASSOCIATION WITH OTHER STUDIES

This study is related to Study 22 – Downstream Migration of Juvenile American Shad at Vernon.

EXISTING INFORMATION AND NEED FOR ADDITIONAL INFORMATION

FERC states on page B-35 in the SPD:

> TransCanada's proposed study 22 to monitor juvenile shad out-migration would provide nearly all the information FWS requested with one exception: the project's effect on downstream migratory delay. Because the source of the radio-tagged shad is unknown and stresses associated with tagging, holding, and transport will occur, the radio-tagged shad may not be representative of their wild, untagged counterparts, and, therefore, may not be suitable to evaluate migratory delay as TransCanada asserts (section 5.9(b)(7)).

The source of radio-tagged fish is expected to be from a FWS hatchery in North Attleboro, Massachusetts, and the shad are expected to be of Connecticut River origin. Therefore, the shad will not be from "unknown" sources as FERC has suggested. It is assumed that the fish can be raised to sufficient size for tagging, which is estimated to be at least 110 millimeters (mm) in length. TransCanada is collaborating with FWS on a transport survival and dummy tagging test of juvenile shad currently being raised at the hatchery. FWS is raising fish this year to help determine whether they can grow shad up to or above the minimum size needed for tagging with a target length of 110 mm. The purpose of these tests is to develop proper transport, handling, and tagging procedures to reduce the risk of injury and mortality effects before Study 22 commences in 2015.

TransCanada continues to believe that Study 22 will provide the needed information on the timing, duration, magnitude, and residence time (i.e., migratory delay) of the downstream migration of juvenile American shad and their proportional passage route selection.

With regard to American eel, TransCanada believes that Study 19 will provide information on the timing, duration, and magnitude of the downstream migration as well as on residence time (i.e., migratory delay) for this species. FERC does not discuss any need for additional information from the requested hydroacoustic study, but simply states that such a study "could inform" the other eel studies (Studies 11,

19, and 20). However, the application of hydroacoustic technology to monitor eels is speculative at best because there are no widely accepted or used protocols for applying this technology to eels or adequate supporting studies that suggest any meaningful information on eels can be gained.

PROJECT NEXUS

The falls at Bellows Falls, Vermont, is recognized as the historical upstream limit of migration for American shad in the Connecticut River (Langdon et al., 2006). Spawning between Vernon dam and Bellows Falls dam is known based on the production of juvenile shad in the Vernon impoundment (e.g., Normandeau, 2013). Limited information is available regarding the overall effect of the Vernon Project on downstream migration of juvenile shad. Project operations may influence the downstream passage route selection, forebay residency time, and predation and mortality of juveniles during passage under varying flow conditions.

As described in the Pre-Application Documents (PADs) for the Wilder, Bellows Falls, and Vernon Projects, a limited number of American eels were \collected during sampling for the Fish Assemblage and Habitat Assessment of the Upper Connecticut River Study (Yoder et al., 2009). A single eel was collected from the Vernon impoundment upstream of Vernon dam. No eels were observed during sampling conducted within the Bellows Falls impoundment or upstream of Wilder dam. No eels have been collected since 2004 during Entergy's annual sampling in the vicinity of Vermont Yankee (Normandeau, 2012). However, as noted in the PAD for the Vernon Project, 262 immature American eels were documented moving upstream through the upstream fish ladder at the Vernon Project during 2012 (Lael Will, Vermont Fish and Wildlife, personal communication). Some information is available about the timing of downstream migration of American eel in the Connecticut River watershed and in other basins. Monitoring of the downstream bypass at the Holyoke dam (canal louver array) was performed in 2004 and 2005 (Kleinschmidt, Inc., 2005, 2006; Normandeau, 2007). Results of the 2004 study indicated outmigration occurred at night, between the hours of 1700 to 0400 with peak activity (70 percent) between the hours of 1900 to 2100. Most eels were collected between October 13 and November 7. In 2005, sampling occurred almost every night from October 5 through November 9. The nightly emigration activity occurred between the hours of 1900 and 2400.

However, as TransCanada notes throughout this study plan, the use of hydroacoustic technology to gather certain information on juvenile shad and adult eel is not supported as a generally accepted practice in the scientific community.

STUDY AREA AND STUDY SITES

The study area encompasses the Vernon Project forebay and downstream fish passage area.

METHODS

TransCanada proposes to use a calibrated split-beam echosounder system to monitor juvenile shad in the forebay in the vicinity of the downstream fishpipe, which is the primary downstream passage route for shad. This method (originally included in the Study 22 Revised Study Plan) will characterize the timing, duration, and relative abundance of the juvenile shad downstream migration. Placement of the single echosounding transducer will be selected to optimize detectability given beam geometry, acoustic, and physical conditions of the site, and where shad are expected to have the highest probability to occur regularly in highest abundance.

To confirm the presence of juvenile shad, visual observations will be made twice per week. In addition, a lift net will be used to sample fish in the forebay for size characterization. Monitoring will occur over 2 months, expected to begin in early to mid-September through October or mid-November. Monitoring will be triggered when river temperature decreases to approximately 19 degrees Celsius (°C) (O'Leary and Kynard, 1986) and be terminated when juvenile shad are no longer observed or the river temperature reaches 5°C, whichever occurs first.

To complement other methods in Study 22 (route selection via radio tagging and release of tagged fish within larger schools of wild fish, and turbine survival of balloon-tagged fish), echosounding with the split-beam transducer should provide the information needed to describe timing, duration, and relative abundance of juvenile American shad during out-migration observed near the entrance of the downstream fishpipe.

METHODS REQUESTED BUT NOT ADOPTED

Comprehensive Hydroacoustic Array: TransCanada maintains its objections to the HA Study for the reasons specified in its Request for Rehearing; the Request for Rehearing is attached as Attachment C for reference. TransCanada continues to believe that a comprehensive hydroacoustic array or system as requested by FERC is not needed to accomplish the goals and objectives of the study and that it will not serve to provide more reliable data to meet the goals and objectives identified by FERC: determine the timing, duration, and magnitude of the downstream migration of juvenile American shad and adult silver American eels and the Project's effect on downstream migratory delay of juvenile shad. This is primarily due to the fact that timing, duration, and relative magnitude of the juvenile shad outmigration can be effectively subsampled at less cost in a location where shad are expected to be present (i.e., a single echosounding transducer sampling juvenile shad passing through the downstream fishpipe). The other objectives of route selection and migratory delay are adequately addressed by Study 22's FERC-approved radiotelemetry methodology, which is the primary scientifically accepted technique for determining the individual fate of shad at high levels of certainty. Hydroacoustic indices are unable to provide such certainty. Therefore, FERC's request for a comprehensive hydroacoustic array does not demonstrate a need for this additional information (ILP study criterion 4).

Furthermore, characterizing the migratory delay of juvenile shad as requested by FERC, even in a qualitative manner, cannot be accomplished using a single hydroacoustic array because (1) it is unknown whether fish detected over time is the same fish or different fish; and (2) duration within the beam will not necessarily represent residence time and it cannot be compared to a reference residence time to assess whether time to pass is delayed or not. Migratory delay is generally referred to as excessive time to effectively pass through a project using a variety of conveyance structures. To quantify delay, three river-wide hydroacoustic arrays as well as a series of dam-mounted transducers would be required to estimate the transit time of matched peaks in relative indices of abundance between segments (an upstream control reach, forebay, and tailrace). This approach assumes there will be a high abundance of fish or migratory pulses of fish that allow for peaks to be detected above the background signal and the ability to match those from array to array. In contrast, radiotelemetry provides a direct measure of individually coded shad. This multiple-array hydroacoustic configuration is described for shad as "Plan B" in Appendix C of the Request for Rehearing (Attachment C) and would cost more than $3 million for a single year study and more than $6 million for a 2-year study (based on a 4-month monitoring season). Therefore, FERC's request for such a hydroacoustic study does not demonstrate a need for such a costly study and why the alternate Study 22 is insufficient to obtain the needed information at much lower cost (ILP study criterion 7).

Study 22 already includes radiotelemetry of juvenile shad, which will be released with hundreds of wild juveniles to facilitate typical schooling movement characteristics to provide information on forebay residency time (i.e., migratory delay) and proportional passage route selection. Radio-tag size has become smaller in recent years and is now suitable for juvenile American shad. This tool has been used with juvenile American shad for several other studies (e.g., recently on the Susquehanna River) (Normandeau and Gomez and Sullivan, 2012), and is consistent with generally accepted scientific practice for this purpose (ILP study criterion 6).

Hydroacoustic Monitoring for American Eels: FERC also requested hydroacoustics as a means to monitor downstream migrating silver phase adult American eels. However, TransCanada continues to believe that hydroacoustics is not consistent with generally accepted scientific practice for this purpose given the lack of peer-reviewed, published studies that demonstrate the successful use of hydroacoustics to monitor downstream migrating eels at a large hydropower dam. Based on the cited studies that FERC identified in the SPD, results from using this approach would likely be questionable, unreliable, and certainly far less reliable than the information to be obtained from the widely accepted method (radiotelemetry) in Study 19. Therefore, FERC's request does not meet the ILP study criterion 6. TransCanada, in its Request for Rehearing, described that the incremental design elements to attempt to monitor eels in the multi-array "Plan B" would add more than a million dollars annually to a study cost (i.e., "Plan C" in the Request for Rehearing). However, even the addition of a single, split-beam echosounding transducer to the proposed shad monitoring plan (at much lower incremental cost) will not provide scientifically supportable results for eels.

Two-Year Study: FERC requested a 2-year study because "adult American eels are strongly influenced by environmental conditions that vary significantly from year to year" (page B-35 of the SPD) and because a 2-year study is needed to "address the magnitude of the out-migrating adult American eel population" (page B-36 of the SPD). Environmental conditions are beyond the control of TransCanada and are not a result of normal project operations. A 2-year study would serve only to confound any results related to the magnitude of eel out-migration since each year may experience numerous different environmental conditions that could affect the run, primarily driven by precipitation, which is a strong trigger to eel out-migration (Haro, 2003). This would be further compounded by a small run size, which is anticipated at the Vernon Project.

Furthermore, FERC does not address why a 2-year study for juvenile shad would be needed. Therefore, FERC's request for a 2-year study does not demonstrate a need for such a costly study (for either shad or eel) or why the information in Study 19 (a 1-year study) is insufficient to obtain the needed information at much lower cost (ILP study criterion 7). TransCanada continues to believe that a 1-year study conducted in conjunction with radiotelemetry of shad in Study 22, rather than a 2-year study as requested by FERC, is appropriate. In addition, FWS in its September 4, 2014, comment email concurs with a 1-year study at this time (see Attachment B).

ANALYSIS

In this study, hydroacoustic data collected from the fishpipe area will be processed using industry-standard signal processing software to remove acoustic contributions of noise and other echoes from the echograms, and classify echoes consistent with juvenile shad size and behavior. Depending on the quality of the data and the abundance of fish, echo counting of tracked echo detections of juvenile shad-classified echoes, or of fish echo-integration derived fish densities will provide a relative index of juvenile shad abundance over time sufficient to describe timing, duration and within-season relative magnitude of the outmigration run.

CONSISTENCY WITH GENERALLY ACCEPTED SCIENTIFIC PRACTICE

The proposed study methodology, data collection, and analysis techniques to complete the study objectives are consistent with generally accepted practices with respect to the study objectives of monitoring the timing, duration, and relative abundance of cluepids (Simmonds and MacLennan 2005, Dunning and Gurshin 2012, Gurshin et al., in press).

DELIVERABLES

A report will be prepared that presents methods, analysis, and results of the study. A draft final study report will be provided after the study analysis is complete and the results are available. The report will be prepared for stakeholder review and comment. Stakeholder comments on the draft final report will be included in the final report with an explanation of any stakeholder comments not incorporated.

Results and conclusions will be reported in either the Preliminary Licensing Proposal (PLP) or Draft License Application (DLA) for the project. Exhibit E of the Final License Application will include modified results and conclusions, as appropriate, in response to stakeholder comments on the PLP or DLA.

SCHEDULE

This study will be conducted in the fall of the second study year (2015). The monitoring period is planned to extend from early September through October, although it could be shifted slightly later (e.g., similar to the FWS fall 2014 downstream passage schedule for juvenile shad on the Merrimack River in New Hampshire). A study report will be prepared after all field work and data analyses are completed.

LEVEL OF EFFORT AND COST

The preliminary estimated cost for this study is $135,000 to $165,000 to monitor juvenile shad for 2 months with a single split-beam echosounding transducer.

LITERATURE CITED

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ATTACHMENT A

August 26, 2014 Consultation Meeting Notes and Materials

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TransCanada

Hydroacoustics Consultation Meeting
August 26, 2014

Meeting Materials

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TransCanada Hydroacoustics Study Systems Cost Estimate
8/25/2014

	TransCanada Hydroacoustics Study Systems designed to meet Agency Stated Goals	# Arrays	Monitoring Duration	Target Fish	Field Labor and Expense (excludes diving costs)	Data processing, analysis, reporting	Hydro-acoustic Equipment and related	Imaging Sonar (DIDSON), Rotator	Ancillary Equipment and Costs	Total +/- 10%
1	**Proposed** - Single split-beam at fish pipe (part of Study 22). Total Study 22 cost = $360,000-$420,000	n/a	2 months	shad	20,000	33,000	60,000		20,000	**133,000**
2	**One single-level upstream array (2 months):** Equipment: # of transducer - 24. Ancillary Equipment includes generator power, fuel, software licenses and data storage, HTI support for installation of HA equipment. Field labor - longer mobilization and set-up, same frequency (weekly), more effort due to # of transducers, more data processing and analysis.	1	2 months	shad	146,000	156,000	196,000		32,000	**530,000**
3	**One single-level upstream array (4 months):** Equipment: # of transducer - 24; Ancillary Equipment includes generator power, fuel, software licenses and data storage, HTI support for installation of HA equipment. Field labor - longer mobilization and set-up, same frequency (weekly) over twice as long monitoring period. Data processing of twice as much data. Equipment rental and related costs for nearly twice as long.	1	4 months	shad	192,000	275,000	310,000		34,000	**811,000**
4	**Dam mounted single-level array w/ DIDSON & rotator:** Equipment: # of Didson/Rotators - 1; # of transducers - 15; Ancillary Equipment includes generator power, fuel, software licenses and data storage, HTI support for installation of HA equipment. Field labor - longer mobilization and set-up, same frequency (weekly) over twice as long monitoring period. Data processing of twice as much data and additional DIDSON processing and analysis. Equipment rental and related costs for nearly twice as long.	1 @ dam	4 months	shad	158,000	300,000	250,000	122,000	33,000	**863,000**

	TransCanada Hydroacoustics Study Systems designed to meet Agency Stated Goals	# Arrays	Monitoring Duration	Target Fish	Field Labor and Expense (excludes diving costs)	Data processing, analysis, reporting	Hydro-acoustic Equipment and related	Imaging Sonar (DIDSON), Rotator	Ancillary Equipment and Costs	Total +/- 10%
5	**Dam mounted bi-level array w/ DIDSON & rotator:** Equipment: # of Didson/Rotators - 1; # of transducers - 30; Ancillary Equipment includes generator power, fuel, software licenses and data storage, HTI support for installation of HA equipment. Field labor - longer mobilization and set-up, same frequency (weekly) over twice as long monitoring period. Data processing of twice as much data plus additional for processing and analysis for eel, and for DIDSON. Equipment rental and related costs for nearly twice as long.	1 @ dam	4 months	shad and eel	205,000	350,000	370,000	122,000	33,000	**1,080,000**
6	**One bi-level upstream array w/2 DIDSONS, no rotators:** Equipment: # of Didson - 2; # of transducers - 24; Ancillary Equipment includes generator power, fuel, software licenses and data storage, HTI support for installation of HA equipment. Field labor - longer mobilization and set-up, same frequency (weekly) over twice as long monitoring period. Data processing of twice as much data plus additional data analysis for eel and for DIDSON. Equipment rental and related costs for nearly twice as long.	1	4 months	shad and eel	192,000	350,000	310,000	118,000	33,000	**1,003,000**
7	**Three single-level arrays (2 months):** Equipment: # of transducer - 72; Ancillary Equipment includes generator power, fuel, software licenses and data storage, HTI support for installation of HA equipment. Field labor - longer mobilization and set-up for 3 arrays, same frequency (weekly) more effort due to more transducers.	3	2 months	shad	438,000	468,000	588,000		96,000	**1,590,000**
8	**Three single-level arrays (4 months):** Equipment: # of transducer - 72; Ancillary Equipment includes generator power, fuel, software licenses and data storage, HTI support for installation of HA equipment. Field labor - longer mobilization and set-up for 3 arrays, same frequency (weekly) more effort due to more transducers over twice as long, more data processing and analysis.	3	4 months	shad	576,000	729,000	930,000		102,000	**2,337,000**

	TransCanada Hydroacoustics Study Systems designed to meet Agency Stated Goals	# Arrays	Monitoring Duration	Target Fish	Field Labor and Expense (excludes diving costs)	Data processing, analysis, reporting	Hydro-acoustic Equipment and related	Imaging Sonar (DIDSON), Rotator	Ancillary Equipment and Costs	Total +/- 10%
9	**Three bi-level arrays w/2 DIDSONS on each array, no rotators**: Equipment: # of Didson - 6 # of transducer - 72; Ancillary Equipment includes generator power, fuel, software licenses and data storage, HTI support for installation of HA equipment. Field labor - longer mobilization and set-up for 3 arrays, same frequency (weekly) more effort due to more transducers over twice as long, more data processing and analysis.	3	4 months	shad and eel	588,000	1,050,000	930,000	354,000	102,000	**3,024,000**
10	**Dam mounted single-level array w/ DIDSON & rotator (4) PLUS Three single-level arrays (8) for 4 months.** **(Design to meet stated FERC Study requirement goals.)**	4 inc dam	4 months	shad	734,000	1,029,000	1,180,000	122,000	135,000	**3,200,000**
11	**Dam mounted bi-level array w/ DIDSON & rotator (5) PLUS Three bi-level arrays w/2 DIDSONS on each array (9), no rotators.** **(Design to meet stated FERC Study requirement goals.)**	4 inc dam	4 months	shad and eel	793,000	1,400,000	1,300,000	476,000	135,000	**4,104,000**

For both 10 and 11, there would be some modest savings in field labor/expense and ancillary equipment.

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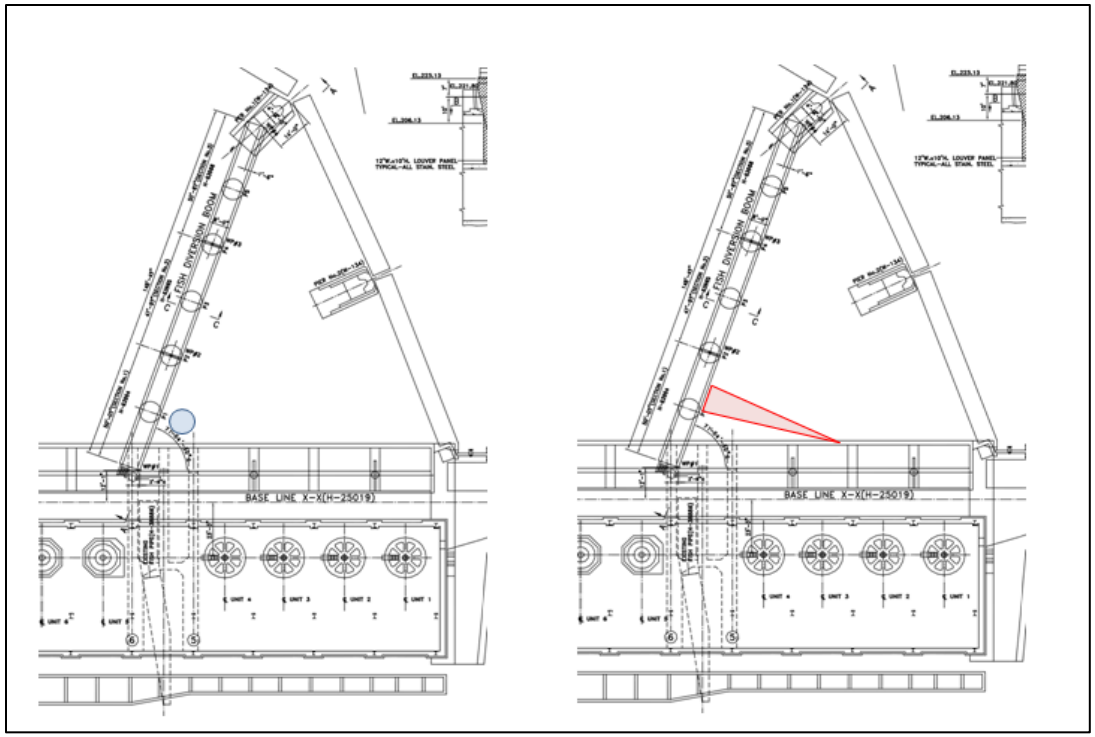
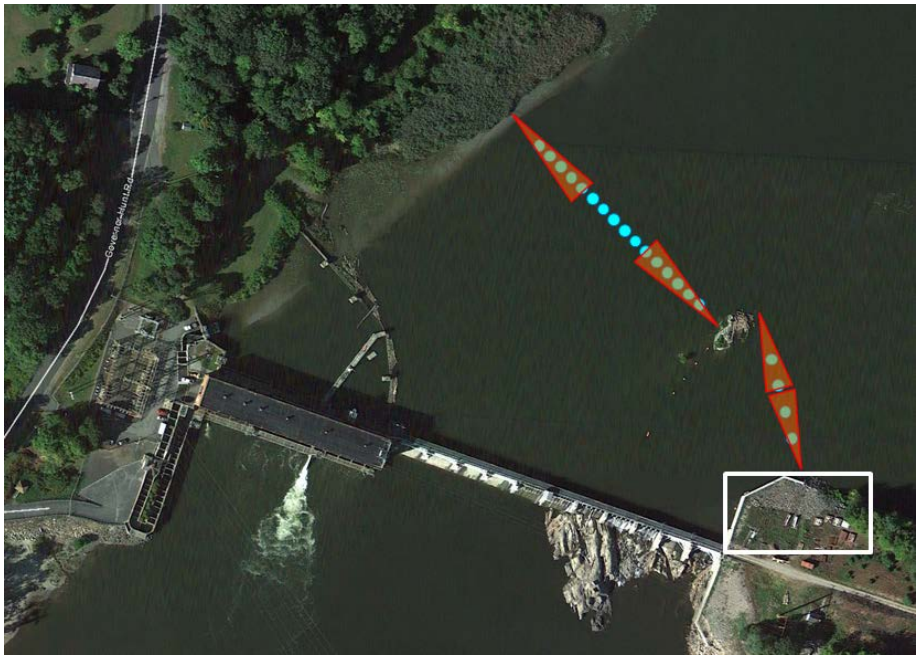
1) shad only:
Conceptual diagram of the location of single split-beam transducer (in white square) mounted to sample about 100% of the fish pipe entrance for monitoring the temporal pattern in relative abundance of out-migrating juvenile American shad at Vernon Dam.

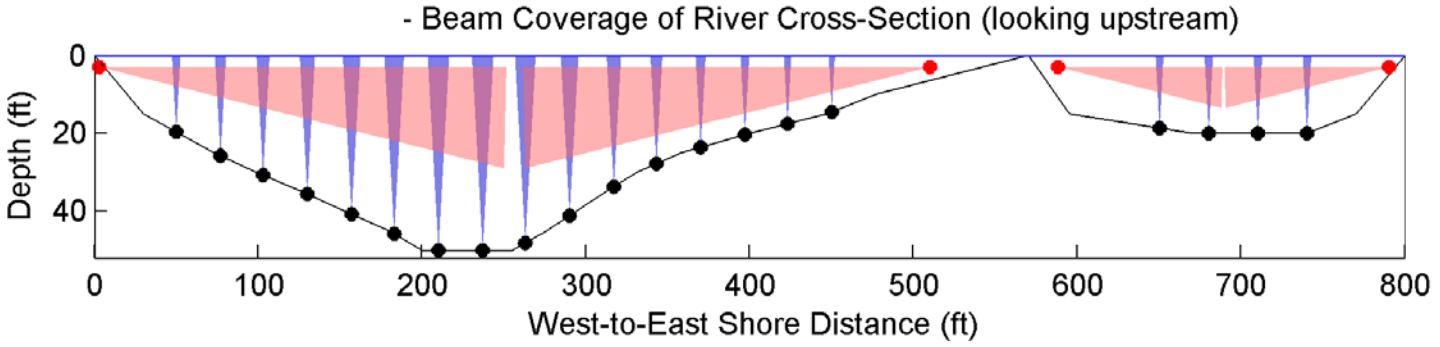
1) Beam geometry of two configurations depending on evaluation of site conditions. Left: blue circle showing a 10-ft wide beam footprint from a 15° split-beam transducer mounted near the bottom and aimed toward the surface. Right: red triangle represents the ideal beam cone shape from a 15° split-beam transducer mounted to the dam face and aimed horizontally near the fish pipe entrance.





2) and 3) shad only: Conceptual diagram. Cyan dots represent the 20 upward-looking split-beam transducers mounted onto the riverbed; Red triangles represent the conical beams of four horizontally aimed transducers pointing away from the shore slopes; the white rectangle delineates proposed area for an instrumentation shed and generator to support the study

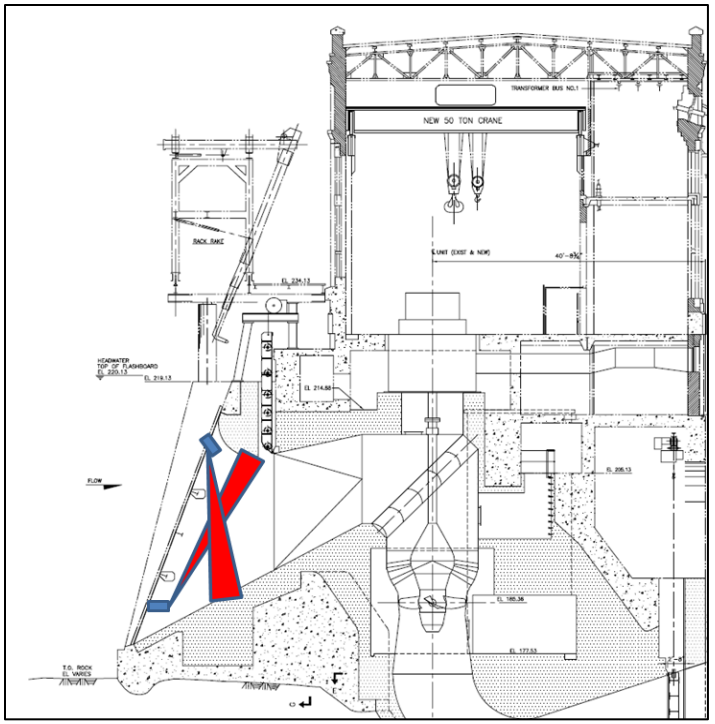
2) and 3): Beam geometry. Beams are mapped to scale but axis units are not to 1:1 scale to improve visualization. Blue cones represent upward-looking 15° split beam transducers and red cones represent side-looking 6° split beam transducers.



