Central Hudson
Gas & Electric Corporation

May 6, 2014

Hon. Kathleen H. Burgess
Secretary
State of New York Public Service Commission
Three Empire State Plaza
Albany, New York 12223

Re: Central Hudson Gas & Electric Corporation - Long Range Vegetation Management Plan

Dear Secretary Burgess:

Central Hudson Gas & Electric Corporation is submitting three (3) copies of its revised Long Range Vegetation Management Plan for its Transmission System.

The plan is intended to be a working guide for Central Hudson personnel who work on various aspects of the transmission management program. It sets forth the basis for the procedures and practices that Central Hudson uses in planning, implementing and controlling its right-of-way vegetation management program.

The Plan, originally submitted to the Public Service Commission in September of 1981, has been the subject of revisions and modifications as described in the Introduction contained on Page 3 of the plan.

The various revisions were necessary to bring the Plan into compliance with the Commission's Order Requiring Enhanced Transmission Right-of-Way Management Practices by Electric Utilities, issued on May 19, 2011 in Case 10-E-0155 and into compliance with the NERC Vegetation Management Standard, FAC-003-3.

If you have any questions or concerns regarding this submittal, please feel free to contact me on 845-486-5844 or Mr. Michael Gallucci, on 845-486-5988.

Very truly yours,

Donald L. DuBois, Jr.
Manager Electric T&D

cc: Mr. D. Morrell – NYSDPS w/Attachment
Mr. C. A. Freni, Senior Vice President Customer Services
Records Management

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Central Hudson Gas & Electric Corporation

Transmission Right-of-Way Program

Long-Range Vegetation Management Plan/Transmission Vegetation Management Plan

May 06, 2014

Reviewed by:

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Table of Contents

1. Introduction

The purpose of this document is to update and present a long-range vegetation management plan for Central Hudson Gas & Electric Corporation's transmission rights-of-ways, as originally required by the New York State Public Service Commission on December 15, 1980, in Case 27605. The original plan provided for environmentally and economically sound system-wide vegetation management designed to insure reliable electric transmission, as well as the long-term development of relatively stable and compatible plant communities within the right-of-way. The plan has been updated and revised eight times following its original submittal on March 31, 1981, including:

- September 15, 1981
- December 15, 1981
- June 1, 1982
- April 1, 1984
- June 30, 1991
- March 3, 1992
- November 26, 2007
- May 6, 2014

This revision incorporates recognized best management practices, together with management, application and technological advances that have occurred in integrated vegetation management since the last revision on November 26, 2007. It further incorporates sound integrated vegetation management practices for high-pressure gas transmission rights-of-ways. The plan will be reviewed annually and updated when changes are required to more accurately reflect the management practices implemented in the field.

2. Description of Central Hudson Gas & Electric Corporation

2.1 Service Territory

Central Hudson Gas & Electric Corporation (Central Hudson), a part of the CH Energy Group Inc., is an investor-owned utility serving a population of more than 550,000 in a region known as the Mid-Hudson Valley, encompassing an area of 2,700 square miles. A map of the Central Hudson service territory is provided in Appendix 1. The region served by Central Hudson extends in a north to south direction along the Hudson River Valley, from 10 miles south of Albany to 30 miles north of New York City. During 2012, Central Hudson provided electric service to an average of 300,000 customers, gas service to an average of 75,000 customers, including residential, commercial, industrial and governmental users located in portions of the counties of Albany, Greene, Ulster, Sullivan, Orange, Putnam, Dutchess and Columbia.

Major population centers served by Central Hudson are Poughkeepsie, Fishkill and Beacon in Dutchess County, Newburgh in Orange County, Kingston in Ulster County, and Catskill, in Greene County. Central Hudson's major industrial customers are the International Business Machines Corporation that has principle facilities located in East Fishkill (Beacon) and Poughkeepsie, and two cement-producing facilities in Greene County.

2.2 Management Description

Central Hudson Gas & Electric Corporation vests its management responsibilities in the Chief Executive Officer of the corporation. The President reports directly to the Chief Executive Officer. The corporate organizational structure is illustrated in Appendix 2.

Under the President, the Corporation is organized into various corporate groups, with the responsibility for electric and gas rights-of-ways under the Senior Vice President Customer Services. Appendix 3 identifies the roles and responsibilities of personnel within the Customer Services Group. The Manager of Electric T & D is responsible for all vegetation management activities at Central Hudson, including all electric and gas transmission vegetation management activities.

Appendix 4 illustrates the organizational structure of the Electric T & D Division.

The Director of Line Clearance (Director) reports to the Manager of Electric T & D and is responsible for administering the Transmission Right of Way Maintenance in accordance with the Long Range Vegetation Management Plan as it relates to Central Hudson's Electric and Gas Transmission Systems. The Director will utilize the ground and aerial inspection reports, as well as the results obtained from the vegetation field inventory process to:

- Prepare the annual work plan for those lines scheduled for routine cycle maintenance
- Identify the extent of off-cycle hot spot and danger tree work
- Identify the extent of edge reclamation work proposed for the scheduled year.

The work plan will be used to develop the budget projection.

Three Utility Foresters and one Line Clearance Foreman report to the Director of Line Clearance. Two of the Utility Foresters have primary responsibility for the Vegetation Management Program for both electric and gas transmission line clearance activities and will be assisted as required by either the Line Clearance Foreman or other Utility Forester. The Utility Foresters will perform the field assessments, develop the schedule for completing the routine cycle maintenance and other identified vegetation management requirements, select the appropriate integrated vegetation management (IVM) methods through prescription programming, conduct contractor training, provide daily contractor oversight, and evaluate effectiveness and efficacy. Customer and landowner communication related to the plan will also be assigned to the Utility Foresters responsible for Transmission Vegetation maintenance. Utility Foresters will have general utility experience, practical field experience associated with Utility Transmission ROW clearing, and a formal education in Forestry. The Utility Forester will participate regularly in pesticide/herbicide training workshops or seminars to remain current with regulatory issues and concerns related to their use. In addition, the Utility Forester will remain abreast of the latest techniques and best management practices for utility line clearance through training workshops or seminars.

The Line Clearance Foreman and the third Utility Forester share responsibility for electric distribution line clearance activities system wide. They may, on occasion, assist with transmission line clearance activities. One Line Clearance Foreman/Utility Forester has responsibility for line clearance activities on the west side of the Hudson River, while the other has responsibility for line clearance activities on the east side of the river. Each Foreman/Utility Forester will perform field assessments to determine vegetation management requirements for each electric distribution circuit identified for line clearance activities, provide daily contractor oversight, evaluate effectiveness and efficacy, and handle customer and landowner communication related to the plan. Line Clearance Foreman/Utility Foresters will have general utility experience and field experience in distribution line clearance activities or a formal education in Forestry or a combination of both. They will regularly participate in training workshops or seminars to remain knowledgeable in best management practices pertaining to utility line clearance.

2.3 Physical and Environmental Variations

2.3.1 Location of the Transmission System

Central Hudson's service area and its transmission system extend from the plains of southern Albany County southward to the Hudson Highlands, and westward from the area of the Connecticut border to the mountains of the Catskills. The Hudson River, a dominant landscape feature, flows through the area from north to south.

2.3.2 Land Forms and Physical Features

2.3.2.1 Western Portion

The Catskill Mountains occupy much of the western side of the service area. They are generally rounded with steep slopes ranging from 18 percent to 37 percent, with high local relief marked by elevation changes of as much as 1,000 feet.

2.3.2.2 Northern, Eastern and Central Portion

Hills with elevation changes of hundreds of feet and moderate slopes (9 percent to 18 percent) are common in the northern, eastern and central portions of the area.

2.3.2.3 Southern and Central Portion

Rolling plains with gentle slopes of 2 percent to 9 percent and local relief of elevation changes of tens of feet occur in scattered patches throughout the central and southern portions of the service area.

2.3.2.4 Southwest and Hudson River Portion

Flat plains with less than 2 percent slope and no local relief occur in some areas along the Hudson River and in the southwestern portion of the service area.

2.3.3 Forest Regions and Sub-Regions

Central Hudson's service area lies in three distinct forest regions and eight sub-regions of New York State.

2.3.3.1 The Catskill Region

The Catskill region is located in the northwestern portion of the area. The High Peak sub-region is located primarily in Greene and Ulster Counties, but portions extend into surrounding counties. This is a rugged area of steep hills and mountains with narrow valleys. The parent rock of the Catskills is sandstone and shale. The slopes are forested with northern hardwoods; spruce occurs only at the highest elevations. Basic land uses in the sub-region are recreation, farming and forestry.

The Catskill Resort sub-region extends into a small portion of the service area. The terrain is rolling except along streams where slopes are steep. More than half the area is used for recreation including hunting and fishing.

2.3.3.2 The Mohawk – Hudson Region

The Mohawk – Hudson region extends north and south through the center of Central Hudson's service territory.

The Mid-Hudson sub-regions is an area of flat-to-rolling land extending northward on both sides of the Hudson River from Ulster County to Washington County. The southern portion of the sub-region lies within the service area and contains numerous fruit farms while further north, dairy, poultry and truck farming are common.

The Taconic Foothills sub-region lies in central Dutchess and Columbia Counties. The terrain is rolling-to-hilly with elevations between 500 and 1,300 feet. Agriculture dominates much of the sub-region, especially the deep, fertile soils of the

valleys. Many part-time residents from the metropolitan areas have farms and vacation homes in this area.

