Cricket Valley Transmission Line and Re-conductoring Project

Exhibit 3

Alternatives
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXHIBIT 3 ALTERNATIVES</td>
<td>3-1</td>
</tr>
<tr>
<td>3.1 Introduction</td>
<td>3-1</td>
</tr>
<tr>
<td>3.2 The “No Action” Alternative</td>
<td>3-2</td>
</tr>
<tr>
<td>3.3 Alternative Transmission Technologies</td>
<td>3-4</td>
</tr>
<tr>
<td>3.3.1 Transmission Voltage</td>
<td>3-4</td>
</tr>
<tr>
<td>3.3.2 Underground Transmission Line Technologies</td>
<td>3-5</td>
</tr>
<tr>
<td>3.3.3 High Voltage Direct Current (HVDC) Technology</td>
<td>3-10</td>
</tr>
<tr>
<td>3.4 Alternative Routes</td>
<td>3-10</td>
</tr>
<tr>
<td>3.5 345 kV Aboveground Transmission, Design Alternatives</td>
<td>3-12</td>
</tr>
<tr>
<td>3.5.1 Structure Selection</td>
<td>3-12</td>
</tr>
<tr>
<td>3.5.2 Foundation Design</td>
<td>3-12</td>
</tr>
<tr>
<td>3.5.3 Conductor Selection</td>
<td>3-13</td>
</tr>
<tr>
<td>3.5.4 Insulator Selection</td>
<td>3-13</td>
</tr>
</tbody>
</table>

# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure 3-1</th>
<th>Pleasant Valley to Long Mountain Locus Map</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 3-2</td>
<td>Existing Transmission, Hudson Valley</td>
</tr>
<tr>
<td>Figure 3-3</td>
<td>Overhead 345 kV, Existing Line 398 and New Monopole, Typical Cross Section</td>
</tr>
<tr>
<td>Figure 3-4</td>
<td>Underground 345 kV Transmission, Typical Cross Section</td>
</tr>
<tr>
<td>Figure 3-5</td>
<td>Underground 345 kV Transmission, Typical Transition Structure, Photo</td>
</tr>
<tr>
<td>Figure 3-6</td>
<td>Underground 345 kV Transmission, Typical Transition Facility (2 sheets)</td>
</tr>
<tr>
<td>Figure 3-7</td>
<td>Underground 345 kV Transmission, Typical Vaults</td>
</tr>
<tr>
<td>Figure 3-8</td>
<td>Routing Study Area</td>
</tr>
</tbody>
</table>
3.1 Introduction

Cricket Valley Energy Center, LLC ("Cricket Valley") is proposing to: (1) develop a new approximately 14.6-mile 345 kilovolt (kV) transmission line parallel to the existing Consolidated Edison Company of New York, Inc.’s ("Con Edison") 345 kV Line 398 ("Line 398") from the planned Cricket Valley switchyard (the "Cricket Valley Switchyard") in the Town of Dover, New York to Con Edison’s Pleasant Valley Substation in the Town of Pleasant Valley, New York (the "Transmission Line"); and (2) re-conductor an approximately 3.4-mile segment of the existing 345 kV Line 398 in the Town of Dover between the Cricket Valley Switchyard and the New York-Connecticut state line (the "Re-conductoring Segment") (collectively the “Project”).

The Project will also include improvements to Consolidated Edison’s Pleasant Valley Substation. New protection and communication system upgrades will be required within the existing control buildings at the Pleasant Valley Substation.

On September 26, 2012, the New York State Department of Environmental Conservation (NYSDEC) issued a State Environmental Quality Review Act ("SEQRA") Finding Statement for the Cricket Valley’s proposed combined cycle, natural gas-powered 1,000 megawatt (MW) electric generating facility in Dover, New York (the "Generation Facility") and the Cricket Valley Switchyard – the Generation Facility’s point of interconnection to the New York Independent System Operator ("NYISO") administered transmission grid.

The Generation Facility was granted a Certificate of Public Convenience and Necessity ("CPCN") by the New York Public Service Commission ("PSC" or "Commission") in February of 2013. As approved by the PSC, the Generation Facility would tie into the adjoining Con Edison Pleasant Valley/Long Mountain Line 398. Line 398 is an intertie connecting the NYISO operated grid with the New England ISO (ISO-NE) operated grid. The Pleasant Valley/Long Mountain 345 kV Line 398 is one of three interties in upstate New York.