5) – shad and eel: Conceptual diagram of sampling configuration for Plan D. Cyan dots represent the upward-looking split-beam transducers at fish bypass, fish pipe, and trash sluice. Red triangle represent the conical beams of four horizontally aimed transducers pointing across opening to the two tainter gates; and blue bar represents the bank of 10 upward-looking and 10 downward-looking elliptical split-beam transducers mounted behind the trash racks.

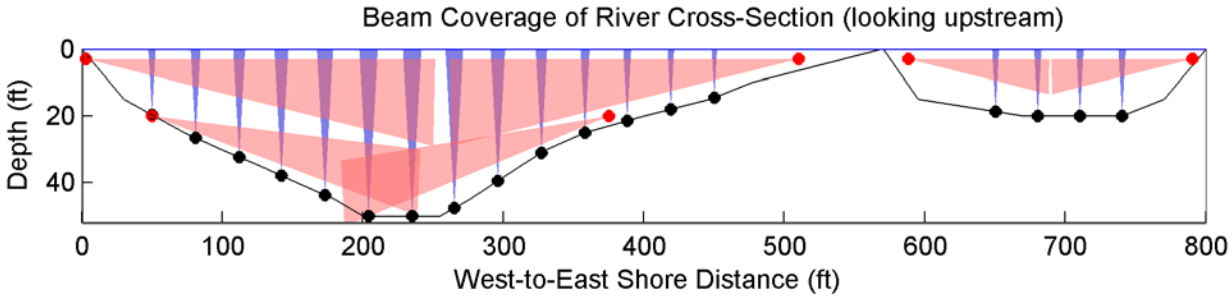
5): Example of an upward-looking (for shad) and downward-looking (for eel) transducer (200 kHz split-beam) mounted on pan-tilt rotators for adjusting to optimal sampling behind the trash racks

Note: Item 4) would have only upward looking transducers for shad monitoring.



6) –shad and eel: Similar to 2) and 3), but replace two of the upward-looking split-beam transducers with two horizontally aimed transducers to sample near the bottom of the center of the channel where eels are likely to prefer. Two horizontally-aimed imaging sonars would also be used to classify eels.
Cyan dots represent the 18 upward-looking split-beam transducers mounted onto the riverbed; Red triangles represent the conical beams of 6 horizontally aimed transducers pointing away from the shore slopes; green triangle represent imaging sonars; the white rectangle delineates proposed area for an instrumentation shed and generator to support the study

6): Blue cones represent upward-looking 15° split beam transducers and red cones represent side-looking 6° split beam transducers. Note: Imaging sonars would be aimed horizontally and co-located with the bottom centered horizontal transducers.



7) and 8) – shad only; and 9) – shad and eel: Replicates 2) and 3) at three sites – upstream, in the forebay, downstream. Red lines mark the transducer arrays . Exact locations may shift following site evaluations.

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TRANSCANADA HYDRO NORTHEAST INC.
HYDROACOUSTICS STUDY CONSULTATION MEETING
AUGUST 26, 2014 – WILDER, VT

Attendees:

USFWS: John Warner, Ken Sprankle (by phone)
NHFGD: Gabe Gries (by phone)
VTDEC: Eric Davis (by phone)
NHDES: Owen David
CRWC: David Deen
TC: John Ragonese
Normandeau: Dr. Chris Gurshin, Rick Simmons, Maryalice Fischer

FERC staff were invited to participate in the meeting, as required in the FERC Study Plan Determination, but FERC staff declined via email on August 14, 2014, stating "…because there is a pending rehearing request before us on this very study, we are unable to participate at this time according to the Commission's ex parte rules". A copy of that correspondence is included at the end of this Attachment A.

Meeting Purpose:

- FERC Study Plan Determination of February 21, 2014 required consultation with state and federal agencies prior to development of a study plan for a hydroacoustics (HA) study at Vernon.
- Provide the working group a better sense of the costs to implement various HA system layouts/configurations. TC wants to show how costs scale up rapidly for different configurations by showing 11 examples of HA configurations that were intended to various aspects of FERC's study goals and objectives..
- Discuss the similarities and differences between the FirstLight HA study goals, objectives and facility constraints and those at Vernon based upon the FERC study goals and objectives.

Background:

- In the Revised Study Plan, TC's original study plan 22 proposed to use a single beam HA transducer at the fish pipe for 2 months to study juvenile shad. The results of Study 22 would be analyzed in conjunction with other studies that assessed route selection and turbine survival of juvenile shad. FERC ordered TC to develop a 2-year HA study and to assess adult American eel to supplement other eel studies (studies 11, 19, 20). HA would be used in a 2-year study to evaluate magnitude, timing, duration and delay for both juvenile shad and adult eel.
- FERC has not acted on TC's rehearing request of March 24, 2014.
- TC has to comply with the determination order.

Discussion:

TransCanada presented a spreadsheet of 11 various configurations as well as plan view diagrams of how they could be deployed. A copy of these materials follows these meeting notes in this Attachment A.

FWS (Sprankle) wants to know the various routes of potential egress, and understand the trash gate. FWS is most interested in monitoring in front of the turbine trash racks (rather than behind) and the surface sluice gate, assuming it is the primary spill gate likely to be used.

TC (Ragonese) indicated that the trash gate /sluice is only opened to move trash, and not open all the time. The first spill gates to open are tainter gates 1 and 2, then the 8 subgates. Other spill gates are only opened as necessary if flows increase.

FWS (Sprankle) – this array (#2, #3) is too far upstream. FWS is interested in where the fish are closer to the dam, and when they are in front of the trash racks etc. Normandeau (Gurshin) referred to the study requests/comments and FWS's prior request. He noted that shad school tightly during the day, forming a mass so you can't distinguish the number of fish, particularly near intakes.

Gurshin: May see some individual fish movement on the periphery of the school but it is difficult to get a good estimate of abundance. The primary reason for the example configurations (#2, #3) was to get at magnitude. You also cannot see directionality with HA (are they moving up and down in the water column).

FWS (Sprankle) – if there is a mass of fish detected, and then they disappear from the echoes, FWS wants to understand where they went (e.g., through turbines, fish bypass etc.). FWS wants to use HA to put radio tagged fish into context and see if they are behaving in the same manner as wild fish. FWS notes that FirstLight will monitor/tag from 08/15 – end of October rather than TC's 2 or 4 month examples.

Ragonese – notes that upstream array configurations will not capture project delay.

Gurshin – notes that a dam mounted array – also won't answer question of project delay. HA behind trashracks is the same as the 2009 study but with split beam and rotators, different frequency (to cut down on noise, bubbles, etc.), and different beam angle shape (6 x 12^{o} elliptical) to optimize coverage and improve on the 2009 study. Use of DIDSON is so far the best way to distinguish eels from background.

Ragonese – to get at what TC thinks agencies want (timing, duration, delay and magnitude of the run) would require 3 arrays.

Gurshin – delay can be estimated via 3 arrays by tracking signal peaks (since you can't know if they are the same fish or not) and time delays. In telemetry you know when each fish arrives.

FWS (Sprankle). An array in front of the trash rack intakes to characterize when fish show up in forebay area and then directional movement into trashracks (via vertical positioning). FWS would be interested in that proposal. How long those targets remain in that area, where they move up/down etc.

Ragonese – to clarify, FWS is suggesting monitoring in front of racks. Shad and/or eel?

FWS (Sprankle) – FWS is interested in shad; FWS didn't talk about eels in their requests or comments.

NHFGD (Gries) - notes that NH is interested in eels.

FWS (Warner) – FWS wouldn't anticipate asking for a $4 or $8 million study. The question TC seems to be asking is, is configuration 11 (3 arrays plus dam array for shad and eel) what agencies really need.

FWS (Sprankle) – read from FWS rehearing comment letter of April 23, 2014 - FWS stepped back from the notion of 3 arrays in favor of a single array. Would prefer that array in front of the intakes. What can TC control in terms of operations?

Ragonese response – not much.

Ragonese – what exactly are agencies asking us to monitor? All gates/passage routes or just unit intake in forebay? What TC is showing for costs and configurations are examples not proposals or options just illustrations of how systems designed for the goals of the SPD affect cost. TC is looking for more clarity of what agencies want and need by showing different example configurations and their cost implications.

FWS (Warner) – will need some time internally to focus on what pieces FWS needs and get back to TC.

(NHFGD) Gries – agrees with Warner, it is difficult to say today what is needed.

NHDES (David) - question about using HA for eel, notes that FL is using it for that.

Gurshin – describes FWS study references in 04/23/14 letter (via table provided). Only 2 studies even included eels. For eels, HA is still R&D based. Gurshin has not come across peer-reviewed scientific studies that use fixed-location hydroacoustics to study timing, delay, duration, or magnitude of out-migration of juvenile shad at hydroelectric dams or any riverine site. There are a few examples of entrainment studies, and more for other herring species like threadfin shad, alewife, bluebacks.

Ragonese – questioned the agencies if TC is misreading the goals in either the SPD or have agencies changed their view on what is wanted. Is TC misunderstanding terminology or objectives?

Simmons/Gurshin – "magnitude" definition needs clarity. We understand the behavioral aspects as fish approach intakes. There is a big difference b/t relative abundance vs. absolute abundance.

FWS (Sprankle) – FWS wants relative abundance (equals magnitude in his view) over the run, with river/operational conditions, how fish were moving/milling and where (inside/outside of fish boom, etc.).

Ragonese - TC had defined magnitude as the scale/shape (e.g. the curve) of the run over the duration of the run.

FWS (Sprankle) – FWS criticism of study 22 was that HA at the fish pipe only would not be representative over all operations/flows.

Gurshin – Because juvenile shad school, echo counting would not provide a reliable abundance estimate. Instead, volume backscattering strength over time could be one relative measure of abundance. Other relative indices could include categorical data, low-medium-high, or percentages to characterize temporal and spatial distributions.

Ragonese – what about potential delay caused by the project, how to draw that out?

FWS (Sprankle) – from the literature, it seems that delay can be characterized by how targets move (with volume analysis) to get sense of size of school – when are the fish moving, when do they sound, when are they no longer within the zone of monitoring?

Gurshin – delay implies a unit of time (slower or longer than a reference). That is why configuration # 11 for instance would be needed to get an upstream sense prior to influence from the project as well as the downstream.

FWS (Sprankle) – assume tagged fish come down with wild fish, then compare rates of movement b/t tagged vs. wild fish. When does the group of wild fish sound? Why wouldn't you be able to discern that?

Ragonese – what is the sounding depth you have in mind? Sprankle –20 feet. Shad and the fish passage facilities are surface oriented. Fish height in water column depends on time of day among other things.

Ragonese - none of the forebay is deep except right in front of the intakes.

Gurshin – split beam HA will not be able to track movement of schools of fish between different potential routes/locations horizontally because you cannot track or discern schools from one beam to another. They will be passing through the single beam or not, but you won't know if it is the same school or not in each beam.

FWS (Warner) – want to identify fish behavior within operations.

Gurshin – putting transducers in front of racks to monitor behavior, there would be a question on relative magnitude data. A school could just stay within the HA beam for several days and look like a large migratory run, vs. a smaller school that keeps milling and passes the beam repeatedly.

FWS (Sprankle) – with horizontal and vertical beams, you can't get any directional information of targets?

Gurshin – Within a single beam, you can get some info on individuals on the periphery, and can get some phase info on a school and you can get some up/downstream and east/west, but only within an individual beam. You cannot piece together data from multiple transducers as that creates too much uncertainty. DIDSON (high frequency multi-beam sonar that produces video image) might get at some of that.

Gurshin – we could give you relative magnitude (high/low/medium).

FWS (Sprankle) – that is okay.

Ragonese – but is it worth the cost?

FWS (Sprankle) – it is definitely worth the cost along with the tagging, HA will help answer the questions of is the fish bypass working, which turbines are they using, etc. relative to wild fish

FWS (Sprankle) – is DIDSON more susceptible to turbidity than split-beam?

Gurshin (in response to questions from Ragonese) – DIDSON uses video rather than signal processing, but if there are high particulates and debris, range and quality of images can be affected. You would need more DIDSON units to provide coverage, and to account for reduced range from turbidity, other environmental conditions (e.g. wind, debris) as DIDSONs have a very narrow beam. Data processing would entail a lot more data than split beam, but you could compress the data, use image recognition software, etc., but at much higher cost.

Simmons – DIDSON could also identify and/or distinguish species in some cases at a certain distance.

Meeting Outcome:

FWS (Warner) – will review with Sprankle, may have some questions on technology, and will get back to TC.

CRWC (Deen) – requests that FWS to share that with others in the working group.

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From: Shana Murray [mailto:Shana.Murray@ferc.gov]
Sent: Thursday, August 14, 2014 4:56 PM
To: Jennifer Griffin; andrew.gast-bray@lebcity.com; bob@americanwhitewater.org; rstira@gdfsuezna.com; brett.battaglia@hdrinc.com; Brian Hanson; cfoss@nhaudubon.org; dclem@lymeproperties.com; ddeen@ctriver.org; Don Mason; dhjorth@louisberger.com; Doug Royer; Drew Trested; eric.davis@state.vt.us; ethan@biodrawversity.com; gabe.gries@wildlife.nh.gov; gregg.comstock@des.nh.gov; jeff.crocker@state.vt.us; McClammer@aol.com; john.howard@gdfsuezna.com; John Ragonese; john_warner@fws.gov; kkennedy@tnc.org; blackrivercleanup@yahoo.com; Kenneth Hogan; ken_sprankle@fws.gov; lael.will@state.vt.us; li@eurekasw.com; LRobinson@GEIConsultants.com; ldewald@entergy.com; mark.goodwin@lebcity.com; mwamser@gomezandsullivan.com; mary.mccann@hdrinc.com; Maryalice Fischer; matthew.carpenter@wildlife.nh.gov; mbutts@uvlsrpc.org; melissa_grader@fws.gov; michael.sears@hdrinc.com; michael.chelminski@stantec.com; Nicholas Ettema; nscormen@gmail.com; normansims1@gmail.com; owen.david@des.nh.gov; Rick Simmons; Robert.Mitchell@hdrinc.com; rod.wentworth@state.vt.us; sara.cavin@uvlt.org; Shawn Keniston; shelley.hadfield@lebcity.com; Stephen.Arnold@hdrinc.com; Steven Eggers; wendy@vermontjewel.com; tom.christopher@comcast.net; Thomas Payne; Chris Gurshin
Cc: Matt Buhyoff
Subject: RE: Scheduling Hydroacoustics Consultation Meeting

Good Afternoon Everyone,

We appreciate the invite to this Hydroacoustics consultation meeting. Unfortunately, because there is a pending rehearing request before us on this very study, we are unable to participate at this time according to the Commission's ex parte rules.

Shana

From: Jennifer Griffin <jennifer_griffin@transcanada.com>
Sent: Thursday, August 14, 2014 3:57 PM
To: andrew.gast-bray@lebcity.com; bob@americanwhitewater.org; rstira@gdfsuezna.com; brett.battaglia@hdrinc.com; bhanson@normandeau.com; cfoss@nhaudubon.org; dclem@lymeproperties.com; ddeen@ctriver.org; dmason@normandeau.com; dhjorth@louisberger.com; droyer@normandeau.com; dtrested@normandeau.com; eric.davis@state.vt.us; ethan@biodrawversity.com; gabe.gries@wildlife.nh.gov; gregg.comstock@des.nh.gov; jeff.crocker@state.vt.us; McClammer@aol.com; john.howard@gdfsuezna.com; John Ragonese; john_warner@fws.gov; kkennedy@tnc.org; blackrivercleanup@yahoo.com; Kenneth Hogan; ken_sprankle@fws.gov; lael.will@state.vt.us; li@eurekasw.com; LRobinson@GEIConsultants.com; ldewald@entergy.com; mark.goodwin@lebcity.com; mwamser@gomezandsullivan.com; mary.mccann@hdrinc.com; mfischer@normandeau.com; matthew.carpenter@wildlife.nh.gov; mbutts@uvlsrpc.org; melissa_grader@fws.gov; michael.sears@hdrinc.com; michael.chelminski@stantec.com; Nicholas Ettema; nscormen@gmail.com; normansims1@gmail.com; owen.david@des.nh.gov; rsimmons@normandeau.com; Robert.Mitchell@hdrinc.com; rod.wentworth@state.vt.us; sara.cavin@uvlt.org; Shawn Keniston; shelley.hadfield@lebcity.com; Stephen.Arnold@hdrinc.com; seggers@normandeau.com; wendy@vermontjewel.com; tom.christopher@comcast.net;

tpayne@normandeau.com; cgurshin@normandeau.com
Cc: Shana Murray; Matt Buhyoff
Subject: RE: Scheduling Hydroacoustics Consultation Meeting

Hi Everyone,

Thanks for hanging in there with us on this one. We've finalized the date for the Hydroacoustics meeting, Tuesday August 26th, 9:30 – 4:00 with a break from about 12:00 – 1:30 (USFWS staff have a conf. call), we'll provide pizza for lunch. The Fairfield Inn conference room is not available, but TransCanada's new office building has an available conference room. The new office (nick-named the ROC) is in Wilder, VT next to the old operations center and the Wilder Station, below is a Google Maps screen shot. The address is 255 Wilder Dam Road.

We have 2 WebEx call-in numbers for the meeting, one for the AM portion and one for the PM portion. The summarized information for calling in is here, the detailed information is below the Google Map.

Topic: Hydroacoustic Study Consultation AM portion
Date: Tuesday, August 26, 2014
Time: 9:30 am, Eastern Daylight Time (New York, GMT-04:00)
Meeting Number: 928 210 885
Meeting Password: Abcde12345

Topic: Hydroacoustic Study Consultation PM portion
Date: Tuesday, August 26, 2014
Time: 1:30 pm, Eastern Daylight Time (New York, GMT-04:00)
Meeting Number: 926 434 873
Meeting Password: Abcde12345

Please let me know if you have any questions.

Jen

ATTACHMENT B

Responsiveness Summary and Comments received from FWS

Hydroacoustics Responsiveness Summary

Written comments and questions on the Hydroacoustic Study were provided by John Warner of FWS via email on September 4, 2014. Those comments have been summarized here with TransCanada's (TC) responses to each. The FWS comment email follows this responsiveness summary in this Attachment B.

Comment	Response
Of the three options provided in Appendix C [of TC's March 24, 2014 Request for Rehearing, and "Option B" in Appendix C of that document], the Service recommends that TC pursue the methodology described in Option B, with the following modifications:	It should be noted that Appendix C of the Request for Rehearing did not include options for specific study proposals. Rather, the three "Plans" included therein were intended to provide examples of the types of configurations, equipment, information resulting, and extent of costs that would be required to implement hydroacoustics for the purposes defined in FERC's SPD. However "Plan B" in the rehearing request was limited to the study of juvenile shad, not also to American eel. Therefore, TransCanada infers that the FWS does not feel that American eel should be part of this study (FWS also verbalized this sentiment in the August 26, 2014 consultation meeting).
1. According to TC, the project spills infrequently during the outmigration period. When it does spill, inflow is beyond the control of the project. Based on this, the Service believes the forebay array does not need to cover all of the bays and gates along the dam (i.e., the array only needs to cover the project turbine intake area, the downstream bypass and the downstream fish pipe).	We agree that spillway portions and conveyance structures should not be monitored. Therefore TransCanada infers that the FWS is no longer concerned with or desires to examine behavior, route selection, or movement of shad or eel across the entire face of the dam using HA. These objectives will be assessed using radiotagging under Study 22.
2. We believe that the [study] may be completed in a single season, contingent (as with other studies) on whether any significant anomolous [sic] weather/flow/ops events compromise data.	We concur, and this one-year approach is in keeping with the schedules for all the other aquatics studies that could be affected by similar conditions outside of the control of TransCanada.
3. The study should run from August 15 through Nov 15.	We respectfully disagree with the need for a 3-month monitoring period. Juvenile American shad in the New England region typically begin downstream migration in mid-

Comment	Response
	September when water temperatures begin to drop below 20 C and their downstream movement is usually caused by a rain event. The downstream migration peaks around 15 C, which usually occurs in October. In Normandeau studies on the Merrimack River at Lowell and Lawrence dams, only handfuls of juvenile clupeids were captured during the mid-September period (NAI 1994a; NAI 1994b; NAI 1991). In these studies, the runs began in earnest in late September or early October and didn't peak until mid-October in most years. We also note that the 2014 FWS schedule for operation of the downstream bypasses on the Merrimack River for migrating juvenile shad and adult eels is September 15 through November 15. Therefore, we believe that a 2-month monitoring period (early September through October) is appropriate for this study, and is the same monitoring schedule in the FERC-approved Study 22.
4. After careful consideration, the Service believes that the most downstream array in Option B (downstream of Vernon Dam) can be excluded as having two full arrays (upstream of the dam and at the dam) should allow for an assessment of delay (Option B states: "the lag time between pulses (peaks) can provide inference on transit time or residency time at the population level...." which we understand to mean delay).	Based on discussions at the consultation meeting, we now understand that FWS is interested in relative magnitude rather than absolute magnitude. The multi-transducer array configurations are not necessary to characterize relative magnitude, and therefore our Study Plan 34 does not propose multi-array configurations. Our proposed Study Plan can reasonably estimate relative magnitude with a single split-beam echosounding transducer. Contrary to the FWS' suggestions at the consultation meeting, migratory delay cannot be assessed with an HA array. The FWS made the following statements at the consultation meeting: 1.) "*….a mass of fish detected, and then they disappear from the echoes…";* 2.) *"…delay can be characterized by how targets move (with volume analysis) to get sense of size of school – when are the fish moving, when do they sound, when are they no longer within the zone of monitoring…";* *3.)" …with horizontal and vertical beams, you can't get any directional information of*

Comment	Response
	targets?..." *4.) "…assume tagged fish come down with wild fish, then compare rates of movement between tagged vs. wild fish. When does the group of wild fish sound? Why wouldn't you be able to discern that?..."* However, as Normandeau stated at the consultation meeting prior to the receipt of this comment:, • Split beam HA will not be able to track movement of schools of fish between different potential routes/locations horizontally because you cannot track or discern schools from one beam to another. They will be passing through the single beam or not, you won't know if it is the same school or not in each beam. • If putting transducers in front of racks to monitor behavior, there would be a question on relative magnitude data. A school could just stay within the HA beam for several days and look like a large migratory run, vs. a smaller school that keeps milling and passes the beam repeatedly • Within a single beam, you can get some information on individuals on the periphery, and can get some phase information on a school, and you can get some up/downstream and east/west, but only within an individual beam. You cannot piece together data from multiple transducers as that creates too much uncertainty.
We believe that Option B, with the recommended modifications, will provide data that meets the objectives of determining timing, duration and magnitude of wild juvenile shad outmigration, assessing passage routes and delay, and relating migration characteristics to operational/environmental conditions.	TransCanada respectfully disagrees for all the reasons outlined in the consultation meeting summary, the above response to FWS comments, the Proposed Study Plan for Study 34 responding to FERC's SPD, and the Request for Rehearing. The FWS' recommended modifications to "Plan B" will not provide meaningful information on migratory delay that would be commensurate with the costs for such an approach. TransCanada estimates that the FWS recommended 3-month monitoring period for juvenile shad only, with what we understand

Comment	Response
	to be FWS's recommendation of one array located in the forebay upstream of the trash racks and one array covering the area inside the forebay including turbines, the fishpipe, and the fish bypass would cost approximately $900,000 to $1 million. This configuration is quite different from the "Plan B" configuration as noted above.

References:

Normandeau Associates (NAI). 1991. An assessment of the effectiveness of a fish bypass for passing juvenile alewives at the Lowell Hydroelectric Project, Lowell, MA. A report prepared for Consolidated Hydro, Inc., Andover, MA.

Normandeau Associates (NAI). 1994a. Use of the fish bypass at the Lawrence Hydroelectric Facility during fall 1993. A report prepared for Consolidated Hydro, Inc., Andover, MA.

Normandeau Associates (NAI). 1994b. Use of the fish bypass at the Lowell Hydroelectric Facility during fall 1993. A report prepared for Consolidated Hydro, Inc., Andover, MA.

From: Warner, John
To: John Pagonese
Cc: ddeen@ctriver.org; Drew Trested; gabe.gries@wildlife.nh.gov; gregg.comstock@des.nh.gov; jeff.crocker@state.vt.us; kkennedy@tnc.org; ken_sprankle@fws.gov; lael.will@state.vt.us; matthew.carpenter@wildlife.nh.gov; melissa_grader@fws.gov; owen.david@des.nh.gov; Rick Simmons; rod.wentworth@state.vt.us; Chris Gurshin; Robert Easton; Maryalice Fischer; Jennifer Griffin
Subject: Re: Scheduling Hydroacoustics Consultation Meeting
Date: Tuesday, September 09, 2014 11:59:42 AM

Hi John,

This message provides feedback to the August 26, 2014 conference call regarding the hydroacoustic study at Vernon:

BACKGROUND

1. FERC issued its SPD on February 21, 2014, requiring TC to develop, in consultation with FWS, VANR and NHFGD, a Vernon Hydroacoustic Study. The study plan and documentation of consultation was to be provided to FERC in the ISR due September 15, 2014.

2. TC requested that we participate in a conf. call to discuss the hydroacoustics study. The call was held on August 26, 2014. No materials were provided by TC ahead of time for the agencies to review. FWS, VANR (DEC staff) and NHFGD were on the call, as well as TC and Normandeau.

3. On the call/Webex meeting, TC presented a number of study designs in an Excel spreadsheet and requested feedback on the presented alternatives. When FWS stated that the agencies needed time to digest the info, TC responded that they were not presenting new information as they had provided these options in their rehearing request (dated March 24, 2014).

4. Subsequent to the August 26th conference call, FWS reviewed the rehearing request. Appendix C of their request contains study design options (but only three options, not the dozen or so that were discussed during the conference call): the original single beam at the d/s bypass, arrays at three river sites and at the dam for juvenile shad and arrays at three river sites and at the dam for both shad and eels.