The Hudson Estate sub-region includes flat and rolling land along the Hudson River in densely populated portions of western Dutchess, southeastern Ulster and northeastern Orange counties. The rolling terrain and low elevations of between 100 and 1,000 feet provide ideal conditions for production of vegetables and tree and vine fruits.

The Shawangunk sub-region is a narrow rocky range that extends into Ulster County. The area is largely forest growing on shallow, acid and infertile soil. Recreation is the primary use for land in the sub-region.

Only the extreme northern tip of the Wallkill sub region extends into the southern end of the service area. Farming dominates this area.

2.3.3.3 The New England Region

The New England region occupies the southeastern portion of the service territory.

The Hudson Highlands sub-region is a relatively suburban area with rolling to steep terrain ranging in elevation from 100 to 1,500 feet. Although essentially residential, much of the area is forested.

2.3.4 Forest Growth and Soil Productivity Zones

Soil productivity and forest growth are generally medium with only about one-fourth of the area classified as low productivity.

Approximately 40 percent of Central Hudson's service area is in Zone I, the fastest timber growth rate in New York State. Approximately 40 percent of Central Hudson's area is in Zone III, having an above average growth rate. Only 20 percent of the service area is rated as Zone VI, having a below average growth rating.

2.3.5 Climate

The heavy snowfalls and extreme temperatures common to the mountainous northwest portion of the service territory moderate considerably in the rolling hills and flatlands of southern Dutchess County.

The National Oceanic and Atmospheric Administration reports the average annual rainfall at Albany, NY is 39.4 inches, and 44.7 inches at LaGuardia Airport in New York City. The average annual rainfall reported at Poughkeepsie, NY is 46.5 inches.

While there may be periods of significant short-term, seasonal drought and areas with localized weather variations, the short-term effects of drought are generally mitigated on an annual basis in the service territory. Additionally, most tree growth in the northeast occurs in the spring and early summer, when available soil moisture is most readily available. As a result, drought is not considered a significant factor in New York or the Central Hudson service territory that reduces tree growth enough to impact the annual schedule or budget process for transmission vegetation management.

2.3.6 Environmental Concerns within the Central Hudson Service Area

Sections of Central Hudson's service area are highly sensitive to environmental involvement, and there exists continuing public pressure relating to aesthetics and land use. Some of the reasons or existing public concerns are noted below:

2.3.6.1 Historical

Central Hudson's service area has literally been a crossroads of history. Prior to the voyage of Henry Hudson up the Hudson River in the Half Moon in 1609, the valley had been a focal point for an active Indian civilization, artifacts of which are still being discovered. Historical landmarks of our country's colonization, its fight for independence and subsequent industrialization abound in the area, from the 17th century stone structures of Dutchess settlers and restorations of major Revolutionary War sites, to former mansions and estates acquired by industrial and political giants of a developing economy. Central Hudson is identified with and is an integral part of this area. The means by which electricity and gas are supplied, as well as, the technological, social and economic issues involved in that supply, reflects this pervasive historical association.

2.3.6.2 Accessibility and Aesthetics

The Hudson River flows through the center of the service area. It has always been heavily used for both commerce and recreation. Major highways follow the river valley connecting metropolitan New York City with the state capitol in Albany, as well as with the recreational areas in northern New York State, New England and Canada. The service area is, therefore, highly visible.

The ease of accessibility to both New York City and Albany has brought population growth in recent years to major population centers in Poughkeepsie, Kingston and Newburgh. As roads and transportation improved, the southern portion of the service territory was placed within commuting distance of New York City, leading to significant expansion and growth. The remainder of the service territory has also long been popular for vacation and summer homes for people from New York City, spurring growth throughout the more rural areas.

2.3.6.3 Recreation

Recreational opportunities abound throughout the region. The Catskill Mountains provide numerous ski areas, lakes for summer and winter sports, as well as clear streams and fairly large forested areas that are fished and hunted heavily. The Hudson River also contributes significantly to the readily available recreational opportunities, and attracts visitors from around the country and world.

2.3.6.4 Agricultural Heritage

The fertile valley portions of the service area have been actively farmed since the days of early settlement. Growth, development and the abandonment of marginal farms have put pressure on open space and preservation of existing agricultural activities. The return of organic farming methods in some areas has also required flexibility in treatment methods and timing to accommodate today's sensitivities along with traditional concerns.

2.3.6.5 Sensitive Resources

The presence and preservation of unique and sensitive resources improves the quality of life for people throughout the service territory and adjoining regions. They cover a wide range of resources, including portions of the New York City Municipal Water System, The Catskill Forest Preserve and surrounding areas, other parks and private recreational sites, streams wetlands, sensitive habitats, threatened and endangered species, and other environmental or cultural sites. Each of these factors receives consideration in the planning and implementation of the transmission right-of-way management plan.

3. The Electric Transmission System

3.1. Construction and Physical Features

Most electric rights-of-ways are easements that vary in width and voltage. Typical operating voltages include 69, 115 and 345 kilovolts (kV).

Several of the 115 kV lines were constructed in the 1950s and 60s, on low-profile wooden H-frame or single pole construction. The conductors on these lines do not have the greater mid-span to ground clearance normally afforded taller steel towers. As a result, species height and growth considerations become significant factors for determining which species are compatible with the facility, as well as influencing effective and reliable maintenance cycles.

Most of the bulk transmission 345 kV lines were constructed in the 1970s on right-of-way that was acquired in fee title. However, portions of these lines were constructed on more restrictive easements in order to avoid condemnation proceedings. Areas with restrictive vegetation management clauses are currently being reviewed and classified for regular mid-cycle assessment. Central Hudson utilizes regular aerial and ground patrol procedures to monitor growth on these sites and promptly schedule any remedial work required to insure system reliability. A listing of sites that require periodic mid-cycle field review will be developed by the end of the cycle and annually updated and incorporated into the Appendices.

3.2. General Location

The 345kV, bulk transmission lines, generally run in a north-south direction. They interconnect with lines and substations for the New York Power Authority and National Grid Transmission Company in the north. They extend to the south of Newburgh where they connect with Consolidated Edison and Orange and Rockland Utilities.

Lines of lower transmission voltage, including 115 kV and 69 kV, extend to the east and west to peripheral locations, as well as providing important interconnection to New York State Electric and Gas in the west and Northeast Utilities in Connecticut.

A map showing an overview of the electric system is included in Appendix 1.

3.3. The Extent of the System

Central Hudson's electric transmission system includes 600 right-of-way miles, and approximately 9,645 acres. A detailed master list of all electric transmission rights-of-ways is included in Appendix 5, while a list of special requirements for Article VII electric projects is included in Appendix 6.

4. The Gas Transmission System

4.1 Incorporation of Gas and Electric Plans

During discussions with the PSC about submitting revised long-range plans on electric transmission, the New York utilities agreed to incorporate the vegetation maintenance activities on gas transmission into the long-range vegetation management plan for electric. It was further agreed that the new generic plan would then replace all previously submitted long-range plans for individual projects. This plan includes a master list of all gas transmission facilities in Appendix 7, and incorporates all Article VII and non-Article VII gas facilities into a common generic plan. Specific Article VII conditions for individual gas projects are discussed in Appendix 8.

4.2 Right-of-Way Maintenance Practices and Procedures

Central Hudson operates and maintains four transmission gate stations and 161 miles of coated and cathodically protected gas transmission pipe. The four gate stations receive gas from the Iroquois, Duke, Tennessee, and Columbia interstate gas pipeline systems. Central Hudson's gas transmission pipeline runs from Selkirk to Tuxedo on the west side of the Hudson River, and from Somers to Lagrange on the east side of the Hudson River. The gas transmission system on the east and west side of the Hudson River, from the Highland Flow Control Station (West Shore) to the Poughkeepsie Receiver Station, is interconnected through a Hudson River crossing north of the old Poughkeepsie Railroad Bridge.

Most of Central Hudson's gas transmission system consists of grade B through X-60 steel with a wall thickness range of 0.250 inches to 0.375 inches, pipe diameters between 10 inches and 16 inches, and maximum allowable operating pressures of between 565 and 750 psig.

These pipelines require frequent inspection to insure system safety and reliability, including visual inspections four times per year, and an annual leak inspection. The annual leak inspection requires traveling the length of every pipeline with a flame ionization unit, within at least six inches of the ground in order to check for possible leaks. This patrol cannot be performed when the ground is frozen or snow covered, and requires mowing the vegetation immediately prior to the inspection in order to cut vegetation to no more than six inches in height. As a result, all gas transmission pipelines shall have a 10-foot area immediately over the pipeline mowed on an annual basis. The remainder of the permanent right-of-way shall be maintained through primarily mowing, on a cycle of no more than five years. Actual cycle lengths shall be determined by field conditions, the stability of various plant communities found within the right-of-way, and system safety, reliability, access requirements and budgetary constraints. The objective of the right-of-way management program shall be to foster, develop and maintain stable communities of compatible grasses, ferns and other low-growing herbaceous plants, and to effectively eliminate or control incompatible woody growth.

As discussed, the primary vegetation maintenance method for gas shall be regular mowing. However, as described within this plan, the company shall utilize selective integrated vegetation management methods, including the selective application of herbicides to areas of the right-of-way that are not accessible to mowing equipment, and/or to areas of woody brush that are not effectively controlled through mowing.

These patrol requirements further incorporate a review of the pipeline right-of-way to look for erosion, grade changes due to excavation, construction activity, and other factors affecting safety and operation, or unauthorized encroachment.