The CPCN approval also noted that Cricket Valley would need to “contribute to system reinforcements on the New York State Transmission System” (Order Granting Certificate of Public Convenience and Necessity, Case 11-E-0593, Feb 14, 2013, page 5-6; also see Condition 12, page 27, or the “CPCN”). At the time of the CPCN approval, the NYISO 2011 Class Year Study was underway; the study would subsequently determine the extent of transmission upgrades required for Cricket Valley to Interconnect to the grid.
The results of the 2011 Class Year study were released in July 2013 (NYISO Class Year 2011 Facilities Studies System Upgrade Facilities Initial Round Report, July 9, 2013). With respect to Cricket Valley’s Generation Facility, NYISO determined that the Project is a system upgrade facility (“SUF”) necessary to allow the Generation Facility to interconnect with the grid without adversely impacting the reliability, stability, operability or transfer limits of the system.

The Cricket Valley Switchyard, Transmission Line and the Re-conductoring Segment together will fulfill the NYISO SUF determination, and allow the Generation Facility to interconnect with the grid. After construction, ownership of the Cricket Valley Switchyard, the Project and the associated Certificate of Environmental Compatibility and Public Need (“CECPN”) will be transferred to Con Edison, which will own, operate and maintain the Cricket Valley Switchyard and the Project.

From the New York – Connecticut state line, Line 398 continues southeasterly to the Long Mountain Substation, a distance of approximately 5.5 miles. This segment of the line, as well as the Long Mountain Substation, is owned and operated by Northeast Utilities (“NU”). The Connecticut portion of Line 398 will be permitted, engineered and re-conducted by NU as a separate project under the jurisdiction of Connecticut regulators. Cricket Valley has an agreement with NU for the NU re-conductoring project. A locus map for the Pleasant Valley to Long Mountain 345 kV Line 398 is provided as Figure 3-1.

In the process of examining an alternative Project concept which would allow the Generation Facility to interconnect with the grid, Cricket Valley considered a number of alternatives and sub alternatives. The alternatives considered included the “No Action” alternative, as well as a range of transmission technologies and voltages. While use of the existing Con Edison Line 398 right of way is an available and direct route, Cricket Valley also examined the area for potential alternative routes. Sub alternatives evaluated included structure configurations as well as the choice of conductors.

3.2 The “No Action” Alternative

The Project is an SUF required by NYISO to allow the interconnection of the very efficient, natural gas fired, 1,000 MW Generation Facility, at a desirable location, proximate to the Pleasant Valley Substation. As noted in the PSC CPCN (pages 1 and 2):

“The new facility is expected to provide cost effective electricity with lower emissions than many existing generating facilities. The facility may also act as a replacement for generation forced to retire due to environmental or other regulatory factors. Further, the facility is expected to provide black-start services and to rehabilitate an inactive industrial site and provide economic growth for Dutchess County and the Town of Dover.”
As noted on page 7 of the CPCN, economic benefits are expected to include approximately 300 construction jobs, 28 permanent operations jobs, secondary employment benefits and substantial tax payments to the Town of Dover. On a broader basis, the March 2012 NYISO Congestion Assessment and Relief Integration Study ("CARIS") indicated that connection of a 1,000 MW generation facility to the Pleasant Valley substation would produce an estimated ten-year electricity production cost savings of $330 million (present value). The ten-year production cost savings are due to the uncongested location and the assumed better heat rate of the generic generating unit compared to the average system heat rate. More recently, the Phase 1 NYISO 2013 CARIS Report increased the recommended generation solution to relieve transmission congestion to a 1320 MW generation facility at Pleasant Valley. A 1,320 MW plant would reduce congestion by 18% in 2017 and 31% in 2022. Even though the estimated ten-year electricity production cost savings was revised down to $231 million (present value), the 2013 CARIS Report shows that the Pleasant Valley generation solution produces higher production cost savings in the aggregate over a ten year period than alternative transmission solutions. Accordingly, CVEC anticipates that the Project could potentially generate $231-$330 million in production cost savings identified in CARIS for the benefit of New York State ratepayers.

Without the proposed Project, none of the substantial benefits of the $1.4 billion Generation Facility can be realized. Accordingly, the no-action alternative is not considered to be a viable option. Additional supporting information is provided in the balance of Section 3.2.

On September 26, 2012, the NYSDEC issued a favorable Finding Statement for the Generation Facility, stating that the Project will displace the operation of older, less efficient generating plants and have a positive impact on the current use of energy, while minimizing environmental impacts to the maximum extent possible. The Town of Dover also issued a favorable SEQRA finding statement and a Special Use Permit on January 30, 2013.