5. The Appendix C options were never presented to the agencies as a study plan, nor did TC solicit our comments on those options. However, since TC must submit a study plan in the ISR, the Service herein provides comments on the options described in Appendix C of the rehearing request.

COMMENTS

Of the three options provided in Appendix C, the Service recommends that TC pursue the methodology described in Option B, with the following modifications:

1. According to TC, the project spills infrequently during the outmigration period. When it does spill, inflow is beyond the control of the project. Based on this, the Service believes the forebay array does not need to cover all of the bays and gates along the dam (i.e., the array only needs to cover the project turbine intake area, the downstream bypass and the downstream fish pipe).

2. We believe that the may be completed in a single season, contingent (as with other studies) on whether any significant anomolous weather/flow/ops events compromise data.

3. The study should run from August 15 through Nov 15.

4. After careful consideration, the Service believes that the most downstream array in Option B (downstream of Vernon Dam) can be excluded as having two full arrays (upstream of the dam and at the dam) should allow for an assessment of delay (Option B states: "the lag time between pulses (peaks) can provide inference on transit time or residency time at the population level...." which we understand to mean delay).

We believe that Option B, with the recommended modifications, will provide data that meets the objectives of determining timing, duration and magnitude of wild juvenile shad outmigration, assessing passage routes and delay, and relating migration characteristics to operational/environmental conditions.

We are available for further discussion of this matter as needed - Thank you -- JW

On Thu, Aug 14, 2014 at 3:57 PM, Jennifer Griffin <jennifer_griffin@transcanada.com> wrote:

> Hi Everyone,
>
> Thanks for hanging in there with us on this one. We've finalized the date for the Hydroacoustics meeting, Tuesday August 26th, 9:30 – 4:00 with a break from about 12:00 – 1:30 (USFWS staff have a conf. call), we'll provide pizza for lunch. The Fairfield Inn conference room is not available, but TransCanada's new office building has an available conference room. The new office (nick-named the ROC) is in Wilder, VT next to the old operations center and the Wilder Station, below is a Google Maps screen shot. The address is 255 Wilder Dam Road.
>
> We have 2 WebEx call-in numbers for the meeting, one for the AM portion and one for the PM portion. The summarized information for calling in is here, the detailed information is below the Google Map.
>
> Topic: Hydroacoustic Study Consultation AM portion
> Date: Tuesday, August 26, 2014
> Time: 9:30 am, Eastern Daylight Time (New York, GMT-04:00)
> Meeting Number: 928 210 885
> Meeting Password: Abcde12345
>
> Topic: Hydroacoustic Study Consultation PM portion
> Date: Tuesday, August 26, 2014
> Time: 1:30 pm, Eastern Daylight Time (New York, GMT-04:00)
> Meeting Number: 926 434 873
> Meeting Password: Abcde12345
>
> Please let me know if you have any questions.
>
> Jen

ATTACHMENT C

TransCanada Request for Rehearing

March 24, 2014

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

TransCanada Hydro Northeast Inc.	**)**	**Project No. 1892**
	)	**(Wilder)**
	)	**Project No. 1855**
	)	**(Bellows Falls)**
	)	**Project No. 1904**
	)	**(Vernon)**

REQUEST FOR REHEARING OF TRANSCANADA HYDRO NORTHEAST INC. OF STUDY PLAN DETERMINATION

Pursuant to Section 313(a) of the Federal Power Act ("FPA") (16 U.S.C. § 825*l*(a)) and Rule 713 of the Federal Energy Regulatory Commission's ("FERC" or "Commission") Rules of Practice and Procedure (18 C.F.R. § 385.713), TransCanada Hydro Northeast Inc. ("TransCanada"), licensee and potential applicant for new licenses for the Wilder Hydroelectric Project No. 1892 ("Wilder"), the Bellows Falls Hydroelectric Project No. 1855 ("Bellows Falls"), and the Vernon Hydroelectric Project No. 1904 ("Vernon") (collectively, "Projects") hereby requests rehearing of the Study Plan Determination for Aquatic Studies – Wilder, Bellows Falls and Vernon Hydroelectric Projects ("SPD") issued by the Commission's Director of the Office of Energy Projects ("Director") on February 21, 2014.[1]

As discussed herein, the Director's SPD required TransCanada to perform a "new study," the Vernon Hydroacoustic Study. The inclusion of this new study in the SPD was in error, arbitrary and capricious, and unsupported by substantial evidence. TransCanada respectfully requests that the Commission on rehearing (i) find that the Vernon Hydroacoustic

[1] Order No. 2002-A clarified that once the Director makes a study plan determination pursuant to 18 C.F.R. § 5.13(c), that determination may then be appealed to the Commission in a request for rehearing pursuant to Rule 713 of the Commission's Rules of Practice and Procedure (18 C.F.R. § 385.713). *Hydroelectric Licensing Under the Federal Power Act*, Order No. 2002-A, 106 FERC ¶ 61,037, at P 17 (2004). *See also Duke Power*, 117 FERC ¶ 61,303, at P 12 (2006).

Study would not provide additional information useful to the Commission or state and federal mandatory conditioning agencies in order to craft license conditions for the Vernon Project, and (ii) because hydroacoustic technology is not a generally accepted practice within the scientific community to achieve the objectives stated in the SPD and because of the exponential increase in costs in exchange for limited information, eliminate the Vernon Hydroacoustic Study from the SPD.

STATEMENT OF ISSUES

Pursuant to Rule 713(c) of the Commission's Rules of Practice and Procedure (18 C.F.R. § 713(c)), TransCanada states that the matter raised herein presents the following issue:

> Whether the Director acted arbitrarily and capriciously and contrary to the study criteria set forth in Section 5.9(b) of the Commission's regulations when he required TransCanada to develop and conduct the Vernon Hydroacoustic Study. 16 U.S.C. § 825*l*(b); 18 C.F.R. § 5.9(b)(1)-(7); *City of Centralia v. FERC*, 213 F.3d 742, 748 (D.C. Cir. 2000); *Bangor Hydro-Electric Co. v. FERC*, 78 F.3d 659, 663 (D.C. Cir. 1996).

BACKGROUND

The Wilder, Bellows Falls, and Vernon Projects are located on the Connecticut River in New Hampshire and Vermont. The current licenses for these projects expire on April 30, 2018. On October 31, 2012, TransCanada initiated the integrated licensing process ("ILP") pursuant to Part 5 of the Commission's regulations (18 C.F.R. Part 5) by submitting to FERC Notices of Intent ("NOI") to seek new licenses for these projects, and separate Pre-Application Documents ("PAD") for each project.[2] As part of the ILP, TransCanada is required to consult

[2] In addition to the NOIs and PADs filed by TransCanada for the Wilder, Bellows Falls, and Vernon Projects, FirstLight Hydro Generating Company ("FirstLight") is the licensee of the Turners Falls Hydroelectric Project No. 1889 and the Northfield Mountain Pumped Storage Project No. 2485, which are also located on the Connecticut River downstream of the Vernon Project, and filed a single NOI and PAD for its projects on October 31, 2012. The Commission's Scoping Document 1, issued on December 21, 2012, indicated its intent to prepare a single

with resource agencies, tribes, and other stakeholders to develop study plans and subsequently conduct studies that will serve to inform Commission staff's environmental analysis and, ultimately, the Commission's decision on whether and under what conditions to issue a license. The studies also provide information to resource agencies in considering terms and conditions for inclusion in any license.

Section 5.9(b) of the Commission's regulations requires that any study request from a stakeholder, including FERC and mandatory conditioning agencies, must address the following criteria ("Study Criteria"):

> (1) Describe the goals and objectives of each study proposal and the information to be obtained;
>
> (2) If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;
>
> (3) If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;
>
> (4) Describe existing information concerning the subject of the study proposal, and the need for additional information;
>
> (5) Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements;
>
> (6) Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge; and
>
> (7) Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs. 18 C.F.R. § 5.9(b).

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environmental impact statement for all five TransCanada and FirstLight projects located on the Connecticut River.

In Order No. 2002, the Final Rule promulgating these seven Study Criteria as Section 5.9(b) of the Commission's regulations, the Commission affirmed the following statement it had articulated in the Notice of Proposed Rulemaking regarding consideration of the Study Criteria:

> Our intention is that the criteria will be applied as a whole, so that *the mere fact that a study request can be related to an agency management goal will not ensure that the study is required to be conducted*. This necessarily implies that judgment calls will be made, and it is our intention that those calls be made in light of the principle that *the integrated licensing process should to the extent reasonably possible serve to establish an evidentiary record upon which the Commission and all agencies or tribes with mandatory conditioning can carry out their responsibilities*. We do not intend to second guess the appropriateness of agency or Tribal resource management goals, but must consider study requests based on those management goals in light of all applicable criteria, such as the "nexus" criteria, as well as the potential for conflict with important Commission policies, practices, or rules. Order No. 2002, at P 86 (citing NOPR, 102 FERC ¶ 61,185 (2003) (FERC Stats. & Regs. ¶ 32,568, at p. 34,705).

For studies proposed by the potential applicant in the Proposed Study Plan, the potential applicant must explain how each study satisfies the criteria enumerated in Section 5.11(d), which are substantially similar to the Study Criteria provided in Section 5.9(b), except that (2) and (3) from the Study Criteria above are replaced with a new (2) as follows: "Address any known resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied." *See* 18 C.F.R. § 5.11(d).

The Commission has also prepared *A Guide to Understanding and Applying the Integrated Licensing Process Study Criteria*, dated March 2012, to help stakeholders craft study requests that clearly identify and explain the basis of their information needs and recommended study methods ("Guidance"). The Guidance expressly states that "[t]he requested study methodology must be generally accepted in the scientific community *for the purpose for which it*

would be used." Guidance at p. 6 (emphasis added). With respect to Study Criteria No. 7 (level of effort and cost), the Guidance states as follows:

> Where alternative methods of obtaining the data have been proposed, it is important that the study proponent explain why the proposed alternative study methods would not be adequate to meet the stated study objectives. Where such information is lacking, it is difficult for the applicant, Commission staff, and other stakeholders to compare the level of effort and cost with the type and quality of the information that would be obtained under the various proposed methodologies. *Id.*

The Guidance further answers the question "How does FERC assign value to *increments* of information when determining why costs are reasonable or unreasonable?" with the following answer:

> Section 5.9(b)(7) *requires* that study requests consider the level of effort and cost of the study being requested and *why an alternative (less costly) study would not be sufficient to meet the information needs*. A study would not be rejected based on cost alone; rather, the decision is based on whether the information is needed and whether that information can be gathered in a more cost-effective manner.
>
> The cost of the study should be in line with the potential level of effect. For example, we would not require a million dollar study to determine a precise answer to a minor potential impact. If the cost of the study appears to be out of line with the magnitude of the potential impact based on available information, the Commission may rely on existing information to assess the effects and may or may not require measures based on that information. Guidance at p. 14-15 (emphasis added).

Pursuant to Section 5.9, TransCanada received study requests for information to assess the Projects' effects from interested stakeholders, including, as relevant here, the U.S. Department of the Interior's Fish and Wildlife Service ("FWS"), the New Hampshire Fish and

Game Department ("NHFGD"), and the Vermont Agency for Natural Resources ("VANR"). The FWS requested 21 studies, four of which are relevant to this request for rehearing:[3]

(1) A study to determine the impact of Vernon Project operations on the downstream migration of juvenile American shad, which the FWS, under the header "Methodology Consistent with Accepted Practice," states would be best studied by a combination of approaches, including hydroacoustics,[4] radio telemetry, and balloon tags. The FWS recognized that "new, very small radio tags make assessment of juvenile shad passage now achievable." The FWS further states that additional hydroacoustic assessment immediately upstream and downstream of the Vernon Dam for one year would provide information on the timing of migration to and through the area. The FWS does not discuss the level of effort required for hydroacoustic studies for these two purposes, and it estimates that the cost would be $150,000 for radio tagging, balloon tagging, and the multiple hydroacoustic arrays required to assess migration to and through the area of the Vernon Project. FWS March 1, 2013 Study Request at p. 60-61;

(2) An American eel survey conducted through a combination of electroshocking and eel pots. The FWS estimated that the effort would be 30 days for the electrofishing survey. The FWS did not provide an estimated cost but instead offered that a similar study in another relicensing proceeding that would require two nights was estimated to cost $25,000. *Id.* at p. 69;

(3) An evaluation of the timing of downstream migratory movements of American eels on the mainstem Connecticut River preferably by active trapping methods. The

[3] VANR and NHFGD filed study requests for the juvenile American shad downstream migration study and the three eel studies that were *identical* to the FWS' study requests. *See* VANR March 1, 2013 Study Request and NHFGD March 1, 2013 Study Request.

[4] A brief description of hydroacoustic technology generally and the types of hydroacoustic technology are provided in Appendix A.

FWS recognizes that "these methods are technically challenging on larger mainstem rivers." The FWS states that "[p]assive monitoring of migrant eels using hydroacoustic methods offers an alternative to active trapping. However, this form of passive monitoring requires verification of potential acoustic targets." The FWS offers that "[t]wo potential locations offer opportunities to conduct simultaneous passive and active sampling: the Cabot Station (Turners Falls Project) canal/forebay and the Holyoke Dam forebay and canal louver/bypass system." Neither of these locations is near the Vernon Dam. The FWS estimates that the level of effort would be moderate and the cost is estimated to be $50,000 per year. *Id.* at p. 78-79; and

(4) A downstream American eel passage assessment at the Vernon, Bellows Falls, and Wilder Projects using radio telemetry because, as the FWS recognized, radio telemetry is "an accepted technology that has been used for a number of studies associated with hydropower projects." The FWS expects that the level of effort would be moderate to high, and the cost is estimated to be $175,000 per year. *Id.* at p. 84, 87.

Based on the received study requests and stakeholder comments on the PAD, on April 16, 2013, TransCanada filed its Proposed Study Plan pursuant to Section 5.11(a) of the Commission's regulations (18 C.F.R. § 5.11(a)). The Proposed Study Plan explained each proposed study in the context of the Study Criteria, and with respect to study requests, identified each received study request, the study plan responsive to the study request, and the rationale for why a particular study was not adopted. The Proposed Study Plan included 33 studies, including, as relevant to this rehearing, four studies that aligned with the FWS' information needs related to American eel and juvenile American shad:

- Study 11 – American Eel Survey;
- Study 19 – American Eel Downstream Passage Assessment;
- Study 20 – American Eel Downstream Migration Timing Assessment; and

- Study 22 – Downstream Migration of Juvenile American Shad.

With respect to these studies, the Proposed Study Plan provided preliminary cost estimates based on the scope of the study requests and the proposed studies. In general, TransCanada adopted the methodology proposed by the resource agencies. However, with respect to Study 22 (Downstream Migration of Juvenile Shad), TransCanada proposed to use radio telemetry and HI-Z Turb'N Tag®, a balloon tagging method (hereinafter referred to as "balloon tagging"), but did not propose to use passive hydroacoustics, as had been requested by FWS, VANR, and NHFGD in their identical study requests. The Proposed Study Plan explained that the use of hydroacoustics has limitations, which are known based on a previous study conducted in 2009 by Normandeau Associates Inc. ("Vernon 2009 Study").[5] The objective of the Vernon 2009 Study was to estimate the proportional route selection of emigrating juvenile American shad through Vernon Dam's ten turbine units, the fish pipe, and the fish tube through fixed-aspect hydroacoustics placed behind the trashracks. Sixteen transducers were installed by divers to sample each turbine unit, the fish pipe, and the fish tube. The results of the Vernon 2009 Study were disappointing because the study was not able to provide information on proportional route selection among generating units and passage routes as was intended.

On July 9, 2013, in response to comments on the Proposed Study Plan and study plan meetings, TransCanada filed with the Commission an updated Proposed Study Plan. Again, TransCanada had not proposed to use hydroacoustic technology for any study. On July 15, 2013, the FWS provided comments on 20 studies proposed in the updated Proposed Study Plan, including Study 11 (American Eel Survey); Study 19 (American Eel Downstream Passage Assessment); Study 20 (American Eel Downstream Migration Timing Assessment); and Study

[5] Normandeau 2010. Route Selection of Emigrating Juvenile American Shad at the Vernon Project, 2009. Prepared for TransCanada Hydro Northeast Inc., Concord, NH.

22 (Downstream Migration of Juvenile American Shad). With respect to Study 11, Study 19, and Study 20, the FWS provided comments that did not mention or request the use of hydroacoustic technology as a methodology for the studies. With respect to Study 22, the July 15, 2013 FWS letter stated equivocally that "relying *solely* on radio-tagged juveniles and [balloon tagged] juveniles . . . may or may not represent the natural timing, duration, and magnitude of wild fish outmigration(s) and the operational/environmental conditions that are occurring in those periods of natural movement." Therefore, the FWS recommended use of hydroacoustics in the Vernon Dam forebay "to *quantitatively* determine timing, duration, and magnitude of the juvenile outmigration, which would provide important context to the limited number and release timeframe of radio-tagged juvenile fish releases." FWS July 15, 2013 letter at p. 13 (emphasis added). This appears to reflect a shift in the FWS' request for use of hydroacoustic technology from a multi-array proposal to assess residency (migratory delay) to a one-array proposal to assess the timing, duration, and magnitude of the juvenile outmigration. The FWS did not explain the rationale behind this shift.

The FWS' July 15, 2013 letter then recounted a dialogue between a hydroacoustic vendor and FWS staff regarding the 2009 Normandeau study:

> The May 23, 2013 meeting stimulated significant discussion on the topic of hydroacoustic evaluations used at Vernon in an unsuccessful juvenile shad study in 2009. The [FWS'] Connecticut River Coordinator has contacted Hydroacoustic Technology Incorporated (HTI), the company that provided the equipment for that study, and corresponded with the Bruce Ransom, the HTI Program Manager who recalled working with TransCanada's consultant on that project. Mr. Ransom noted that the 2009 study was restricted to a set-up with transducers located only behind the trash racks (due to the objective of determining entrainment into the turbine units), and utilized wide beam transducers that resulted in significant backscatter (noise). He further noted that the transducers were mounted on fixed, non-adjustable mounts that did not allow for transducer adjustment to

> achieve a cleaner signal. Mr. Ransom's email response included the following statements: "there are better ways to instrument and hydroacoustically monitor shad…at Vernon Dam;" "One could resolve passing juvenile shad in-turbine with the transducer array deployed at Vernon in 2009, although only in certain bands;" "The Vernon 2009 results aren't indicative of hydroacoustic sampling capabilities at the site;" and "*With a sufficient deployment and testing period, proper transducer selection and placement, and probably incorporation of rotators to refine optimal aiming angle post deployment, we feel that one could do a good job of monitoring downstream shad entrainment from behind the trash racks at Vernon Dam…*" these statements indicate that despite the disappointing results of the 2009 study, *properly deployed hydroacoustic transducers would provide quality data to address the study objectives*. We note that as part of their relicensing studies, FirstLight is proposing installation of hydroacoustic equipment at Cabot Station and the canal Gatehouse at the Turners Falls Project and at the Northfield Mountain Pumped Storage intake to assess juvenile shad outmigration. The goals and objectives of those studies are the same as the goals and objectives of this study at Vernon. *Id.* at 13 (emphasis added).

The FWS' July 15, 2013 letter gave no consideration of the level of effort and cost of the hydroacoustic array advertised by the hydroacoustic vendor, nor did it discuss the potential difficulties in analyzing the data, even if the most comprehensive array were developed.

On August 14, 2013, TransCanada filed with the Commission its Revised Study Plan ("RSP"), pursuant to Section 5.13(a) of the Commission's regulations, which reflected comments received during the study plan meetings and discussions, and the formal comments filed by stakeholders with the Commission. The RSP again included 33 individual studies and data collection efforts, and the four studies relevant to American eel and juvenile American shad referenced in this rehearing request. The specific objectives and estimated cost of the four studies are summarized in the table below.

Study No.	Study Name	Species	Study Objective	Estimated Cost
11	Eel Survey	American Eel	• Characterize the distribution of American eel in the project	$115,000

Study No.	Study Name	Species	Study Objective	Estimated Cost
			impoundments, riverine sections and the project-influenced portions of tributaries upstream of Wilder, Bellows Falls and Vernon dams; and • Characterize the relative abundance of American eel in the project impoundments, riverine sections and the project-influenced portions of tributaries upstream of the dams.	
19	Eel Downstream Passage Assessment	American Eel	• Quantify the movement rates, timing and relative proportion of silver eels passing through various routes at the projects including the turbines, the Bellows Falls bypassed reach, downstream passage facilities and spillways; and • Assess instantaneous and latent mortality and injury of silver eels passed through each turbine type.	$400,000-$450,000
20	Eel Downstream Migration Timing Assessment	American Eel	• Assess the timing of American eels migrating from the Connecticut River to their spawning grounds.	$30,000
22	Downstream Migration of Juvenile Shad	Juvenile Shad	• Assess the effects of project operations on the timing, route selection, migration rates, and survival of juvenile shad migrating past the project; • Characterize the proportion of juvenile shad using all possible passage routes at Vernon over the period of downstream migration under normal operating conditions; and • Conduct controlled turbine passage survival tests for juvenile shad passed through one of the older Francis units and one of the new Kaplan units to estimate the relative survival specific to those unit types.	$360,000-$420,000

With respect to Study 22, TransCanada's RSP proposed to use a single-beam hydroacoustic transducer located at the fish bypass to assess the timing of the juvenile shad migration. TransCanada estimated that Study 22, with the addition of the single-beam hydroacoustic transducer, would cost between $360,000 and $420,000 for one year.

On August 29, 2013, the FWS provided comments on five studies proposed in the RSP, including Study 22 (Downstream Migration of Juvenile American Shad). Regarding TransCanada's proposal to use a single-beam hydroacoustic transducer at the fish pipe to monitor the timing of the migration of juvenile shad, the FWS stated as follows:

> The Service believes the way to gain the most comprehensive understanding of the juvenile shad outmigration and its relationship to project operations and environmental conditions is to have transducers at *all possible passage routes* (i.e., intake, fish bypasses, spillway gates). A single transducer near the fish pipe may provide sufficient insight into the timing, duration and relative abundance of the run, assuming that passage through the fish pipe is indicative of passage through other potential routes. However, a single transducer directed towards the fish pipe will not allow for an *assessment of delay at the project*. In order to determine if outmigrants are delaying in the forebay area, [TransCanada] needs to install an array of transducers sufficient to get full coverage on either side of the upstream end of the louver. As currently proposed, juvenile shad could enter the forebay area and be there for an unknown period of time before proceeding through the fish pipe (or other passage routes). The additional coverage in the upper forebay (or upstream of the forebay) is needed to assess rate of movement through the forebay area and relate this movement to project operations. FWS August 29, 2013 letter at p. 4 (emphasis added).

In response to TransCanada's RSP, no other agency filed comments discussing hydroacoustic technology.

On November 26, 2013, FERC conducted a technical meeting for stakeholders to identify resource studies that may be affected by the closure of Entergy Vermont Yankee's nuclear plant ("Vermont Yankee"). Vermont Yankee discharges a thermal plume into the

Connecticut River above Vernon Dam, and it is anticipated that the closure of Vermont Yankee on December 29, 2014, would eliminate this thermal plume, thereby affecting the baseline conditions upon which to analyze the Vernon Project's effects on resources, the study schedule, and the scope of proposed studies.

At the meeting, an agenda prepared by FERC staff was distributed.[6] This agenda included a list of 20 of TransCanada's proposed studies, which FERC staff had identified as potentially affected by the closure of Vermont Yankee. The agenda included one "new" study, the Vernon Hydroacoustic Study, which the agenda identified as recommended by FWS, NHFGD, and VANR, even though no entity had filed a study request for a Vernon Hydroacoustic Study. Notwithstanding, at the technical conference, FERC staff stated: "I inadvertently included [the Vernon Hydroacoustic Study] as a stand-along study request, but it was really a modification to other studies." November 26, 2013 Technical Meeting Transcript at p. 71.[7] FERC staff further stated with respect to the Vernon Hydroacoustic Study:

> And like I said yesterday, the last study here not being – *is a requested study that was not adopted*. *My mistake was the way I incorporated it here*. But it is an issue that is in dispute.
>
> I wanted to make sure we discussed these components that maybe influence – *this could almost be a stand-alone study*. We're discussing them equally as if they were proposed or not proposed. *Id.* at p. 76-77 (emphasis added).

To be clear, a Vernon Hydroacoustic Study was *never* requested as a separate study.

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[6] The agenda for the November 26, 2013 technical meeting is provided in Appendix B. FERC staff emailed the agenda to stakeholders before the meeting and distributed the agenda at the meeting. The agenda is not docketed in FERC's eLibrary for any of the three Project proceedings.

[7] The transcript of the technical meeting regarding all three Projects is available in FERC's eLibrary only under Project No. 1892.

On December 31, 2013, TransCanada submitted revisions to the RSP based on discussions held at the November 26, 2013 technical meeting and on a December 18, 2013 conference call, and comments submitted in response to TransCanada's December 16, 2013, distribution via email of its proposed revisions. With respect to Studies 11, 19, 20, and 22, to ensure the baseline for evaluation of the Projects' effects reflect the actual baseline environmental conditions in the future, TransCanada and stakeholders agreed to delay initiation of all American eel and American shad studies until after the shutdown of Vermont Yankee.

On January 9, 2014, the FWS filed a brief letter with FERC to clarify the FWS' position with respect to the use of hydroacoustic technology as a method to evaluate the Vernon Project's potential impact on downstream juvenile shad migration. The FWS letter stated that it believes the use of a "comprehensive hydroacoustic array" is required to evaluate potential project operations and/or structural impacts to juvenile shad. The FWS indicated that its concerns are with respect to migration dynamics (*i.e.*, frequency, timing, and duration) that may be influenced by the Vernon Project. The FWS further stated that "hydroacoustics will be utilized to address the same objectives for potential juvenile shad impacts at both of FirstLight's projects . . . and [w]e believe it is important that similar approaches and techniques for American shad studies be used by [FirstLight and TransCanada] at their projects so that there can be consistent and comparative review. . . ."

As with its prior filings regarding use of hydroacoustics as a method to study juvenile shad, the FWS did not explain how a comprehensive hydroacoustics array as a methodology to study juvenile shad migration dynamics is consistent with generally accepted practice in the scientific community – as required by 18 C.F.R. § 5.9(b)(6) – except to repeat the sales pitch from the hydroacoustic vendor, Mr. Ransom, nor did FWS describe considerations of

level of effort and cost, or why any of TransCanada's proposed alternative studies would be insufficient to meet the FWS' information needs.