5. History of Right-of-way Management

5.1. Early History

Prior to the 1950s, Central Hudson maintained control of brush on its electric transmission rights-of-ways by hand cutting. The work was done during periods of plentiful, inexpensive labor. Brush disposal, when required, was usually accomplished by burning. While it was recognized that most species re-sprouted vigorously from the stump and roots when cut, there was no other effective control method available at the time. A multitude of smaller stems would appear from the few larger trees that were cut. The sprouts were nourished by the established root systems and grew very rapidly. Four to eight feet of growth per year, or more, were common. Re-clearing this brush at relatively short intervals was a constant struggle, while rising labor costs and increasing stem densities mandated more effective methods of vegetation control.

Mechanical mowing has been the traditional method of vegetation control for gas transmission line rights-of-ways. Those sections of the right-of-way that could not be mowed because of wetlands, rock outcrops or accessibility problems were maintained by hand cutting.

5.2. Development of Chemical Control Measures

Herbicides were introduced in the early 1950s, as utilities sought more effective ways to control vegetation on its electric rights-of-ways. As herbicide treatment methods developed and proved effective, Central Hudson also recognized the importance of developing a sound management plan that balanced environmental considerations. By the mid-1950s, Central Hudson had developed its first right-of-way management plan. While the industry was perfecting broadcast herbicide applications in these early days, the Central Hudson plan specifically required the selective removal of tall-growing species that were capable of affecting line reliability. It was also written to satisfy four significant requirements for environmental stability and compatibility.

- Removal of non-compatible species while favoring the development and growth of compatible shrubs, herbs and wildflowers within the right-of-way
- Encourage the growth of compatible vegetation within the right-of-way to support food and cover for animals
- Reduce the visual impact of the right-of-way on the environment
- Encourage the preservation of ground cover to help prevent erosion

Vegetation maintenance methods evolved into a combination of hand cutting and treatment of the stump and all exposed roots with a herbicide treatment, and basal treatment to the lower stem and exposed roots of tall-growing species where cutting was not required. These methods were proved quite satisfactory at controlling growth at minimal cost through the 1950s and 1960s.

5.3. Herbicide Moratorium

Coinciding with public criticism of the use of herbicides in the Vietnam conflict, Central Hudson ceased the use of herbicides for brush control in late 1969 so the safety of herbicide use might be thoroughly studied. Subsequent to the Federal Environmental Protection Agency certification of appropriate herbicide products, Central Hudson again resumed its use of herbicides as an effective management tool. To better understand the role of herbicides in a sound, integrated vegetation management program, Central Hudson further joined with the other investor-owned utilities in New York to conduct extensive research into appropriate management practices and methods through the Empire State Electric Energy Research Corporation (ESEERCo) during the 1970s, 1980s and 1990s.

As a result of the moratorium, Central Hudson also experienced significant adverse effects on its system reliability, and it became readily apparent that cutting brush could not economically or effectively control undesirable growth on the right-of-way.

5.4. The Emerging Solution

The return to herbicide treatment methods progressed carefully and slowly. Favorable growing seasons continued to compound the problem of uncontrolled woody growth. With the help of nationally recognized consultants, and the addition of a vegetation management professional to staff, a system-wide appraisal of brush conditions was conducted in the 1980s, and an accelerated program for vegetation control was developed. The use of basal applications was diminished due to their requirement for oil penetrants and carriers, and the higher application rates needed for effective control. They were replaced by low-volume, backpack foliar methods that require very low rates, as a new generation of products with reduced risks and more environmentally compatible labels emerged in the 1980s. Mechanical mowing followed by low-volume ground foliar treatments were added to traditional hand clearing and stump treatment methods to affect a turnaround in control of undesirable brush on the electric transmission system.

5.5. Cyclical Scheduling

Throughout the 1980s and 1990s, Central Hudson managed its rights-of-ways following a "spot management" approach that effectively reviewed the system each year, but treated just those areas of taller growth that required attention. In 2002, a 5-year cyclic program was implemented that enabled Central Hudson to more effectively and efficiently manage the right-of-way, and better implement the goals of the long-range plan. The cyclic approach is an industry best management practice that has enabled Central Hudson to improve the scheduling and budget processes, reduce public and environmental intrusion and maximize contractor efficiency.

Scheduling priorities began with completion of the bulk transmission (345 kV) system and some of the 115kV lines in 2002, followed by radial 115 kV lines in 2003. Most of the looped 115 kV lines were completed in 2004. Additional 115 kV and some radial 69 kV lines were completed in 2005. The remaining 115 kV lines as well as the looped 69 kV lines were completed in 2006.

The goal for a 5-year cycle is not intended to be an arbitrary scheduling requirement, but rather a guideline that may be shortened or lengthened for individual lines in the future, based on regular field assessment and the annual vegetation management patrols by the Utility Foresters. It is intended that maintenance activities will be scheduled when the right-of-way as a whole is at an optimal treatment size for effective control, while minimizing costs and environmental impact. Routine patrol procedures shall be used to identify isolated locations where re-growth exceeds the norm for the overall right-of-way, and schedule off-cycle remedial activities to insure system reliability.

6. Transmission Right-of-Way Vegetation Management Policy

Central Hudson's transmission right-of-way management policy is to provide for the safe, reliable and economically efficient transmission of electric and gas energy in a manner that is compatible with the environment.

The program is designed to accomplish this through the implementation of recognized best management practices, the application of sound integrated vegetation management philosophies and practices, and by continually acting as a "good steward" of the environmental resources that are managed.

All right-of-way vegetation is maintained in a manner that strives to prevent tree-caused outages to the electric transmission system from beneath and/or beside the line. In addition, natural and man-made features are to be maintained in an environmentally stable and accessible condition within the right-of-way to facilitate routine and emergency operations. This is accomplished through routine monitoring, sound planning and implementation of the appropriate vegetation management control techniques. The program further seeks continuous improvements in its state-of-the-art management systems and treatment methods.

The program seeks to maintain vegetation on gas rights-of-ways in a condition of grass and small herbaceous growth that facilitates leak detection and corrosion testing requirements, and is accessible for routine and emergency repairs. It further seeks to manage edge encroachment to prevent canopy closure and facilitate aerial inspection.

The program incorporates good customer and public relations, and continually seeks sound practical measures to improve customer relations, public education and regulatory cooperation.

7. Transmission Right-of-Way Goals, Objectives and Strategies

7.1 Goal A: To Assure the Integrity of the Transmission Facility

This goal encompasses the impact of tree growth and other vegetation on system reliability, as well as the long-term stability of right-of-way vegetation.

Successful implementation will be measured by a goal of zero outages on the 345 kV bulk transmission system and critical interconnect lines from any vegetation growing into the lines from below the conductor, and by a continued long-term reduction in outages from any vegetation growing into the lines on the 115 kV and 69 kV lines or by trees falling onto any electric transmission line from outside the right-of-way.

7.1.1. **Objective:** To continuously improve reliability of the electric system by striving to eliminate the risk of outages from tall-growing woody vegetation invading the "wire security zone" and growing into the conductor on 345 kV, and reduce the risk of tree caused outages from growth within the right-of-way on lower voltage 115 kV and 69 kV facilities.

Strategy a: Apply the modified[1] wire zone – border zone and wire security zone principles across the right-of-way. This will be accomplished by focusing attention on the wire zone to eliminate all tall-growing tree and shrub species that could invade the open space of the wire security zone and significantly reduce clearance between the conductor and vegetation under the wires. Those lines constructed with low profiles will generally have mid-spans of grasses, herbaceous growth and low shrubs, while lines with higher profiles may include taller-growing shrub species within the wire-zone area.

Strategy b: Develop a database that lists each site where easement and/or landowner restrictions prevent the full implementation of the wire security zone clearances, together with a recommended schedule for mid-cycle monitoring.

Strategy c: Taller shrub and small tree species, as identified by Central Hudson, will be permitted along the right-of-way edges, within the border zone. In addition, denser shrub communities will be permitted along the edge of the right-of-way to maximize natural competition and reduce undesirable tree densities in the future.

Strategy d: Complete an edge encroachment and danger tree survey of all rights-of-ways in conjunction with the existing 5-year maintenance cycle and field inventory process, and identify areas that have not been maintained to full width (see typical cleared widths in Table 2, page 23) or contain hazard tree conditions. Develop a schedule of manual and mechanical pruning, clearing and widening to improve clearances between the transmission line and the forest edge, in accordance with budget constraints and to the extent permitted by existing ownership and/or easement conditions.

7.1.2 **Objective:** Continuously improve reliability by maintaining and reclaiming the full width of the right-of-way. During right-of-way maintenance and edge reclamation work, where feasible, taller shrub and small tree species that are compatible with transmission vegetation ROW management practices will be retained along the edge of the right-of-way within the border zone.

Strategy a: Continual maintenance of right-of-way edges in the year of or year preceding the scheduled routine maintenance program.

Strategy b: Utilize aerial and ground patrol procedures, and field assessments to monitor edge conditions, and incorporate system reliability performance reviews to

[1] The concept of the modified wire zone - border zone model of vegetation management, as agreed to between NYS Department of Public Service and the New York investor-owned utilities, incorporates the retention of low-growing shrub species within the wire zone when those species will not invade a predetermined open air space around the conductor described as the wire security zone in this document. For more discussion of the wire security zone clearances and the modified wire zone border zone principles see Sections 8.2.3.1 and 8.2.3.2 of this plan.

identify high risk facilities and sites. Tree removal and/or side trimming operations will be scheduled as permitted by field conditions, easement provisions and/or public constraints.

7.1.3 **Objective:** Continuously improve reliability by reducing outages caused by danger trees falling onto the lines from beyond the right-of-way edge. The Commission has defined a "danger tree" as any tree rooted outside of a right-of-way that due to its proximity and physical condition poses a particular danger to a conductor or other key component of a transmission facility.

