AMENDED ATTACHMENT TO SPECIAL USE PERMIT APPLICATION

SEPTEMBER 5, 2013

AMENDED ANSWERS TO QUESTIONS 7, 12 – 20

As noted in the Application for Transportation and Utility Systems and Facilities on Federal Lands, several items required extensive responses. Those responses are included in this Attachment. These responses and accompanying Exhibits replace those attached to the June 28, 2011 Special Use Permit (SUP) Application.

Item 7 — Project Description

Northern Pass Transmission LLC (Northern Pass) applies for a SUP from the United States Department of Agriculture Forest Service (Forest Service or USFS) authorizing it to construct, own, operate, and maintain an electric power transmission line (Northern Pass Transmission Line or Project) crossing portions of the White Mountain National Forest (WMNF) for which an existing private easement does not exist (the Proposed Use). *See* Exhibits 1, 2, 3. This SUP Application Amendment amends the Northern Pass SUP Application submitted on June 28, 2011. This Application also follows the Submittal for Initial and Second-Level Screening dated December 29, 2010 (Screening Submittal) which contains additional information regarding the Project, and it reflects the information contained in an amended application with the U.S. Department of Energy (DOE) for a Presidential Permit for the Project filed on July 1, 2013.

Northern Pass's purpose and need for the Project is to build and operate a participant-funded transmission line to deliver 1,200 MW of competitively priced, clean, low-carbon, base-load power (approximately 98 percent hydropower) from Québec to New Hampshire and the rest of New England.

The Project would deliver 1,200 megawatts (MWs) of low-carbon power to the electric transmission system in New Hampshire. Within the United States, the Project would consist of an approximately 153 mile long single circuit ±300 kV high voltage direct current (HVDC) transmission line that would extend from the Canadian-New Hampshire border and run southerly through New Hampshire and across approximately 10.56 miles of the WMNF to a converter terminal that will be located in Franklin, New Hampshire. *See* Exhibits 1, 2, 3. From there, the DC power will be converted to alternating current (AC), and transmitted via a new 345 kV transmission line approximately 34 miles in length to an existing substation in Deerfield, New Hampshire. Neither the converter terminal nor the new 345 kV transmission line would be located on any WMNF lands.

Northern Pass has altered some aspects of this overall route outside of the WMNF to address public comments about the original route. Specifically, in October 2010, Northern Pass proposed an overall route to DOE that it believed was reasonable and minimized any impacts associated with the Project. Public comments, particularly with respect to that part of the North Section where there is no existing transmission right-of-way (ROW), persuaded Northern Pass to seek a new route. In its amended July 1, 2013 Presidential Permit application to DOE, Northern Pass has proposed a new route in the

northern 40 miles of the transmission corridor located on land that its affiliate, Renewable Properties Inc., has purchased or leased or obtained an easement on from willing property owners. Just as it did when proposing the original route, Northern Pass sought to maximize the use of existing ROWs, minimize encroachment upon conservation areas, minimize the environmental impacts of both construction and operation of the line, promote reliability, and minimize visual impacts to New Hampshire communities. While the new proposed route is slightly longer, it makes greater use of existing ROWs and developed transportation corridors; it relies in large part on land that an affiliate of Northern Pass has successfully acquired in fee or by way of lease or easement for Project purposes from willing property owners; it affects 155 fewer parcels of land; it largely avoids more populated areas; thus affecting 70 percent fewer residents in areas with no pre-existing ROW than the originally preferred route would have; and it reduces visibility of the line both through routing changes and refinement of the transmission line design.

Northern Pass proposes to construct a portion of the Project within the existing transmission corridor in the WMNF (Corridor) in order to minimize impacts to the WMNF. This Corridor is 150 feet wide.[1] Despite the changes described above to the overall route, the route within the WMNF is very similar to that proposed in the June 2011 SUP application. With the exception of a new section on a private easement in Stark, discussed below, the proposed WMNF route (the Proposed Route) remains unchanged from 2011. *See* Exhibits 1, 2, 3.

The Proposed Route within the WMNF includes approximately six miles of permit area held by Public Service Company of New Hampshire (PSNH) pursuant to an existing SUP and approximately 4.55 miles of existing private easements (for which Northern Pass does not request a SUP).[2] By using existing transmission corridors in the WMNF, the Project would minimize clearing activities, disturbance of wetlands, and visual impacts, and would avoid a new crossing of the Appalachian Trail (AT).

Constructing the Northern Pass Transmission Line within the WMNF would require the relocation and replacement of all portions of the existing PSNH 115 kV AC transmission line within the WMNF so that both the PSNH line and the Northern Pass can fit within the existing Corridor. PSNH will separately request authorization to relocate its line from the Forest Service in a different SUP application.

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[1] With two exceptions, the PSNH SUPs authorize at least 150' wide corridors. The first is likely a typographical mistake. SUP Authorization WTM0771, east of I-93, identifies the Corridor as being 100 feet wide. Based on a review of the existing and past Forest Service SUPs for that location, the 100' wide permit area in Authorization WTM0771 appears to be a typographical error. Prior to the 2007 renewal of Authorization WTM0771, the width of the corridor in that location was 225'. A review of available records indicates that PSNH did not make any request to reduce the corridor width in that area, nor is there any record of any explicit or articulated decision by the USFS to alter the corridor width in that location. The probability that a typographical error occurred is also supported by the fact that PSNH holds a private easement in that location that is 225' wide. If the 100' width is the result of a typographical error, no actual widening of the physical corridor covered by the existing permit area in this location would be necessary. The other exception is an approximate ¼ mile long section located in the southern limits of the WMNF where U.S. Department of Agriculture Forest Service SUP FIA-136 provides PSNH with a 100-foot wide area. FIA-136 was issued as a result of PSNH accommodating the construction of Interstate 93. In the location of the FIA-136 SUP PSNH has an existing 225-foot wide easement.