On January 10, 2014, TransCanada submitted a letter to FERC, in part, responding to the FWS' January 9, 2014 letter. TransCanada continued to contend that as proposed in its RSP, Study 22 will sufficiently meet the goals and objectives of the study. The January 10, 2014 letter also noted that the FWS had indicated differing objectives in Study 22 that a hydroacoustic array would help inform, and the wide range in costs associated with the FWS' loose terminology. For example, to conduct Study 22 with two hydroacoustic arrays – one above Vernon Dam and one below Vernon Dam – as requested in the FWS' March 1, 2013 study request, the total cost of Study 22 for one year would increase to between $1.6 and $1.7 million. TransCanada January 10, 2014 letter at p. 2. In contrast, the multiple-unit array of hydroacoustic transducers across all Vernon Dam passage routes (one array) was estimated to add an additional $530,000 to $600,000 to the existing cost of Study 22 for one year. *Id.* at p. 3.

On February 21, 2014, FERC issued the SPD for Aquatic Studies wherein it required a Vernon Hydroacoustic Study primarily associated with Study 22, but also as a component of Studies 11, 19, and 20. With respect to Study 11 (American Eel Survey), the Director required the installation of a hydroacoustic array at Vernon Dam in order to:

> provide data on the out-migrating population of adult American eel from above Vernon dam in an efficient and cost-effective manner because the study would be conducted at one key project location (Vernon dam) rather than the entire watershed upstream. Data provided by TransCanada's proposed study 18 – *American Eel Upstream Passage Assessment* along with data from study could be used to make some assumptions on the distribution and relative abundance of eels above each project. This information, when coupled with hydroacoustic data from Vernon dam, could be used to estimate the number of adult eel out-migrating past each project; thereby, supporting an analysis of the need for downstream fishways at each project (sections 5.9(b)(5), (6) and (7).

> For these reasons, we do not find it necessary to expand the geographic scope of study 11 – *American Eel Survey* to include tributaries to Connecticut River watershed or surveys for juvenile upstream migrating eels therein. SPD at B-16

With respect to Study 19 (American Eel Downstream Passage Assessment), the SPD adopted the study as proposed by TransCanada in its RSP, with the delay of the start of the study until after closure of the Vermont Yankee facility. Despite the fact that the Director does not discuss Study 19 in the SPD, the Director nonetheless effectively modified Study 19, without discussion or consideration of the Study Criteria, to require a comprehensive hydroacoustic array to gather information to be used to meet the objectives of Study 19.

With respect to Study 20 (American Eel Downstream Migration Timing Assessment), TransCanada proposed to conduct this study by reviewing available literature for the Connecticut River Basin and other rivers in the Northeast to characterize the general timing of the Connecticut River American eel downstream migration. NHFGS and VANR requested a field component to determine the migration timing of silver phase American eels. Specifically, NHFGD requested that fyke nets or other sampling methods be used at the mouth of upstream tributaries to obtain data. In response, the Director required TransCanada to develop and implement a comprehensive hydroacoustic study at Vernon Dam. The Director explained as follows:

> The resulting hydroacoustic data should be used to quantify and characterize the outmigration of silver phase American eels within the Connecticut River basin upstream of Vernon dam and would provide the information on the timing and magnitude of downstream American eel migration necessary to evaluate potential project effects on American eel and the need for protective license conditions (section 5.9(b)(5)) without the need for the requested and potentially costly fyke netting.
>
> Therefore, we recommend that the analysis of study 20 – *American Eel Downstream Migration Timing Assessment* incorporate the results of the Vernon Hydroacoustic Study. Because TransCanada

> proposes to utilize data from other on-going relicensing studies, it is unlikely this recommendation would result in any significant increase in cost to study 20 (section 5.9(b)(7)). SPD at B-27, B-28.

With respect to Study 22 (Downstream Migration of Juvenile American Shad), TransCanada's RSP proposed to include methods such as radio telemetry, balloon tags, and a single beam hydroacoustic transducer to monitor the downstream fish bypass at Vernon Dam, in response to agency requests. The Director did not substantively address Study 22 in the SPD, but instead requested a new Vernon Hydroacoustic Study. The Director characterized the stakeholders study requests as follows:

> Project operations and facilities may affect downstream migrating silver phase American eel and adult and juvenile American shad populations in the Connecticut River. These potential effects include entrainment and turbine mortality, migratory delay and route selection (section 5.9(b)(5)). SPD at B-28.

The Director stated that FWS, NHFGD, and VANR had filed the same study request to utilize hydroacoustic monitoring of the juvenile shad outmigration at the Vernon dam. The Director further stated that VANR also "notes" that the implementation of hydroacoustic monitoring could inform Study 11, and that VANR and NHFGD recommend a field component to support Study 20. SPD at B-27.

Thus, the Director ordered TransCanada to "develop a comprehensive hydroacoustic study for the Vernon Hydroelectric Project." The Director explained his reasoning as follows:

> TransCanada's proposed study 22 to monitor juvenile shad out-migration would provide nearly all the information FWS requested with one exception: the project's effect on downstream migratory delay. Because the source of radio-tagged shad is unknown and stresses associated with tagging, holding, and transport will occur, the radio-tagged shad may not be representative of their wild, untagged counterparts, and, therefore, may not be suitable to evaluate migratory delay as TransCanada asserts (section 5.9(b)(7)).

> Hydroacoustic data could also quantify and characterize the outmigration of silver phase American eels residing within the Connecticut River watershed upstream of the Vernon Project (sections 5.9(b)(6) and (7)). SPD at B-35.

In addition, because downstream migrations of adult American eels "are strongly influenced by environmental conditions which can vary significantly from year to year," SPD at B-35, the Director (citing section 5.9(b)(7)) ordered TransCanada to perform the Vernon Hydroacoustic Study for two years "to determine the timing, duration, and magnitude of the downstream migration of juvenile American shad and adult silver American eels at the Vernon Project." SPD at B-36.

The Director required TransCanada to file the Vernon Hydroacoustic Study with the Commission for approval when it files its initial study report in September 2014. The Director further required that the data generated from the Vernon Hydroacoustic Study be utilized in the analysis of Study 11, Study 19, Study 20, and Study 22. Finally, the Director stated the following with respect to the cost and level of effort required for the Vernon Hydroacoustic Study:

> Based on TransCanada's estimate, the development and implementation of this study would increase the cost of TransCanada's study plan by $530,000 to $600,000 but would provide significantly greater information on American eel population and their downstream migrations in the Connecticut River and on potential juvenile shad migration delays in the Vernon Project forebay (section 5.9(b)(7)). SPD at B-36.

DISCUSSION

Actions of the Commission must be supported by substantial evidence and must not be arbitrary or capricious. *See* § 313(b) of the Federal Power Act (16 U.S.C. § 825l(b)); *City of Centralia v. FERC*, 213 F.3d 742, 748 (D.C. Cir. 2000); *Bangor Hydro-Electric Co. v. FERC*, 78 F.3d 659, 663 (D.C. Cir. 1996). The Director's requirement in the SPD that TransCanada

develop and conduct the Vernon Hydroacoustic Study violated these requirements because it was arbitrary and capricious and not based on substantial evidence.

Specifically, the Director erred because:

- The use of hydroacoustic technology for the purpose of informing the objectives of Study 11 (American Eel Survey), Study 19 (American Eel Downstream Passage Assessment), Study 20 (American Eel Downstream Migration Timing Assessment), and Study 22 (Downstream Migration of Juvenile American Shad) is not generally-accepted in the scientific community;

- TransCanada's RSP proposed scientifically proven methodologies to study all objectives of Studies 11, 19, 20, and 22, and no stakeholder has demonstrated otherwise; and

- The estimated $8 million cost of the two-year Vernon Hydroacoustic Study (as described by the Director and the Director's uncritical reliance on the FWS' comments), as a single study would cost *more* than the current estimated cost of conducting *all* of the other 33 studies approved by the Director *combined*, which are estimated to cost approximately $6 million (an increase of more than 100 percent in the cost of studies).

TransCanada's proposed methodologies for conducting studies to gather information to determine the Projects' effects on juvenile American shad and American eel are based on proven scientific methods and would result in sufficient information at a reasonable cost to assess the Projects' effects on American eel and juvenile American shad in order for the mandatory conditioning agencies and FERC to craft appropriate license conditions. Therefore, the requirement to conduct a Vernon Hydroacoustic Study should be eliminated from the SPD.

I. The Director Erred in Requiring a Vernon Hydroacoustic Study

A. The Director Unilaterally Imposed a Compulsory Vernon Hydroacoustic Study Despite the Lack of Evidence in the Record that Any Stakeholder Requested a Stand-Alone Study or a Modification of the Four Studies Identified in the Vernon Hydroacoustic Study

There is no evidence in the record that *any* stakeholder requested a stand-alone Vernon Hydroacoustic Study. Notwithstanding, at the November 26, 2013 technical meeting conducted by FERC staff to identify *existing* resource studies presented in TransCanada's RSP

that may be affected by the closure of Vermont Yankee, FERC staff distributed an agenda that included for the first time a "*new* Vernon Hydroacoustic Study." In response to questions about this "new" study identified after TransCanada had submitted its RSP, FERC staff gave the following explanation:

> So the next item was kind of an error on my part in the study plan determination. It's the – We got requests for modification to TransCanada's studies to incorporate – to a number of TransCanada's movement studies to incorporate hydro-acoustics at Vernon. *I inadvertently included it as a stand-alone study request, but it was really a modification to other studies*. Transcript of November 26, 2013 Technical Meeting at p. 72.

At a minimum, based on this statement alone, the Director erred in requiring a stand-alone Vernon Hydroacoustic Study in the SPD.

The Director also erred in requiring the Vernon Hydroacoustic Study as a modification to the four other studies because, despite FERC staff's statement at the November 26, 2013 technical meeting that the presentation of a "new" study was in error, no stakeholder had submitted proposed modifications to TransCanada's Proposed Study Plan or Updated Proposed Study Plan with respect to hydroacoustics that addressed the Study Criteria, as required by Section 5.12 of the Commission's regulations. 18 C.F.R. § 5.12. In fact, as more particularly described with respect to each study below, only the FWS provided comments that even mentioned hydroacoustic technology, and these comments were provided only with respect to Study 22. Therefore, FERC staff had no basis for raising the issue of a "new" Vernon Hydroacoustic Study at this late stage of the study plan process. As described below, the Director also erred in modifying Study 22 to expand its existing hydroacoustic component.

Moreover, FERC staff did not present at the November 26, 2013 technical meeting nor in its SPD any discussion of the significant issues associated with a Vernon Hydroacoustic Study in the context of the Study Criteria, namely whether hydroacoustic

technology is the *only* available methodology to provide information for the development of license requirements; whether hydroacoustic technology is consistent with generally accepted practice in the scientific community for the purpose for which it would be used; and whether the exorbitant cost to conduct the Vernon Hydroacoustic Study is appropriate relative to the low value, incremental information to be gained. Therefore, the Vernon Hydroacoustic Study should be eliminated from the SPD.

B. The Director Grossly Misapplied TransCanada's Cost Estimates and Failed to Analyze the Incremental Value of the Low Quality Information Derived from Hydroacoustic Technology in Light of the Exorbitant Cost

In the SPD, the Director found that "the development and implementation of [the Vernon Hydroacoustic Study] would increase the cost of TransCanada's study plan by $530,000 to $600,000 but would provide *significantly greater information* on American eel population and their downstream migrations in the Connecticut River and on potential juvenile shad migration delays in the Vernon Project forebay." SPD at p. B-36. The Director is incorrect. The Director grossly underestimated the cost of such a study and grossly overestimated the value of the *incremental* information to be gained by the Vernon Hydroacoustic Study.

In the SPD, the Director incorrectly implies that a hydroacoustic array is a "one size fits all" tool that can be designed and installed once, and then used to collect data on various aspects of American eel and American shad behavior. On the contrary, the installation of a hydroacoustic array optimized to monitor juvenile shad in the Vernon forebay, as ordered by the Director, would not be useful for detecting eels during outmigration. Notwithstanding, in either case, the use of hydroacoustic technology for the purposes identified in the Director's Vernon Hydroacoustic Study would be very expensive.

Appendix C, attached hereto, provides three examples of hydroacoustic sampling plans to achieve the objectives of Studies 11, 19, 20, and 22, namely timing, duration,

magnitude, residency time, and route selection. Plan A in Appendix C is TransCanada's current proposal to use a single beam hydroacoustic transducer located at the fish pipe to assess the timing, duration, and relative magnitude of the juvenile shad migration. The *total* cost of Study 22, including radio tagging, balloon tagging, and the single beam hydroacoustic transducer, is estimated to be between $360,000 and $420,000. Plan B in Appendix C, which would only meet the objectives of Study 22 and would not target eels, is estimated to cost $2.93 million annually, or $5.86 million for two years. Plan C in Appendix C would assess the objectives of both the eel and juvenile shad studies and is estimated to cost $4.08 million annually or $8.16 million for two years.

In the SPD, the Director used estimated figures presented by TransCanada in its January 10, 2014 letter, wherein TransCanada estimated the cost of a *single* hydroacoustic array in the Vernon forebay for one year. The Director's use of these figures for the scope described in the Vernon Hydroacoustic Study for two years grossly misrepresented the costs of such a study, and was arbitrary and capricious. For this reason alone, the Director should eliminate the hydroacoustic study from the SPD.

The Director's further finding that use of hydroacoustic technology would provide "significantly greater information" on American eels and juvenile American shad is incorrect and unsubstantiated. In fact, the use of hydroacoustic technology for the purposes of assessing the objectives of Studies 11, 19, 20, and 22 is not a generally accepted practice in the scientific community. Hydroacoustic monitoring of outmigrating anguillid eels has not been well-documented (only two published studies exist on this topic), and there have been few applications of this technology. In fact, the Electric Power Research Institute ("EPRI") is *currently* soliciting proposals for a *pilot program and/or feasibility studies* to evaluate the

potential for using hydroacoustic arrays to monitor outmigrating silver American eels. This demonstrates the uncertainty of such a methodology in the scientific community. The Director should have considered the fact that hydroacoustic technology for monitoring eels is not a generally accepted practice within the scientific community. He failed to do so.

In addition, use of hydroacoustic technology to assess eel migration would be particularly ineffective at Vernon Dam because there are so few documented American eels in the Connecticut River watershed upstream of Vernon Dam. With these low numbers, it may be impossible to detect the eels, or the detections may be so few that the information will have little value. Except for a few eels detected in two small tributaries, there are *no* records of American eel since 1970 in the Connecticut River watershed between the West River (a tributary upstream of the Vernon Dam) and the Canadian Border. In addition, only 27 American eel were collected in the Vernon impoundment during a 21-year period from 1991 to 2011 as part of Vermont Yankee's annual monitoring. That same study collected only a single eel in the Vernon impoundment between 2000 and 2011.

Furthermore, the use of hydroacoustic technology to assess the residency time of juvenile American shad is not a generally-accepted practice in the scientific community. As explained below with respect to Study 22, residency is a behavioral characteristic exhibited by individual fish, which TransCanada will assess by radio tagging, a well-accepted practice in the scientific community for assessing residency.

The Director's assertion that a Vernon Hydroacoustic Study would result in "significantly greater information" with respect to American eel and juvenile American shad is incorrect, not supported by substantial evidence, and arbitrary and capricious. Moreover, there is no evidence in the record that the Vernon Hydroacoustic Study would provide incremental

information of reasonable quality. Given the exorbitant cost of the Vernon Hydroacoustic Study and the low-quality of any incremental information, the Director erred in requiring the Vernon Hydroacoustic Study. Therefore, it must be eliminated from the SPD.

C. The Director's Decision to Expand the Vernon Hydroacoustic Study to Two Years is Arbitrary and Capricious

The Director ordered that TransCanada conduct the Vernon Hydroacoustic Study for two years. The Director's *only* basis for this time period is a study that the Director cites for the proposition that "downstream migrations of adult American eel are strongly influenced by environmental conditions which can vary significantly from year to year." SPD at p. B-35. TransCanada agrees that the referenced study discusses environmental factors that may influence or trigger migration, primarily driven by precipitation. However, given the long residency times of eels prior to downstream migration (in some cases, decades), and the fact that not all silver eels may complete migration in a single year, it is unclear how a two-year study would more sufficiently address the magnitude of the outmigrating adult eel population than a one-year study. As previously noted, given the very small number of eels above Vernon Dam, the successful monitoring of such a small population would be difficult at best and perhaps impossible. Furthermore, the Director cited no basis for requiring a two-year Vernon Hydroacoustic Study for juvenile American shad.

The Director's imposition of a two-year study period for the Vernon Hydroacoustic Study is not based on substantial evidence in the record. Therefore, the Vernon Hydroacoustic Study must be eliminated from the SPD.

II. The Director Erred When He Modified Four Studies to Include the Vernon Hydroacoustic Study

A. Study 11 – American Eel Survey

The goal of Study 11 is to provide baseline data on the presence of American eel upstream of Vernon Dam in the project-affected areas of the Wilder, Bellows Falls, and Vernon Projects. The objectives of Study 11 are to characterize the *distribution* and *relative abundance* of American eel in the project impoundments, riverine sections, and the project-influenced portions of tributaries upstream of the Project dams. As proposed in the RSP, Study 11 would use electrofishing and eel traps and would include tributary sampling on a randomized subset of project-affected tributary reaches. TransCanada's preliminary estimate of the cost of this study, as proposed in the RSP, is $115,000.

In the SPD, the Director approved TransCanada's proposed Study 11 with modifications, one of which requires installation of a hydroacoustic array at Vernon Dam. Specifically, the Director concluded that installation of a hydroacoustic array *suggested by VANR* "would provide data on the out-migrating population of adult American eel from above Vernon dam in an efficient and cost-effective manner because the study would be conducted at one key project location (Vernon dam) rather than the entire watershed area upstream." SPD at B-16.

The requirement to install a hydroacoustic array to gather data for Study 11 is not based on substantial evidence in the record or a reasoned analysis of the Study Criteria and is therefore arbitrary and capricious.

As an initial matter, the Director mischaracterizes VANR's study request and comments on the updated Proposed Study Plan concerning hydroacoustics. VANR's study request stated that a combination of electroshocking and eel pots should be used to collect eels and determine catch rates. In its July 15, 2013 letter commenting on the updated Proposed Study

Plan, VANR's only objection to TransCanada's proposed Study 11 concerned the geographic extent of surveying upstream within the watershed, and VANR requested that the full Connecticut River watershed be surveyed. VANR even offered to collaborate with the licensee by using the electroshocking and eel pot methodologies, and offered that "if the licensee were to tag yellow eel and monitor within project-affected areas, [VANR] would be willing to take over and monitor and/or sample throughout tributaries or ponds." The July 15, 2013 letter concluded VANR's comments on Study 11 with the following statement: "Setting up Hydroacoustics array at Vernon would support this study, and *should be considered*." VANR July 15, 2013 letter at p. 12 (emphasis added). VANR did not include *any* discussion of the seven Study Criteria as they relate to use of hydroacoustics to gather information on the distribution and relative abundance of eels.

Because VANR's reference in the comment letter was only a suggestion to consider use of hydroacoustic technology, and was not a study request with discussion of the relevant Study Criteria (e.g., did not include discussions as to how this technology would support Study 11, the scientific validity of using hydroacoustic technology to achieve the objectives of Study 11, or the cost of a hydroacoustic array), TransCanada did not include a response to this request for consideration in its RSP. Likewise, VANR had not requested use of hydroacoustic technology in its March 1, 2013 study request. Notwithstanding, TransCanada did consider using hydroacoustic technology as part of Study 11 and ultimately rejected VANR's suggestion because of the high costs to install a hydroacoustic array relative to the low value of the data likely to be gathered on eels. The record includes no other discussion or mention of using a hydroacoustic array as a component of Study 11 by agencies or FERC.

The Director also erred when he concluded that a hydroacoustic array "would provide data on the out-migrating population of adult American eel from above Vernon dam," and that data from Study 18 and data from a hydroacoustic array under Study 11 "could be used to estimate the number of adult eel out-migrating past each project; thereby, supporting an analysis of the need for downstream fishways at each project." The purpose of Study 11 is to provide baseline data on the distribution and relative abundance of American eel; the purpose of Study 11 is not to evaluate migratory behavior. No agency, nor FERC before the issuance of the SPD, has suggested otherwise. In any event, given the small numbers of American eel in the basin above Vernon Dam, it is unlikely that many eels will be monitored during downstream migration and thus the study results from a hydroacoustic array would have little value.

TransCanada notes that the data gathered pursuant to several other studies will inform the objectives of Study 11 – information on the distribution and relative abundance of American eel. TransCanada agrees with the Director's statement that Study 18 (American Eel Upstream Passage Assessment) can be used in tandem with the data from Study 11 to make assumptions on the distribution and relative abundance of eels above each project. In addition, Study 10 (Fish Assemblage Study) likely will provide additional information on American eel distribution and abundance and Study 17 (Upstream Passage of Riverine Fish Species Assessment) may also identify upstream migrating immature eels that could inform Study 11.

With respect to the geographic scope of Study 11, TransCanada agrees with the Director's conclusion that a watershed-wide survey would be cost prohibitive, but disagrees with the Director's implication that a hydroacoustic array would therefore be cost effective. TransCanada did not include a watershed-wide eel survey component in Study 11 because the VANR study requests did not discuss how the results of such a study would inform potential

license requirements (Study Criteria No. 5) or the level of effort or cost of studying such a broad geographic scope (Study Criteria No. 7). A watershed-wide eel survey would be cost prohibitive, and the value of the study results would be low because the very low numbers of documented American eel in the upper basin suggest that very few eels will be available for monitoring at Vernon. Citing Study Criteria No. 7 (level of effort and cost), the Director concluded that limiting the geographic scope of Study 11 only to project-affected reaches of the Connecticut River would "misinform an analysis of potential project effects" because the population of eels affected by the Project "would likely be substantially underestimated." As described above in the general comments regarding eels, eel detection in the Vernon impoundment from 1991 to 2011 *was* extremely low. In addition, it is unclear how Study Criteria No. 7 (level of effort and cost), which was cited by the Director, is related to the Director's conclusion that TransCanada's proposed geographic scope of Study 11 would "misinform" an analysis of project effects by underestimating the population of American eels.

While TransCanada did not propose a watershed-wide geographic scope, Study 11 will include tributary sampling on a randomized subset of project-affected tributary reaches. Supplemental data for Study 11 will be provided on the number of immature eels migrating upstream from Vernon, as well as size class and distribution of American eel within the project-affected areas from Study 18, Study 10, and results from those studies will be incorporated into the Study 11 analysis.

Study 11, as proposed in the RSP, would survey the mainstem of the Connecticut River and selected tributaries by electrofishing and eel pot methods, would satisfy the agreed-upon objectives of the study (distribution and relative abundance of American eel), would provide information for agencies and FERC to develop license conditions, would use well-

proven methodologies accepted by the scientific community, and would constitute a feasible level of effort and reasonable cost. Including the entire Connecticut River watershed within the relevant geographic scope of Study 11 is not commensurate with the potential effects of the Projects on American eel.

B. Study 19 (American Eel Downstream Passage Assessment)

In the SPD, the Director approved TransCanada's RSP for Study 19 without modification or discussion. The goal of Study 19 is to assess whether project operations are adversely affecting American eel downstream migration timing and survival. The specific objectives of Study 19 are: (1) to quantify the movement rates, timing, and relative proportion of silver eels passing via various routes at the Projects including through the turbines, the Bellows Falls bypassed reach, downstream passage facilities, and spillways; and (2) to assess the instantaneous and latent mortality and injury of silver eels passed through each turbine type. Information regarding American silver eel downstream passage would be gathered by radio tagging and systematically monitoring fish movements and passage with the use of radio telemetry and balloon tags. Information regarding downstream passage survival would be gathered by using balloon tagging.

Notwithstanding the Director's approval of Study 19 without discussion, in requiring the new Vernon Hydroacoustic Study, the Director modified Study 19 to require that a comprehensive hydroacoustic array be utilized to "[p]rovide information on the timing, duration, magnitude, and passage route selection of downstream migrating American eels." SPD at B-36. The Director's decision was arbitrary and capricious and not based on substantial evidence in the record. No stakeholder in the entire prefiling process for this proceeding has requested the use of hydroacoustic technology as a methodology for Study 19. Therefore, the Director could not have relied on any evidence in the record to support such a modification of Study 19 to require use of

hydroacoustic technology to "provide information on the timing, duration, magnitude, and passage route selection of downstream migrating American eels."

The information identified by the Director to be gathered with a hydroacoustic array – timing, duration, magnitude, and passage route selection of downstream migrating American eels – is not consistent with the objectives of the "approved" study plan for Study 19, the goal of which is to assess the *timing* and *survival* of American eels during the downstream migration.

In modifying Study 19 to require a comprehensive hydroacoustic array, the Director also failed to consider any of the Study Criteria. The Director did not consider the objectives of Study 19 in determining whether hydroacoustic technology would be an appropriate methodology to gather data related to the timing and survival of American eels during the downstream migration. The Director also did not consider whether hydroacoustic technology is an appropriate methodology for assessing the timing and survival of American eel during the downstream migration. Finally, the Director did not consider the cost of a hydroacoustic array to "provide information on the timing, duration, magnitude, and passage route selection of downstream migrating American eels."

Because the Director erred when it required a comprehensive hydroacoustic array for the purposes of gathering information in Study 19, the Vernon Hydroacoustic Study should be eliminated from the SPD.

C. Study 20 (American Eel Downstream Migration Timing Assessment)

The goal of Study 20 is to assess the timing of American eels migrating from the Connecticut River to their spawning grounds. The specific objective of Study 20 is to characterize the general migratory timing and presence of silver phase American eels in the Connecticut River in the context of environmental factors such as air and water temperature,

turbidity, rainfall, river flow, lunar phase, and flow-related operations of hydroelectric projects on the mainstem of the Connecticut River. RSP at p. 199. In the RSP, TransCanada proposed to conduct a thorough review of currently available literature for the Connecticut River Basin and other rivers in the Northeast to characterize the general timing of the Connecticut River American eel downstream migration.

In the SPD, the Director approved TransCanada's proposed Study 20 with one modification: the Director required TransCanada to install "a comprehensive hydroacoustic system" at Vernon Dam, RSP at B-28, in order to "*quantify* and characterize the outmigration of silver phase American eels within the Connecticut River basin upstream of Vernon dam and . . . provide the information on the timing and magnitude of downstream American eel migration necessary to evaluate potential project effects on American eel . . . without the need for the requested and potentially costly fyke netting." SPD at B-27. The Director further surmises that "it is unlikely this recommendation would result in any significant increase in cost to study 20." SPD at B-28.