On February 14, 2013, the PSC granted the Generation Facility a CPCN, finding the Facility was necessary and convenient for public service because: (1) a demand side management alternative would not serve the base-load energy demand the Facility is intended to service and would also forgo the black start capabilities expected from the Facility; (2) renewable technologies do not appear to be viable alternatives for this scale of Facility at the Facility location; (3) construction of the Facility will rehabilitate an inactive industrial site, which would not otherwise be achievable. The CPCN also states that, “as an additional source of power generation in the Hudson Valley, the project will help meet long-term electric system capacity needs and may relieve short term reliability concerns due to generation retirement” (CPCN, page 18).

Under the no-action alternative, there are additional Project benefits that would not be realized. First, the Project connects the 1,000 MW Generation Facility to the NYISO-administered grid in Zone G, below the congested Upstate New York / Southeast New York
As described above, NYISO’s “Congestion Assessment and Relief Integration Study” (CARIS) (March, 2012) specifically identified the addition of 1,000 MW of new generation at the Pleasant Valley Substation as a solution to reduce congestion in the Leeds to Pleasant Valley transmission corridor (see Figure 3-2 for the location of the Leeds Substation in Athens, NY).

In addition, the Transmission Line and Re-conductoring Segment will increase the overall capability of the transmission system to transfer power between ISO-NE and NYISO under certain operating scenarios. Depending on the actual dispatch of the transmission system and nearby generation (including the Generation Facility), additional transfer capability may be available between the two regions, thereby creating opportunities for additional economic transfers of power as well as capability for transfers of emergency energy and reserve sharing.

Under the no-action alternative, these significant additional Project benefits would not be realized.

### 3.3 Alternative Transmission Technologies

Given that the “No Action” alternative is not a preferable course of action, Cricket Valley moved forward to examine a range of potential transmission voltages and technologies.

#### 3.3.1 Transmission Voltage

The backbone of the New York bulk power system is a grid of 345 kV transmission lines together with the 765 kV Massena to Marcy transmission line. This system allows for the efficient movement of bulk power from generation facilities across the state to major load centers, including the New York City metropolitan area. Transmission facilities at 345 kV are typically used to interconnect sizeable power plants to the bulk transmission system.

As originally proposed and approved by the PSC, the Generation Facility was to connect to the existing 345 kV Pleasant Valley/Long Mountain Line 398. This interconnection would allow the Facility’s full 1,000 MW output to be delivered into the New York grid via Con Edison’s 345 kV Pleasant Valley Substation. As discussed in detail in Exhibit E-4, the second Transmission Line required by NYISO will strengthen this interconnection under a variety of contingency conditions. Only minor modifications are required at the Pleasant Valley Substation to accommodate the new 345 kV Transmission Line from the Generation Facility. As explained below, the use of an interconnection at 345 kV remains the right solution for the Cricket Valley project.

The necessary interconnection could, in theory, be accomplished using lower voltage transmission facilities (115 kV, 138 kV, 230 kV). However, a lower voltage interconnection would require the use of multiple lines in lieu of a single new 345 kV line. The use of lower voltage lines would also likely require additional transformers at the Pleasant Valley Substation. This adds incremental complexity and cost to the system and would require
additional space at the Pleasant Valley Substation. Moreover, a lower voltage solution would likely have incremental system losses when compared to the 345 kV solution. These additional system losses have both an economic and environmental cost, as more fuel would need to be consumed and more emissions would be produced to generate the same amount of electrical output. For these reasons, a lower voltage interconnection is unreasonable in this case.

3.3.2 **Underground Transmission Line Technologies**

Cricket Valley is proposing to construct the overhead 345 kV Transmission Line within the unused portion of Con Ed’s Line 398 right-of-way. The existing Line 398 is on the north side of the 250-foot wide right-of-way and is supported on steel lattice structures. As shown on Figure 3-3, the existing Line 398 right-of-way can readily accommodate a new 345 kV circuit. Cricket Valley plans to use delta configuration steel monopoles for most transmission structures; the poles will be set approximately 75 feet from the southern edge of the right of way. As also shown on Figure 3-3, the existing Con Edison lattice structures are typically ~100 feet in height; the new monopoles will typically be ~140 feet in height. While taller, the new monopoles will have a more streamlined and narrower visual profile.