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[2] Northern Pass anticipates that Public Service Company of New Hampshire will also submit an amendment to its existing SUPs to relocate its existing transmission line within the Corridor in order to accommodate the Project.

This SUP Application Amendment reflects the following modifications to the Project since Northern Pass LLC filed the original SUP Application in June 2011:

1. Northern Pass has significantly advanced the design of the Project, with the specific objective of reducing the visibility of the Project by taking advantage of forested buffers and natural terrain and by reducing structure heights where possible. The SUP Application Amendment includes information about structure heights and design and six visual simulations that reflect the transmission structures within the WMNF.

2. The SUP Application Amendment now includes a transmission line along a private easement in Stark which traverses the WMNF for a distance of 3,610.10 feet.

3. The SUP Application Amendment includes a request that the Proposed Use include a helicopter landing pad relocated from the existing ROW.

4. The SUP Application Amendment includes additional information on the potential environmental impacts of the Project as revised and proposed measures to avoid or mitigate those impacts.

5. The SUP Application Amendment provides additional information on the historic and cultural resources in the general area of the Project as revised, including the results of preliminary archeological surveys.

(a) **Type of system or facility.**

The Project will be an electric power transmission line.

(b) **Related structures and facilities**

1. Transmission structures

Within the Corridor, Northern Pass proposes to use primarily lattice steel structures, with some tubular steel monopole structures where warranted by local conditions, for the proposed HVDC line and tubular steel monopole structures for the relocated 115 kV transmission line. Exhibit 4 shows the structure types that the Project proposes to use in WMNF. The proposed HVDC transmission line will be co-located with the relocated existing 115 kV transmission line, thus minimizing visual impacts.

The proposed structures heights are identified in Exhibit 5. The HVDC lattice configuration will have an approximate base dimension of 30 feet by 30 feet and taper to a six foot by five foot column half way up the structure. HVDC lattice structures will be anchored to four concrete foundations at the corners of the base approximately three to five feet in diameter. Because the base is spread out on four foundations, it has less environmental impacts to the land's surface than the monopole structures discussed below, which use one large base. The drilled shaft foundation could range from 10 to 20+ feet deep depending on soils and load requirements for individual structural locations.

Monopole configurations for the HVDC transmission line will be approximately five to ten feet in diameter at the base, tapering to approximately one to two feet in diameter at the top. These structures will be anchored to concrete foundations approximately seven to twelve feet in diameter. The drilled

shaft foundation could range from 15 to 30+ feet deep depending on soils and load requirements for individual structural locations.

Relocated 115 kV monopole structures will be approximately two to four feet in diameter at the base, tapering to approximately one to two feet in diameter at the top. Angle structures for the relocated 115 kV line will be anchored to concrete foundations approximately three to five feet in diameter. Tangent structures, in contrast to angle structures, will be constructed with direct-embed foundations in which a hole is drilled three to four feet in diameter, part of the monopole structure is placed in the hole, and the voids are then backfilled with native soil or an engineered crushed rock. During the detailed design process, other foundation designs may be considered where they might improve constructability, reduce environmental impacts, or achieve other benefits.

For the proposed HVDC line the arms of the structures support insulator strings, bundled conductors, a dedicated metallic return conductor, and an overhead shield wire. The overhead shield wires will have a fiber optic core to enable communications and system protection functions between the two HVDC converter terminals, and between the Franklin HVDC converter terminal and the Deerfield Substation. The relocated 115 kV line will have arms that support insulator strings, conductors, and overhead shield wire.

Exhibit 6 shows a typical cross section of what the proposed structures will look like post construction.

Overall, the structure heights that Northern Pass is proposing for the portions of the Project crossing the WMNF range from 75 feet (three structures) to 110.5 feet (one structure). Northern Pass is proposing to construct the overwhelming majority of the structures in the WMNF at heights between 80 feet and 100 feet; a common DC structure height in WMNF will be 85-95 feet; a common AC structure height in WMNF will be 88-97 feet. *See* Exhibit 5.

Because the new structures will be co-located with the PSNH transmission line, they will be spaced approximately the same as the rebuilt PSNH transmission line. The majority of structures will be spaced approximately 500 to 700 feet apart; maximum spacing will be approximately 850 feet. The distance between structures will depend on the terrain and the height of the structures.

As described in the June 28, 2011 SUP Application, the transmission line will cross the AT in one location. As further discussed, this is not a new crossing – rather, Northern Pass has designed the Project so that the Project will cross at the same place the existing PSNH line crosses the AT. Using this one crossing will reduce visual impacts.

Northern Pass has designed the new transmission structures with the WMNF's Scenic Integrity Objectives in mind, including those defined for Very High and High Scenic Integrity.[3] "Very High … [r]efers to landscapes where the valued landscape character 'is intact' with only minute if any deviations. The existing landscape character is expressed at the highest possible level."[4] "High … [r]efers to landscapes where the valued landscape character 'appears intact.' Deviations may be present but must repeat the form, line, color, texture, and pattern common to the landscape character so completely and at

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3 *See* WMNF Forest Plan Management Area Direction for MA 8.3 at 3-52 (2005).