The Director's requirement to install a comprehensive hydroacoustic array is arbitrary and capricious and is not based substantial evidence in the record.

The original study requests from VANR and NHFGD, filed on March 1, 2013, recommended that both owners of the Connecticut River hydropower projects – TransCanada and FirstLight – conduct a study at either FirstLight's Turners Falls Project (at the Cabot Station) and/or at a downstream project owned by another licensee (City of Holyoke Gas & Electric Department, FERC Project No. 2004). VANR and NHFGD stated that the reason for conducting this study at both of these locations is because these locations have a canal and "offer opportunities to conduct simultaneous active and passive sampling." VANR and NHFGD

further stated that "[e]ach location possesses a route of downstream passage which conducts a significant portion of river flow . . . and each has a proximal bypass equipped with sampler so that fish can be concentrated/collected from the passage route."

In the Proposed Study Plan and RSP, TransCanada disagreed with the need to conduct a field component as part of Study 20 for four reasons: (1) none of TransCanada's Connecticut River Projects include a canal or other conveyance that would facilitate the monitoring requested for this study; (2) VANR and NHFGD requested the same study of FirstLight, which will gather information that can be used by all Connecticut River projects, and FirstLight has plans to conduct this field study at Cabot Station; (3) TransCanada's Study 20 purposefully proposed to conduct a literature review to supplement the field study to be conducted at FirstLight's project, which did not include a literature review component; and (4) until sufficient numbers of eels are documented within the TransCanada project-affected areas, a field component to this study is premature.

Neither VANR nor NHFGD filed comments in response to TransCanada's RSP related to this study or the use of hydroacoustic technology. Therefore, the Director erred in suggesting that a hydroacoustic component of this study was in dispute after TransCanada had submitted its RSP.

The Director erred in requiring a field component to Study 20 because there is no record evidence (in fact there is record evidence to the contrary) that this information must be gathered at Vernon Dam. Instead of reviewing the Study Criteria and considering TransCanada's comments that this very same information would be gathered as part of the FirstLight study at Cabot Station, the Director summarily concluded that "providing a field component to the study to sample outmigrating silver eels would provide empirical data for use

in TransCanada's proposed analysis in study 20." TransCanada agrees that empirical information is important, but a field component that satisfies the objectives of Study 20 at the Vernon Dam would be redundant, given the FirstLight study to be conducted at Cabot Station, and infeasible, given that there is no "proximal bypass equipped with sampler so that fish can be concentrated/collected from the passage route," as there is at Cabot Station. Even the FWS agrees that the "hydroacoustic data that FirstLight will collect . . . could provide valuable information regarding the timing of eel outmigration on the Connecticut River." FWS July 15, 2013 letter at p. 11. Accordingly, information will be collected on this topic at Cabot Station, and can be included in the TransCanada ILP record as a basis for the Commission and other agencies with mandatory conditioning responsibilities to carry out their responsibilities.

The Director's assertions that a hydroacoustic array at Vernon Dam for Study 20 would be "unlikely" to "result in any significant increase in cost to study 20," SPD at p. B-28, and could eliminate the need for "potentially costly fyke netting," SPD at p. B-27, is arbitrary and capricious and not supported by the record evidence. Neither VANR nor NHFGD included estimates of the cost of fyke netting in their study requests. Therefore, the Director had no basis to assume that fyke netting is costly, nor to imply that fyke netting is more costly than a hydroacoustic array. Furthermore, VANR only provided a cost estimate for conducting a limited hydroacoustic study as a field component of Study 20 at FirstLight's Cabot Station; a study which will be conducted by FirstLight. In the SPD, the Director included no cost information regarding the required hydroacoustic array in the vicinity of Vernon Dam for purposes of Study 20. Therefore, the Director had absolutely no basis on which to make these statements.

TransCanada estimates that the annual cost of a hydroacoustic study to characterize the migratory timing and presence of silver phase American eels in the Connecticut

River in relation to air and water temperature, turbidity, rainfall, river flow, lunar phase, and flow-related operations of the Projects would be $4.08 million (Appendix C at p. C-3, C-16). In contrast, TransCanada estimates that a properly designed fyke netting evaluation on a small subset of the tributaries of the Connecticut River would likely be two orders of magnitude less ($40,000) than the cost to install a comprehensive hydroacoustic array at Vernon.

D. Study 22 (Downstream Migration of Juvenile American Shad)

The goal of Study 22, as defined in the Revised Study Plan, approved by the Director in the SPD, is to assess whether Vernon Project operations affect the safe and timely passage of emigrating juvenile American shad. RSP at p. 219. The specific objectives of Study 22 are: (1) to assess the effects of project operations on the timing, route selection, migration rates, and survival of juvenile shad migrating past Vernon; (2) to characterize the proportion of juvenile shad using all possible passage routes at Vernon over the period of downstream migration under *normal operating conditions*; and (3) to conduct controlled turbine passage survival tests for juvenile shad passed through one of the older Francis units and one of the new Kaplan units to estimate the relative survival specific to those unit types. *Id.* In conjunction with a previous juvenile American shad turbine survival study, TransCanada expects that Study 22 would provide the information to evaluate migration timing and forebay residency of juvenile shad. *Id.*

In the RSP, TransCanada proposed to use several study methods to conduct Study 22, including radio telemetry, balloon tagging, and a single beam hydroacoustic transducer. TransCanada explained that due to the configuration and specifications of the Vernon Project and the potential limitations inherent in working with juvenile American shad, the prescribed combination of methods and monitoring tools would provide the necessary information for Study 22. RSP at p. 222. Radio telemetry would be used to provide information on the forebay

residency time of juvenile American shad and proportional passage route selection. Balloon tagging would be used to estimate the direct survival of fishes that pass through hydro turbines or spill structures. And, a single beam hydroacoustic transducer would be used to monitor in the forebay in the vicinity of the downstream fish pipe to provide additional *qualitative* information on the timing, duration, and relative abundance of the American shad downstream migration (*i.e.,* population information). This method can provide quantitative estimates of abundance of those fish detected within the acoustic beams, but cannot provide a quantitative estimate of absolute abundance or magnitude of the entire run. TransCanada's proposed combination of methods is the most reasonable given the unique configuration of the Vernon facilities, the objectives of Study 22, and the widely recognized limitations of working with juvenile shad.

The Director should eliminate the Vernon Hydroacoustic Study from the SPD because installing a comprehensive hydroacoustic array for the purposes identified in the SPD and the FWS comments is unreasonable given the exorbitant cost in light of the limited value of the incremental information to be gained, is not based on substantial evidence regarding costs, and is contrary to the Commission's Guidance. TransCanada's estimated cost for Study 22 prior to the Director's SPD was $360,000 to $420,000. In the SPD, the Director concludes that "[b]ased on TransCanada's estimate, the development and implementation of this study would increase the cost of TransCanada's study plan by $530,000 to $600,000 but would provide significantly greater information on . . . potential juvenile shad migration delays in the Vernon Project forebay." SPD at p. B-36. The Director grossly misapplied the cost figures presented by TransCanada.

Neither TransCanada nor any agency presented any estimated cost in the record for a study as expansive as the Director's Vernon Hydroacoustic Study. The Director used

estimated figures presented by TransCanada in its January 10, 2014 letter, wherein TransCanada estimated the cost of a *single* hydroacoustic *array* in the Vernon forebay, as proposed by the FWS in its January 9, 2014 letter. At a minimum, the "comprehensive hydroacoustic study" demanded by the Director would require *three* such arrays plus hydroacoustic transducers mounted on the dam at passage routes. The estimated cost for such a configuration is $2.93 million annually (Appendix C at p. C-3, C-13). Since the Director requires that the Vernon Hydroacoustic Study be performed for two years, the cost is estimated to be $5.86 million. This is approximately equal to the cost of *all* 33 studies proposed by TransCanada in its RSP *combined*. When considered in light of these costs, coupled with the fact that the information that may be gained from a Vernon Hydroacoustic Study has almost no incremental value beyond that which will be gathered through TransCanada's plans to assess juvenile shad migration through radio telemetry, balloon tagging, and a single beam hydroacoustic transducer, it is clear that the Vernon Hydroacoustic Study should be rejected.

Moreover, the Commission's own Guidance as to whether FERC would reject a study solely based on cost states that while a study will not be rejected on cost alone, the Commission's decision "is based on whether the information is needed and whether that information can be gathered in a cost-effective manner." The Commission's Guidance further states that "[i]f the cost of the study appears to be out of line with the magnitude of the potential impact based on available information, the Commission may rely on existing information to assess the effects." As described below, the information alleged to be "needed" from the Vernon Hydroacoustic Study has limited incremental value, and the cost of the study is far out of line with the magnitude of the potential incremental impact because TransCanada will be gathering

significant information though radio telemetry and balloon tagging. Therefore, the Director should eliminate the Vernon Hydroacoustic Study from the SPD.

In the SPD, the Director required TransCanada to develop a comprehensive hydroacoustic study based primarily on comments from the FWS.[8] The Director erred in relying on the FWS' unsubstantiated assertions regarding the acceptability of hydroacoustic technology in the scientific community for the purposes requested by the FWS, the incremental informational value of such a methodology, and the cost. Furthermore, the FWS requests and comments for comprehensive hydroacoustic monitoring systems have identified inconsistent goals for use of the technology and are inconsistent in the scope of the requested deployment of technology, without an attendant explanation of how the modified request or comment meets the Study Criteria.

In its March 1, 2013 study request for Study 22, the FWS stated that the impact to juvenile shad outmigrants would be best studied by a combination of approaches, including hydroacoustics, radio telemetry, and balloon tags (i.e., individual behavioral characteristics). The FWS further stated that an additional hydroacoustic assessment immediately upstream *and* downstream of the Vernon Dam would provide information on the timing of migration to and through the area (i.e., population characteristics). FWS estimated that Study 22 with all proposed methodologies – radio tagging, balloon tagging, and hydroacoustic technology – would cost $150,000. This is a gross underestimate of the estimated cost of such a study and reflects a lack of understanding of the sampling technology necessary to provide information to satisfy the

[8] FWS, VANR, and NHFGD initially submitted the same original study requests which generally requested the use of hydroacoustic technology to assess juvenile shad outmigration. In response to TransCanada's RSP, wherein it proposed to use a single-beam hydroacoustic transducer to assess the migration timing of the population of juvenile shad, neither VANR nor NHFGD filed any objections to the proposed study.

objectives of Study 22. In its Proposed Study Plan, TransCanada's Study 22 proposed to use radio telemetry and balloon tagging to assess individual shad behavioral characteristics such as residency, but did not propose any methodology to assess the population characteristics. In response, the FWS' July 15, 2013 letter expressed concern that "relying *solely* on radio-tagged juveniles and [balloon tagging] juveniles may or may not represent the natural timing, duration, and magnitude of wild fish outmigration." FWS July 15, 2013 letter at p. 13. The FWS "recommended the use of hydroacoustics in the Vernon Dam forebay to *quantitatively* determine timing, duration, and magnitude of the juvenile outmigration, which would provide important context to the limited number and release timeframe of radio-tagged juvenile fish releases." *Id.* The FWS did not mention downstream deployment of a hydroacoustic array or hydroacoustic technology to monitor and assess all potential passage routes such as spill gates.

In response, TransCanada proposed in its RSP to install a single beam hydroacoustic array at the fish bypass to assess population migration characteristics, such as the timing and duration of the migration. Hydroacoustic technology might provide some limited and *qualitative* information on forebay residency time, but such an array would not provide useful *quantitative* estimates of forebay residency time. As is the case at virtually all dams, juvenile shad at Vernon have been observed milling in the forebay. A hydroacoustic system would not facilitate an estimate of the number of fish passing Vernon because the bias of multiple records per fish could not be accounted for. Even if each route could be monitored at a point of commitment to passage (which may be infeasible at Vernon), the reliability of the estimate would be low due to temporal and spatial subsampling, bias due to debris and other species, and annual variability. Therefore, there would be little incremental value in any information gained from a hydroacoustic "array." In addition to failing to characterize accurately the value of

hydroacoustic technology to sample individual fish behavior, the FWS provided no additional cost information to support its expanded study request.

The FWS' July 15, 2013 letter also relied heavily on excerpts from emails from a hydroacoustic vendor, Mr. Ransom, to support its implied conclusion that a hydroacoustic array could produce data that would result in incremental additional information to meet the objectives of Study 22. Referring to the Vernon Dam 2009 study, the objective of which was to estimate the proportional route selection of emigrating juvenile American shad through Vernon Dam's ten turbine units, the fish pipe, and the west fish tube via fixed aspect hydroacoustics, the FWS offered the following excerpts from Mr. Ransom's email to justify the use of hydroacoustic technology to assess individual fish behavior:

> 'The Vernon 2009 results aren't indicative of hydroacoustic sampling capabilities at the site;' and 'With a sufficient deployment and testing period, proper transducer selection and placement, and probably incorporation of rotators to refine optimal aiming angle post deployment, we feel that one could do a good job of monitoring downstream shad entrainment from behind the trash racks at Vernon Dam…' *These statements indicate that despite the disappointing results of the 2009 study, properly deployed hydroacoustic transducers would provide quality data to address the study objectives*. FWS July 15, 2013 letter at p. 13 (emphasis added).

These statements are not reliable for purposes of establishing that a comprehensive hydroacoustic array for assessing the residency of juvenile shad in Vernon forebay is generally accepted within the scientific community (Study Criteria No. 6). First, the Vernon 2009 study had *disappointing* results, largely because of the difficulty of installing a suitable hydroacoustic array. TransCanada agrees that the Vernon 2009 study could be improved upon, but the cost to produce high value, incremental data for purposes of Study 22 is exorbitant and not justifiable based on the Commission's Study Criteria. Moreover, Mr. Ransom (and the FWS) mischaracterize the objective of the Vernon 2009 Study as measuring entrainment of

individual juvenile shad, when, in fact, the purpose of the study was to estimate the proportional route selection exhibited by the population. The FWS made no attempt to address the level of effort and cost of installing the array advertised by Mr. Ransom. In the entire record, these statements from Mr. Ransom are the FWS' *only* evidence supporting the FWS' incorrect conclusion that hydroacoustic technology is generally accepted within the scientific community for the purposes of assessing individual juvenile shad behavior. In any event, Mr. Ransom's statements are out of context, not specific to the objectives of Study 22, and unsubstantiated. Therefore, the Director erred in relying on them, and the Vernon Hydroacoustic Study must be eliminated from the SPD.

The FWS also notes in the July 15, 2013 letter that FirstLight is proposing to install hydroacoustic equipment at Cabot Station to assess juvenile shad outmigration, and summarily concludes that the "goals and objectives of those studies are the same as the goals and objectives of this study at Vernon." This is incorrect, and the Director cannot reasonably rely on such assertions as a basis for requiring TransCanada to install a comprehensive hydroacoustic array. In suggesting a link between the FirstLight and TransCanada studies with respect to juvenile shad, the FWS ignored the significant differences in the physical configuration of the projects. FirstLight intends to install hydroacoustic technology in a canal at the Cabot Station. This likely would involve a simple configuration that allows the hydroacoustic transducers to monitor fish passing through the canal. In contrast, the FWS requested that TransCanada install comprehensive hydroacoustic arrays upstream and downstream of the Vernon Dam and with full coverage of the Vernon forebay. Therefore, the Director erred in relying on the FWS' implication that because a hydroacoustic array at Cabot Station is relatively simple, the same can be said for Vernon.

Notwithstanding, TransCanada proposed to install a single-beam hydroacoustic transducer at the fish pipe for the purpose of monitoring the timing, duration, and relative abundance of the juvenile shad run (*i.e.*, population information). The FWS filed responsive comments on August 29, 2013, which stated as follows:

> a single transducer directed towards the fish pipe will not allow for an assessment of *delay* at the project. In order to determine if outmigrants are delaying in the forebay, [TransCanada] needs to install an array of transducers sufficient to get full coverage on either side of the upstream end of the louver. As currently proposed, juvenile shad could enter the forebay area and be there for an unknown period of time before proceeding through the fish pipe (or other passage routes). The additional coverage in the upper forebay (or upstream of the forebay) is needed to assess rate of movement through the forebay and relate this movement to project operations. FWS August 29, 2013 letter at p. 4 (emphasis added).

There are a number of problems with the FWS' characterization of the purpose of the study. Specifically, the FWS continues to request use of hydroacoustic technology to assess residency, an individual fish characteristic, when TransCanada is collecting this information through radio-tagged individuals. Radio tagging is the *best* methodology for assessing residency in the forebay, and neither the FWS nor any other stakeholder has introduced a shred of evidence to the contrary. Hydroacoustic technology is not appropriate as a sampling methodology to gather information on individual fish because there is no way to track individuals; hydroacoustic technology is only appropriate to monitor populations and TransCanada will be monitoring the juvenile shad population characteristics with its single-beam hydroacoustic transducer. Moreover, in order to assess "rate of movement through the forebay" (also known as "residency") with hydroacoustic technology, a second upstream array would be necessary, for a total of three arrays. Despite effectively expanding its study request, the FWS provided no

additional cost information and no explanation as to why this new requested information is necessary. The Director in the SPD failed to recognize or address this matter.

Based on the repeated unsubstantiated assertions of the FWS with respect to the use of hydroacoustic technology to assess individual shad behavior such as residency, the Director requires TransCanada to conduct a Vernon Hydroacoustic Study for the sole reason that it believes Study 22 would not provide information on the Project's effects on downstream migratory delay. On this point, the Director states the following:

> TransCanada's proposed study 22 to monitor juvenile shad out-migration would provide nearly all the information FWS requested with *one exception*: the project's effect on downstream migratory delay. Because the source of the radio-tagged shad is unknown and stresses associated with tagging, holding, and transport will occur, the radio-tagged shad may not be representative of their wild, untagged counterparts, and, therefore, may not be suitable to evaluate migratory delay as TransCanada asserts. SPD at B-35.

The Director's finding that radio tagging *may* not be suitable to evaluate juvenile shad residency (migratory delay) is arbitrary and capricious, not supported by substantial evidence, and patently untrue. Nowhere in the record does the FWS or any other agency challenge the validity of radio tagging to assess residency (migratory delay). Assuming that juvenile shad of sufficient size to tag are available, a telemetry-based evaluation is the *best* way to characterize forebay residency time (and proportional passage route selection). In order to facilitate this, the FWS is hoping to raise juvenile shad longer than 110 millimeters in length in a hatchery so the juvenile shad are of a sufficient size to accommodate a radio tag in order to assess residency time. TransCanada has conducted passage delay assessments utilizing radio telemetry at Vernon Dam for more than 20 years. In response to this point the Director merely quipped "that TransCanada did not indicate for which species these assessments were conducted – Atlantic salmon or American shad or other." SPD at p. B-35.

Residency information and route selection is specific to each individual fish, and therefore can only be deduced by methods that track an individual, such as radio tagging. Hydroacoustic technology cannot discern between individuals and therefore conclusions cannot be made about individual behavior. A single-beam hydroacoustic transducer is sufficient to assess the timing of the migration of juvenile shad, which is accomplished by measuring the movement of schools of shad (population) through Vernon Dam. For the Director to require a hydroacoustic array to gather the *same* information that will otherwise be gathered on individual shad through radio tagging is contrary to the Commission's own guidance, which explains that the decision whether to reject a study based on cost alone "is based on whether the information is needed and whether that information can be gathered in a more cost-effective manner." In this case, population information on the timing of juvenile shad migration will be provided by the single-beam hydroacoustic transducer, and information on individual fish behavior regarding residency and route selection will be provided by the radio tagging. The use of radio telemetry is the *best* way to evaluate individual behavior, assess route selection relative to operations and flow, estimate residency time and congregation areas, and many other aspects of fish behavior, and is well documented in the published literature. Neither FERC nor any agency has explained (although FERC and the FWS have made unsubstantiated assertions) why TransCanada's significantly less costly study would not be sufficient to meet the information needs of FERC and the agencies.

The Director also errs in his finding that "[b]ecause the source of the radio-tagged shad is unknown and stresses associated with tagging, holding, and transport will occur, the radio-tagged shad *may* not be suitable to evaluate migratory delay." SPD at p. B-36. As with the last point, neither FERC nor any agency has provided any evidence to substantiate this assertion.

First, the "source" of the juvenile shad to be tagged is *known*: they are expected to be grown in a hatchery by the FWS. Second, the notion that wild fish are more representative than tagged fish and that hydroacoustic technology is a better tool to assess wild fish ignores the fact that hydroacoustic technology *cannot* identify individuals, and therefore there is no way to assess the residency of an individual in the Vernon forebay with hydroacoustic technology whether that individual is wild or tagged (except that radio telemetry provides information on the behavior of the tagged fish). Finally, TransCanada does not agree with the Director's characterization of potential behavioral differences between tagged shad and wild shad. In practice, the tagged shad and the wild shad will move in the same schools of fish and therefore exhibit the behavior of the population. To conduct Study 22, TransCanada intends to collect hundreds of wild shad in back water areas upstream of Vernon Dam and release ten groups of ten radio tagged juvenile shad together with the wild fish in order to have a large enough group of fish (including the radio tagged subset) migrating in their natural schooling behavior. Radio telemetry will provide specific information on the behavior of individual shad and the school of shad as a whole, particularly where multiple signals emanate from similar locations. The single beam hydroacoustic transducer will provide information on the timing and duration of the wild juvenile shad population.

In the FWS' August 29, 2013 letter, cited by the Director in his SPD, the FWS states that the single-beam hydroacoustic transducer at the downstream fish pipe would not allow for an assessment of delays to downstream migration at the Project. The FWS further requests the installation of a hydroacoustic array at "all possible passage routes" (*e.g.*, turbine intakes, fish pipe, fish tube, spillway gates) through Vernon Dam, without any discussion of the cost of such a

proposal (which is a significant expansion from the original study request), whether alternative methods suffice, or whether such a method is generally accepted in the scientific community.

As previously discussed, TransCanada's single beam hydroacoustic transducer is intended to assess the timing, duration, and relative abundance of juvenile shad, not residency (migratory delay). The information from the radio tagged fish will be used to assess residency and route selection. A hydroacoustic array "across all possible passage routes" to assess residency is inappropriate, infeasible, and unnecessary to meet the overall goal and objectives of Study 22. The Vernon Project is complex and includes eleven surface and eight submerged spillway gates, ten turbine generators, a trash sluice gate, and two downstream fish bypasses. Collectively, these structures are more than 950 feet long and constitute the dam/powerhouse structure. Given TransCanada's protocol for inflow that exceeds station capacity, in which various spill gates are opened methodically based on the amount of inflow and to maintain specified reservoir elevations under different inflow levels, it would be rare to operate most of the spill gates. Therefore, it is unreasonable to propose installation of hydroacoustic technology at many of the spill gates because they would not be used for passage.

None of the agencies, including FERC in the SPD, explained why TransCanada's proposed hydroacoustic transducer located at the downstream fish pipe would be insufficient to provide the information needed to meet the study objectives. The fish pipe, along with a louver array and supplemental downstream fish tube, are designed to direct downstream migrating fish into those passage routes. Thus, the fish pipe is the most appropriate location to qualitatively monitor for passage timing, duration, and for an index of magnitude.

CONCLUSION

The Director's determination that TransCanada must perform the Vernon Hydroacoustic Study should be eliminated from the SPD. The determination was in error,

arbitrary and capricious, and unsupported by substantial evidence. Specifically, the Director erred because: (i) the use of hydroacoustic technology for the purpose of informing Studies 11, 19, 20, and 22 is not generally accepted in the scientific community; (ii) TransCanada's RSP proposed scientifically proven methodologies to study all objectives of Studies 11, 19, 20, and 22, and no stakeholder has demonstrated otherwise; and (iii) the estimated $8 million cost of a Vernon Hydroacoustic Study, which alone would cost more than the total cost of the other 33 TransCanada studies *combined*, is out of line with the low value, incremental information that may be gained from such a study.

Accordingly, TransCanada respectfully requests that the Commission grant rehearing of the Director's SPD, and eliminate the requirement to develop and conduct a Vernon Hydroacoustic Study, as requested herein.

Respectfully submitted,

/s/ Kimberly Ognisty

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Dated: March 24, 2014

APPENDIX A

What is Hydroacoustic Technology?

Hydroacoustics is a general term for the study and application of sound in water. Hydroacoustic sensing involves passive acoustics - listening for sounds, or active acoustics - making a sound and listening for the echo. The primary tool in fisheries acoustics is an echo sounder (active acoustics). This instrument operates on the same principles as a recreational or commercial fishfinder, but is engineered for greater accuracy and precision. An acoustic echo sounder transmits a pulse of acoustic energy into the water. The pulse of energy travels through the water at a speed of approximately 1,500 m/sec. When the acoustic pulse encounters an object, such as a fish or the bottom of the riverbed, some of the energy (i.e., an echo) is reflected back to the transducer. The echo sounder amplifies the received signal and then sends it to an output device and digital echo processor.

Target strength is a critical factor in fisheries acoustics because it provides a link between acoustic backscatter and animal biomass. Target strength is a measurement of how well a fish or other target scatters sound back towards the transducer. In general, larger animals have larger target strengths, though other factors, such as the presence or absence of a gas-filled swim bladder in fishes, may have a much larger effect. Target strength is usually measured empirically by comparing field samples against acoustic signals, or calculated with numerical models.

A basic hydroacoustic system includes a high frequency echo sounder, one or more transducers with cables, a chart recorder, an oscilloscope, and a computer-based echo processing system. If more than one transducer is used, a multiplexer is also required.

A variety of echo sounders are available:

- Single-beam is the earliest version; a target is detected in the beam but its specific location within the beam is unknown.
- Split-beam uses a single beam but divides the transducer face into four quadrants, allowing the location of the target to be triangulated to a specific location (in three dimensions) within the beam. The split beam calculates target strength which allows for the target to be located and tracked within the beam. Distinct characteristics, such as size or swim pattern can be used to differentiate target species from other species or backscatter. However, species with similar characteristics, or species with echos resembling backscatter, may not be distinguishable from one another. In Appendix C we have proposed using this type of echo sounder.
- Multi-beam uses multiple overlapping single beams. Typically these units track a target from one beam to another but not within each beam. It isn't possible to separate target species from other species with this system because it cannot measure direct target strength. This system is also considerably more expensive than split-beam echo sounders.
- Imaging sonar or duel frequency identification sonar (e.g., DIDSON or Aris) is a relatively new tool. It is a high frequency multi-beam sonar that uses an acoustic lens system to focus the sonic beam while providing video-like images of the monitored

area. The high-resolution images can provide information on the targets physical size, shape and orientation as well as location and movement. Equipment costs are significantly higher than echo sounder systems. In Appendix C we have proposed using this in limited areas.