While the vast majority of new high voltage transmission lines are conventional above ground designs, there are situations where underground construction is necessary, such as in densely developed urban areas where the rights-of-way necessary for overhead construction are not available. Underground construction for street level electric distribution lines and individual home service feeds, can be a viable alternative to above ground construction as the benefits of improved aesthetics, and reliability with respect to falling trees and can potentially outweigh the additional costs and construction stage environmental impacts. This is particularly true when distribution lines and service drops can be installed as part of the initial road and utility construction effort for a new subdivision.

Unlike street level distribution lines, underground construction for a 345 kV line would not typically be considered, especially in this instance where the existing Con Edison right-of-way provides a very direct route between the Cricket Valley Switchyard and the Pleasant Valley Substation and the existing right-of-way can readily accommodate a new above ground 345 kV circuit.

As discussed in further detail in the balance of this section, underground alternatives to the Transmission Line are not considered to be practicable, due to issues of constructability, environmental impacts during construction and cost. Construction of a 345 kV transmission line to connect the Cricket Valley Switchyard to the Pleasant Valley Substation in an underground configuration would unavoidably result in considerably greater impacts than the proposed overhead configuration. Underground construction along the Con Edison right-of-way would involve extensive ground disturbance, including trenching along the
entire length of the line; whereas overhead construction impacts are limited primarily to structure locations. If a 345 kV transmission line were to be installed underground along the entire existing 14.6-mile section of the Con Ed right-of-way construction activities would require additional controls to protect sensitive environmental areas, there would be certain unavoidable environmental impacts to wetlands, waterways, and potential rare species habitat and, project costs would be considerably higher.

However, in the interest of providing a full and balanced consideration of alternatives, Cricket Valley has examined underground construction for a portion of the Line 398 right-of-way. Cricket Valley examined an underground line within the existing Line 398 right of way between the Pleasant Valley Substation and the Pleasant Valley/La Grange town line, a distance of approximately 2.7 miles (see Figure 3-1).

To provide some context, the portion of the Town of Pleasant Valley crossed by the proposed line is shown on the Wetlands Delineation mapping provided in Exhibit 4, Figure 4.6-3, specifically sheets 1 through 5 (of 35). For ease of reference, the mapping is replicated as an attachment to this Exhibit (Figure 4.6-3). The mapping shows the existing Line 398 right-of-way, the location of the existing Line 398 345kV overhead line and the proposed location of the new 345 kV overhead line, also within the existing Line 398 right-of-way.

The existing Con Edison right-of-way for Line 398 exits the northwest corner of the main Pleasant Valley Station, heads north for approximately 1,000 feet, and then turns to the east. The line then runs past the north end of the Pleasant Valley Sub Station, crosses Route 44/Main St and Wappinger Creek, past a ball field and then continues to the east across open space and agricultural lands.

About 1,400 feet east of Route 44, the Line 398 right-of-way crosses South Avenue. The right-of-way then continues across wooded land for approximately 2,800 feet before crossing Forest Valley Road. From that point, the right-of-way continues to the southeast, crossing more wooded lands and a tree farm. The right-of-way then crosses Traver Road and then continues across a large forested wetland area, agricultural fields and woodland before reaching the Pleasant Valley/La Grange town line.

Within 300 feet of the edges of the 2.7 mile stretch of right-of-way within the Town of Pleasant Valley1, there are two homes to the north of the right-of-way, west of Route 44/Main St. There are three homes on South Ave, 13 homes along Forest Valley Rd, and a single home along Travers Rd. With the exception of these locations, the area is a mix of open space, wooded lands and agricultural lands.

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1 A total width of 850 feet (300 + 250 + 300)
As a starting point for the consideration of an underground alternative, Cricket Valley examined the two underground cable systems that could be considered for a 345 kV underground application: cross-linked polyethylene ("XLPE") and high-pressure fluid-filled ("HPFF") systems. While the traditional HPFF systems (also known as “pipe type cable”) continue to provide reliable service in a number of urban areas, Cricket Valley and its engineers focused on the solid dielectric XLPE cable system. The use of an XLPE system avoids the need for additional equipment associated with circulating and cooling large volumes of dielectric fluid. A solid dielectric 345 kV cable system for the underground alternative could be configured with three 2500 kcmil copper conductors for each phase (a total of nine conductors). Each conductor would be placed in its own PVC\(^2\) conduit. The nine conduits, three spare conduits, and the necessary smaller monitoring and control cable conduits would be placed in a concrete encased duct bank. An illustrative cross section is provided as Figure 3-4. As shown on the Figure, the minimum dimensions of the concrete encased duct bank would be 5 feet wide and 4 feet in depth. The duct bank would be covered by a minimum of 3 feet of thermal backfill. Accordingly, the minimum trench requirement is 5 feet wide (plus an allowance for shoring and work space) by 7 feet deep. Allowing a minimum of an additional foot of width for shoring, the minimum trench cross section would be 42 square feet. Accordingly, 1,000 feet of trench would require the excavation of ~1,560 cubic yards of material and the subsequent placement of a similar volume of concrete (less the volume of the conduit) and thermal fill.