4 WMNF Forest Plan Glossary at 28.

such scale that they are not evident."[5] The Scenic Integrity Objectives, along with landscape character goals, inform scenery management desired conditions. As recognized by law, desired conditions that are not management area standards do not need to be consistent with all aspects of a Forest Plan, including scenic objectives, in the same manner that such actions need to be consistent with management standards.

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Here, in light of the changes to the Project, the landscape character will remain intact and will appear intact because the Project will be co-located next to a relocated existing transmission line that is already part of the landscape. This co-location will ensure that visual impacts will be minimized.

Northern Pass has included six visual simulations of the Project within the WMNF, attached as Exhibit 7.[6] The simulation locations for the Project were selected to convey to the public what the Project will look like from key vantage points and public viewing areas in the WMNF. Members of the public, the Project team, and LandWorks (the Northern Pass visual impacts consultant) suggested the locations for these and other simulations located on Northern Pass's website.[7] They selected, among others, locations considered to have local, state, or national significance as scenic or recreational resources and locations within conserved landscapes.

The drawings below provide some basis for how we see things in the landscape and ways in which the presence and location of transmission corridors affect visibility and the nature of that visibility.

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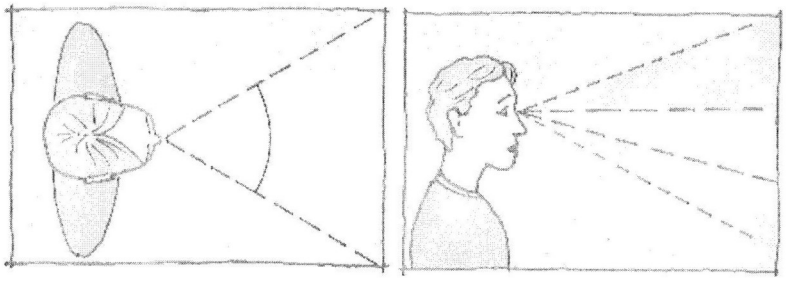
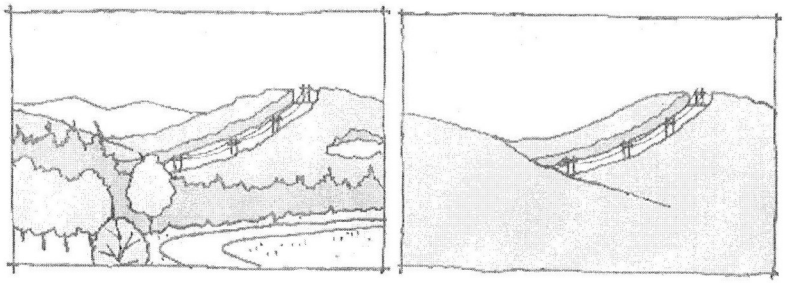
5 *Id.*

6 For the new portion of the Project in Stark discussed below, the spacing and configuration of the structures will be slightly different than those in the rest of the WMNF Corridor (and represented in these simulations) due to the proximity of the PNGTS pipeline.

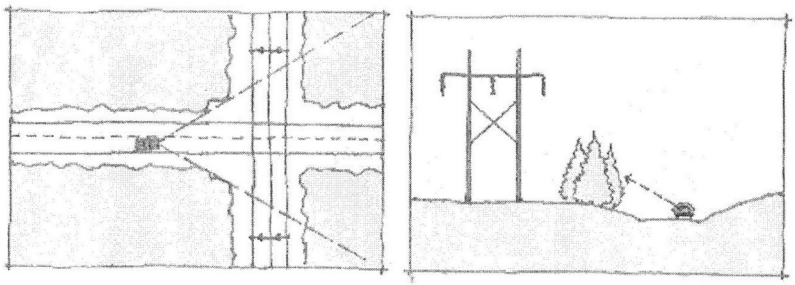
7 *See* http://northernpass.us/visual-simulations.htm



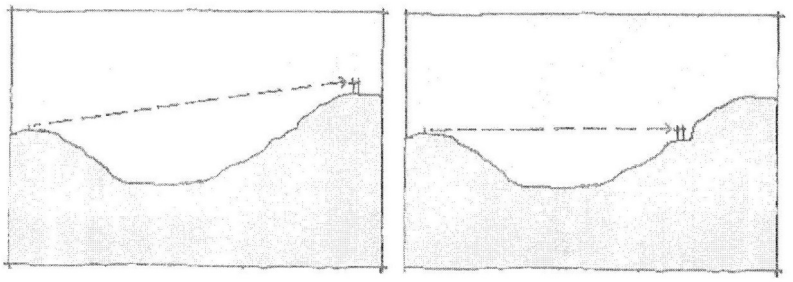
1. How humans perceive the visual environment is based, in part, on the capacity of the human eye to "take in" visual elements in a typical view. These illustrations depict the horizontal and vertical "cone of vision" for the human eye.



2. Landscapes that have many elements in them are able to better accommodate visual change. These two illustrations depict how a transmission line is readily de-emphasized, or "visually absorbed" by a landscape with a number of distinct elements, versus a landscape where the corridor is the only feature.



3. At road and trail crossings, the human cone of vision coupled with movement through the landscape can reduce or eliminate views of transmission structures. Roadside or trailside vegetation and screening can also de-emphasize or eliminate views of a transmission line.



4A. Transmission line structures are likely to be more visible when they are seen against a backdrop of sky, referred to as "sky-lining" or sky lighting".

4B. Transmission line structures are less visible/noticeable when there is a vegetative or landform backdrop that provides "back grounding".