Strategy a: Implement a danger tree program to target securing permission and removing any tree with a physical condition including but not limited to mortality, lean, decay, cavities, cracks, weak branching, root lifting, or other instability that poses a danger to a transmission facility in the year of or year preceding the scheduled routine clearing program.

Strategy b: Utilize aerial and ground patrol procedures, and field assessments to monitor danger tree conditions, and incorporate system reliability performance reviews to identify high risk facilities and sites. Danger tree removals will be scheduled as permitted by field conditions, easement provisions and/or public constraints.

7.2 Goal B: To Encourage Low-Growing Stable Plant Communities in Rights-of-Ways

The goal is to manage the right-of-way in a manner that encourages a rich, diverse blend of stable herbaceous and compatible shrub communities across the right-of-way, and to maximize the benefits of these communities in resisting tree invasion. The goal applies sound, ecologically centered Integrated Vegetation Management (IVM) principles (as described in the position paper of the Electric Energy Alliance of New York, *Application of IPM on Electric Utility Rights-of-ways in New York State*, see Appendix 9) to create and maintain this blend of compatible species that, in turn, effectively reduce and minimize herbicide use requirements.

The goal is accomplished through the following: periodic field assessment, optimizing the treatment schedule, implementing the right-of-way inventory and work reporting process, maximum use of prescriptive, stem specific treatment methods, and close supervision, training and management of the crews. The goal will be measured through the establishment of compatible grass and shrub densities that occupy up to 70 percent or more of the overall right-of-way canopy, while incompatible densities average 30 percent or less (light densities) at the time of treatment. The success of the right-of-way management plan can also be measured by a gradual, long-term reduction in the amount of herbicide required to treat and control incompatible vegetation.

7.2.1. **Objective:** Sustain the long-term stability of desirable plant communities within the right-of-way, and use natural competition and predation to minimize the invasion of tall-growing, non-compatible species. Identify and use the most cost-effective vegetation management techniques commensurate with the environmental and public concerns and constraints for each site.

All vegetation management activities shall be completed in a manner that effectively controls re-growth, while striving to minimize herbicide use. Treatment activities shall minimize adverse impacts to adjacent, compatible vegetation and prevent damage to environmentally sensitive resources.

Strategy a: Develop and implement a site-by-site field inventory process that enables the Utility Foresters to pre-plan routine IVM activities, and use prescriptive

programming of proven, effective control techniques tailored to the environmental and public constraints of each site.

Strategy b: Apply sound Integrated Vegetation Management (IVM) principles to selectively target and control undesirable species, while fostering and encouraging the development of relatively stable compatible communities of herbaceous and shrub species. Tall-growing, undesirable vegetation that survive natural competition and predation will be treated within the framework of a 5-year maintenance cycle.

Strategy c: Use the selective application of approved herbicide products to effectively control and eradicate re-growth from the stumps and root systems of tall-growing incompatible species.

Strategy d: Perform all field maintenance activities using properly trained and certified right-of-way vegetation management personnel, and maintain appropriate work monitoring and auditing procedures.

7.2.2. **Objective:** Improve crew identification of all incompatible vegetation, with emphasis on shrub and tree species that are capable of invading the wire security zone.

Strategy a: Conduct start up training with contractor crews and supervision to review right-of-way maintenance specifications, methods and techniques required to successfully implement the program goals, objectives and strategies.

Strategy b: Train crews to understand wire zone – border zone concepts, the wire security zone clearance standards, and the effect of sag and sway upon vegetation to conductor clearance requirements.

Strategy c: Continue crew and supervision training in shrub identification, so they can recognize the mature height of various shrubs and effectively implement the wire security zone clearance standards along the entire right-of-way.

Strategy d: Train crews to recognize areas where shrub and tree species may invade the wire security zone, with special emphasis on mid-span locations, and to use selective IVM techniques to eliminate incompatible species from these areas.

7.2.3. **Objective:** Maintain existing access into and along all electric and gas facilities to insure access for routine and emergency vegetation management, and for transmission line operations, maintenance, and repairs.

Strategy a: Maintain existing routes and travel paths by selectively treating, with approved herbicides, all woody growth, and keep these paths in stable herbaceous growth. The access path that is free of woody vegetation may be up to25 feet wide.

Strategy b: Utilize herbicide treatment, or mowing and herbicide treatment to re-establish access routes that have become overgrown, or to establish new routes where required for routine or emergency operations.

Utilize the wire zone as the travel path to improve conductor-to-vegetation clearance under the lines whenever possible, in accordance with equipment clearance limits and site conditions.

Strategy c: Access to all electric structures will be improved by maintaining a 15-foot radius around each pole and tower site that is free of woody vegetation.

Strategy d: Treat and/or remove all vines growing on electric and gas facilities at the time of routine maintenance.

Strategy e: Damage to existing access roads will be repaired where erosion threatens access and/or environmental quality. Maintain all cross-drainage devices, swales, ditches and other improvements to prevent water damage to access, facilities and other features.

7.2.4. **Objective:** Continue a pesticide use reduction strategy to minimize long-term herbicide requirements. Note that while Central Hudson remains committed to a long-term pesticide reduction strategy, the reclamation of the wire security zone and/or forest edges may necessitate a short-term increase in pesticide use on some sites. Central Hudson will continue to minimize impacts even in these areas through the following strategies.

Strategy a: Selectivity of herbicide treatment methods and crew training will be optimized to reduce the gallons-per-acre use requirements and minimize the zone of effect on adjacent shrub and herbaceous vegetation.

Strategy b: Actively seek and test new herbicide products and mixtures, treatment methods and delivery systems to provide greater environmental compatibility, reduce environmental risks, and increase public and worker safety, while meeting or exceeding reliability and effectiveness requirements.

Strategy c: Use test plots, field studies, industry workshops, and other resources to stay abreast with product advances and improvements in IVM technology.

7.2.5. **Objective:** When necessary, keep sufficient records to monitor right-of-way conditions, including long-term density conditions of compatible and non-compatible vegetation, herbicide use and cost effectiveness.

Strategy a: A computerized inventory process will be utilized to develop a baseline for compatible and incompatible densities that can be used to measure species density, herbicide use and cost performance over time.

Strategy b: Compile and provide standardized reports consistent with the annual requirements of the NYS PSC and Department of Environmental Conservation (DEC).

7.2.6. **Objective:** Establish and maintain cost-effective treatment schedules for each gas right-of-way.

Strategy a: Maintain most gas rights-of-ways on a regular mowing cycle that supports periodic leak and corrosion inspection schedules. The goal of a successful gas vegetation management program is to maintain the right-of-way in stable grass and herbaceous communities, free of shrub and tree species that could interfere with leak detection or access.

Strategy b: Incorporate the appropriate IVM techniques, selection criteria and best management practices to hand clear and control undesirable woody vegetation in areas that are inaccessible to mowing equipment, or where herbicide treatment is required to eliminate undesirable woody growth that is not controlled through regular mowing.

Inventories will not be required for occasional spot application and herbicide treatment on gas rights-of-ways.

7.2.7. **Objective:** To support vegetation management research designed to better understand the ecosystem dynamics of IVM, and the response of the compatible and non-compatible communities to various herbicide and non-herbicide methods.

Strategy a: Remain current with the on-going state, regional and national research into the environmental and ecological impacts of various right-of-way management methods, including both herbicide and non-herbicide alternatives.

Strategy b: Seek appropriate partners to participate in regional and statewide research initiatives, and equitably share the economic burden and the benefits of such research.

Strategy c: Publish and disseminate research results and findings for peer review.

7.3 Goal C: To Maintain Environmental Quality and Sensitive Resources

The goal of maintaining environmental quality incorporates the way in which the program is administered with how the vegetation is managed. It requires that the program and its related activities are applied in a manner that is compatible with sensitive resource requirements, such as areas of high aesthetic value or high visual sensitivity, sensitive aquatic or wetland resources, endangered species or unique cultural resources, and other significant resources. It also requires a thorough knowledge and understanding of environmental regulations and concerns, together with a determination to work productively with local, state and federal agencies having jurisdiction and permitting authority over maintenance activities.

The success of the program is measured in its ability to respond to and address environmental requirements and secure required permits in a timely manner, without compromising long-term reliability or effectiveness

7.3.1. **Objective:**Foster and maintain visual screens of natural, low-growing species at high visibility sites.

Strategy a: Maintain buffer zones of compatible, low-growing species at high use road crossings and other areas of high visual sensitivity, and manage the height of vegetation in these buffer zones to assure system reliability and the implementation of the wire security zone standards.

Strategy b: Continue to remove tall-growing, incompatible vegetation from buffer zone during scheduled maintenance, up to the limits of the easement and/or special permitting requirements, and convert all buffer zones to naturally occurring, compatible species.

7.3.2. **Objective:** Protect sensitive aquatic resources from adverse impact by maintenance activities, such as herbicide contamination, erosion or physical degradation.

Strategy a: Buffer zones shall be maintained with compatible, low-growing vegetation at sensitive aquatic sites, including streams, lakes and ponds. Conduct all treatment activities in a manner that minimizes the disturbance of compatible shrub and herbaceous communities, and reduces or eliminates the risk of erosion and runoff.