Most echo sounders emit just one frequency, which can be customized. Low frequencies are less susceptible to background noise and therefore provide a cleaner "view" of the target and have been applied in limited studies to monitor eel. Shad, however, avoid low frequencies so higher frequencies are used in non-confined areas. Low frequencies are sometimes used to monitor shad after they have passed trash bars or intake screens where they are unable to swim away from the sound. Multi-frequency units are on the market, but are extremely expensive (~ million dollar range) and found on NOAA ships.

For the study designs included in Appendix C, a testing period, which could be significant depending on complexity of the hydroacoustic array, is necessary to determine optimal system configuration before the final array is installed and wired. Divers would install transducers and run cables, and adjust transducers as necessary through the monitoring period. An instrumentation shed would store the electronics and computers and would include a moderate sized propane tank to fuel a power generator for 2-3 days before re-fueling is required. Periodic sampling is done to confirm species and size composition of acoustically detected fish.

Hydroacoustics offers a tool to fisheries science but it is not a panacea. Concerns inherent to hydroacoustics include:

- Hydroacoustics cannot reliably identify species directly. It can estimate fish size, and this information coupled with multi-frequency and distributional information (e.g., depth or diel distributions) or behavioral data (e.g., swimming path, velocity) frequently aids partitioning of fish abundance estimates by species.
- The collection of large quantities of data, so much data that it can be challenge to store and analyze.
- Difficulty monitoring fish very close to boundaries, such as near the very bottom or the surface.
- Scientific hydroacoustic equipment capable of reliable quantification of fisheries parameters requires a significant investment. Expenses incurred at the front end include leasing and purchasing equipment, designing and testing an optimal site specific and study specific array configuration, and installation of the equipment. Back end expenses include processing and analyzing the copious data collect.

APPENDIX B

Vermont Yankee Technical Meeting
Wilder, Bellows Falls, and Vernon Hydroelectric Projects

Meeting Agenda

Tuesday, November 26, 2013, at 9:00 AM
Marlboro College Graduate School, Glass Room
28 Vernon Street
Brattleboro, VT 05301
(802) 258-9200

9:00 – 9:20 Overview
- Introduction of Participants
- Meeting Objectives
- Ground Rules

9:20 – 10:00 Entergy
- Presentation on Vermont Yankee Closure
- Clarification Questions / Answers

10:00 – 10:30 Stakeholder Caucus

10:30 – 12:00 Study Discussion*

12:00 – 1:00 Lunch

1:00 – 2:45 Study Discussion*

2:45 – 3:00 Break

3:00 – 3:45 Study Discussion*

3:45 Meeting Summary
Licensing Process Schedule and Concerns
Next Steps

* Discussed in the order listed in the attachment

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 (Alasmidonta heterodon) and Co-Occurring Mussel Study	TransCanada
25 -- Dragonfly and Damselfly Inventory and Assessment	TransCanada
New -- Vernon Hydroacoustic Study	FWS, NHFGD, VANR

APPENDIX C

Appendix C - Alternatives/Options

This appendix outlines three hydroacoustic sampling options (Plans A through C) depending on the objectives, cost-benefit considerations, and justification of scope. Table C-1 provides an overview of each Plan's intended objective, relative data quality, and additional cost over that estimated for Study 22 – *Downstream Migration of Juvenile American Shad*. The narrative and diagrams that follow Table C-1 for each plan detail the hydroacoustic equipment required, the configuration of transducers and/or arrays needed, an estimated annual cost for each plan (+/- 10%) that would be in addition to the Study 22 (or other studies) costs, verification, analysis and results expected from the hydroacoustic plan, as well as important assumptions and considerations.

Definitions of the terminology for the parameters of interest, as stated by resource agency requests and the Director in his SPD, and referenced in Plans A-C below:

- "**Timing**" is the time of arrival and departure of migratory fish (shad or eels) in the forebay, and not the timing of passage of the project through turbines, gates, or fishpipe.
- "**Duration**" of the migration is undefined in the study requests, but is defined herein to mean the duration of the period when outmigrating shad or silver eels are present within the forebay, and not the overall duration from spawning site to sea.
- "**Magnitude**" of the migration run of shad or silver eels is an undefined term in the study requests, and an ambiguous term in fisheries science, but is interpreted herein to be relative (*e.g.*, CPUE, decibels, low-medium-high), which can be used as a relative index of abundance if standard methods are consistently used. However, magnitude in the context of migration runs would be synonymous with absolute abundance or counts (*i.e.*, population size). Plans B and C attempt to estimate absolute abundance, but there is an element of imprecision inherent in such an estimate due to sampling error, sampling biases, and extrapolation of data to account for locations and periods of time in which monitoring was ineffective or absent.
- "**Delay**" is a term that implies knowledge of an ambient ("natural) or defined threshold in residence time in a particular river reach. If the Vernon forebay residence time is statistically longer than the residency time would be if a particular river reach was not impounded, then "delay" could be determined. Since the natural residency time is unknown, we assume "delay" to mean the quantitative estimate of time an individual spends in the forebay.

State of the Science

Hydroacoustic sampling methods have become an accepted technique for estimating fish abundance in coastal and ocean waters as well as to monitor fish passage in riverine waters (Simmonds and MacLennan 2005). Its use to estimate fish passage originated with the focus on migrating salmonids at hydropower facilities (Thorne and Johnson 1993; Kubecka and Wittingerova 1998; Enzenhofer and Cronkite 2000; Krumme and Saint-Paul 2003). Fixed-location hydroacoustics have since been adopted to measure other species such as clupeids such as American shad (Guillard et al 1998; Pedersen and Trevorrow 1999; Dunning and Gurshin 2012). However, hydroacoustic monitoring of outmigrating anguillid eels has not been well

documented with the exception of a couple of published studies (McCarthy et al. 2008; Mueller et al. 2008).

Table C-1. **Summary of example hydroacoustic sampling plans that achieve the objectives identified in Studies 11, 19, 20, and 22.** The objectives include timing and duration, magnitude, residency time, and route selection. "High Data Value" means reliable data that satisfies the study goals and objectives. "Low Data Value" refers to data that is imprecise or adds little additional information to study goals and objectives. Cost information is ±10% and represented as *additional* costs to study plans as proposed.

	Plan A	**Plan B**	**Plan C**
Additional Annual Cost	**$0** (Included in Study 22 in RSP)	**$2.93 Million**	**$4.08 Million**
Total 2-year Study Cost		**$5.86 Million**	**$8.16 Million**
Location of hydroacoustic equipment	Single transducer at Fish Pipe.	3 river arrays plus transducers behind trash racks and across expected bypasses.	3 bi-level river arrays plus transducers behind trash racks and across expected bypasses.
Juvenile Shad			
Timing and Duration	**HIGH Data Value** based upon monitoring at Fish Pipe.[a]	**HIGH Data Value** based upon monitoring forebay and passage routes.[a]	**HIGH Data Value** based upon monitoring forebay and passage routes.[a]
Magnitude	**HIGH Data Value** of relative index of abundance of entire run, based upon monitoring at Fish Pipe.[a]	**HIGH Data Value** but low incremental value of relative index of abundance within entire run, based upon monitoring forebay and passage routes.[a] **LOW Data Value** of absolute abundance or population size, based upon sampling error, biases, and the extent of extrapolation for areas not effectively monitored.	**HIGH Data Value** of relative index of abundance within entire run, based upon monitoring forebay and passage routes.[a] **LOW Data Value** of absolute abundance or population size because of sampling error, biases, and the extent of extrapolation for areas not effectively monitored.
Residency Time	**Determined in Study 22** - not by hydroacoustic transducer at Fish Pipe.[b]	**LOW Data Value** as it requires positive identification schools as they pass multiple sequential arrays and transducers or are repeatedly identified by a single array or transducers. Not possible to determine individual fish behavior or residency time.	**LOW Data Value** as it requires positive identification schools as they pass multiple sequential arrays and transducers or are repeatedly identified by a single array or transducers. Not possible to determine individual fish behavior or residency time.
Route Selection	**Determined in Study 22** - not by hydroacoustic transducer at Fish Pipe.[b]	**HIGH Data Value** but low incremental value of estimation of proportional selection based upon comparison of relative number of targets detected by monitoring forebay and passage routes.[b] **LOW Data Value** in terms of definitive population numbers utilizing passage route options. Not possible to determine individual fish behavior or residency time.	**HIGH Data Value** but low incremental value of estimation of proportional selection based upon comparison of relative number of targets detected by monitoring forebay and passage routes.[b] **LOW Data Value** in terms of definitive population numbers utilizing passage route options. Not possible to determine individual fish behavior or residency time.

	Plan A	Plan B	Plan C
American Eel	Does not target eels.[c]	Does not target eels.[c]	
Timing and Duration			**LOW Data Value** because (1) unproven technology for monitoring eels; (2) unknown (predictably low) population of eels outmigrating leading to lower probability of detection; and (3)Non-schooling behavior leading to lower probability of detection.
Magnitude			Similar to Shad above
Residency Time			Similar to Shad above
Route Selection			Similar to Shad above

[a] Coupled with data from downstream monitoring from FirstLight studies at Turners Falls or Holyoke Dams.
[b] Study 22 will provide information on residency time and route selection of sampled shad via radio tagging and release with wild shad population.
[c] Study 19 will also provide information on residency time and route selection of sampled eels via radio tagging.

Plan A: Single Split-Beam Transducer to Monitor Juvenile Shad Near Fish Pipe

This design is included in TransCanada's Study Plan 22 – Downstream Migration of Juvenile Shad at Vernon.

Location—Figure A-1 shows the location of the transducer in the forebay.

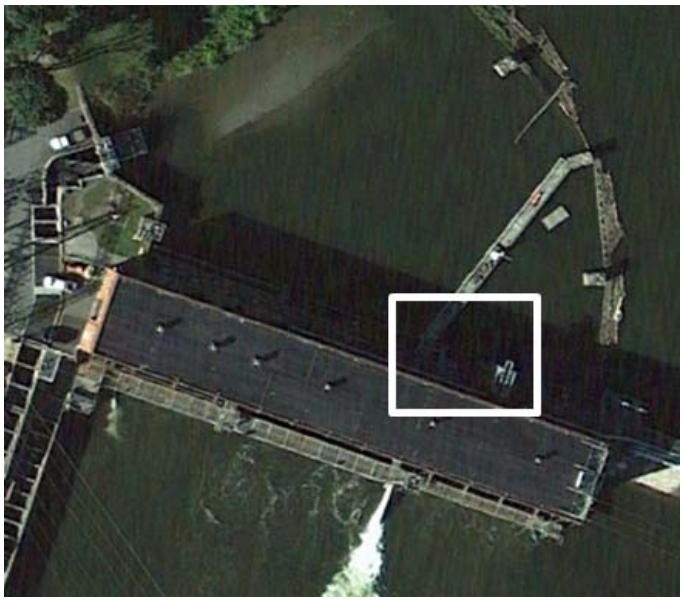

Figure A-1. Conceptual diagram of the location of a single split-beam transducer (in white square) mounted to sample about 100% of the fish pipe entrance for monitoring the temporal pattern in relative abundance of out-migrating juvenile American shad at Vernon dam.

Equipment Description— This plan is based on using a single HTI split-beam echosounder. The acoustic frequency of 420 kHz would be selected because shad may detect (Mann et al. 1997) and avoid the ultrasound at commonly used fishery echosounder frequencies (38-200 kHz; Dunning et al. 1992; Ploskey et al. 1995; Ross et al. 1993, 1996), and the higher frequency and resolution is suitable for detecting small fish. The transducer cable would be secured to the dam infrastructure and lead to an indoor facility where echosounder electronics and computers could be operated.

Sampling Coverage—The opening at the entrance of the fish pipe is 7.6 ft x 4.0 ft. Following a site visit, the transducer beam width and deployment configuration will be determined. A horizontally aimed transducer could be mounted to the face of the dam. A transducer could also be mounted to the river bed or to the dam structure and aimed vertically to the surface where the juvenile shad are expected to congregate and pass through the fish pipe opening. Either configuration could sample near 100% of the depth layer and width of the fish pipe immediately upstream of the opening (Figure A-2).

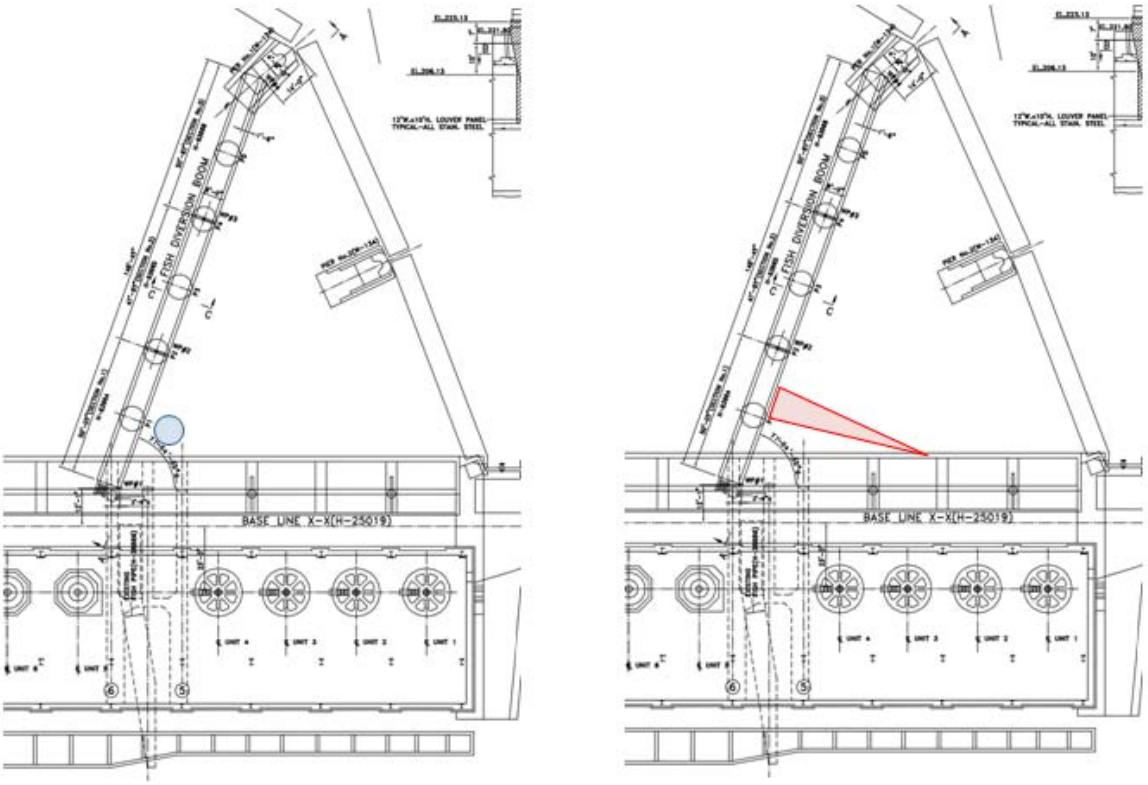

Figure A-2. Beam geometry of two Plan A configuration options dependent on an evaluation of site conditions. Left: blue circle showing an approximately 10-ft wide beam footprint from a 15° split-beam transducer mounted near the bottom and aimed toward the surface. Right: red triangle represents the ideal beam cone shape from a 15° split-beam transducer mounted to the dam face and aimed horizontally near the fish pipe entrance.

Sampling Schedule—The system would be installed and adjusted in late July for continuous monitoring from August through November, which will capture the entire period outmigrating juvenile shad are known to move downstream. The temporal sampling by the transducers would be continuous (24/7) and would be sampled in manageable echogram sizes of 1- to 5-minute durations.

Expected Results—Both the relative index of volume backscattering strength and acoustic estimate of passage can provide sufficient temporal resolution for estimating the timing, duration, and relative magnitude of juveniles in the vicinity of the upstream fish pipe opening. However, it provides no direct measure of absolute or relative abundance of the whole-river outmigration, exit route selection or the residency time of individuals within the forebay.

Cost—The estimated one-year cost of this option is approximately $135,000 ±10% and is included in the total Study 22 cost where this option was proposed (Revised Study Plan, August 14, 2013). The cost is based on a 2-month monitoring period (Sep – Oct), consistent with the rest of the Study 22 schedule, and assumes no schedule delays and no equipment replacement due to weather or other acts beyond TransCanada's control.

Analysis and Metrics—The split-beam transducer will collect information necessary for determining relative fish size, position within the beam, direction and rate of movement through the beam, and volume backscattering strength proportional to fish density (Foote 1983; Simmonds and MacLennan 2005). Echo integration, echo counting or both would be considered for deriving fish density depending on their observed distributions. Like other clupeids (Dunning and Gurshin 2012; Gurshin et al. *in review*), juvenile shad may form dense schools during the day that make echo counting difficult, but scatter as individuals during the night. The fish flux (number per unit area [vertical plane] and time) would be determined by the acoustic fish density estimate, and the rate of movement downstream and proportion that move toward the fish pipe opening as estimated by split-beam tracking of individuals of juvenile shad size and/or from radio telemetry results that are also part of Study 22. The fish flux then can be used to extrapolate to daily passage through the fish pipe.

Verification—Weekly cast netting effort is also included in Study 22 and would provide biological samples to confirm species and size composition of acoustically detected fish.

Assumptions and Considerations — Several assumptions and considerations are important in this approach and its results:

- Background noise and acoustic scattering contributions by other targets (e.g., macroinvertebrates, entrained surface bubbles, sediment gas bubbles, other small fish) are assumed to be either negligible, or can either be quantified, or can be removed from analysis.
- The continuity of the study and the completeness of results may be compromised by natural acts beyond control (e.g., hurricanes, floods) or by vandalism.
- The acoustic estimate of fish density attributable to juvenile American shad during outmigration can be separated from the natural variability. This could be problematic if abundance is low and the relative contribution of false detection and false classification is high. During the most recent three years that data are available, the annual (July-November) catch of juvenile American shad in the Vernon impoundment based on about 240 beach seine hauls/year was only 1,313 in 2012, 82 in 2011, and 195 in 2010 (Normandeau 2013). The standing crop index for juvenile American shad in the lower Vernon impoundment during 2000-2012 ranged from 723 to 31,491 (Normandeau 2013). During the same period, the number of adult shad passing upstream at Vernon dam ranged from 65 in 2007 to 10,715 in 2012 and the number trucked from the Holyoke Lift and stocked in the Vernon impoundment ranged from 71 in 2001 to 2,128 in 2009 (Normandeau 2013).
- For estimating timing and duration of the outmigration, migration must start and end during the study period. Early and late migration is subject to more environmental variability.
- Absolute or relative abundance of the outmigration run for the whole river, residency time of individuals, and route selection cannot be determined by this sampling configuration. Theoretically, if sufficient fine-scale radio telemetry results from Study 22 provide an estimate of the proportion of all juvenile shad that exit through the fish pipe, then acoustically derived fish passage estimates at the fish pipe could be scaled to the whole river. However, this depends on being able to differentiate between fish

swimming toward the opening, those being entrained, and those milling about in front of the opening.

- The trends in relative abundance of juvenile shad observed at the fish pipe are assumed to be representative of juveniles arriving to the other locations (forebay, turbine units, and spillways).

Plan B: Hydroacoustic Arrays at 3 RIVER Sites AND AT DAM to Monitor Juvenile Shad Migration & Transit Times

This plan includes three river hydroacoustic arrays upstream, in the forebay and downstream of the dam plus additional transducers located at expected passage routes (primary spill gates, fish bypasses and at the 10 turbine intakes). This plan targets juvenile shad only, not American eel.

Location—Figure B-1 shows the approximate locations of the three river transducer arrays. Three arrays are needed in order to estimate run timing, duration and magnitude through the project. The upstream array should be located downstream of significant shad spawning areas (to be determined by Study 21 – American Shad Telemetry Study). One potential spawning area may exist in the east side backwater area shown in Figure B1 between the upstream and forebay arrays. If it is a spawning area, this could confound results by introducing juvenile shad not monitored at the far upstream array, but the overall effect is expected to be small. Proper site river morphology for optimal technology performance is also a factor in locating the upstream and downstream arrays.

Figure B-2 shows the approximate locations of transducers at the dam at Units 1-10, the two fish pipes, the trash sluice and two most eastern tainter gates (Nos. 1 and 2) because typical flow conditions would not require operation of other possible exit routes under most circumstances.

Figure B-1. Conceptual diagram of locations for the three river arrays for Plan B. Red lines mark the upstream, forebay and downstream transducer arrays. Exact locations may change following site evaluations.

Figure B-2. Conceptual diagram of the dam sampling configuration for Plan B. Cyan dots represent the upward-looking split-beam transducers; Red triangle represent the conical beams of four horizontally aimed transducers pointing across the opening to the two tainter gates; and blue bar representing the bank of 10 upward-looking elliptical split-beam transducers mounted behind the trash racks.

Equipment Description—For each river array, this design includes two leased HTI split-beam echosounder systems equipped to multiplex up to 12 transducers per echosounder (total of 24 transducers). Transducers would be mounted to 6-ft long pipe X-shaped stands and secured to the riverbed. Twenty 15° transducers would be aimed vertically to the surface and four 6° transducers would be aimed horizontally (a few degrees from horizontal) to cover the upper water column in the shallow water along the slopes of the shore.

The acoustic frequency of 420 kHz would be selected because shad may detect (Mann et al. 1997) and avoid the ultrasound at commonly used fishery echosounder frequencies (38-200 kHz; Dunning et al. 1992; Ploskey et al. 1995; Ross et al. 1993, 1996), and the higher frequency and resolution is suitable for detecting small fish. Figure B-3 shows a conceptual illustration of the forebay river array beam geometry.

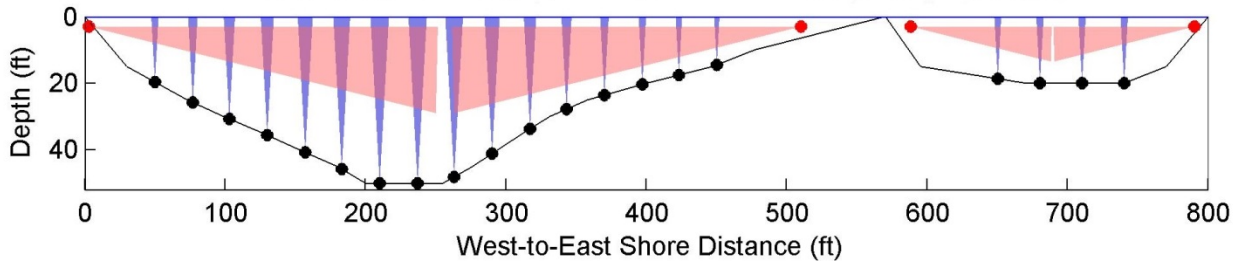

Figure B-3. Conceptual diagram of beam geometry of the forebay river array, pending site evaluation. Beams are mapped to scale but axis units are not to 1:1 scale to improve visualization. Blue cones represent upward-looking 15° split beam transducers and red cones represent side-looking 6° split beam transducers to target shad only.

For the dam-based transducers this design includes two leased 200-kHz HTI split-beam echosounder systems set to multiplex up to a total of 20 transducers to be installed, one set behind each of the trash racks. Upward and downward looking beams provide better coverage of the intakes and make no assumptions of where the fish will actually go, and would improve the design and results from the 2009 study (Normandeau, 2010). Each 6°x12° elliptical split-beam transducer at the intakes would mounted on a pan-tilt rotator to the inside face of each intake trash rack, aimed upward to effectively sample the upper water column inside the intake to target shad (Figure B-4).

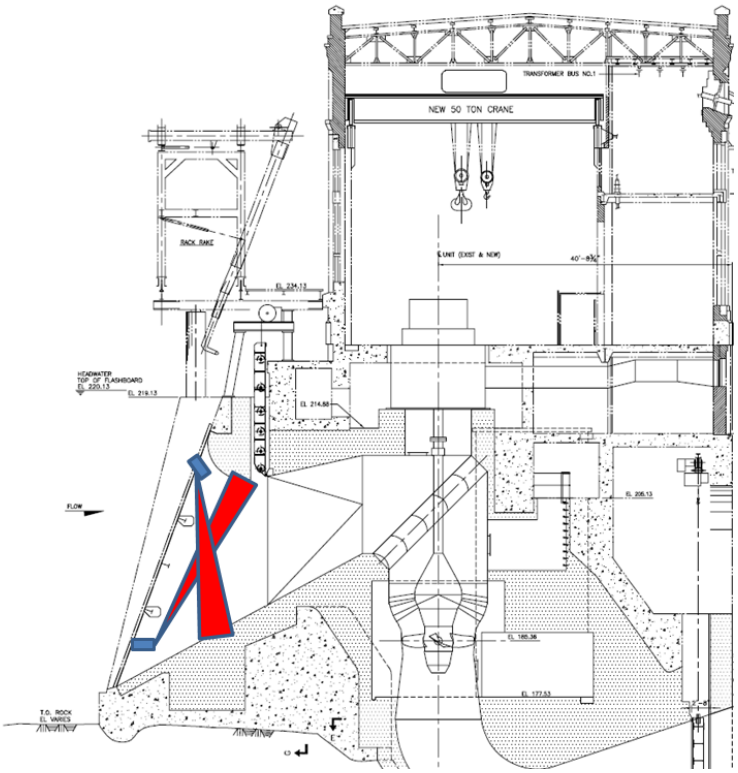

Figure B-4. Example of each turbine generating unit's intake with an upward-looking and downward-looking transducer (200 kHz split-beam) mounted on pan-tilt rotators for adjusting to optimal sampling behind the trash racks.

In addition, a 420-kHz split-beam echosounder system would be used to sample in front of the openings to the west fish bypass, the fish pipe and trash sluice, and at the most eastern two tainter gates Nos. 1 and 2 (see Figure B-2). Transducers would be mounted to the dam structure. The fish pipe, fish tube, and trash sluice openings would likely be sampled by upward-looking 15° split-beam transducers while the opening to the tainter gates may be sampled by a horizontally aimed transducer. Actual system design would depend upon site evaluation. The acoustic frequency of 420 kHz would be selected for beams sampling in the forebay because shad may detect (Mann et al. 1997) and avoid the ultrasound at commonly used fishery echosounder frequencies (38-200 kHz; Dunning et al. 1992; Ploskey et al. 1995; Ross et al. 1993, 1996), and the higher frequency and resolution is suitable for detecting small fish. However, 200 kHz would be used inside the trash racks to reduce scattering from bubble and flow-induced reverberation that would be higher at 420 kHz. The avoidance effect would be considered negligible based on the pointing direction and the location behind the trash racks where fish are committed to entrainment.