\textbf{a. Transition Stations}

The transition from a conventional overhead circuit to an underground circuit, and then back to overhead, is accomplished by the use of a transition station. A photo of a typical 345 kV overhead to underground transition station is provided as Figure 3-5. In the photo, the hydraulic lifts parked within the transition station fence line provide a sense of scale. A concept level drawing for a 345 kV transition station is provided as Figure 3-6.

\textbf{b. Vaults}

Longer runs of 345 kV underground transmission line require the use of underground "vaults" typically at intervals of 1,500 to 2,000 feet. The underground vaults provide access for the necessary cable pulling, space for connections, as well as operational phase maintenance access. Each phase of the underground line (three cables) typically has its own vault, hence there are three vaults at each connection location (see Figure 3-7). The individual vaults are about 10 feet by 30 feet in plan, and 8-10 feet in depth (thus allowing adequate internal headroom for workers). Each vault has two manhole access points. These access points are used for initial cable pulling as well as operation stage inspection and maintenance.

\footnote{PVC, polyvinyl chloride, a stable plastic commonly used for conduits and piping.}
The spacing of the vaults (every 1,500-2,000 feet) is typically determined by limitations on cable pull forces and by the size and weight of a cable reel. If the 2.7 mile stretch of line within the Town of Pleasant Valley were to be undergrounded, approximately 7 to 10 sets of vaults would be required; the exact number would be a function of cable design and local terrain.

c. Shallow Bedrock

For this Project, the prevalence of shallow bedrock is a very significant complicating factor in the use of underground 345 kV. A possible run of underground 345 kV line on the Con Ed Line 398 right-of-way across the Town of Pleasant Valley would be expected to encounter extensive areas of shallow soils underlain by bedrock. Bedrock in the area ranges from relatively soft shale and siltstone to areas of harder limestone. Removal of the softer rock may be accomplished by ripping, however, removal of the harder rock will likely require impact hammers or drilling and blasting. This difficult construction adds considerable cost as well as the potential for significant construction related environmental impacts.3

The estimated cost to construct ~2.7 miles of overhead 345 kV line is approximately $7 million (see Exhibit 9). In contrast, the cost to construct 3 miles of underground 345 kV line in this difficult construction environment could be on the order of $55 million. At this level, the cost of just 2.7 miles of underground line is comparable to the estimated cost of the entire 14.5 mile overhead 345 kV line in the existing Line 398 right-of-way, plus the re-conductoring work and the associated Pleasant Valley Switchyard work (see Exhibit 9).

d. Environmental Aspects

Finally, construction of ~3 miles underground 345 kV transmission line along the Line 398 right-of-way would result in considerably greater construction related environmental impacts than the proposed overhead configuration. Underground construction along the 2.7 mile Pleasant Valley portion of the Con Edison right-of-way would involve extensive ground disturbance including trenching along the entire underground line length, whereas overhead construction impacts are limited primarily to structure locations (~ every 1,100 feet on average, longer spans are possible where necessary). Sensitive environmental features, such as wetlands and watercourses, are located along the 2.7 mile Pleasant Valley portion of the transmission corridor. The Wappinger Creek crosses the ROW between existing structures L-4 and L-5. (see wetlands map, sheet 1). A tributary to Wappinger Creek together with associated wetlands is located between existing structures L-10 and L-11 (see

3 Soil cover over bedrock is expected to be relatively shallow for the majority of the right-of-way. The existing overhead Line 398 transmission line between the Pleasant Valley Substation and the Pleasant Valley/La Grange line is supported on thirteen lattice structures. Ten of the thirteen structures are founded on rock and only three on piers augured into soil.
wetlands map, sheet 4). As shown on wetlands maps, sheets 2, 3, 4 and 5, there are also
wetlands in the vicinity of structure 7, 9, 11 and 13. In some instances, directional drilling
or boring is used in order to avoid impacts to larger streams; however, where directional
drilling is not feasible or practicable, trenching through resource areas would be required
for underground construction. Construction of a duct bank system through wetlands areas
requires a number of temporary measures to minimize construction stage disturbances as
well as restoration and possibly compensatory mitigation once construction is completed.
Similar to cross country pipeline construction, this work would be subject to careful
scrutiny by NYSDEC and the US Army Corps of Engineers. In contrast, overhead
construction, as proposed, has the flexibility to span these resource areas.