Strategy b: Highly selective, stem specific treatments shall be utilized with herbicide products that are specifically approved for ditch bank, stream bank or aquatic use. Establish the following minimum buffer zone distances for non-aquatic herbicide applications:

- Minimum of 25 feet for hydraulic foliar
- Minimum of 15 feet for low volume foliar
- Minimum of 15 feet for basal
- Minimum of 5 feet for cut and stump treatment

Strategy c: Observe a 5-foot, no-treatment-zone immediately adjacent to any flowing stream, pond or lake for any herbicide application.

Strategy d: Obtain permits from the NYS DEC as required for herbicide application in state-regulated wetlands and wetland buffer zones. Comply with the annual reporting to submit suitable systems operating maps or GIS maps and schedules to the NYS DEC by March 31 of each year, that identify rights-of-ways and wetlands to be treated. Maintain regular communication with the appropriate DEC Regional offices and personnel to communicate treatment schedules and facilitate field activities.

Strategy e. Annually communicate with each county Department of Health (DOH) to provide them with the annual treatment schedule and map showing the route of all proposed lines, in order that the DOH may identify public drinking water point sources that may be within or immediately adjacent to the scheduled right-of-way. Also provide a list of treatment methods and approved herbicide products or mixtures that may be used and work with DOH personnel to appropriately avoid or minimize potential adverse impacts to public water supplies.

Strategy f. Identify private drinking water supplies located on or immediately adjacent to the right-of-way, and establish appropriate buffer zones to maintain and protect water quality. Establish a 100-foot no-treatment-zone around public and private wells.

7.3.3. **Objective:** Work with the appropriate state, federal and private agencies to identify and protect known populations of endangered species resources, to understand the risks on the species associated with planned vegetation management activities, and to work with the agencies to develop a plan to minimize the risks and prevent incidental take or damage.

Strategy a: Utilize the annual DEC reporting process to communicate routine vegetation maintenance schedules to DEC, together with suitable maps that identify line locations. The DEC shall provide appropriate copies to the Natural Heritage Program.

Strategy b: Use the information provided by the DEC and the Natural Heritage Program to identify known locations of New York or federally listed threatened and endangered species in proximity to scheduled maintenance activities.

Strategy c: Act as a good steward of the resource by collaborating with the DEC Endangered Species Unit to review and understand the risks and benefits of vegetation management activities on existing populations of threatened or endangered species.

Strategy d: Communicate special treatment and timing to field supervision and crews, and implement all reasonable measures necessary to protect the resource.

7.4 Goal D: To Manage the Right-of-Way in Harmony with Compatible Multiple Use Practices

The goal acknowledges multiple occupancy and use of the rights-of-ways where such use is consistent with the company's primary use, which is transporting electric or gas energy. Any multiple-use cannot adversely affect the rights of Central Hudson to fulfill its mandate to provide safe and reliable energy. Any proposed third party use cannot adversely affect the rights of adjoining landowners or occupants.

The program will allow for the extension of existing, adjacent land use practices into the right-of-way as long as they do not interfere with system integrity, hinder ingress or egress in any way, or restrict vegetation management activities along or within the right-of-way.

7.4.1. **Objective:** Minimize and discourage incompatible uses of the right-of-way to the extent practicable.

Strategy a: Identify uses that are not compatible with the safe operation of the line through routine patrols and field monitoring, including building or structure encroachments within the right-of-way, and adjacent activities such as construction and logging that may impact system reliability or public safety.

Strategy b: Discourage unauthorized vehicular and ATV activity that may threaten environmental integrity by damaging roads, culverts, stream fords, fences, gates and desirable vegetation.

Strategy c: Notify Security, District Operations, Environmental Affairs, Engineering and the ROW departments promptly when unauthorized use such as trespass, dumping or encroachments are identified. Coordinate with these departments to determine the proper course of action in each situation.

Strategy d: Employ reasonable means to educate, notify and inform the public concerning the risks and impacts of unauthorized adverse use. Seek prosecution of known or suspected violators. Reasonable efforts to discourage unauthorized use might also include posting, construction of barricades, and coordination with adjacent landowners.

8. Transmission Right-of-Way Procedures

8.1. Rights-of-Ways Included in the Plan

Central Hudson includes all electric transmission 69kV and above within this long-range plan. Central Hudson's does not include 34.5 kV within the plan because it also functions as distribution. Central Hudson does not have other sub-transmission voltages such as 46 kV.

Certain electric and gas facilities constructed in New York since the mid-1970s have been subject to the environmental and construction requirements of Article VII of Public Service Law. Central Hudson proposes to include all facilities that have been constructed under Article VII requirements within the vegetation management practices put forth in this plan for future maintenance. This will enable the uniform and consistent application of the same guiding policies, procedures and practices to all rights-of-ways regardless of when they were constructed. The special environmental terms and conditions that were established for an electric right-of-way or specific site through the Article VII process, and are relevant to protecting the resource today, have been included in Appendix 6. These conditions are included to ensure their consideration in all future maintenance activities.

Central Hudson also agrees to incorporate the provisions of this plan for gas transmission rights-of-ways, rather than develop separate plans for each Article VII right-of-way. The inclusion of gas is intended to establish uniform and consistent vegetation and environmental management practices for all rights-of-ways. Central Hudson generally maintains gas rights-of-ways by regular mowing. However, several right-of-way segments are either too rocky to be maintained through mowing, or are inaccessible to mowing equipment. The selective application of herbicides following sound integrated vegetation management measures is required to effectively control and manage tall-growing woody vegetation in an environmentally sound, effective manner, while maintaining the right-of-way in an open and accessible manner. The PSC environmental staff agreed during settlement discussions that field inventories would not be required for the application of herbicides on gas facilities. A listing of the Article VII gas rights-of-ways is provided in Appendix 8, together with a listing of all special environmental protection measures that may have been established for those pipelines.

8.2. Program Enhancements and Reliability Improvements

Central Hudson will utilize industry-recognized best management practices including:

8.2.1. Cyclical Schedules

As discussed in section 5.5, Central Hudson adopted a cyclical schedule in 2002. This industry best practice will enable better planning, scheduling and budgeting, while reducing environmental and public intrusion and improving contractor efficiency and costs.

8.2.2. Centralization

The Transmission Right-Of-Way Maintenance Program at Central Hudson is centralized within the Customer Services Group, under the direction of designated Utility Foresters to maximize the efficiencies and benefits of sound, cyclical integrated vegetation management, and insure:

- Uniform and consistent application of the policies, practices and procedures of the long-range plan across the entire transmission system
- Adherence to sound integrated vegetation management practices and implementation of the appropriate vegetation management control techniques
- A Corporate commitment to keep vegetation management professionals abreast of changing technologies
- Adoption and implementation of long-term strategies to monitor and audit tree caused outages, to identify danger trees and edge encroachment areas, and systematically cut and remove trees that threaten reliability

8.2.3 Clearance Standards

Following several years of negotiations between the investor-owned utilities in New York, the New York Power Authority, the environmental staff of the New York State Department of Public Service (PSC), the Department of Environmental Conservation (DEC), and other agencies and parties, a consensus was reached requiring the investor-owned utilities to update and revise their respective long-range right-of-way management plans. This revision incorporates all agreements reached between the parties during those discussions. Foremost among the issues discussed was the adoption of the wire zone - border zone concept of vegetation management across the right-of-way that was first proposed by Drs. Bramble and Byrnes through their Game lands 33 research in central Pennsylvania. Each utility developed a minimum clearance between the conductor and vegetation at the time of maintenance, as well as minimum tree clearances requiring corrective action prior to the next scheduled maintenance within the wire security zone.

8.2.3.1 The Wire Security Zone

The wire security zone is defined as an open, vegetation-free area around the conductor that should be achieved at the time maintenance is performed.

Table 1. Wire Security Zone Clearances at Time of Maintenance (FAC-003-3)

Category	Voltage	Minimum Clearance (feet)
Bulk Transmission	345 kV	25
Transmission	69, 115 kV	20

Factors that have been considered in adopting these standards include:

- Cycle length
- Tree growth rates
- Typical conductor-to-ground clearance
- Span length
- Sag and sway conditions
- Peak load requirements
- Environmental and public constraints

While the wire security zone clearances represent the optimal distance between vegetation and the conductor at the time of maintenance, it is acknowledged that easement and/or other constraints may occasionally limit Central Hudson's ability to achieve these clearances on every site. On a site-by-site basis, easement or environmental restrictions, and landowner or public constraints may limit the actual clearances that can be achieved. Easement restrictions include factors such as right-of-way width, removal rights versus pruning only restrictions, off right-of-way danger tree rights, etc. Environmental constraints include sensitive environmental or public resources, such as forest preserves, parks, public water supplies and other sensitive resources.

However, it was also acknowledged that trained vegetation management professionals can effectively manage sites with less than optimum clearance through regular field review and assessment. When the clearance standards for the wire security zone cannot be achieved due to deficiencies in existing right-of-way widths or other easement restrictions, and tall-growing species are present at other than optimal distances, Central Hudson will perform a mid-cycle review and assessment and take corrective action as required to insure reliability. A list of these sites has been developed by voltage class and has been incorporated into this document as Appendix 10. This list will serve as the checklist for the mid-cycle reviews.

8.2.3.2 The Wire Zone – Border Zone

The wire zone - border zone concept developed by Drs. Bramble and Byrnes more than 20 years ago has become a best management practice of top performing utilities nationwide. As confirmed through the FERC process related to the August 14, 2003 blackout, it is the nationally recognized model for transmission vegetation management which, when effectively implemented, helps insure system reliability. At a national level, the wire zone - border zone philosophy strives to maintain the under wire area primarily in a grass/herbaceous condition, while the shrub and low-growing tree species are permitted to grow in the border zone.