Northern Pass will next develop a visual impact assessment for the Project which will include those portions of the Project within the WMNF. Northern Pass has taken significant steps to reduce the visual impacts from the transmission structures and will continue to work with the Forest Service and other interested parties to minimize impacts to the WMNF and the AT.

Timber-cutting associated with the helicopter pad is also allowed under the Roadless Rule because it is "incidental" to a "not otherwise prohibited" activity.[12] In addition to an identified relocated helicopter pad, field conditions may require the development of future additional helicopter landing sites near the Corridor for use as helicopter emergency landing areas.

3. New Transmission Line Section in Stark

The Project route through the WMNF has been modified to traverse the PSNH easement in Stark, NH.[13] However, this area is not part of the SUP request because it traverses an existing easement, which predates the Forest Service ownership of this land by nearly thirty-eight years and authorizes the holder to erect, repair, maintain, rebuild, operate and patrol electric transmission lines and distribution lines.[14]

The new Stark section will traverse the WMNF in the area identified in Exhibit 2. Within the WMNF, the new Stark section is 150 feet wide and 3,610.10 feet long.

(c) Physical specifications

Northern Pass requests a permit area through the WMNF that would be approximately 31,733 feet (6 miles) in length (not including the area covered by the existing private easements) and approximately 150 feet in width.

The Project will remain within the footprint of the Corridor, including all Project roads. These roads will be generally located where the existing access roads are today, will be approximately 16 feet in width, and will be improved only to the extent needed to accommodate equipment and vehicles typically for off-road construction. The total length of access roads within the WMNF is proposed to be 10.5 miles. The proposed access roads are shown in Exhibit 10. No roads outside the Corridor would be constructed or used: rather, special construction techniques will be used. These will include construction during winter periods when the ground is frozen (most notably the Bog Pond area in Lincoln) which will help to minimize disturbances to wetlands; the use of construction matting; and the use of helicopter construction techniques to minimize the impact on the WMNF.

The Project will require additional clearing and grading in order to construct, operate and maintain the structures necessary to support the transmission line. Generally, the Corridor will have to be cleared to a 150' width. Based on an analysis of 2010 New Hampshire Department of

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[12] *See* 66 Fed. Reg. at 3272 (36 C.F.R. § 294.13(b)(2)); *see also Hogback Basin Preservation Ass'n*, 577 F.Supp.2d at 1154 (cutting 21.5 acres of timber was incidental to a not otherwise prohibited management activity).

[13] *See* Exhibit 9, Easement from Dean F. Miles and Glen E. Miles to Public Service Company of New Hampshire, April 31, 1946 (filed August 27, 1946).

[14] *Id.* A SUP is not required for the portions of the Project in new Stark section because the PSNH's easement is an outstanding property right. *See Minard Run Oil Co. v. United States Forest Service*, 670 F.3d 236, 243 (3d Cir. 2011) (drilling on reserved rights did not require Forest Service authorization, and these holdings "apply with even greater force to outstanding rights"); Forest Service Manual (FSM) 2734.2 (setting forth the Forest Service policy for granting road and trail rights-of-way on Forest Service lands and providing that "[t]he holder of outstanding rights perfected on acquired land prior to Forest Service acquisition ... may exercise those rights without obtaining a special use authorization, unless the document creating the rights provides for an additional authorization"). This was confirmed by the WMNF previously in communications with PSNH.

Transportation aerial photography and input from Northeast Utilities Transmission field personnel, the current PSNH ROWs are cleared as follows:

1. The ¼ mile ROW section adjacent to Interstate 93 covered by PSNH SUP FIA-136 is cleared to approximately 120-feet in width;
2. In a 2.6 mile section near the Kinsman Trail (SUP FIA-120) the ROW cleared width ranges between 75 to 100-feet.
3. For the remainder of WMNF, the ROW cleared width is generally 130' with some sections greater than 130' and some smaller.

For the additional clearing needed, vegetation would be removed from the proposed Northern Pass Transmission Line footprint using mechanical methods. Forested vegetation would be removed using low-impact tree clearing. Low-impact tree clearing incorporates a variety of approaches, techniques, and equipment to minimize site disturbance and to protect wetlands, watercourses, soils, rare species and their habitats, and cultural resources. Appropriate erosion and sediment controls would be deployed as necessary. Where removal of woody vegetation is required, vegetation would be cut flush with the ground surface to the extent possible. Where practical, trees would be felled parallel to and within the Corridor to minimize the potential for off-Corridor vegetation damage. Care would be taken to maintain vegetation along stream banks and within wetlands to the extent possible. During and after the transmission line construction, off-Corridor "hazard" trees that could possibly pose hazards to the integrity of the transmission lines would be identified and removed following consultation with the local Forest Service office. Hazard trees that are weak, broken, decaying, infested or other similar trees could cause flashovers or contact the structures or conductors, or violate the conductor clearance zones if they were to fall toward the transmission lines.

(d) **Term of years needed**

Northern Pass requests a permit area for the life of the transmission line and thus requests a permit area for the maximum duration available under Forest Service regulations.

(e) **Time of year of use or operation**

The Northern Pass Transmission Line will operate year round.

(f) **Volume or amount of product to be transported**

The Northern Pass Transmission Line will transport 1,200 MW of primarily hydro-electric generated power.[15]

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[15] The electricity delivered over the Project would consist of "system" power comprised of approximately 98% hydroelectric generation, with the balance made up of a combination of other sources of generation.