Placing a segment of the line underground in the Town of Pleasant Valley would eliminate
a number of transmission structures and the overhead cabling. However, given that there is
an existing overhead 345 kV line on the right of way,\(^4\) the incremental visual benefit of
undergrounding is limited (See Exhibit 4.4). An underground line segment would also
require the construction of two transition stations (see Figure 3.5 for a representative photo).
Placing a segment of the line underground also serves to eliminate any electric fields from
the new line and alters magnetic field effects. However, the Transmission Line will comply
with PSC edge of right-of-way guidelines (see Exhibit 4.10). These small improvements in
environmental effects must be weighed against the more significant construction stage
environmental effects.

e. **Reliability**

Finally, with respect to reliability, underground transmission is typically not affected by the
extreme weather events that could, in theory, damage above ground transmission.
However, the above ground transmission is designed and built to rigorous standards and
will operate reliably within a well maintained right-of-way. More broadly, above ground
high voltage transmission systems have an excellent reliability record. To the extent that
portions of New York and neighboring states have suffered from widespread and prolonged
power outages in recent years, the cause has typically been widespread damage to the low
voltage street/road side distribution portion of the system.\(^5\) It should also be noted that
while underground transmission is arguably more resistant to extreme weather events,
damage or failure can be difficult to isolate and take significantly longer to repair than do
issues with an above ground circuit.

\(^4\) The existing 345 kV line was constructed in 1964 and thus has been part of the community viewshed for nearly 4
decades.

\(^5\) Significant outages associated with Sandy resulted from storm surge flooding of low lying substations and other
critical facilities.
3.3.3 **High Voltage Direct Current (HVDC) Technology**

For long transmission lines (ones considerably longer than the Project), High Voltage Direct Current ("HVDC") technology can be an economical alternative because fewer conductors are needed, line losses are reduced, and no compensation reactors are required (unlike alternating current ("AC") lines). The HVDC technology would, however, not be cost effective or technically feasible for this Project. Converter stations would have to be built at either end of the HVDC segment. These stations would substantially increase the costs of the project, with no compelling technological advantage.

3.4 **Alternative Routes**

As discussed in Section 3.1 of this Exhibit, the NYISO 2011 Class Year Study determined that a new 345 kV line would be needed between the Generation Facility and Con Edison’s Pleasant Valley Substation (the Transmission Line). In addition, the existing 345 kV Line 398 to the east of the Generation Facility will need to be re-conductored (the Re-conductoring Segment). With respect to the Re-conductoring Segment, the 3.4 mile New York portion of the existing Line 398 is part of this Application. The 5.5 mile Connecticut portion of the existing Line 398 is the responsibility of NU.

The Existing Con Edison Line 398 runs from the Pleasant Valley Substation, eastward past the Generation Facility site, continuing on to the Long Mountain Substation in New Milford, CT. The 250-foot wide ROW can accommodate a second 345 kV line and is the obvious route for the Transmission Line between the Cricket Valley Switchyard and the Pleasant Valley Substation. Further, modifications to the Pleasant Valley Substation to accommodate the Transmission Line will occur within the existing footprint of the existing substation. As part of the NYISO Class Year Study process, Con Edison specified the design requirements for necessary upgrades to the Pleasant Valley Substation, specifically the modification of Bay 2, in their RFP # CE-SS-4500-24897-12. No additional land will be necessary to make the necessary modifications to Bay 2 at the Pleasant Valley substation.