The right-of-way vegetation management model adopted by the NYS Department of Public Service and the New York investor-owned utilities in the early 1980s encouraged the retention of shrub and small tree species regardless of their location within the right-of-way. While most of these species will never grow into the lines, over the past 20 years many have grown tall enough to encroach on the wire security zone and significantly reduce the air space between the top of vegetation and lines. As a result, the high-density shrub communities have masked tall-growing tree species that were growing inside of them. Once these tall-growing species emerge from the competition of the shrub canopy, they can rapidly grow into the conductor if the wire security zone has been compromised over the years.

The model now proposed for New York is best described as a modified wire zone - border zone. It represents the marriage of the best principles from both the original wire zone - border zone and shrub retention philosophies that will significantly improve reliability, and better manage access and long-term costs. It signifies a shift away from a philosophy where dense shrubs were allowed to dominate the right-of-way, including the wire zone, to one that recognizes the need for increased clearance between all vegetation and the conductors and the long-term benefits of a stable mosaic of compatible shrubs and herbaceous growth. It further recognizes the need to establish minimum wire security zone clearances between vegetation and the conductors at the time of maintenance, including Minimum Vegetation Clearance

Distances (MVCD) as established in FERC FAC003-3. In addition, it will improve access within the wire zone for vegetation management activities. The improved clearances are designed to allow for regrowth over the length of the cycle, together with allowances for sag, sway and the loading requirements of today's electric transmission grid. When implemented, it provides for a significant air space between the conductor and vegetation that can be readily seen when doing routine aerial or ground patrol surveys.

Numerous tall-growing shrub and small tree species have been removed from the compatible list of wire-zone species due to their ability to encroach upon the wire security zone over time, and hide incompatible tall-growing tree species. Generally, these shrub and small tree species will continue to be retained within the border zone, along the right-of-way edge where clearances are greater, and where their competition provides a vital biological control that reduces invasion along the forest edge by tall growing tree species. This philosophy incorporates the best management practices of the wire zone - border zone concept with more than 25 years of research and successful shrub management strategies in New York. By allowing certain low-growing shrub species within the wire zone, it further mitigates some of the concerns expressed by PSC staff that wholesale conversion of wire zone sites would require a significant increase in herbicide use.

As adopted, the wire zone - border zone model for New York will encourage a blend of herbaceous and small shrub species, where permitted by line profile and conductor-to-ground clearances. The acceptable range of compatible shrub densities within the right-of-way may average up to 70 percent. However, densities may be lighter within the wire zone and higher in the border zone to achieve this average. This will facilitate crew access for both routine maintenance and emergency repairs, while still maximizing habitat and environmental values, and minimizing herbicide use requirements. Lower profile lines, such as the wood pole H-frame lines will have wire zones predominated by herbaceous growth and only the smallest growing shrubs, while lines that are constructed on taller poles and towers, such as some 345 kV lines may allow taller-growing shrubs within the wire-zone, where there is greater conductor-to-ground clearance.

The New York utilities have agreed that, while all of the tall-growing shrubs that have invaded the wire security zone may be removed, no more than 30 percent of the smaller shrub cover will be removed from the line in any treatment cycle. PSC staff repeatedly expressed concerns that utilities not rely solely on high volume foliar application to remedy this problem, thereby significantly increasing herbicide use. Central Hudson has not needed to utilize high volume hydraulic applications since restoring herbicide use in the late 1970s. Where wire zone sites have become overgrown in the past, Central Hudson has relied on mowing and follow-up treatment with low-volume backpack application to convert them to compatible species. For some right-of-ways where clearance distances will not support taller shrub species, high-volume applications may be appropriate under certain site conditions. Although these treatments would generally be limited to targeting taller stems or clumps of shrubs that intrude into the wire security zone it may in some cases make sense to utilize wholesale treatment of an entire right-of-way to convert the tall-growing shrub communities into more compatible vegetation within the wire-zone.

The lists of compatible species that may be typically retained within the wire zone or border zone, together with a list of species that are generally non-compatible within the right-of-way are included in Appendix 11.

8.2.3.3. Reliability

Figure 1 examines the trend in sustained tree-caused outages to the electric transmission system from 1999 to 2013. During that period, there were 46 sustained outages on the system. Of those outages, 43 were on 69kV lines, 3 were on 115kV lines, and zero occurred on 345kV bulk transmission lines.

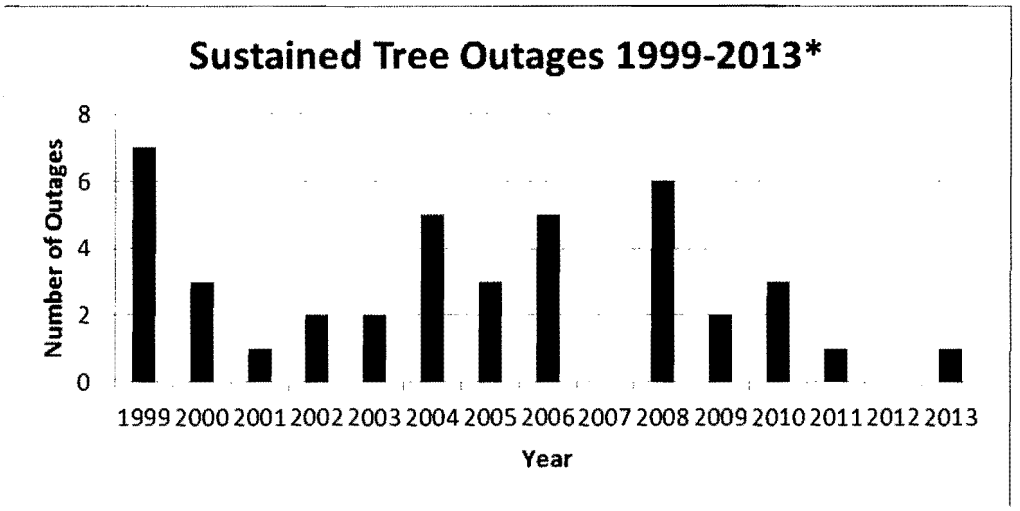


Figure 1: Trend for Sustained Tree Outages on Electric Transmission System

In addition to these outages, there have been 106 transient outages on the system that have been attributed to trees from 1999 to 2013. A sustained outage is one that resulted in an interruption of five minutes or more, in accordance with PSC outage reporting requirements, while a transient interruption in one that is less than five minutes in duration and effectively resulted in a momentary service interruption. There were 77 momentary outages on 69kV lines, 28 on 115kV lines, and one on the 345kV bulk transmission lines. Figure 2 shows the numbers of momentary or transient outages from 1999 to 2013, together with the trend in transient outages.

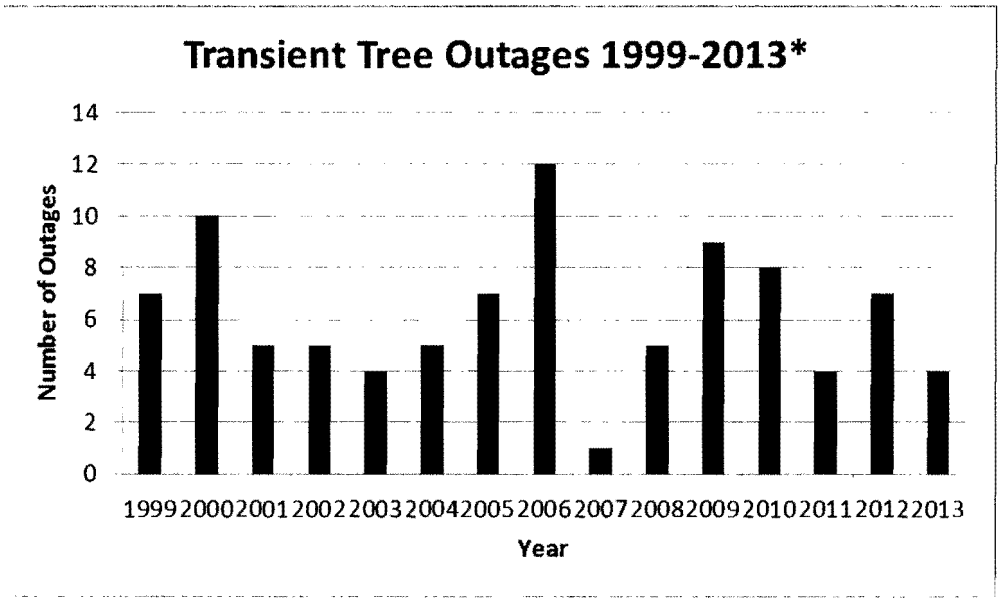


Figure 2: Trend for Transient Tree Outages on the Electric Transmission System

*Figures exclude outages that from the Twin Peaks, Hurricane Irene, October 2011 Snow Storm, and/or Superstorm Sandy weather events

Seventy-nine percent of all tree related outages occurred on 69kV lines, while 20 percent of the outages were on 115kV lines. In 2000, there was one momentary outage on the 345kV system. Since then, there have been no tree-caused outages on the bulk transmission system. It should also be noted since 2007 when Central Hudson starting tracking exact tree locations associated with transmission outages; all but one was associated with trees located outside the ROW.

Central Hudson shall investigate each vegetation caused outage and submit a report annually by March 31st to the Secretary of the Department of Public Service discussing each vegetation-caused outage in the preceding calendar year. Information for each outage shall include line designation, voltage, location, tree location, species, height, condition, distance from conductor to the base of the tree, slope, and weather condition at the time of the outage, length of outage, and tree condition.

