ATTORNEY GENERAL
DEPARTMENT OF JUSTICE

33 CAPITOL STREET
CONCORD, NEW HAMPSHIRE 03301-6397

GORDON J. MACDONALD
ATTORNEY GENERAL

JANE E. YOUNG
~~ANN M. RICE~~
DEPUTY ATTORNEY GENERAL

July 2, 2018

Hand-Delivered

Pamela G. Monroe, Administrator
New Hampshire Site Evaluation Committee
21 South Fruit Street, Suite 10
Concord, New Hampshire 03301

Re: **SEC Docket No. 2015-04 – Application of Public Service Company of New Hampshire d/b/a Eversource Energy for a Certificate of Site and Facility for the Construction of a New 115 kV Transmission Line from Madbury Substation to Portsmouth Substation (Seacoast Reliability Project)**

Dear Ms. Monroe:

Enclosed you will find an original and one copy of the Supplemental Direct Testimony of Payson R. Whitney, III, P.E., ESS Group for filing in above-referenced matter.

A copy of this letter along with the testimony has been forwarded this day via electronic mail to the SEC Service List.

Thank you for your attention to this matter. Please feel free to call with any questions.

Sincerely,

Christopher G. Aslin
Senior Assistant Attorney General
Environmental Protection Bureau
(603) 271-3679
Christopher.aslin@doj.nh.gov

/llm
Enclosures
cc: Distribution List

#1774287

THE STATE OF NEW HAMPSHIRE
SITE EVALUATION COMMITTEE

Docket No. 2015-04

APPLICATION OF PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE D/B/A EVERSOURCE ENERGY FOR A CERTIFICATE OF SITE AND FACILITY FOR CONSTRUCTION OF A NEW 115kV TRANSMISSION LINE

THE SEACOAST RELIABILITY PROJECT

SUPPLEMENTAL DIRECT TESTIMONY OF PAYSON R. WHITNEY, III, P.E., ESS GROUP, INC.

ON BEHALF OF
COUNSEL FOR THE PUBLIC

JULY 2, 2018

Purpose of Testimony

Q. Please state your name, position and your employer.

A. My name is Payson R. Whitney, III, P.E., Vice President, Water & Coastal Engineering for ESS Group, Inc. ("ESS").

Q. Have you previously filed testimony in this docket?

A. Yes, I submitted pre-filed direct testimony along with my colleague Matthew D. Ladewig on behalf of Counsel for the Public dated July 31, 2017.

Q. What is the purpose of your current supplemental testimony?

A. In response to recommendations made by the New Hampshire Department of Environmental Services ("NHDES") in its February 28, 2018 letter to the Site Evaluation Committee ("SEC"), and in compliance with the revised Procedural Order issued on May 31, 2018, this supplemental testimony provides an evaluation of the use of horizontal directional drilling ("HDD") for the proposed Little Bay crossing and of the NHDES recommended jet plow trial in advance of the proposed cable installation.

Evaluation of HDD Alternatives

Q. What were NHDES' recommendations for evaluation of the use of HDD for the Little Bay crossing?

A. NHDES requested that the SEC consider requiring the Applicant to provide an evaluation of two alternative uses of HDD for the Little Bay crossing:

1. Shore-to-shore cable installation using HDD, and
2. Nearshore cable installation at one or both landfalls where hand-jetting is currently proposed by the Applicant.

Q. Please provide a general overview of cable installation using HDD.

A. HDD is a construction technique for the installation of underground cables in which the cable is pulled through a conduit that is placed underground in a borehole drilled by a directional drilling rig. The HDD process begins by mobilizing the HDD rig and related equipment to the drilling staging area. Once the equipment is set up, a small excavation is

made for the drill entry and for holding the bentonite and freshwater slurry that forms an impervious lining in the borehole during the drilling process.

A pilot hole is drilled from the entry pit to the exit point. After the pilot hole is complete, a series of reamers are placed on the drill pipe to widen the borehole to the desired diameter in stages (borehole diameter is larger than the conduit diameter to allow the conduit to be pulled through the borehole). A pulling head is then placed on the end of the drill pipe, which is used to pull the conduit into the borehole.

During the time that the borehole is being drilled, the bentonite and freshwater slurry drilling mud is circulated through the borehole and back to the HDD operations area. It is possible that geologic conditions (loose sediment, fractured rock) can cause a loss of circulations and escape of the drilling mud, which is known as a frac-out.