(g) **Duration and timing of construction**

Construction of the portion of the Northern Pass Transmission Line within the WMNF will take approximately 9-12 months of active construction to complete. Construction within the WMNF will occur in phases at various times over the approximately 30 months it will take to construct the Northern Pass Transmission Line in its entirety.

(h) **Temporary work areas needed for construction**

Northern Pass will seek to minimize the area needed for temporary work, but the Project will require some temporary work areas to carry out construction within the WMNF. The number and location of these temporary work areas have not yet been determined. The temporary work areas will likely consist of a combination of temporary storage areas, staging areas, and crane pad areas. The temporary storage and staging sites will be within the Corridor or in nearby areas outside the WMNF. As much as possible, the Northern Pass will locate these temporary work areas outside of the WMNF.

Establishing these areas in proximity to construction sites will minimize the potential for inconvenience or nuisance effects to the public (*e.g.*, as a result of the movement of equipment, manpower, and supplies to and from the Corridor along public roads). Within the WMNF, if required, crane pad areas may be located within the Corridor at individual transmission structure locations where the means of access to transport cranes is available. Crane pads are used to stage structure components for final on-site assembly and to provide a safe, level work base for the construction equipment used to erect transmission structures. These pads can vary in size depending on specific requirements for each structure, but they could range between 5,000 and 14,000 square feet. Temporary storage areas are used to store material, equipment, and supplies and are typically between 2 to 5 acres depending on the exact use of the site. Staging areas are used to temporarily stockpile materials for construction closer to the worksite and are typically less than 2 acres.

The quantity or type of temporary work areas required within the WMNF will ultimately depend on the construction methods used. Because Northern Pass has not identified the specific locations of such temporary work areas, it has not identified those locations on the accompanying map. Northern Pass will update this information as more detailed information becomes available through the permit process.

Item 8 – Exhibits

Exhibit 1	WMNF Proposed Route Map 2a
Exhibit 2	WMNF Proposed Route Map 2b (Stark)
Exhibit 3	Outreach Maps
Exhibit 4	Structure Types
Exhibit 5	Northern Pass Project Chart of Proposed Structure Heights
Exhibit 6	Cross sections of Proposed WMNF Structures
Exhibit 7	WMNF Visual Simulations
Exhibit 8	WMNF Preferred Route Proposed Helipad Map 4
Exhibit 9	Easement from Dean F. Miles and Glen E. Miles to Public Service Company of New Hampshire
Exhibit 10	WMNF Preferred Route Access Roads Map 3
Exhibit 11	WMNF Preferred Route Railroad
Exhibit 12	WMNF Preferred Route Railroad (Stark)
Exhibit 13	Wetlands Table

Item 12 — Technical and Financial Capability

Northern Pass, LLC is a New Hampshire limited liability company in good standing in New Hampshire. Northern Pass, LLC is wholly owned by NU Transmission Ventures, Inc., which is, in turn, a wholly-owned subsidiary of Northeast Utilities, a public utility holding company.

Northern Pass, LLC has the technical and financial capacity to complete the Proposed Use. See 36 C.F.R. § 251.54(d). Northern Pass will draw on the proven resources of Northeast Utilities, which has highly developed expertise in the design, siting, and construction of high voltage transmission systems within their service areas in Connecticut, Massachusetts, and New Hampshire. Numerous projects have been completed by Northeast Utilities over the past several years. Northern Pass, as organized, has the economic capability to undertake the Proposed Use. In the last ten (10) years, Northeast Utilities has invested over $3 billion in major new transmission projects. For example, in 2008, to improve electric reliability and reduce costly congestion charges to customers in southwest Connecticut, Northeast Utilities successfully completed $1.6 billion in upgrades, spanning more than 109 miles of the electric grid serving the region. These transmission upgrades have saved customers more than $600 million since they were completed. Those projects won a 2008 Platts Global Energy Award for "Energy Construction

of the Year." In addition, Northeast Utilities won the 2009 Edison Award from the Edison Electric Institute (EEI). The Edison Award, EEI's highest honor, recognizes U.S. and international electric companies for outstanding leadership, innovation, and advancement of the electric industry. More recently, Northeast Utilities received approvals to commence the construction of the $700 million Greater Springfield Reliability Project.

Item 13(a) — Reasonable Alternative Routes and Modes

1. *Standard for Reasonable Alternatives*

Using the National Environmental Policy Act (NEPA), DOE and the Forest Service will "[r]igorously explore and objectively evaluate all reasonable alternatives" to the Project and thus to the requested SUP.[16] DOE and the Forest Service must also consider a no-action alternative.[17] Not every alternative is reasonable. The Council on Environmental Quality (CEQ) has stated that "[r]easonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense."[18] The Forest Service has no obligation to consider alternatives that are not practical or feasible (and thus, unreasonable). The D.C. Circuit has held that "CEQ regulations oblige agencies to discuss only alternatives that are feasible, or (much the same thing) reasonable."[19]

Nor must the Forest Service consider alternatives that do not meet the purpose and need statement articulated in the NEPA analysis.[20] While the NEPA analysis has not yet been completed, the Project's purpose and need is to build and operate a participant-funded transmission line to deliver 1,200 MW of competitively priced, clean, low-carbon, base-load power (approximately 98 percent hydropower) from Québec to New Hampshire and the rest of New England. This Project purpose and need should be prioritized in the development of the NEPA analysis's purpose and need statement.[21] Where "a private party's proposal triggers a project, the agency may 'give substantial weight to the goals and objectives of that private actor.'"[22] Northern Pass evaluated and herein describes reasonable alternative routes and modes with these standards in mind.