Table 2 identifies the typical cleared right-of-way width Central Hudson strives for when building or maintaining a single circuit/tower line at various voltage classes. While this is the optimal cleared width for a single tower line right-of-way, from forest edge to forest edge, it is not intended to be a mandatory standard. Central Hudson recognizes and encounters situations within its routine maintenance activities where right-of-way width deficiencies, easement language, public constraints and regulatory limitations prohibit clearing the right-of-way out to these widths.

Table 2 Cleared Widths

Typical Right-of-Way Width

Voltage	Total Width	Centerline to Edge
345 kV	150 ft.	75 ft.
115 kV	100 ft.	50 ft.
69 kV	100 ft.	50 ft.

From the outage data, most tree-caused outages have occurred on either the 69 or 115 kV lines with right-of-ways 100 feet wide, with 50 feet from centerline to the edge of right-of-way. The growth and encroachment of trees and tree branches into the right-of-way from the forest edge has become a significant reliability risk on these older lines over the years. In fact, today most tree-caused outages are the result of something falling onto the lines from along the edge of the right-of-way or further off of the right-of-way.

In order to reduce the outage risk posed by edge encroachment, Central Hudson has completed an edge reclamation initiative to remove any encroachment within the existing limits of the ROW. As additional ROW width is acquired, these new areas will be reviewed to identify the type and extent of work required to reclaim these areas and establish priorities for remediation. Central Hudson's edge exposure is similar to most utilities in New York and requires side trimming as part of the routine maintenance to remove the side growth of trees located beyond the edge of the right-of-way that is beginning to intrude upon the transmission facilities from the side. The 69 kV lines with their narrower rights-of-ways exhibit the greatest exposure and risk of tree-caused outage, as evidenced by the data.

The improved reliability performance of the bulk transmission system is probably the result of wider rights-of-ways (typically 75 feet center to edge) and taller construction that, in turn, reduces the risk of trees falling into the line from beyond the right-of-way. The 345 kV lines were the first rights-of-ways scheduled for comprehensive field review and edge reclamation under this program, due to the sensitive and critical nature of the bulk system.

Effective implementation of this program will require continued field monitoring, evaluation and prioritization. It will also require a multi-faceted effort using a couple of methods to balance cost and prioritize efforts to widen and improve edge clearances. The first method

uses conventional two- and three-person ground crews to cut individual trees or clear small areas when this growth has intruded into the minimum clearance standards of the specification. This cutting and clearing may be done at the time of regular maintenance, or in response to aerial or ground patrols. The second method employs specialized widening and clearing equipment to reclaim longer sections of forested edge that have become overgrown and pose a more significant risk. Specialized equipment includes but is not limited to the use of excavators, timber harvester, Sky Trims (skidder with boom saw attached), and use of an Aerial Saw. In areas where both men and equipment have restricted access and/or to limit the spread of Invasive species along the utility ROW, the use of the aerial saw may be the technique of choice. The use of the Aerial Saw would be limited to these circumstances and will not be used to replace normal side trimming operations.

8.2.4. Field Inventories

Central Hudson acknowledges the benefits a uniform inventory process will bring to the program, including:

- Better identification of the compatible shrub and non-compatible tree densities, treatment areas, treatment methods and work completions
- Uniform record keeping and reporting, including herbicide use and cost reporting
- Improved contract management and cost controls
- The ability to identify and monitor program trends

In 2005, Central Hudson developed and implemented a field inventory process and program for the preparation of routine right-of-way management activities. It included uniform reporting in accordance with the guidelines established by the PSC during joint discussions with the joint utility group.

8.3 Transmission Line Inspection Procedures

The electric transmission system is inspected periodically by company personnel and contractors using various methods and cycles to maintain system reliability, extend service life of the system and insure public safety.

8.3.1 Routine Aerial Patrol Procedures

Central Hudson conducts routine aerial patrols of all transmission lines four times per year. These patrols are typically a fast fly-by to identify right-of-way encroachments or severely damaged structural components that could affect reliability, and are scheduled to conform to the following time frames:

1. February - March
2. May - June
3. August - September
4. November - December

The primary function of the aerial patrol is to assess and log abnormal line hardware conditions, including conductors, structures, insulators, guys and other attachments. At the same time, personnel look for vegetation that might be growing into the wire security zone from beneath the lines, potential danger tree conditions along the edge of the right-of-way, and unauthorized use or unusual conditions (e.g. severe erosion). All abnormal conditions are logged on the Electric Transmission Right-of-way Patrol Report, and reported to the appropriate department personnel. Vegetation management problems are reported to the Utility Foresters. A copy of the Electric Transmission Patrol Report is provided in Appendix 12.

8.3.2 Comprehensive Inspections

Comprehensive ground inspections are performed over a 5-year cycle to inspect the structures, hardware, wire and rights-of-ways. This includes evaluations of foundations, insulators, wire and other span components, lattice towers, steel poles, anchors, guys, wood poles, arms, braces, hardware, grounding, danger signs and guy guards, as well as measurements of ground resistance. Clearance measurements are also taken in areas where ground clearance, vegetation clearance and wire-to-wire crossing clearance is questionable. Digital images are recorded of conditions that require further review by engineering.

In addition, comprehensive aerial inspections can also be utilized to provide more accurate assessment of hardware conditions at the top of the structure or pole as well as provide details relative to vegetation clearances to conductor.

8.3.3 Transmission Line Patrols

The Utility Foresters generally complete a vegetation patrol of the entire transmission system in late spring to early summer. This patrol may be completed from the air or on the ground. The purpose of this patrol is to review the system shortly after full leaf development and spring growth to:

- Annually review the condition of the bulk transmission system and critical interconnect lines before the start of the peak summer load season. The bulk transmission lines will be patrolled by both air and ground.
- Annually determine the effectiveness of the previous years' vegetation maintenance activities, and identify any misses or skips that require follow-up attention by the contractor.
- Perform a mid-cycle review of isolated sites on the system that are known to have less than optimum clearance due to easement, environmental or public constraints and may require pruning to sustain the minimum clearance requirements prior to the next scheduled maintenance.
- Utilizing the results of the Quarterly Aerial Patrols, identify any critical areas and/or hazard tree conditions that may have developed since the last patrol, and to continually review and assess short and long-range scheduling priorities.

These assessments help to determine the optimum cycle length for each right-of-way within the guidelines of the broad 5-year cycle. This information is essential to the decision-making process to short-cycle or long-cycle a right-of-way based on overall field conditions. These assessments are also critical to monitoring program effectiveness and performance, including the efficacy of various products and techniques in controlling incompatible growth, reinvasion, annual growth rates and growing season variations.

The Utility Foresters are directly responsible for implementing all remedial and corrective action. However, this work may be coordinated with other Forestry or Divisional Operations personnel. Corrective work is generally completed by the line clearance contractor work force, and reported through the crew time sheets. These time sheets are reviewed and approved by the Utility Foresters.

8.3.4. Data Storage and Work Priority (NextGrid)

All inspection data and images related to line hardware and/or structures are stored in a central database called NextGrid. All vegetation related items are entered into both the NextGrid and Clearion Software Vegetation Management System. In NextGrid severity ratings are assigned to all conditions and are defined in both general terms for most items, as well as specific terms for some components. A severity scale from 1 to 5 is utilized, with 5 indicating conditions that warrant repair or replacement within the next twelve months, and 4

representing items that warrant correction within the thirty-six months. A condition rating of 1 is good, 2 is fair, and 3 requires monitoring.

During any of the above inspections, any condition including right-of-way vegetation encroachments that are an immediate hazard to the transmission facilities and/or public safety are required to be immediately reported to a company representative for appropriate action. All vegetation management conditions are reported to the Utility Foresters for field investigation and the appropriate remediation.

8.3.5. Minimum Vegetation Clearance Standards

The "wire security zone" standards establish the minimum vegetation-to-conductor clearances at the time maintenance is performed. Over time, regrowth into the conductor area is expected. Appendix 21 depicts the vegetation clearances for conductors on Central Hudson's 345kV lines, as well as the FV and FP lines, (69kV and 115kV respectively). In addition, Appendix 21 depicts the minimum clearance between conductor and vegetation for the remaining 69 kV and 115 kV lines. The bulk transmission system (345 kV) and the FV and FP lines will be inspected annually from the ground as required by NERC Mandatory Reliability Standards – Standard FAC-003-3 Transmission Vegetation Management Program (see Appendix 13) prior to peak summer load season to facilitate coordination and implementation of required remedial maintenance.

8.4 The Scheduling and Budget Approval Process

The Manager of Electric T & D, in conjunction with the Director of Line Clearance, and the Utility Foresters, shall maintain the master schedule of electric rights-of-ways (see Appendix 14) that identifies the scheduled year for all maintenance based on the priorities of the cyclical program adopted in 2002. The master schedule shall be annually reviewed and updated as necessary to adjust for varying field conditions, and incorporate the results of the Utility Foresters' annual field assessment. The master schedule for gas rights-of-ways shall schedule and report similar information essential to sound management practices for the gas rights-of-ways.

8.4.1. Preliminary Schedule

The Utility Foresters utilize the annual assessment patrol, together with day-to-day observations and input from Operations and other departments to continually review and update the scheduling priorities of the master schedule. Each right-of-way shall be scheduled for a comprehensive review the year following routine IVM activities to insure complete and effective implementation of the specification. The right-of-way shall also be reviewed after mid-cycle to begin to assess future cyclical scheduling priorities and the need for any additional off-cycle work. The Utility Foresters shall also regularly review those sites with reduced right-of-way width or minimum clearance due to other restrictions to insure prompt and effective scheduling of off-cycle remedial activities.