Prior to pulling the conduit, the conduit must be assembled. Ideally, drillers would like sufficient space to lay out the conduit for the entire drill length on land; however, space constraints at the drill site often will not accommodate this. In the case where there is limited space for conduit lay out, the conduit is assembled in sections using the space available, but sufficient space is needed to reduce the number of conduit sections to as few as possible. The width of the area needed for conduit lay out and assembly is dependent on the number of boreholes requiring conduits and is generally about 30 feet wider than the total width of the conduits required (e.g., for two 3-foot diameter conduits, the required width would be about 36 feet).

In some cases, internal conduits are placed inside the borehole conduit by pulling them through the borehole conduit to hold the individual cables. These internal conduits must also be assembled as described above. When internal conduits are used, the voids between the internal conduits and the borehole conduit are filled with a clay/bentonite or similar material and then the pipe ends are sealed. Pulling wires for the cables are also installed inside the internal conduits. After the internal conduit installation and void filling is complete, the pipe ends are sealed and the HDD equipment is removed from the site. Concrete transition vaults are then installed in the area of the HDD entry pit to provide an area to splice the submarine and upland cables together.

Following installation of the conduit, internal conduits if used, and transition vaults, the cables are attached to the pulling wire and the cables are pulled by a winch through the conduit and into the transition vault, where they are spliced to the upland cables within the transition vault. The splicing process can take a number of days or weeks to complete depending on the design of the cable. After splicing is complete, the transition vaults are closed and the disturbed areas are restored to pre-construction conditions.

Q. What are the limitations to using HDD techniques to install the submarine cable across the entire width of Little Bay?

A. The Little Bay crossing is approximately 1.1 miles long. It is possible to successfully advance an HDD bore across such a distance (depending on borehole size), and it is our understanding that this technique has been used to install fiber optic cables across the Hudson River near New York City and electric cables across Newark Bay, each of which has a similar width. When considering the use of HDD for submarine electric cable installations, the limitation is often not the length that can be drilled with HDD, but rather, the pulling limitations (maximum allowable tension and maximum pulling force) of the cable to be installed. Pulling a cable for a distance beyond the manufacturer's recommended maximum unsupported pulling length can jeopardize the structural and functional integrity of the cable. The Applicant will need to determine if an HDD bore across Little Bay and the pulling of the cable through that length of conduit is feasible for its proposed cable design.

Another consideration is that HDD borehole conduits do not dissipate heat generated during electric cable operation as effectively as the surrounding sediments. This buildup of heat can de-rate or damage the cable over time, which may mean a circulating fluid-based cooling system (e.g., glycol) would be necessary to maintain the design electrical capacity of the cable. Again, the Applicant would need to determine if such a cooling system would be necessary based on the design of the cable and the HDD bore, and would also need to determine what potential impacts would be associated with the presence of a cooling system.

Q. Is there an HDD alternative to crossing the entire Little Bay?

A. Yes. As recognized by NHDES, nearshore cable installation at one or both landfalls could be achieved using HDD, combined with jet plow burial for the middle of the Little Bay crossing.

Q. Is HDD commonly used for installing cables at landfalls?

A. Yes. HDD is commonly used for making landfall approaches as a means of minimizing nearshore impacts, but may not be the most advantageous solution in all situations. The feasibility of using HDD for cable installation must be made on a site-specific basis and take into account considerations such as: conditions at the landfall, navigational conditions in the adjacent waterbody, work area land availability, proximity to residential and other land uses, size and spacing of HDD conduits required to avoid derating the cable's ability to transfer power, ability to lay out and pull HDD conduit through the bore hole, time required to complete HDD operations versus other cable landfall techniques, subsurface geology, potential for drilling fluid breakout, and overall impacts to the community. Each of these considerations must be evaluated and compared against other options for submarine cable installation to make the decision on the landfall installation to be used. ESS has experience with submarine cable projects that have used both HDD and standard excavation/hand-jetting techniques at cable landfalls, including projects where HDD was used at one landfall and the standard excavation/hand-jetting techniques was used at the other landfall.

Q. Are there other construction operations that are required to facilitate an HDD operation for a submarine cable landfall installation?