Transducer cables would be weighted down with sandbags secured by divers and would run to the east (NH) shore. An instrumentation shed would store the electronics and computers. The system would include a moderate sized propane tank to fuel a power generator for 2-3 days before re-fueling is required.

Sampling Coverage—The three river arrays would be located upstream and downstream of the dam. The effective sampling coverage may vary depending on exact locations and bathymetry at the selected sites. The forebay array would sample approximately 18% of the river's total cross-section (see Figure B3). Due to beam spreading, the wide 15° upward-looking transducers would effectively sample the upper water column where juvenile shad are expected to be predominantly distributed. The degree of coverage of the 20 upward-looking transducers over the ~500-ft channel segment would provide approximately 10-20% sampling error (coefficient of variation of 0.1-0.2). It is expected that the upstream and downstream arrays would have similar sampling coverage. The dam-based transducers would sample all possible passage routes that would be available to downstream migrating juvenile shad approximately 95% of the time during the migration season.

Sampling Schedule—The system would be installed and adjusted in late August for continuous monitoring from September through October because previous studies in the Connecticut River (O'Leary and Kynard 1983) and in the lower Vernon impoundment (Normandeau 2013) have shown the peak migration of out-migrating juvenile American shad occurs within this period. Alternatively, and at higher cost, the system could be installed in late July for continuous monitoring from August through November to better ensure that very early and/or late migrations are captured.

The temporal sampling by the transducers would likely follow a stratified systematic or random sampling scheme suitable for estimating a patchily distributed species, and provide an unbiased mean and variance estimate (Skalski et al. 1993, 1996). For example, at the start of each 2-hour block, one transducer would be randomly selected to start the sequence of each transducer transmitting at a high ping rate for one minute that would produce a total of 5 replicates per block for each transducer.

Expected Results—Both the relative index of volume backscattering strength and acoustic estimates of absolute abundance can describe the natural variability before and after out-

migration. However, the signature of the outmigration could be episodic and detected at the array as transient peaks in the acoustic index. If fish are low in abundance, gradually come down the river, or if milling creates a dampening effect, there could be a long moderate elevation in the acoustic index or a long semi-continuous damped signal in the time series corresponding to active outmigration.

The temporal pattern described can infer the timing and duration of the outmigration upstream of the project. The magnitude in the abundance index can be used as a relative measure for comparing multiple years using the same gear and sampling design, or as an estimate of absolute abundance if the uncertainty can be quantified and error within an accepted value. The lag time between pulses (peaks) can provide inference on transit time or residency time at the population level with two river segments (a far upstream segment and segment containing the forebay, dam, and tailrace). In addition, acoustic estimates of entrainment and passage would provide temporal and spatial patterns for quantifying the timing, duration, abundance and route selection over the range of typical flow conditions that include operation of the sampled passage routes (turbines, fish bypasses, trash sluice and tainter gates No. 1 and 2).

Acoustic estimates of entrainment and passage would provide temporal and spatial patterns for quantifying the timing, duration, abundance and route selection over typical flow conditions that operate the sampled passage routes.

Cost— Total estimated annual cost for a study using this hydroacoustic sampling plan would be approximately $2.93 million for a 4-month sampling period (Aug–Nov) and assumes no schedule delays and no equipment replacement due to weather or other acts beyond TransCanada's control. This cost includes study plan development, mobilization, monitoring, demobilization, analysis, and reporting. It doesn't include additional costs for modifications that may result from the study plan approval process. This cost does not include any costs associated with other sampling methods proposed in the revised study plans, and would replace Plan A proposed in Study 22. Costs associated with dive operations, safety and operational review, and direct mount materials are also not included.

Analysis and Metrics—The split-beam transducers would collect information necessary for determining relative fish size, position within the beam, direction and rate of movement through the beam, and volume backscattering strength proportional to fish density (Foote 1983; Simmonds and MacLennan 2005). Echo integration, echo counting or both would be considered for deriving fish density depending on their observed distributions. Like other clupeids (Dunning and Gurshin 2012; Gurshin et al. *in review*), juvenile shad may form dense schools during the day that make echo counting difficult, but then scatter as individuals during the night. The fish flux (number per unit area [vertical plane] and time) would be determined by the acoustic fish density estimate, and the rate of movement downstream and proportion that move downstream as estimated by split-beam tracking of individuals of juvenile shad size and/or from radio telemetry results. The fish flux then could be used to extrapolate to daily passage for the whole river cross-section. Depth layers could be weighted accordingly to the observed vertical distribution of juvenile shad. For transducers behind the trash racks, entrainment can be assumed to be 100%.

Verification—A weekly pelagic trawl and cast netting effort upstream of each of the three river arrays would provide biological samples to confirm species and size composition of acoustically detected fish.

Assumptions and Considerations—Several assumptions and considerations are important in evaluating this approach and its results:

- Background noise and acoustic scattering contributions by other targets (e.g., macroinvertebrates, entrained surface bubbles, sediment gas bubbles, other small fish) are assumed to be either negligible or can either be quantified or can be removed from analysis.
- The continuity of the study and the completeness of results may be compromised by natural acts beyond control (e.g., hurricanes, floods) or by vandalism.
- The fish density metrics derived from sampled portions will be representative of the unsampled portions, and can be scaled to stratified or whole-river estimates.
- The selected river array locations will be far enough upstream to minimize effects of milling behavior and far enough downstream to include counts of juveniles from all spawning grounds upstream of Vernon dam.
- The acoustic estimate of fish density attributable to juvenile American shad during out-migration can be separated from the natural variability which could be problematic if abundance is low and the relative contribution of false detection and classification is high. During the most recent three years that data are available, the annual (July-November) catch of juvenile American shad in the Vernon impoundment based on about 240 beach seine hauls/year was only 1,313 in 2012, 82 in 2011, and 195 in 2010 (Normandeau 2013). The standing crop index for juvenile American shad in the lower Vernon impoundment during 2000-2012 ranged from 723 to 31,491 (Normandeau 2013). During the same period, the number of adult shad passing upstream at Vernon dam ranged from 65 in 2007 to 10,715 in 2012 and the number trucked from Holyoke Lift and stocked in Vernon Pool ranges from 71 in 2001 to 2,128 in 2009 (Normandeau 2013).
- For estimating timing and duration of the outmigration, migration must start and end during the study period. Early and late migration is subject to more environmental variability.
- The peaks in magnitude (relative or absolute) that correspond to episodes of outmigration can be detected above the natural variability at the three sites and can be tracked (correlated) between the sites to determine the statistically significant lag times.
- Outmigration of juveniles from spawning or nursery habitat between sites does not confound the results (i.e., fish detected at sites downstream that didn't pass at the upstream sites).
- If outmigration occurs gradually, especially if abundance is low, then the peaks in the three time series may be difficult to track and determine transit times.
- Ideally, the pre-migration and post-migration levels should be observed at all sites so tracking of all pulses or peaks in the time series brackets the outmigration. As a result, this may require monitoring for longer than the cost-estimated 4-month duration to ensure that early or late migrants are detected at the first and last sites.
- Absolute abundance is subject to uncertainty of multiple parameters.

- Modifications to the 2009 Vernon Study (Normandeau 2010) would improve acoustic data quality include elliptical instead of circular beams, exclusive split-beam transducers for locating and TS estimates instead of single beam transducers, use of pan-tilt rotators to adjust the deployment for reducing interference, the use of 200 kHz instead of 420 kHz would reduce effects from bubbles, and raw data collection would allow for optimizing threshold and analysis settings.

Plan C: Hydroacoustic Arrays at 3 RIVER Sites AND AT DAM to Monitor Juvenile Shad AND ADULT EEL Migration & Transit Times

This plan is similar to Plan B and designed to target both juvenile shad and adult American eels.

Location—Same as Plan B (see Figures B-1 and B-2).

Equipment Description—Similar to Plan B for the river arrays but replaces two of the upward-looking split-beam transducers with two additional horizontally aimed transducers to sample near the bottom of the center of the channel where adult eels are likely to prefer (Figure C-1). Two horizontally-aimed imaging sonars at each river array also would be added to classify adult eels. The dam-based design is similar to Plan B with the addition of an imaging sonar (ARIS) suitable for classifying eel echo traces that would be deployed on a pole or rail system that could be used to move between turbine units (Mueller et al. 2008). It could also be mounted on a pan and tilt rotator to optimize sampling coverage in front of turbine intakes.

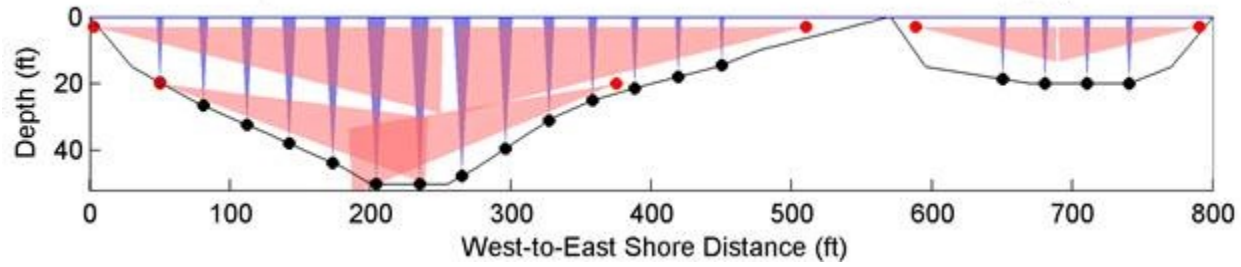

Figure C-1. Conceptual diagram of beam geometry of the forebay river array, pending site evaluation. Beams are mapped to scale but axis units are not to 1:1 scale to improve visualization. Blue cones represent upward-looking 15° split beam transducers and red cones represent side-looking 6° split beam transducers. Note: Imaging sonars would be aimed horizontally (2 additional red cones) and co-located with the bottom centered horizontal transducers to target adult eels.

Sampling Coverage—Same as Plan B and with the addition of imaging sonars and transducers aimed horizontally at river arrays to target adult eels, and the downward-looking beams at the turbine intakes in Plan B would also target where eels may prefer to pass (Brown et al. 2009).

Sampling Schedule—The system would be installed and adjusted in late July for continuous monitoring from 1 August through 30 November when out-migrating juvenile American shad and out-migrating silver-phase American eels are known to occur. Temporal sampling by the transducers would likely follow a stratified systematic or random sampling scheme suitable for estimating a patchily distributed species and provide an unbiased mean and variance estimate (Skalski et al. 1993, 1996). For example, at the start of each 2-hour block, one transducer would be randomly selected to start the sequence of each transducer transmitting at a high ping rate for one minute that would produce a total of 5 replicates per block for each transducer.

Expected Results—Same as Plan B, and targeting both juvenile shad and adult eels.

Cost—Total estimated annual cost for a study using this hydroacoustic sampling plan would be approximately $4.08 million for a 4-month monitoring period (Aug – Nov) and assumes no schedule delays and no equipment replacement due to weather or other acts beyond control. This cost includes study plan development, mobilization, monitoring, demobilization, analysis, and reporting. It doesn't include additional costs for modifications that may result from study plan

approval process. This cost doesn't include any costs associated with other sampling methods proposed in the revised study plans, and would replace Plan A proposed in Study 22. Costs associated with dive operations, safety and operational review, and direct mount materials are not included.

Analysis and Metrics — Same as Plan B with the addition of analysis for, and classification of adult American eels.

Verification—Weekly cast netting effort would provide biological samples to confirm species and size composition of acoustically detected fish. In addition, the imaging sonars would provide density information and target classification for eels to corroborate and complement the split-beam transducer results.

Assumptions and Considerations—Same as Plan B with the addition of:

- The distribution and abundance of eels will be suitable for acoustic detection.

Appendix C References

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CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document upon each person designated on the official service list compiled by the Secretary in the proceedings for Project Nos. 1892, 1855, and 1904 via electronic mail or first-class mail.

Dated at Washington, D.C., this 24th day of March, 2014.

/s/ *Kimberly Ognisty*

Kimberly Ognisty

ATTACHMENT D

Response of TransCanada to Supplemental Information

June 27, 2014

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

TransCanada Hydro Northeast Inc.	)	**Project No. 1892 (Wilder)**
	)	**Project No. 1855 (Bellows Falls)**
	)	**Project No. 1904 (Vernon)**

RESPONSE OF TRANSCANADA HYDRO NORTHEAST INC. TO SUPPLEMENTAL INFORMATION

TransCanada Hydro Northeast Inc. ("TransCanada"), licensee and future applicant for new licenses for the Wilder Hydroelectric Project No. 1892, Bellows Falls Hydroelectric Project No. 1855, and Vernon Hydroelectric Project No. 1904 ("Vernon Project") (collectively, "Projects"), hereby submits this Response to Supplemental Information placed into the record by Federal Energy Regulatory Commission ("FERC" or "Commission") Staff on June 20, 2014, regarding the use of hydroacoustic technology to assess the downstream migration of American eel through the Vernon Project. As discussed herein, the supplemental information supports TransCanada's position that hydroacoustic technology is not yet generally accepted in the scientific community to assess aspects of the downstream migration of American eel and that use of this technology on a scale necessary to assess the timing and duration, magnitude, residency time, and route selection of eels through the Vernon Project is prohibitively expensive.

I. BACKGROUND

On February 21, 2014, the Director of FERC's Office of Energy Projects ("Director") issued a Study Plan Determination for Aquatic Studies – Wilder, Bellows Falls and Vernon Hydroelectric Projects ("SPD") that required TransCanada to develop and implement a Vernon Hydroacoustic Study ("VHS"), which would address the objectives of four studies

proposed by TransCanada and approved, with modifications, in the SPD.[1] With respect to assessing American eel, the Director required a hydroacoustic array as a component of Study 11 – American Eel Survey ("Study 11"), the goal of which is to provide baseline data on the presence of American eel upstream of Vernon Dam in Project-affected areas. The objective of Study 11 is to characterize the distribution and relevant abundance of American eel in the Project's impoundment, riverine sections, and the Project-influenced portions of tributaries upstream of the Vernon Dam. In the SPD, the Director required TransCanada to develop and implement a plan to install a hydroacoustic array to "provide data on the out-migrating population of adult American eel from above Vernon dam in an efficient and cost-effective manner . . . ." SPD at p. B-16.

The Director also required a comprehensive hydroacoustic array as a component of Study 19 – American Eel Downstream Passage Assessment ("Study 19"), the goal of which is to assess whether Project operations are adversely affecting American eel downstream migration timing and survival by radio tagging and systematically monitoring fish movements and passage with the use of radio telemetry and balloon tags. The objective of Study 19 is to quantify the movement rates, timing, and relative proportion of eels passing through various routes at the Project and to assess the instantaneous and latent mortality and injury of eels passing through each turbine type. In the SPD, the Director required TransCanada to develop and implement a plan to install a comprehensive hydroacoustic array to "[p]rovide information on the timing, duration, magnitude, and passage route selection of downstream migrating American eels." SPD at p. B-36.

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[1] Three of these studies concerned American eel and one study concerned juvenile shad. This Response addresses the supplemental information placed into the record by FERC Staff regarding the use of hydroacoustic technology to assess American eel.

Finally, the Director required a comprehensive hydroacoustic array as a component of Study 20 – American Eel Downstream Migration Timing Assessment ("Study 20"), the goal of which is to assess the timing of American eels migrating from the Connecticut River to their spawning grounds downstream. The objective of Study 20 is to characterize the general migratory timing and presence of silver phase American eels in the Connecticut River in the context of environmental factors such as air and water temperature, turbidity, rainfall, river flow, lunar phase, and flow-related operations of hydroelectric projects on the mainstem of the Connecticut River. In the SPD, the Director required TransCanada to develop and implement a plan to install a comprehensive hydroacoustic system in order to "quantify and characterize the outmigration of silver phase American eels within the Connecticut River basin upstream of Vernon dam and . . . provide information on the timing and magnitude of downstream American eel migration necessary to evaluate potential project effects on American eel . . . without the need for the requested and potentially costly fyke netting." SPD at p. B-27.

The SPD required TransCanada to file a VHS plan, which addresses the objectives of Study 11, Study 19, and Study 20, with the Commission by September 13, 2014.[2]

On March 24, 2014, TransCanada filed a timely Request for Rehearing of Study Plan Determination ("Request for Rehearing"), which is currently pending before the Commission. In the Request for Rehearing, TransCanada requested that the Commission remove from the SPD the requirement to develop and implement the VHS and challenged the Director's

[2] The SPD requires TransCanada to develop and implement a VHS that uses hydroacoustic technology to assess the timing and duration, magnitude, residency time, and route selection of adult eel and juvenile shad at the Vernon Project. The adequacy of hydroacoustic technology as it relates to both species was discussed in the Request for Rehearing. However, it does not appear that FERC Staff placed into the record of these proceedings any scientific studies related to juvenile shad and the use of hydroacoustic technology with respect to that species. Therefore, this Response addresses only the two eel studies and the request for proposal for a pilot eel study added to the record by FERC Staff on June 20, 2014.

inclusion of the VHS because such a comprehensive hydroacoustic study had not been properly requested, consistent with the Commission's study criteria regulation, 18 C.F.R. § 5.9(b), by any agency or FERC Staff. In particular, no entity, including FERC Staff, had explained how the VHS methodology is consistent with generally accepted practices in the scientific community for assessing the timing and duration, magnitude, residency time, and route selection of outmigrating eels at a large hydroelectric project. Likewise, no entity, including FERC Staff, submitted any information in the record describing considerations of level of effort and cost for the VHS, and why alternative studies, namely Study 11, Study 19, and Study 20, as proposed by TransCanada, would not be sufficient to meet the information needs of the requesting entities. *Id.*

As explained in the Request for Rehearing, TransCanada's August 14, 2013 Revised Study Plan had proposed methodologies that are generally accepted in the scientific community to meet the objectives of Study 11, Study 19, and Study 20, such as radio tagging, balloon tagging, sampling, and a literature review.[3] *See* Request for Rehearing at pp. 25, 29, 31-32. TransCanada also explained that conducting a VHS, as described by the Director in the SPD, would be incredibly expensive. Request for Rehearing at pp. 21-22. TransCanada estimated that the annual cost of a VHS that quantitatively assesses the timing and duration, magnitude, residency time, and route selection of eel and juvenile shad would be $4.08 million. *Id.*; *see also* Appendix C of Request for Rehearing at p. C-3. Because the SPD requires that TransCanada conduct the VHS for two years, the two-year cost of the VHS would be $8.16 million, or more expensive than all 33 of TransCanada's other studies *combined*. *Id.*

[3] In addition, TransCanada's Revised Study Plan for Study 22 – Downstream Migration of Juvenile American Shad – proposed to deploy a single split-beam hydroacoustic transducer to monitor the entrance to the fish pipe (the primary fish pathway for downstream movement) for two months (September-October).

On June 19, 2014, TransCanada filed a Motion for Expedited Action on its Request for Rehearing, which requested action thereon by August 1, 2014, because the SPD, as it currently stands, requires TransCanada to file the VHS study plan by September 13, 2014. The next day, on June 20, 2014, FERC staff placed three new items into the FERC record relevant to the SPD and TransCanada's Request for Rehearing:

> (1) A February 20, 2014 Request for Proposals issued by the Electric Power Research Institute ("EPRI") to assess the utility of hydroacoustic technologies to study downstream migrating American eel approach and behavior at Iroquois Dam ("EPRI RFP"), which includes in Appendix C a 2009 white paper by Versar Inc. entitled *Review of Technologies for Guiding, Capturing, Holding, Transporting, and Monitoring Outmigrating Eels* ("Versar Report");
>
> (2) A 1999 study by Haro et al. that considered the utility of using hydroacoustic technology to assess the timing and magnitude of the American eel downstream migration in the bypass at FirstLight Hydro Generating Company's ("FirstLight") Turners Falls Project (FERC Project No. 1889) ("Haro Study"); and
>
> (3) A 2005 pilot study by Kleinschmidt Associates and Aquacoustics to assess the use of hydroacoustic technology to detect downstream migrating eels in the Anson Canal as they approach the powerhouse of the Anson Project (FERC Project No. 2365) ("KA Study").

II. RESPONSE TO SUPPLEMENTAL INFORMATION

The EPRI RFP, the Versar Report, and the studies referenced therein, which include the Haro Study and the KA Study, support TransCanada's position that the use of hydroacoustic technology to assess the timing and duration, magnitude, residency time, and route selection of outmigrating eels is not yet generally accepted in the scientific community, and that

use of hydroacoustic technology for these objectives in an area larger than a canal or small forebay is prohibitively expensive.[4]

A. THE SUPPLEMENTAL INFORMATION DEMONSTRATES THAT USE OF HYDROACOUSTIC TECHNOLOGY TO ASSESS DOWNSTREAM EEL MIGRATIONS IS NOT YET GENERALLY ACCEPTED IN THE SCIENTIFIC COMMUNITY

The EPRI RFP and the Versar Report demonstrate that hydroacoustic technology is not currently generally accepted in the scientific community to assess the objectives required by the VHS, including downstream eel migration timing and duration, magnitude, residency time, and route selection. As discussed in the EPRI RFP, EPRI solicited proposals for a small scale pilot study to determine *if* existing hydroacoustic technologies are capable of documenting the relative abundance and distribution of outmigrating eels at the Iroquois Dam on the St. Lawrence River. EPRI RFP at p. 11. The EPRI RFP specifically identifies hydroacoustic technology (or multiple technologies deployed simultaneously) as promising, but not yet generally accepted, to accomplish the objectives of the pilot study. *Id.*

Appendix C of the EPRI RFP is the Versar Report, which is included as essential background information for potential bidders. The Versar Report gathered and collated results from a comprehensive world-wide search for literature and information on the feasibility of using monitoring technologies, such as hydroacoustics, in the vicinity of Iroquois Dam to determine the effectiveness of various guidance or concentration devices for outmigrating eels. EPRI RFP at p. 10. Section 9 of the Versar Report reviewed state-of-the-art technologies that

[4] While this Response pertains to the application of hydroacoustic technology to assess American eel, it does not diminish in any way the position taken by TransCanada in its Request for Rehearing that application of this technology on the scale necessary at the Vernon Project to assess the movement of juvenile shad, as required by the SPD, would be grossly expensive ($2.9 million annually for a period of two years) and would add little additional information beyond that which will be gathered using more economical and proven technologies as TransCanada proposed in its August 14, 2013 Revised Study Plan.

could be used to monitor the movements of eels, including *all* known uses of standard active sonar (*e.g.*, split-beam) and sonar imaging (*e.g.*, dual frequency identification sonar ("DIDSON")), and found that the most common application of both technologies to fisheries at hydroelectric projects was to detect and assess salmon. *See* Versar Report at p. 9-18 (Appendix C to EPRI RFP). The Versar Report is crystal clear regarding the application of hydroacoustics to outmigrating eels: "Few studies to date have involved the use of hydroacoustics to monitor migrating eels in riverine systems." *Id.* at p. 9-19.

The only two studies that used hydroacoustics for this purpose are the Haro Study, which involved only standard active sonar, and the KA Study, which involved both standard active sonar and sonar imaging. However, neither the Haro Study nor the KA Study demonstrate that the use of hydroacoustic technology to assess the objectives identified in the VHS regarding eel outmigration at hydroelectric facilities is generally accepted in the scientific community. The Haro Study was conducted at the Turners Falls Project's Cabot Station in a canal, which is a confined trough with very directional flows and constant velocities when measured across the canal itself. Consequently, the study required a relatively small hydroacoustic array and design. The primary objective of the Haro Study was to evaluate whether adult eel echoes could be discriminated from other common acoustic targets (*i.e.*, similarly sized fish or objects). The Haro Study came to the limited conclusion that "it *appears* that hydroacoustic tools can be used as a *qualitative* tool to determine the spatial and temporal patterns of behavior of large eels in hydroelectric forebays." Haro Study at p. 11 (emphasis added). The Haro Study also acknowledged important limitations in the study, notably that "discrimination of eel targets from those of other fishes remains problematic," particularly for fish such as common carp, northern pike, large adult smallmouth bass, and walleye, and other "confounding factors" in a

hydroacoustic survey, such as water turbulence and turbidity, and the presence of drifting debris, especially given that "it is generally accepted that peak downstream movements of eels will occur when these conditions may at times be at their worst for acoustic monitoring (*i.e.*, high flows)." *Id.* at p. 12. Quantifying the number of eels detected passing the facility (the magnitude of the migration) was acknowledged as beyond the scope of the study. *Id.* at p. 3.

In contrast to the limited physical area within which the Haro Study was conducted, the Vernon Project has a 600-foot-long spillway and 355-foot-wide powerhouse and associated forebay. Additionally, due to the position in the river and the configuration of the Project (*e.g.*, located on a bend in the river with a small rock outcrop island immediately upstream, the presence of a louver array, a fish pipe, etc.) the flow lines into and within the Vernon forebay are complex and not uniform or consistent. The SPD requires that the VHS cover all passage routes for not only eels but also shad, and, therefore, a much more comprehensive hydroacoustic array would be required than that used at Cabot Station. *See* Plan C in Appendix C of the Request for Rehearing at pp. C-3, C-4, C-16, C-17. Also, fish of a similar size as adult eel, such as adult smallmouth bass and walleye, are present in the vicinity of the Vernon Project, and the Connecticut River at the Vernon Project carries a large quantity of debris, some of which is likely to have a similar target strength as adult eels, both of which would make eel detection difficult, as noted in the Haro Study. Thus, the narrow conclusion from the Haro Study that it *appears* hydroacoustic tools could be used to determine the spatial and temporal patterns of behaviors of eels in hydroelectric forebays in a qualitative manner, namely the Cabot Station canal, is not applicable to the Vernon Project, which exhibits substantially different characteristics. More importantly, the SPD requires TransCanada to develop and implement a VHS that qualitatively and *quantitatively* assesses numerous objectives

related to the outmigration of eels that were simply not studied in the Haro Study, including duration, magnitude, residency time, and route selection.