2. *Methodology for Selecting Project Alternative and Considering Other Alternatives*

Northern Pass has evaluated numerous routes throughout the State of New Hampshire for the Northern Pass Transmission Line. Routes other than those seriously considered were deemed unreasonable based on increased social or environmental impacts or excessive costs.

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[16] 40 C.F.R. § 1502.14(a); *see also* 42 U.S.C. § 4332(2)(C)(iii); *Vermont Yankee Nuclear Power v. NRDC*, 435 U.S. 519, 551 (1978).

[17] *See Center for Biological Diversity v. U.S. Dept. of Interior*, 623 F.3d 633, 642-43 (9th Cir. 2010) (rejecting a land exchange because of problems with the agency's assumptions for the no-action alternative).

[18] CEQ 40 Questions, Question 2a

[19] *Citizens Against Burlington v. Busey*, 938 F.2d 190, 195 (D.C. Cir. 1991).

[20] *Biodiversity Conservation Alliance v. Bureau of Land Management*, 608 F.3d 709, 715 (10th Cir. 2010); 40 C.F.R. § 1502.13.

[21] *Colorado Environmental Coalition v. Dombeck*, 185 F.3d 1162, 1174-75 (10th Cir. 1999); *Citizens Against Burlington v. Busey*, 938 F.2d 190, 195 (D.C. Cir. 1991).

[22] *Biodiversity Conservation Alliance*, 608 F.3d at 715 (quoting *Citizens' Comm. to Save Our Canyons v. U.S. Forest Serv.*, 297 F.3d 1012, 1030 (10th Cir.2002)).

In order to develop the potential project routes, specific steps were taken. An initial project area was established, prior to developing routes, based on the Project end points and a preliminary review of possible constraints in the area. Constraints are sensitive resources that could be affected by a transmission line. Constraints were identified by using the following four methods: field reconnaissance, review of United States Geological Survey (USGS) topographic maps, aerial photography and geographic information system (GIS) data, contact with state and federal agencies, and input from natural resource and conservation groups. Project representatives also met with state and federal resource agencies to obtain input on the Project. All of this information was mapped using GIS software to create constraint maps of the Project area.

After development of the constraint maps, the next step was to identify potential routes. The objective was to identify routes that begin at the northern portion of New Hampshire, connect to the proposed Southern Terminal, and continue to the existing Deerfield Substation, while reducing or minimizing impacts to the extent practicable to both human and natural resources. The routes consist of individual segments that can be combined to form a continuous path between endpoints. This step included multiple alternatives through each section of the Project area. The major factors in the routing were identified to minimize impacts to the extent practicable including: using existing private easements and other rights-of-way where possible, including the existing SUP area for PSNH; avoiding or minimizing new rights-of-way (particularly through state or federal forests or parks); minimizing the number of residences along the routes (particularly newly affected residences); minimizing the visual effect of the Project; avoiding conservation areas; and minimizing impacts to known cultural resource sites.

3. Alternatives Considered

Northern Pass considered the following alternatives for the whole of or parts of the Project, including the portions that Northern Pass now proposes to route through WMNF.

1. Original Proposed Route
2. Alternative Route Bypassing WMNF (passing through the towns of Easton, Landaff, Bath, Haverhill, Piermont, Orford, Wentworth, Dorchester, Groton, Rumney, Plymouth, Bridgewater, and Ashland)
3. Underwater Line
4. Underground Line
5. Underground in Highway ROW
6. Railroad ROW
7. Other Proposed Corridors
    a. Champlain Hudson Power Express
    b. Northeast Energy Link
    c. Vermont Transmission Corridor
8. Alternatives to the Project as a Whole
    a. Locally-based renewable energy projects, including wind, small hydro and solar.
    b. Demand-side management (DSM) and energy efficiency.
    c. Natural Gas-Fired Generation.
9. No-Action alternative

Item 13(b) describes these alternatives and discusses why they are unreasonable. Northern Pass also considered alternative structure designs, as described below.

4. Alternative Structure Designs

There are a variety of transmission structure types that Northern Pass could employ. Structures can vary both in height and design, and differing designs are desirable at different locations to address operational, environmental and aesthetic interests. In designing the Project, Northern Pass is doing all that it reasonably can to minimize impacts of the line, recognizing that minimizing one impact can increase another. For example, when lower structures are used, more structures are required. That may reduce the number of locations from which the line can be seen, but the increased number of structures could increase wetlands or other on-the-ground impacts in certain areas.

The base structure design for the Project within the WMNF is lattice structures. The structure heights that Northern Pass is proposing for the portions of the Project crossing the WMNF range from 75 feet (three structures) to 110.5 feet (one structure). Northern Pass is proposing to construct the overwhelming majority of the structures in the WMNF at heights between 80 feet and 100 feet; a common DC structure in WMNF will be 85-95 feet; a common AC structure in WMNF will be 88-97 feet. *See* Exhibit 5.

Item 13(b) — Basis for Alternatives Dismissal

1. Original Proposed Route

For purposes of the alternatives analysis, the original overall route through New Hampshire and its alternative segments (except near the Concord Airport) is no longer the preferred route. Public comments from landowners and residents of communities along the original route in the northern portion of the route and the originally proposed alternative segments in the northern, central (where WMNF is located) and southern portions of the route suggest that acquiring the property that would be needed to build the Project along the originally proposed route and its alternatives may be unachievable. Additionally, the new proposed route, which is in large part either on existing ROW or on land that an affiliate of Northern Pass has acquired, leased or obtained an easement for from willing landowners, is preferable for all the reasons identified above.