Nevertheless, Cricket Valley conducted a desktop survey to ensure that no superior alternative routes were overlooked. The desktop analysis examined an area roughly bounded by Route 22 on the east, Route 90 to the north, the existing Con Edison transmission rights-of-way to the west and the existing transmission right-of-way and Route 216 to the south. These roads and transmission rights-of-way form a rectangle which is approximately 15 miles east to west and approximately 10 miles north to south, the “Study Area” (see Figure 3-8). The southwest corner of this Study Area includes the East Fishkill Substation. This substation is located in the Town of East Fishkill, approximately 9 miles south of the Pleasant Valley Station. The East Fishkill Substation is located at the intersection of an east west running 115 kV line and the main north south 345 kV transmission line corridor.
Guided by two key considerations, Cricket Valley examined the Study Area with respect to potential transmission routes. This examination was based upon two primary considerations: 1) the use of existing rights-of-way and easements wherever possible, and 2) the use of direct routes, as opposed to more circuitous routes. The use of existing rights-of-way or easements for highways, roadways, streets, railroads, transit lines, electric transmission lines, gas pipelines and other utilities can help to reduce environmental effects, should facilitate the acquisition of the necessary rights-of-way or easements, and may reduce construction costs. Similarly, the use of more direct routes may reduce environmental effects, construction disruption, and may be less expensive.

As shown on Figure 3-3, the Study Area is largely wooded open space and agricultural lands. The western/southwestern portions of the Study Area include more residential areas. Most of the highways and roads in the Study Area run generally north/south; examples include Route 22, Route 9, Route 82, and the Taconic Parkway. Route 55 crosses the Study Area diagonally, generally running from the southeast to the northwest. There is only one road which crosses the Study Area in a generally east/west direction, that being Route 21.

Similarly, railroads in the Study Area run in a north south direction. One line runs parallel to Route 22/56 on the eastern edge of the Study Area; another rail line meanders through Hopewell Junction, Stormville, Beekman and Pawling on the south side of the Study Area.

The Iroquois Gas Transmission line crosses beneath the Hudson River well to the north, then runs southerly through part of Columbia County and Dutchess County. The Iroquois line turns to the east in the center part of Dutchess County and runs parallel to Con Edison’s Line 398 for some distance before turning to the southeast and continuing across Connecticut, entering Long Island Sound near New Haven.

With respect to other transmission rights-of-way in the Study Area, there is only one. As shown on Figures 3-2 and 3-3, a Central Hudson 115 kV line runs generally eastward from the East Fishkill Substation. At a point about 12 miles east of the substation, the right-of-way reaches the Town of Pawling and turns to the south. At this point, the Central Hudson right-of-way is about 7 miles to the south of the Generation Facility. An interconnection at East Fishkill via the CHG&E right of way would require at least 7 miles of new transmission line right-of-way to connect with the Generation Facility. Locating, securing land rights, permitting and building on 7 miles of new right of way is a substantial undertaking, with significant incremental environmental impacts compared to the Transmission Line. Moreover, the resulting line would be nearly 20 miles in length versus the more direct 14.6 mile Cricket Valley to Pleasant Valley routing within the Line 398 right-of-way. Further, a connection at East Fishkill would require starting the NYISO interconnection process.

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6 The width of the GHG&E right of way and the nature of the easements is not known. It is possible that the width of the existing right of way would need to be expanded in order to accommodate a parallel 345 kV line.
virtually from the beginning as a new interconnection point would be involved), and it
would be a less robust connection to the 345 kV system. The East Fishkill substation is
connected to only a single 345 kV line; the other north south 345 kV lines bypass the East
Fishkill station.

Based on this assessment, it is clear that the proposed Cricket Valley Switchyard to Pleasant
Valley Substation routing, entirely within an existing Co Edison Line 398 right-of-way is the
best option for this Project.

3.5 345 kV Aboveground Transmission, Design Alternatives

3.5.1 Structure Selection

Two basic structure types were considered for the proposed Transmission Line—a single
steel pole with davit arms with a delta arrangement of insulators, and a steel pole H-frame
with a horizontal configuration of insulators. The pole configurations were evaluated to
allow for the following:

- Conductor attachment points, based upon National Electric Safety Code (“NESC”)
  requirements for spacing and clearances;
- Assessment of electric and magnetic fields (EMF);
- Live-line maintenance clearances and practices;
- Lightning performance design considerations; and
- Cost for pole fabrication and delivery and installation as a function of the pole
  weight.

Transmission line structure design was evaluated using Power Line Systems modeling
software (PLS-Cadd and PLS-Pole). Preliminary EMF analyses showed that the electric fields
and magnetic fields were greater using an H-frame rather than a delta steel pole
arrangement. Additionally, the modeling demonstrated that the H-frame arrangement,
unlike the delta steel pole arrangement, would require acquisition of supplemental right-of-
way. Finally, the H-frame arrangement was more costly. The steel pole with the delta
arrangement was, therefore, determined to be the preferred structure configuration.