The KA Study evaluated the ability of two hydroacoustic technologies, split-beam (active sonar) and DIDSON (imaging sonar), to detect outmigrating eels passing the Anson Project in the Kennebec River. Both technologies were installed in the Anson canal and were able to detect approximately 200 eels over a two-week period. The KA Study found that both technologies provided a sufficient sample for determining general run timing and diurnal patterns in the migration of eels. The two technologies differed in their ability to distinguish eel echoes from other species or debris and in the extent of the range that could be covered by the technology. Split-beam systems have a longer range but a lesser ability to differentiate an eel from a large fish or debris. The more expensive sonar imaging systems (DIDSON) are better able to identify eels, but have a shorter range, and therefore would require more equipment for a larger area.

The KA Study does not establish that use of hydroacoustic technology is generally accepted in the scientific community to assess the timing and duration, magnitude, residency time, and route selection of outmigrating eels. The KA Study only obtained data relevant to general run-timing and diurnal patterns of migration, which could be used to partially assess the timing and duration of the eel outmigration. While hydroacoustic technology could be used to help gather information on the timing and duration of the eel migration in the vicinity of the Vernon Project, such information gathering is unnecessary. Specifically, information on the timing and duration of the eel migration will be gathered at the Turners Falls Project's Cabot Station, which is the most immediate downstream project on the Connecticut River from the Vernon Project, with hydroacoustic technology in the canal at the Cabot Station, as proposed by

FirstLight in Study 3.3.5 of its Revised Study Plan, *see* FirstLight's August 14, 2013 Revised Study Plan in Project No. 1889. In addition, TransCanada proposed in its Revised Study Plan, and the Director approved in the SPD, a literature review conducted by TransCanada as part of Study 20 to supplement FirstLight's Study 3.3.5. As previously noted, and as discussed in the Request for Rehearing, no entity has demonstrated that Study 20, as proposed by TransCanada in its Revised Study Plan, is insufficient to achieve the objectives of Study 20, especially given the cost as compared to the cost of deploying a hydroacoustic array at the Vernon Project for these purposes, as required in the SPD.[5]

The KA Study also showed that there are an abundance of eel in the Kennebec River, which is in stark contrast to the number of eel in the Connecticut River upstream from the Vernon Project. As explained in the Request for Rehearing, two decades of eel sampling upstream of the Vernon Project have demonstrated that there are very few eel upstream of the Vernon Project, and therefore an expensive hydroacoustic installation would be useless if there are very few eels to assess. Request for Rehearing at p. 23 (only 27 eels were collected in the Vernon impoundment during annual surveys from 1991 to 2011).

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[5] The KA Study acknowledged that, while a single transducer did not fully cover the entire cross-section of the intake canal for quantitative purposes, it nevertheless explicitly concluded that a "single transducer should therefore be sufficient to determine run timing and diurnal patterns." KA Study at p. 25. In its Revised Study Plan, TransCanada had proposed to install a single split-beam hydroacoustic transducer across the fish pipe at the Vernon Project as part of Study 22 to assess juvenile shad. Although not intended for monitoring eel, placement of the transducer on the river bottom aimed upward could *possibly* monitor the fish pipe entrance and detect eel in addition to shad. And, although unnecessary for the reasons discussed herein, the recordings from the single split-beam hydroacoustic transducer could be used to assess the run timing and diurnal patterns of eels, if present. However, as noted previously, the Director did not consider TransCanada's proposal in the SPD to deploy a single split-beam transducer. Instead the Director required TransCanada to develop and implement a VHS to install a comprehensive hydroacoustic system to assess the timing and duration, magnitude, residency time, and route selection of outmigrating eels and shad. The KA Study does not support such a comprehensive requirement.

B. THE SUPPLEMENTAL INFORMATION CONFIRMS THAT THE USE OF HYDROACOUSTIC TECHNOLOGY FOR THE PURPOSES IDENTIFIED IN THE VHS AT LARGE HYDROELECTRIC PROJECTS IS PROHIBITIVELY EXPENSIVE

The KA Study and the Versar Report confirm that use of hydroacoustic technology for the purposes identified in the VHS is prohibitively expensive. The purpose of the KA Study was to determine whether hydroacoustic technology was a viable option for monitoring the timing and diurnal pattern of the outmigration of eel at the Anson Project. While the two-week-long study resulted in eel detections, ultimately, the licensee chose to conduct monitoring to determine the effectiveness of downstream fish passage measures by using Passive Integrated Transponder ("PIT") tagging of outmigrating eels likely because of the relative cost and low data value of the hydroacoustic system. *Madison Paper Industries*, 120 FERC ¶ 62,145 (2007).[6]

In addition, the Versar Report includes some information for the estimated cost of the hydroacoustic equipment, as reported by vendors responding to the EPRI RFP, for the small scale pilot study at the Iroquois Dam requested in the EPRI RFP. *See* Versar Report, Table 9-4, at pp. 9-24, 9-25 (Appendix C of EPRI RFP). These equipment costs alone range from $250,000 to $1 million for a small scale split-beam system, and $90,000 for each DIDSON transducer. It is unclear from Table 9-4 in the Versar Report how many transducers were expected to be required for the small scale pilot project. To provide context, to conduct the VHS as required by the SPD, which would assess the timing and duration, magnitude, residency time, and route selection of juvenile shad and eel, would require up to 72 standard active sonar transducers and

[6] The licensee in that proceeding had previously proposed a study plan to monitor the effectiveness of the interim downstream eel passage measures that would characterize the behavior of eel and estimate the number of eel passing via the fishway by using a hydroacoustic monitoring system. *See* June 15, 2006 filing of Effectiveness Study Plan in Project No. 2365.

at least five sonar imaging transducers, and cost $4.08 million per year. *See* Plan C in Appendix C to the Request for Rehearing.

A significant cost in the use of hydroacoustics is the cost of personnel to review the hydroacoustic echoes. In contrast to the equipment cost estimates in the Versar Report, TransCanada's cost estimates to conduct the VHS include the cost of study plan development, mobilization of at least three separate multi-depth monitoring hydroacoustic arrays, equipment, continuous monitoring for four months each year, demobilization, analysis to capture the timing and duration, magnitude, residency time, and route selection of relevant fishes, and reporting. *See* Appendix C of Request for Rehearing at pp. C-3, C-4, C-16, C-17. TransCanada believes that its cost estimates are conservative in that they do not include the costs associated with equipment malfunctions and related delays. If the KA Study is any indication, the VHS likely would incur numerous unanticipated additional costs. *See* KA Study at p. 10. Therefore, the supplemental information confirms TransCanada's position that the cost of the VHS would be prohibitively expensive.

III. CONCLUSION

For the foregoing reasons, TransCanada respectfully requests that the Commission consider these comments in response to the supplemental information placed into the record for the Projects by FERC Staff on June 20, 2014.

Respectfully submitted,

/s/ Kimberly Ognisty

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ATTORNEYS FOR TRANSCANADA HYDRO NORTHEAST INC.

Dated: June 27, 2014

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document upon each person designated on the official service list compiled by the Secretary in this proceeding, in accordance with Rule 2010 of the Commission's Rules of Practice and Procedure, 18 C.F.R. § 385.2010.

Dated at Washington, D.C., this 27th day of June, 2014.

/s/ Kimberly Ognisty

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ATTACHMENT E

FWS Comment Letter on Request for Rehearing – April 23, 2014

TransCanada Request to Expedite Rehearing – June 19, 2014

TransCanada Request to Expedite Rehearing – July 25, 2014

United States Department of the Interior

FISH AND WILDLIFE SERVICE

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ORIGINAL

In Reply Refer To: FERC No. 1904-073
TransCanada Hydro Northeast Inc.
Connecticut River
COMMENTS ON TRANSCANADA'S REHEARING REQUEST OF FERC'S STUDY PLAN DETERMINATION

April 23, 2014

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E., Room 1A
Washington, DC 20426

Dear Secretary Bose:

This letter is in response to some of the points made in the request for rehearing on the Federal Energy Regulatory Commission's (FERC) Study Plan Determination (SPD) that TransCanada (TC) filed with FERC on March 24, 2014.

In its request, Winston & Strawn LLP, on behalf of TC, asserts that FERC's requirement that TC conduct a new, stand-alone hydroacoustics study was in error, arbitrary and capricious, and unsupported by substantial evidence. Herein, we provide for FERC's consideration responses to certain statements made by TC (via its legal counsel) relative to the U.S. Fish and Wildlife Service's (Service) position regarding the need for hydroacoustic technology.

- *TC states that the Service has shifted its position regarding why hydroacoustic technology is needed and what its use would be.*

On March 1, 2013, the Service submitted Study Request #6 (Impact of Vernon Project Operations on Downstream Migration of Juvenile American Shad) as part of our comments on TC's PAD. In that request, we stated that "Project discharge adjustments at the dam should be examined relative to timing, duration, and magnitude of juvenile shad migration to and through the dam, with hydroacoustic equipment for natural/wild fish information...Additional hydroacoustic assessment immediately upstream and downstream of the Vernon Dam will provide information on the timing of migration to and through this area." [emphasis added]

The Service again recommended using hydroacoustics to "determine timing, duration, and magnitude of the juvenile outmigration" in its July 15, 2013 comment letter on TC's Proposed Study Plan (PSP). The language used by the Service in the two letters is nearly identical and does not reflect a shift in our position. [emphasis added]

- *TC states that no stakeholder has submitted proposed modifications to TC's PSP or UPSP using the Study Criteria.*

The Service's original study request identified using hydroacoustic technology in Study 22. That request addressed all of the study criteria. Our comments on TC's PSP and UPSP reiterated our request to use hydroacoustic technology. Therefore, we did not propose a methodology that had not already been addressed pursuant to the Study Criteria.

- *TC misinterpreted comments made by the Service in its August 29, 2013 Revised Study Plan (RSP) letter.*

In response to TC's proposal to deploy a single-beam hydroacoustic transducer at the fish pipe, the Service stated "A single transducer near the fish pipe **may** provide sufficient insight into the timing, duration and relative abundance of the run **assuming that passage through the fish pipe is indicative of passage through other potential routes**. However, a single transducer directed towards the fish pipe will not allow an assessment of delay at the project" [emphasis added].

It appears that TC interpreted our statements to mean we agreed that passage through the fish pipe transducer was indicative of passage through other potential routes and therefore additional hydroacoustic transducers would not be needed at other potential passage routes for purposes of determining run timing, duration and magnitude. This is not the Service's position. Our statements were intended to highlight the fact that at present we have no data to support the assumption that passage through the fish pipe is indicative of passage through all other potential routes.

- *TC states that the Service has not explained how a comprehensive hydroacoustics array is consistent with generally accepted practice in the scientific community.*

Hydroacoustic technology has been used for many years at hydropower projects to examine and describe fish behavior through patterns of movement at various project structures (intakes, forebays, etc.) in relation to dam operations (Skalski *et al.* 1998; Nestler *at al.* 1999; Haro *et al.* 1999; Johnson *et al.* 1999; Johnson and Moursund 2000; Johnson *et al.* 2000; Johnson *et al.* 2005; McKinstry *et al.* 2005; Mueller *et al.* 2008; Hamel *et al.* 2008; Khan *et al.* 2009; Anonymous 2013). A common design feature in these studies is the use of multiple transducers in order to provide the necessary spatial coverage to adequately address study questions.

In addition, a search of FERC Online for the period 2000 to 2014 revealed that at least seven FERC projects (FERC Nos. 2145, 2365, 4678, 6842, 7481, 11393 and 12611) have used (or have agreed to use) hydroacoustic technology to monitor fish movement/passage.

- *TC believes that the Service has not sufficiently justified the need for hydroacoustics beyond the single-beam transducer at the fish pipe proposed by TC.*

The Service believes that it has justified the need for hydroacoustics, via both our written letters as well as during study plan development meetings. While the Service stands by the reasons previously submitted, below we provide more explicit details behind our justifications.

The hydroacoustic system requested by the Service will provide valuable information on the timing, duration and magnitude of the juvenile shad outmigration at the project, as well as aid in interpreting the results from the radio telemetry and turbine survival components of the study.

- The radio telemetry study will provide information on rate of movement and passage route selection of test fish. TC proposes to release 10 lots of 10 fish during the middle-to-late part of the passage season. Currently, it is unclear whether a sufficient number of shad large enough to tag (>110mm) will be available to use in the study. In addition, the overall number of test fish limits the number of environmental and/or operational scenarios that can be evaluated.

  Having concurrent hydroacoustic data would allow evaluation of timing, duration and relative abundance during the entire downstream migration, which would encompass a wide array of operational and environmental conditions. It also would ensure that some route selection data are collected (which could be inferred based on comparing the relative abundance of targets at each passage route within a given time frame), even in the event that the radio telemetry component of the study cannot be completed as proposed.

  As TC points out, radio telemetry allows for collecting data on individuals versus the population. The hydroacoustic data would allow for evaluating how congregations of targets (juvenile shad) change over time, over varying operational and environmental conditions, at different passage routes at the project.

- TC has not provided any supporting documentation that suggests a single-beam transducer at the fish pipe would provide data on timing, duration, and relative abundance of the run that is indicative of passage through other potential routes. While the radio telemetry element of the study may allow for verification of this assumption, it also could reveal that this assumption is false. Regardless, the results would not be known until the end of the passage season, which runs the risk of collecting data (single-beam transducer at the fish pipe) that is not sufficient for the Service to use in developing recommendations and/or prescriptions for any new license issued for the project for FERC to use in assessing the project impacts.

  Having concurrent full coverage hydroacoustic data would assist in interpreting the radio telemetry results (e.g., corroborate that test fish are behaving similar to wild fish with respect to route selection, as well as movements). While radio telemetry will allow determination of route selection of individuals, absent hydroacoustic data at all potential passage routes, we would not know whether those fish are selecting a route similar to

wild fish. For example, if the radio telemetry study shows that 50 percent of test fish use the fish pipe, but the single-beam transducer shows no wild targets using that route, it may indicate that the test fish are not behaving like wild fish. Although TC proposes to release the test fish with groups of wild fish to promote schooling behavior, without complementary hydroacoustic data, we would not know if the test fish actually pass a given route with or without a school.

- In September and October of 2012, the Service conducted boat electrofishing surveys along the immediate upstream shoreline (Vermont shore) of Vernon Station and repeatedly observed high levels of juvenile shad surface popping activity inside of the partial length fish diversion boom in the project forebay (Sprankle 2013). The proposed single transducer would not provide coverage for this important area which is in front of Vernon's turbine intakes.

  Although juvenile shad could not be sampled from the area where activity was observed because it was inside a cabled trash boom near the turbine intakes, data shown in that report (Sprankle 2013) were collected along the same shoreline and reflect fish densities/catch rates that align most clearly with this "inside" forebay area (again, an area that the single transducer would not cover). These observations speak to the need for a hydroacoustic system that encompasses different areas of the project. Data collected at the fish pipe only tell us what is happening at the fish pipe. We would not know (1) where other concentrations of targets (i.e., schools of shad) may be at the project; (2) how long those targets remain in those other areas; (3) whether the concentrations move among areas; or (4) how concentrations move among and/or within different project areas over varying operational and/or environmental conditions. Having a comprehensive at-dam array that covers all potential passage routes would fill in these important data gaps.

- The Service originally had expected that multiple arrays would be necessary to gather data on delay (i.e., time spent upstream of the dam before moving through and past the project). However, further review into the published literature has revealed a number of studies where use of a single, full coverage array provided information on fish behavior (i.e., passage, movement, milling, etc.) that we believe would help to answer any issues of delay at the project (Anonymous 2013; Khan *et al.* 2009; Hamel *et al.* 2008; Johnson *et al.* 1999).

The above information clearly shows the need for all three pieces of information: we need to know how quickly and by which routes the radio-tagged fish pass the project; we need to know the survival of test fish through different passage routes; and we need to know how the wild population behaves at the project over the course of outmigration (with respect to timing, duration, relative abundance, and patterns of movement at and among different passage routes). The result of each component will inform and aid in interpreting the results from the other components. Without all three, we could be left uncertain how to interpret data that showed, for example, all of the radio-tagged fish going through the fish pipe, but no hydroacoustic targets picked up at the fish pipe transducer, or, all the test fish going through the turbines, but the single-beam transducer indicates concentrations of targets only at the fish pipe.

- *TC disputes both FERC's and the Service's cost estimates to conduct the study requested.*

While the Service's cost estimate may have been low, we question why TC's estimate is so much higher than FirstLight's (FL) for a very similar study.[1] FL's Study 3.3.3 involves using hydroacoustics, radio telemetry and balloon tags to evaluate downstream passage of juvenile American shad. Relative to hydroacoustics, three separate systems would be deployed: one at the Northfield Mountain intake, one at Turners Falls Gatehouse, and one within the Cabot Station forebay. The estimated cost for the entire study is given as $400,000 to $500,000. This is significantly less than TC's estimate of $2.93 million.

Thank you for this opportunity to comment. If you have any questions regarding these comments, please contact Melissa Grader of this office at (413) 548-8002, extension 124.

Sincerely yours,

for Thomas R. Chapman
Supervisor
New England Field Office

[1] Revised Study Plan for the Turners Falls Hydroelectric Project (No. 1889) and Northfield Mountain Pumped Storage Project (No. 2485). August 14, 2013. FirstLight Power Resources.

cc: John Rangonese
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ES: JWarner:4-23-14:(603)223-2541

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UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

	)	**Project No. 1892**
	)	**(Wilder)**
TransCanada Hydro Northeast Inc.	)	**Project No. 1855**
	)	**(Bellows Falls)**
	)	**Project No. 1904**
	)	**(Vernon)**

MOTION FOR EXPEDITED ACTION ON REQUEST FOR REHEARING OF TRANSCANADA HYDRO NORTHEAST INC.

Pursuant to Rule 212 of the Federal Energy Regulatory Commission's ("FERC" or "Commission") Rules of Practice and Procedure, 18 C.F.R. § 385.212, TransCanada Hydro Northeast Inc. ("TransCanada"), licensee and future applicant for new licenses for the Wilder Hydroelectric Project No. 1892 ("Wilder Project"), Bellows Falls Hydroelectric Project No. 1855 ("Bellow Falls Project"), and Vernon Hydroelectric Project No. 1904 ("Vernon Project") (collectively, "Projects"), hereby submits this Motion for Expedited Action on TransCanada's Request for Rehearing of Study Plan Determination ("Request for Rehearing") filed on March 24, 2014, and currently pending before the Commission. As discussed herein, the Commission should expeditiously act on TransCanada's Request for Rehearing by August 1, 2014, because the Study Plan Determination as it currently stands requires TransCanada to file a Vernon Hydroacoustic Study ("VHS") by September 13, 2014. TransCanada respectfully requests expeditious action on its Request for Rehearing so that it will have clarification as to whether it is required to develop the VHS in the event the Commission denies the Request for Rehearing or, alternatively, so that it will have direction on how to proceed with the development of the VHS if the Commission modifies the VHS on rehearing.

I. BACKGROUND

Under the Commission's regulations, the development of a study plan to submit for Commission approval is a 9-month-long process. *See* 18 C.F.R. §§ 5.11-5.13. A potential applicant must file study plans for comment within 45 days of the deadline for filing comments on the pre-application document. 18 C.F.R. § 5.11. Stakeholders have 90 days to comment on the study plans, 18 C.F.R. § 5.12, and the potential applicant has 30 days to file revised study plans for comment, 18 C.F.R. § 5.13(a). The revised study plans must include the comments received on the study plan, a description of the efforts made to resolve differences over study requests, and, if the potential applicant does not adopt a requested study, it must explain why the request was not adopted. *Id.* Stakeholders then have 15 days to comment on the revised study plans, 18 C.F.R. § 5.13(b), and the potential applicant has 30 days to submit the study plans for Commission approval, 18 C.F.R. § 5.13(c). Thus, at a minimum, the study plan development process requires 9 months to complete.

Consistent with this study plan process, on April 15, 2013, TransCanada submitted for Commission approval 33 study plans for all resources potentially affected by the issuance of new licenses for the Projects. On September 13, 2013, Commission staff issued a study plan determination for 13 of TransCanada's proposed non-aquatic studies. On February 21, 2014, the Commission issued a Study Plan Determination for Aquatic Studies ("SPD"), which required TransCanada to conduct the 20 aquatic studies it had proposed, including a study to assess the downstream migration of juvenile shad, one component of which included a single beam hydroacoustic transducer located at the fish bypass to assess the timing of the juvenile shad migration.

In addition, the SPD required one new study that Commission staff labeled the "Vernon Hydroacoustic Study" (VHS). The SPD required TransCanada to file for Commission

approval a study plan for the VHS concurrent with TransCanada's Initial Study Report on the 13 non-aquatic studies, which is due on September 13, 2014. On March 24, 2014, TransCanada filed a Request for Rehearing challenging the inclusion of the new VHS in the SPD.

II. MOTION FOR EXPEDITED ACTION

TransCanada respectfully moves the Commission to expeditiously act on TransCanada's Request for Rehearing of the SPD by August 1, 2014. As described in TransCanada's Request for Rehearing, TransCanada has requested that the Commission remove the VHS from the SPD. If the Commission were to agree with TransCanada, then any costs incurred to prepare a study plan while awaiting the Commission's order on rehearing would be wasted. Alternatively, even if the Commission does not grant rehearing, it may modify or clarify the scope of the VHS. As discussed in TransCanada's Request for Rehearing, the scope, goals, and objectives of the VHS, as described by Commission staff in the SPD and by the agencies referenced by Commission staff in the SPD – the U.S. Fish and Wildlife Service, the Vermont Agency for Natural Resources, and the New Hampshire Fish and Game Department (collectively, "resource agencies") – are overly broad, vague, and inconsistent. Depending on the extent of the Commission's modifications or clarifications to the SPD in its order on rehearing, TransCanada may need to further revise the study plan in response to such order.

Commission action by August 1, 2014, would allow TransCanada approximately 45 days to prepare a study plan for the VHS for Commission approval. This process involves hiring aquatic resource consultants specialized in the use and application of hydroacoustic technology to design a proposed study plan consistent with the scope, goals, and objectives identified by the Commission. Once a proposed study plan is developed, the resource agencies need to be consulted and given a sufficient amount of time to comment on the proposed study plan. Finally, TransCanada would need to prepare a revised study plan, which addresses the

comments from the resource agencies, to be filed for Commission approval. As previously noted, this process ordinarily requires at least 9 months. At a bare minimum, TransCanada believes that it needs 45 days to prepare a study plan, consistent with the Commission's regulations, for the new VHS, which would require Commission action on TransCanada's Request for Rehearing by August 1, 2014.

Furthermore, the Commission may agree with TransCanada's arguments in its Request for Rehearing that a VHS is (1) redundant because TransCanada has already proposed to use hydroacoustic technology associated with its study to assess the downstream migration of juvenile shad, which was approved by Commission staff in the SPD, and (2) unnecessary because it would not provide meaningful additional incremental information regarding aquatic resources relative to the information to be derived from the Commission-approved studies, as more particularly explained in TransCanada's Request for Rehearing. Should the Commission find that a VHS is unnecessary, then action by the Commission on TransCanada's Request for Rehearing by August 1, 2014, would avoid unnecessary expenditures by TransCanada to develop this study.

III. CONCLUSION

For the foregoing reasons, TransCanada respectfully moves the Commission to expeditiously act by August 1, 2014, on TransCanada's Request for Rehearing of the SPD.

Respectfully submitted,

/s/ Kimberly Ognisty

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ATTORNEYS FOR TRANSCANADA HYDRO NORTHEAST INC.

Dated: June 19, 2014

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document upon each person designated on the official service list compiled by the Secretary in this proceeding, in accordance with Rule 2010 of the Commission's Rules of Practice and Procedure, 18 C.F.R. § 385.2010.

Dated at Washington, D.C., this 19th day of June, 2014.

/s/ Kimberly Ognisty

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UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

	)	**Project No. 1892**
	)	**(Wilder)**
TransCanada Hydro Northeast Inc.	)	**Project No. 1855**
	)	**(Bellows Falls)**
	)	**Project No. 1904**
	)	**(Vernon)**

RENEWED MOTION FOR EXPEDITED ACTION
ON REQUEST FOR REHEARING

Pursuant to Rule 212 of the Federal Energy Regulatory Commission's ("FERC" or "Commission") Rules of Practice and Procedure, 18 C.F.R. § 385.212, TransCanada Hydro Northeast Inc. ("TransCanada"), licensee and future applicant for new licenses for the Wilder Hydroelectric Project No. 1892 ("Wilder Project"), Bellows Falls Hydroelectric Project No. 1855 ("Bellow Falls Project"), and Vernon Hydroelectric Project No. 1904 ("Vernon Project") (collectively, "Projects"), hereby submits this Renewed Motion for Expedited Action on TransCanada's Request for Rehearing of Study Plan Determination ("Request for Rehearing") filed on March 24, 2014, and currently pending before the Commission.

On June 19, 2014, TransCanada filed with the Commission a Motion for Expedited Action on the pending Request for Rehearing of the February 21, 2014 Study Plan Determination ("SPD") issued by FERC Staff, which required TransCanada to develop a Vernon Hydroacoustic Study ("VHS") by September 13, 2014. TransCanada understands that the Commission does not meet in the month of August, and therefore TransCanada was disappointed that the Commission did not act on TransCanada's Request for Rehearing at the Commission's July 17, 2014 meeting. Accordingly, TransCanada herein renews its Motion for Expedited Action because without an order on rehearing that clarifies the scope, objectives, and goals of the

VHS, TransCanada will be required to consult with interested agencies on the development of a VHS, a study that would be based on a technology that is not generally accepted within the scientific community to achieve the objectives stated in the SPD and which is based on objectives that are overly broad, vague, and inconsistent.

As described in TransCanada's Request for Rehearing, TransCanada has requested that the Commission remove the VHS from the SPD because it would cost over $8 million (twice as much as all other studies required by the SPD combined). Because the SPD as it currently stands requires TransCanada to file a VHS by September 13, 2014, TransCanada respectfully requests expeditious action on its Request for Rehearing so that it will have clarification as to whether it is required to develop the VHS in the event the Commission denies the Request for Rehearing or, alternatively, so that it will have direction on how to proceed with the development of the VHS if the Commission modifies the VHS on rehearing.

For the foregoing reasons, TransCanada respectfully moves the Commission to expeditiously act on TransCanada's Request for Rehearing by August 1, 2014.

Respectfully submitted,

/s/ Kimberly Ognisty

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ATTORNEYS FOR TRANSCANADA HYDRO NORTHEAST INC.

Dated: July 25, 2014

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document upon each person designated on the official service list compiled by the Secretary in this proceeding, in accordance with Rule 2010 of the Commission's Rules of Practice and Procedure, 18 C.F.R. § 385.2010.

Dated at Washington, D.C., this 25th day of July, 2014.

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