2. Alternative Route Bypassing WMNF

An alternate route bypassing WMNF would pass through the towns of Easton, Landaff, Bath, Haverhill, Piermont, Orford, Wentworth, Dorchester, Groton, Rumney, Plymouth, Bridgewater, and Ashland. It was not selected for two principal reasons: first, the desire to minimize impacts on the AT, and second, recognition of the practical challenges associated with the acquisition of a large number of private land holdings that the route would entail.

The AT crosses the entire expanse of the State of New Hampshire. Accordingly, any transmission line running from the northern border to southern New Hampshire must cross the AT. To minimize the impacts to the AT, Northern Pass evaluated various routes for the Northern Pass Transmission Line — focusing on existing private easements, other rights-of-way, and existing transmission line areas to minimize the impacts to the environment, particularly to the AT. The Proposed Route would cross the AT within the Corridor along an existing private easement that is

already used for electricity transmission. This reduces the environmental, visual, recreational, and other impacts to the AT. The Alternate Route, which bypasses the WMNF entirely, would require crossing of the AT at the site of an existing road rather than an existing transmission crossing, requiring a new clearing along the AT area. This would result in greater impacts along the AT than the Proposed Route.

Second, routing the Project entirely around the WMNF also presents significant practical problems that the route through the WMNF does not present. Specifically, the Alternate Route would require Northern Pass to acquire and clear approximately 53 miles of new corridor, which would be approximately 13 miles longer than the Proposed Route and require the acquisition of many parcels of privately held land. While Northern Pass indicated from the beginning that it did not want to rely on eminent domain to acquire needed property rights, in 2012, New Hampshire amended its eminent domain law to preclude the use of eminent domain for projects like Northern Pass.[23] This Alternate Route also would have greater visibility than the Proposed Route. Moreover, the Alternate Route would pass within 500 feet of 44 residences that would be newly affected by a transmission line. This compares to two newly affected residences outside the WMNF along the Proposed Route. Other problems include too-narrow rights of way, technological construction issues, and geographic inefficiencies.

3. Underwater Line

Pointing to the example of the Champlain Hudson Power Express (CHPE) project, several members of the public argued in their scoping comments that Northern Pass should have included in its SUP Application the alternative of an underwater line. In developing an underwater line, CHPE has been able to take advantage of the fact that waterways of considerable length and depth lie between the power source and the power delivery point. Northern Pass does not have that option.

The underwater option is not technically feasible for the Project because, unlike Lake Champlain and the portions of the Hudson River where the CHPE project is designed to traverse underwater, the Connecticut River, the largest north-south waterway in the relevant area, which runs along the Vermont/New Hampshire border, can only be navigated by shallow draft vessels above Enfield, Connecticut. Such shallow draft vessels cannot accommodate the equipment needed to install an underwater cable. Thus, an underwater option that might be feasible in other locations and circumstances cannot be used in the New Hampshire portion of the Connecticut River, and there is no alternative waterway.

Specifically, the CHPE Presidential Permit Application describes the equipment needed to lay and then maintain an underwater cable at the required depths, which CHPE explains generally range from three to four feet to 15 feet beneath the bed surface.[24] Most reaches of the Connecticut River in northern New Hampshire are too narrow or too shallow to accommodate vessels larger than canoes, kayaks and small motorized boats. Dams and waterfalls also occur along the Connecticut River,

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[23] Chapter 2:b of the Laws of 2012; codified at NHRSA 371:1.

[24] *See* CHPE Presidential Permit Application, OE Docket No. PP-362, at 7-10. Available at http://energy.gov/oe/downloads/application-presidential-permit-oe-docket-no-pp-362-champlain-hudson-power-express-inc.

requiring even those in small watercraft to portage around them. The Skagerrak, which is a vessel that is designed for laying cable under water, illustrates the impracticability of the underwater approach for the Project. The Skagerrak has a dead weight of 9,373 tons, a beam of 32 meters and is 112 meters long. The draft of this vessel – without the cable loaded on-board – is 5.4 meters. A vessel of such proportions simply cannot navigate the Connecticut River where it would be needed to lay the cable for the Project.

In short, there is simply no viable underwater route for the Project.

4. *Underground Line*

Numerous commenters have suggested that the Project should be installed underground—if not along the entire route, at least in areas such as the WMNF. Several alternatives have been suggested for how the line might be placed underground: (i) along the proposed route; (ii) along a railroad bed; and (iii) along the side of highways. There are some constraining issues in common for all three of these alternatives, and there are some that are particular to each. None of them, however, represents a practical alternative to the Project.

Installing an HVDC transmission line underground requires some or all of the following:

- Excavation of a trench along the underground route;
- Use of construction techniques such as jack & bore, directional boring, and micro-tunneling to go under rivers, streams, or wetlands, or to go through mountains and other sensitive areas where open trench construction is not preferred or feasible;
- Installation of a duct bank (including conduits), in areas where direct bury is not available, with a dimension of approximately three feet by five feet with the top of the duct bank located 30 inches below finish grade. The duct bank will be encased in concrete or flowable backfill for physical protection;
- Installation of cable splice vaults or splicing pads approximately 60 feet long, 15 feet wide and eight feet tall (vaults only) and located approximately every 1,800 feet. The specific dimensions between splice locations are driven by the cable length that can be transported over the road and the physical conditions (terrain, wetlands, water bodies, etc.) of the cable installation location. The specific distance between splicing locations could vary from less than 1,000 feet to approximately 3,000 feet based on these factors;
- Use of large pieces of equipment, including:
  - flatbed trucks to deliver the cable reels (approximately 12 to 14 feet high and weighing approximately 25 to 30 tons each);
  - cranes needed to lift and place the splice vaults into the ground; and
  - a cable-pulling rig needed to install the cable into the completed duct bank system.