3.5.2 Foundation Design

For the preliminary foundation design, given the geology and topography of the area (rock
 ledges with relatively steep slopes), it was assumed that rock anchor or rock micropile
foundations would be used for the Transmission Line. A rock anchor foundation functions
similarly to a pile group foundation (individual anchors in either tension or compression)
except capacity is largely achieved through rock to grout bond. Rock micropile foundations have pre-tensioned anchor rods, and a steel casing in the upper, non-loaded section (in this case soils).

3.5.3 **Conductor Selection**

The conductor selected for both the new Transmission Line and the Re-conductored Segment is bundled “Mallard” 795 Aluminum Conductor Steel Supported (ACSS). The conductor was selected through an optimized process considering the following criteria:

- Ability to meet IEEE 738 rating methodology to carry the specified loadings while minimizing both initial construction costs and line losses;
- Ratings that include summer and winter normal loading conditions and emergency ratings for 15 minutes and 4 hours winter and summer periods;
- Sized to meet or exceed the rating for the existing Con Ed 398 L-Line or sized for a 1000 MW plant, whichever requires the greatest ampacity;
- Maximum Operating Temperature (MOT) of 180°C for ACSS type conductors;
- Construction costs; and
- Energy loss costs.

Four conductor alternatives - Mallard ACSS, Canvasback ACSS, Finch ACSS and Mallard ACSR - were fully evaluated following a pre-selection process which limited the conductor temperatures under summer normal conditions to between 80°C and 120°C and conductor strengths of 30,000 lbs. While the Mallard ACSR two conductor bundle provided the least cost, bundled Mallard 759 ACSS was selected because it provided considerable additional line capacity for any unknown future usage of the line at a modest cost increase. Mallard 759 ACSS also provides a slight improvement over the ACSR conductor relative to annual energy loss costs.

3.5.4 **Insulator Selection**

The insulator selection for the Project was limited to porcelain or pre-stressed glass insulators. Both types of insulators are geometrically similar and are common. However, porcelain insulators have a slight advantage over pre-stressed glass insulators, as porcelain insulators are likely to have fewer electrical performance issues due to arcing.
Cricket Valley Energy Center, LLC

Cricket Valley Transmission Line and Re-conductoring Project

Exhibit 3 – Figures

Figure 3-1  Pleasant Valley to Long Mountain Locus Map
Figure 3-2  Existing Transmission, Hudson Valley
Figure 3-3  Overhead 345 kV, Existing Line 398 and New Monopole, Typical Cross Section
Figure 3-4  Underground 345 kV Transmission, Typical Cross Section
Figure 3-5  Underground 345 kV Transmission, Typical Transition Structure, Photo
Figure 3-6  Underground 345 kV Transmission, Typical Transition Facility (2 sheets)
Figure 3-7  Underground 345 kV Transmission, Typical Vaults
Figure 3-8  Routing Study Area
Cricket Valley Transmission Project  Dutchess County, New York

LEGEND
- Substation
- Proposed Transmission Line Route
- Existing Con Edison Transmission Line Route
- Town Boundary

Scale 1:90,000
1 inch = 7,500 feet

Figure 3-1 Pleasant Valley Station to Long Mountain Station, Locus Map
Cricket Valley Transmission Project     Dutchess County, New York

Overhead 345 kV, Existing Line 398 and New Monopole, Typical Cross Section
Figure 3-4
Underground 345 kV Transmission, Typical Cross Section

Cricket Valley Transmission Project     Dutchess County, New York

FINSIHED GRADE

(3) 6" wide red warning tapes
Themally approved backfill

4" SCH 40 PVC conduit communications duct

2" SCH 40 PVC temperature monitor duct

2" SCH 40 PVC conduit for ground continuity conductor

8" SCH 40 PVC conduit

NOTE:
All dimensions are approximate not for final design
Cricket Valley Transmission Project     Dutchess County, New York
NOTE:
ALL DIMENSIONS ARE APPROXIMATE
NOT FOR FINAL DESIGN
Figure 3-6

345kV TERMINAL A-FRAME

345kV Bus

LIGHTNING ARRESTER

CABLE TERMINATOR

BUS SUPPORT

VAULT
Underground 345 kV Transmission, Typical Vaults

Cricket Valley Transmission Project     Dutchess County, New York

EXISTING 345kV TOWER LINE

345kV UNDERGROUND TRANSMISSION LINE