A. Yes. To complete an HDD installation for a submarine cable landfall operation, an area for the HDD operations area must be prepared on land (typically on the order of 100 feet by 100 feet). Additionally, a long linear area with a width about 30 feet wider than the total width of the conduits required must be available for laying out and joining the borehole conduit sections. In the water, a dredged excavation must be made to a depth below the planned burial depth of the cable to expose the area where the HDD borehole will exit and to facilitate pulling of the cable back to shore through the HDD conduit. To

keep the area excavated in the waterbody open, a temporary sheet-pile cofferdam or gravity cell is usually required prior to excavating. After HDD activities and cable pulling activities are completed, the drilling area on land must be restored to pre-construction conditions, the temporary cofferdam must be removed (sheeting is often cut off at or just below the mudline) and the in-water excavation must be backfilled with clean material.

Q. Please describe the differences in installation technique between a shore-to-shore HDD and a landfall HDD.

A. As mentioned above, a landfall HDD installation requires an in-water work area to transition from HDD to jet plow burial. Prior to the typical HDD work beginning, a temporary cofferdam or gravity cell is installed at the HDD exit location and the area within it is dredged to the required depth. When the pilot hole is drilled, it emerges at the exit point in the pre-dredged offshore temporary cofferdam or gravity cell. For landfall HDD installations, the conduit can be assembled on land or on the water, depending on space availability and potential for conflicts with other users of the area. For an on the water assembly the entire conduit length would be assembled and then floated near the HDD exit point and then pulled back to shore through the borehole. Sufficient room to float the conduit without impeding navigation would be required.

With landfall HDD installations, it is likely that a period of weeks or months may pass between the end of HDD operations and the pulling of the submarine cables. This is largely a result of the timing of the HDD completion relative to the allowable in-water work windows, which are often too short to allow both activities to be completed in a single work window.

To install the submarine cables in the HDD installed conduits, the temporary cofferdam or gravity cell is re-dredged if necessary to expose the offshore end of the HDD conduit, and the transition vaults tops are excavated and removed. Divers then attach the end of one of the submarine cables to the pulling wire and the submarine cable is pulled by a land-based winch through the conduit and into the transition vault. Once in the vault, it is securely anchored. If the cables are to be bundled underwater and jetted into place in a

bundled configuration, this process is repeated until all the submarine cables are securely anchored in the transition vault. Jetting installation of the submarine cables towards the other cable landfall can then begin. If HDD is used at the other landfall, the same process of pulling the cables ashore is used before the final stretch of cable is jetted into the bottom.

Q. Is the submarine cable installed in the HDD installed conduit immediately after the HDD operation is completed?

A. Typically, the cable is not installed immediately after HDD operations are completed. In a waterbody crossing, HDD techniques may be planned for both landfalls. The two HDDs are usually installed in series (i.e., start the second after the first is completed) since the same HDD equipment is typically used at both landfalls. Also, most submarine cable projects are subject to time of year restrictions for in-water activities. These restrictions are often such that the allowable work window will not allow the HDD to be completed in the same work window as the submarine cable installation. In such instances, the HDD work could be completed as much as a year ahead of the submarine cable installation.

Q. In general terms, can you describe the differences in the types of impacts between using HDD techniques to install the submarine cable across the entire width of Little Bay, at one or both landfalls, and use of hand jetting at the landfalls?

A. The Applicant will need to provide a project-specific description of the different alternatives in its evaluation of using HDD for the two Little Bay Crossing alternatives requested by NHDES. The table below provides the SEC with a general summary of the various types of potential impacts and the differences between the alternative installation methods described in the NHDES letter. For the Entire Width HDD Crossing column, the table assumes that such a crossing is technically feasible, which is something the Applicant would need to determine.