- ROW terrain that is accessible by the required large equipment along the entire length of the ROW to allow the cable reels to be placed in the proper position for installation, and allow the cable splice trailers to access the splice locations.

Because cable trenching involves more extensive and permanent disruption of the affected land, inevitably, underground placement typically results in greater impacts than an overhead line in all respects except visibility. It also presents enhanced operations and repair challenges. In an Edison Electric Institute (EEI) survey, utilities identified numerous challenges associated with operating underground, including:

- Longer timeframes and more difficult challenges in installing, maintaining and repairing equipment;
- Greater difficulty to upgrade or make system changes;
- Greater susceptibility to flooding and damage from dig-ins;
- Difficulty of making repairs in frozen ground or areas of heavy snow;
- Need for greater coordination with landowners; and
- Need for more specialized skills and training to maintain systems.[25]

Addressing these challenges entails significant extra costs. The higher costs relate to every aspect of an underground project, including: installation, facility replacement, material costs, design redundancy, operations and maintenance, repairs that require specialty contractors and labor-intensive work to locate faults. EEI also notes that underground projects in geographic areas with severe frost and rocky conditions can face significantly increased costs. Just to build it, however, EEI estimates that an underground line can entail costs that are five to ten times the cost of a comparable overhead line.[26] For a project like Northern Pass that is designed to deliver competitively priced power to the market, these additional costs are economically infeasible if they affect any substantial portion of the line.

Many of the factors that would make an underground route along the entirety of the Project impractical are present in the WMNF. A significant portion of the Proposed Route within the WMNF is located in mountainous areas with steep grades. The installation of a cable requires that a permanent roadway be established along the entire route in order to transport the large cable reels and cable pulling equipment. Additionally, an underground installation would generally require splicing the cables approximately every 1,800 feet. Splicing areas for the cable need to be located on relatively flat terrain, not on the kind of steep slopes present in many areas of the Project.

Constructing the cable system would also have a greater impact on natural resources than an overhead line. The cable system would require that significant construction activities be performed in a continuous straight line. This would afford limited opportunities to avoid wetlands and other sensitive resources within the corridor. By contrast, an overhead line can span sensitive areas, thereby minimizing the disturbance.

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[25] EEI, *Out of Sight, Out of Mind 2012,* at 26-27 (Jan. 2013). Available at http://www.eei.org/issuesandpolicy/electricreliability/undergrounding/Documents/UndergroundReport.pdf

[26] *Id.* at vi. EEI estimates that the costs of an overhead line range from $174,000 to $11 million per mile, whereas the costs of an underground line can range from $1.4 million to $30 million per mile. *Id.* at 30.

In some cases, it would be possible to install a conduit system with a trenchless technology like directional boring. The trenchless construction method would require the use of large equipment at the sending and receiving end of the directional boring locations. Such equipment could not be transported to certain areas of the Project, including substantial areas within the WMNF.

As described above, the Proposed Route crosses hundreds of small streams and several rivers that would require cable installation techniques noted above. An underground cable system and the associated trenching requirements would also likely have a greater adverse impact on archeological resources and sensitive plants and plant communities than an overhead line.

Providing year round access to the entire underground cable route would also present much greater operating challenges than an overhead route, creating the risk that, in the event of trouble with the cable, it could be out of service for an extended period to allow for diagnosis and repair of the problem. Installation of an underground cable system in the WMNF, in particular, would not be practical because of the significant construction impacts and year round access requirements of an underground cable system.

If Northern Pass were to attempt to construct substantial parts of the Project underground in combination with other overhead sections, it would entail a further drawback. Unlike low-voltage lines, an HVDC line at ± 300kV requires a "transition station" at each location where the line would connect the overhead and underground portions of the line. A transition station is similar to a substation: it requires above- and below-grade construction, is surrounded by a chain link fence and occupies an area approximately 160 feet by 180 feet. To include four such permanent facilities (two for each proposed underground segment of the Project) along the 153 mile HVDC line path involves relatively modest impacts. However, building such facilities at regular locations along the line to accommodate each transition between the overhead and underground segments could aggravate, not mitigate, a broad array of the impacts of the Project, including those to wetlands and historic and cultural resources.

Finally, there is an important legal impediment to underground construction along the Proposed Route. Northern Pass has the ability to use the existing PSNH ROW in accordance with and under the conditions of the easements on record. While all of the easements along the Project path allow for overhead lines, very few explicitly provide rights to construct underground facilities. More than 600 easements could require modification for Northern Pass to be authorized to install an underground line. With the passage of legislation in New Hampshire that removed eminent domain rights for the Project, it is extremely unlikely that underground rights for the existing ROW areas could be secured along the entire Proposed Route.

For exactly the kinds of reasons detailed above, during just the last few years, a number of federal agencies have concluded that lengthy underground transmission lines are not a reasonable alternative to overhead lines. Although the projects in question varied in size, design and length, the agencies have uniformly concluded that underground transmission is not a practical alternative except for very short segments. Four examples follow:

- The National Park Service (NPS) rejected full consideration of an underground option for the Susquehanna to Roseland transmission line that crossed three NPS-protected areas because it concluded: "[The] cost would be five to eight times the cost of conventional