Impact Category	Entire Width HDD Crossing	HDD at One or Both Landfalls	Entire Width Jetting Installation
Water Quality Effects from Jet Plowing	None	Jetting length reduced, depending on length of HDD bore(s).	As described by Applicant in the Record
Water Quality Effects from Hand Jetting	None	Likely eliminated, depending on length of HDD bore(s).	As described by Applicant in the Record
Impacts to Bathymetry	None	Avoids nearshore impacts, but requires temporary cofferdam installation and dredging. Jetting length reduced.	As described by Applicant in the Record
Impacts to Sediments	None unless frac-out occurs	Avoids nearshore impacts, but requires temporary cofferdam installation and dredging. Potential for frac-out. Jetting length reduced.	As described by Applicant in the Record
Impacts to Tidal Wetlands	None unless frac-out occurs	Avoids nearshore impacts, and potentially eliminates tidal wetland impacts.	As described by Applicant in the Record
Construction Duration	Longest	Longer than jet plow installation. Multiple construction phases, possibly over multiple years depending on allowable in-water work windows.	Shortest
Noise Impacts	Highest potential and longest duration. Drilling operations typically run almost 24 hours per day, 7 days per week until complete.	HDD use increases impacts. Drilling operations typically run almost 24 hours per day, 7 days per week until complete.	As described by Applicant in the Record
Shoreland Impacts	Depends on HDD entry and operations area locations. Potential impacts at both landfalls.	Depends on HDD entry and operations area location(s). Potential impacts at one or both landfalls.	As described by Applicant in the Record
Upland Construction Area	Requires HDD Operations Area that could be on the order of 0.25 acres at HDD entry location. Smaller operations area required at exit point. Requires space to lay out and join 1.1 miles of HDD conduit per borehole drilled.	Require HDD Operations Area that could be on the order of 0.25 acres at one or two HDD entry locations. Requires space to lay out and join length of HDD conduit equal to length of each borehole drilled.	Limited to area needed to install transition vault and trenches for the cables between waterline and the vault.
Construction Cost	Likely significantly higher than jetting installation and use of HDD at one or both landfalls.	Likely higher than jetting installation.	As described by Applicant in the Record.

Q. Would use of HDD to install the submarine cable at the Little Bay crossing reduce impacts to Little Bay and the surrounding area?

A. Ultimately, it is up to the Applicant to assess and balance the potential impacts associated with the various installation techniques and for the SEC to determine if the selected methods avoid, minimize, or mitigate potential impacts proposed by the Applicant are sufficiently protective of the environment and the public. Installation of submarine cables by jetting is a well-proven, low-impact, and short duration methodology that is used around the world for installing submarine electric and fiber optic telecommunication cables. The use of HDD for cable landfall installation is also very common where nearshore impacts must be avoided. In areas where nearshore impacts are of lesser importance or where site constraints (e.g., limited available land area) prevent the use of HDD, the use of jetting up to the shoreline is also common and well-proven.

Switching from hand-jetting to HDD at the Little Bay landfalls may reduce certain nearshore impacts while simultaneously introducing new impacts (e.g., increased construction noise, changes in construction duration). These new impacts would be significantly increased if HDD is selected to install the cable across the entire 1.1 mile width of Little Bay while the impact to water quality or sediments would be likely eliminated unless a frac-out occurs. From review of the project maps submitted to the record, both landfalls appear to be located adjacent to residential properties, and the addition of HDD to the project could result in increased impacts to these residences when compared to the jetting installation proposed by the Applicant.

Q. When should the determination about using HDD versus the previously proposed hand-jetting be made?

A. In our experience the determination about construction methods is made during the permitting process such that the proponent and regulators can evaluate potential impacts and avoidance, minimization, and mitigation efforts. Changes in construction methods after permits are issued are typically made when information about differing project site conditions is identified and permits are then modified accordingly.

Evaluation of Proposed Jet Plow Trial Run

Q. What was NHDES' recommendation regarding a jet plow trial run?

A. In its February 28, 2018 letter, NHDES requested that the SEC consider requiring the Applicant to perform a jet plow trial in Little Bay and submit a report and recommendations to NHDES and the SEC at least 90 days prior to the proposed cable installation. NHDES proposed that it would then review the submitted report and recommendations and provide its recommendations to the SEC. Cable installation would not be allowed to occur until authorized by the SEC.

Q. Have you been involved in submarine cable projects where regulators have required jet plow trials?

A. Yes. We have been involved in submarine cable projects where regulators have required pre-installation jet plow trials in the project area to simulate expected operating conditions. We have also used these opportunities to test and refine our field procedures for suspended sediment/water quality monitoring to that particular location.

Q. What have these jet plow trials involved?

A. The jet plow trials use the jet plow and cable lay vessel that will install the submarine cable to simulate installation of the submarine cables. During the trials, the installation contractor tests operational settings of the jet plow to minimize associated sediment resuspension while still achieving the design burial depth. The trials are performed in the actual field conditions within representative sections of, or areas proximate to, the proposed submarine cable route. The jet plow fluidizes sediment to the depth necessary to achieve the required cable burial depth over a typical distance of approximately 1,000 feet (without the cable in the plow). Suspended sediment/water quality monitoring is also performed during the jet plow trial to provide data to the installers, to test monitoring equipment, and to practice logistics and communications between the vessels in advance of the installation. In some cases the initial results of the monitoring during the jet plow trials are required to be provided to the regulatory agencies for review.

Q. When are these jet plow trials typically performed relative to the installation of the submarine cable?

A. In my experience, they are typically performed about a week or two before the start of submarine cable installation and last for one or two days.

Q. Why are the jet plow trials performed immediately before installation of the submarine cable?

A. The trials use the cable lay vessel, jet plow, pumps, other equipment, and personnel that will install the submarine cable after they have been mobilized to the project area. Depending on the installation contractor and the project requirements, such equipment usually is either pre-configured or assembled near the project site. Pre-configured equipment spreads are usually well-booked with other projects and arrive at the project site in time to install a particular project. This equipment may not be available for use in a jet plow trial well in advance of the installation. Assembled equipment spreads require several weeks to assemble and several weeks to disassemble. Performing the jet plow trials just prior to the installation activities assures that the trial will use the same equipment and personnel that will be used for the cable installation, provides a trial during the same seasonal conditions as the installation, and allows vessel crews to familiarize themselves with similar tidal, current, and navigational conditions as will be experienced during the installation.

Q. Are their disadvantages to performing a jet plow trial well in advance of the cable installation?

A. The NHDES recommendation is that Applicant must provide a report on the jet plow trial to NHDES at least 90 days in advance of the installation. To meet this requirement, the jet plow trial would most likely need to be completed at least 120 days (4 months) prior to the installation. Mobilization or assembly of the required equipment would need to start in advance of that. There is the potential that a jet plow trial performed this far in advance of the cable installation would not have the exact same equipment or personnel involved, which may not result in an accurate simulation of the cable installation. Additionally, a four plus month gap between the trials and the installation would mean

the jet plow trial would be performed in a different season than the installation, which could conflict with time of year restrictions in the permits and also lead to less valuable predictions of conditions that would occur during the cable installation four months later.

Another factor is the added costs that would result from a separate mobilization (transportation and setup) of the equipment to the project site, operations during the jet plow trials, and demobilization of the equipment (breakdown and transportation). These costs would be in addition to the cost of the cable installation and could be in the range of hundreds of thousands of dollars. In the case of the Seacoast Reliability Project, these added costs would be initially paid by Eversource but ultimately borne by ISO New England ratepayers. Performing the jet plow trial just before the cable installation would most likely result in significant savings to ratepayers when compared to a separate jet plow trial mobilization and demobilization months in advance of cable installation.

Q. How are the results of the jet plow trials used?

A. In my experience, the installers use the results of the jet plow trials to set the operating conditions of the jet plow (e.g., jetting pressures, rates of advancement) to be used during the submarine cable installation. In New York State, the project's permit conditions typically require that the jet plow be operated in accordance with the operating conditions determined during the jet plow trials to minimize suspension of sediments, but not reduce jetting pressures to the point that the required burial depth cannot be achieved.

Q. What sort of reporting to the regulators has been submitted at the end of the jet plow trials for which ESS has participated?

A. In my experience, real-time data measurements from the trials and planned adjustments (if any) to operational settings for the jet plow are provided to the regulators, who work cooperatively with the Applicant to evaluate whether the preferred operating conditions result in total suspended solids ("TSS") concentrations meeting the threshold TSS guidance criterion. If the jet plow trials demonstrate that such criterion is satisfied, the Applicant commences jet plow installation of the submarine cable system immediately after completion of the jet plow trials with no further consultation with the regulators. If the jet plow trials demonstrate that the preferred operating conditions result in real-time

TSS concentrations at the compliance location that exceed the TSS concentrations at the up-current background station by more than an amount specified in the permit, the Applicant reports such conditions to the regulators and works with the representatives of the regulators to evaluate and implement reasonable modifications to the jet plow operating conditions to minimize in-situ sediment resuspension associated with the jet plow installation procedure while still achieving the required burial depth in a timely manner.

Q. When do the regulators respond to the Applicant regarding their review of jet plow trial data?

A. It is important that regulators have certainty as to when the jet plow trial data will be provided for review, and equally important that the Applicant has certainty when the regulator's review will be completed. Because the jet plow trials are typically performed just before the start of submarine cable installation, we have worked on projects where the regulators have agreed to a permit condition that specifies the amount of time they have to review data submitted and report their findings/recommendations back to the Applicant. This avoids undue delay of the start of installation operations, which is typically expected to occur within days of completion of the jet plow trials. Permit conditions have been issued that required the regulators to respond to the Applicant as quickly as within one business day of receiving the jet plow trial data, and regulators have met this commitment.

Q. Does this conclude your supplemental HDD testimony?

A. Yes.