By April 1 of each year, the Utility Foresters shall submit a tentative schedule for the next budget year to the Director of Line Clearance, and the Manager of Electric T & D. This work plan will include those lines scheduled for routine cycle maintenance, as well as a tentative schedule of lines that need side-trimming, widening and/or hot spot or mid-cycle maintenance to maintain minimum clearances, system reliability or public safety

8.4.2. Work Scheduling

The Director of Line Clearance then reviews and discusses scheduling priorities with the Utility Foresters, makes a determination to schedule or delay maintenance, and develops a preliminary budget. The determination to schedule or delay maintenance is subject to system approval and budgetary constraints, and is principally based on safety, reliability, economics, priorities, long-term right-of-way stability, and herbicide reduction strategies. The

preliminary budget is then submitted to senior management for the corporate budget approval process.

The cost of cyclical maintenance and edge widening costs are projected based on acres of floor work and edge distance, together with actual firm price and unit costs from previous years for similar work. The cost projections for off-cycle or hot spot work activities combine workload estimates from field patrols and assessments and utilize hourly crew rates to estimate the funding requirements.

8.4.2.1.1. Safety

Safety relates to the need to schedule routine and remedial maintenance activities before tree growth conditions violate the minimum clearance standards described earlier, and before they create an unsafe work condition or endanger public safety. Vegetation that violates the minimum approach distances defined by OSHA 1910.269 may require the line to be de-energized before corrective maintenance can occur.

8.4.2.1.2. Reliability

Reliability, in part, relates to the effectiveness of the vegetation management program as a major determining factor regarding continuity of electric service. In this sense, it becomes a factor of general height and proximity of vegetation to the conductor, residential tree locations, and danger tree and/or edge encroachment. It also relates to the effectiveness of the program in locating and removing tall-growing incompatible species from within the right-of-way, at all buffer zones, and potential hazard trees and encroachment along the edges. While it includes both routine and emergency maintenance activities, to insure maximum system reliability, maintenance must be scheduled to prevent tree growth before it grows within the minimum clearance requirements for each voltage class.

Reliability is also affected by the height at which incompatible vegetation is most effectively controlled and the effectiveness of the program in sustaining relatively stable, compatible plant communities within the right-of-way. Established rights-of-ways that have experienced multiple cycles of sound IVM practices generally consist of a mosaic of stable grass, herbaceous and compatible shrub communities. These communities effectively compete with and suppress taller growing tree species, and help keep incompatible species within the very-light to light densities at the time of regular maintenance. In addition, the 5-year cycle helps to insure maximum treatment effectiveness by targeting incompatible stems for low-volume selective treatment while they are typically 6 to 10 feet tall. Incompatible stems more than 12 feet tall should be cut and stump treated in order to minimize herbicide used and maximize effectiveness when treating in low-volume foliar sites. Effective timing also requires continued monitoring of clearances within the wire security zone to insure that target stems have not violated the minimum clearance standards, and that they are visible and readily accessible to maintenance crews.

Conversely, recently cleared or reclaimed rights-of-ways may require follow-up work within one to two seasons in order to effectively control re-growth and minimize overall herbicide-use requirements. The objective when hand clearing is to stump treat as many stumps as possible at the time of clearing, and then follow up with a low-volume foliar treatment one to two seasons later. When mowing to reclaim or clear rights-of-ways, a cut

stubble treatment may be possible on small diameter growth at the time of mowing using equipment such as the Brown Brush Monitor. However, larger growth that requires heavier mowing equipment may not be stubble treated and often requires foliar follow-up soon after it re-sprouts. The objective in every case is to control re-sprouts when they are in the range of three to five feet tall to minimize herbicide use requirements.

Treatment effectiveness further relates to the dependability of one method versus another in achieving long-term control. For example, most of the commonly used mechanical clearing methods are not effective in controlling stump or root sprouting following clearing or reclamation. In addition, foliar methods are generally more effective in controlling regrowth, especially on root suckering species than basal or cut and stump treatment methods.

8.4.2.1.3. Economics

Economics relates to the average cost per acre for various management techniques, compared to their effectiveness in controlling incompatible species. Since effective control is paramount to successful vegetation management, treatments should be scheduled so that the optimum effective control is achieved in the most cost-effective manner. The use of techniques that are not as effective at controlling incompatible growth, cause significant damage such as rutting or scarification, or eliminate compatible communities, should be minimized. For example, a decision to defer maintenance may be necessary to allow another growing season for smaller seedling to emerge above the canopy of desirable species and be visible to treatment crews. Scheduling too soon could result in significant skips and shorten future cycle requirements.

8.4.2.1.4. Priorities

Priorities relate to the funds available for right-of-way management activities. A primary objective is to establish level funding, to help insure uniform, consistent implementation across the system. Priorities also relate to developing an annual work plan that considers and ranks workload and projects based on the height and proximity of vegetation to the conductor. The first priority in recommending a right-of-way shall be given to lines where the height of incompatible vegetation is approaching the minimum clearance distance.

The decision to schedule or delay weighs three areas when developing the annual work plan and budget, including the brush acres of cyclical maintenance for the right-of-way floor, the extent and severity of hazard tree removal and edge encroachment, and the extent of off-cycle hot spot pruning and removal needed to maintain sites with minimum clearance. The assorted risks and benefits of scheduling or delaying are then weighed against safety, reliability, environmental, the funds available for vegetation management and other constraints.

8.4.2.1.5. Long-Term Right-of-Way Stability

Long-term stability relates to the implementation of Integrated Vegetation Management (IVM) practices that result in an ecological balance of stable, compatible plant communities that maximize natural competition and predation and minimize reinvasion, herbicide use requirements and maintenance costs. It continually reviews and incorporates the appropriate research and proven best management practices to achieve and sustain its goals and objectives.

The decision to schedule or delay weighs the need to perform work together with the benefits and risks of proceeding or deferring on compatible communities and long-term right-of-way stability. For example, delaying

scheduled cycle maintenance may require more extensive hand clearing in the future to maintain desirable communities, if the non-compatibles become too tall.

8.4.2.1.6. Herbicide Reduction Strategies

Herbicide reduction relates to the strategies and techniques available to effectively manage and control non-compatible vegetation that survive natural competition and emerge through the canopy of desirable vegetation. It relates to developing and utilizing herbicide mixtures, treatment methods, and delivery systems that will continue to reduce the amount of herbicide required to effectively control unwanted growth, while affording the longest possible time between treatments and minimizing adverse impacts on desirable vegetation.

8.4.3. Budget Approval and Final Schedules

Preliminary schedules and budgets are developed in April for work planned for the following year. If the existing multi-year contract is near the end of its term, then a bid specification is prepared to obtain unit pricing as well as time and equipment rates to complete the work outlined in the preliminary schedule. The work is reviewed and bid by the contractors and bids are ready to be awarded by fall in order for work to begin by the first of the year.

Permitting activities begin as soon as schedules and budgets are finalized, and submitted for regulatory approval by spring.

The process is never static, but allows room for modification any time field conditions change. The process also allows for schedule changes at any time to address changing field conditions and reliability requirements.

8.5 The Field Inventory

Central Hudson developed and implemented a field inventory process for vegetation management of electric transmission rights-of-ways in 2005.

8.5.1. The Inventory Method

The Utility Foresters shall ensure that a detailed, site-by-site inventory or work plan is developed each year for those electric rights-of-ways scheduled for routine maintenance the next year. The inventory shall identify areas within the right-of-way with common land use patterns or characteristics, or areas of unique environmental or public concern in such a way as to tailor treatment prescriptions and brush disposal requirements specific to site conditions.

Inventories shall typically be completed during the summer and fall of the year before actual treatment, and may be used for contract bid and award purposes. The goal of the inventory process is to thoroughly assess field conditions on a site-by-site basis, accurately document compatible and non-compatible tree and shrub conditions, assign site-by-site maintenance prescriptions tailored to the sensitivity requirements and vegetation management goals of the site, and to provide a means to facilitate completion as well as cost and herbicide use reporting.

8.5.2. Inventory Records

Central Hudson has developed, and continues to refine, a computerized field inventory and reporting system to record site-specific data, and summarize and report annual activities at the system level. This data will be used to establish density, cost and herbicide use baselines

to effectively measure program performance against long-term goals and objectives going forward.

The data collected through the inventory process shall include the following.

8.5.2.1 Right-of-Way Name and Information

The inventory header information shall identify the right-of-way name, line number and voltage of the predominate facility. When multiple lines occupy the same right-of-way, typical naming protocol shall identify the highest voltage facility that occupies the majority of the right-of-way length. The header information shall also identify typical right-of-way width, length, ownership (e.g. easement, fee or both) and if the right-of-way is an Article VII line.

8.5.2.2 Location

The inventory shall describe the site in relation to the nearest transmission structure. Each site shall be of similar vegetation and/or land use characteristic that warrant a common management technique.

8.5.2.3. Acreage

The site dimensions shall be recorded, including length and width in order to develop an acres calculation for each site that can be used to develop future treatment, cost and performance metrics consistent with industry recognized best management practices and NYS PSC reporting requirements.

8.5.2.4. Land Use

The inventory shall identify the right-of-way and/or adjacent land use activity for each site that influenced the choice of vegetation management technique. In cases of multiple uses or sensitivities, the use with the greatest influence on the method selected should be recorded. The special notes section can be used to describe other sensitivities important to the site.

While the actual format for these inventories has not been finalized, Central Hudson recognizes the need for some form of land use codes that can then be used to sort data, develop baselines and identify future vegetation management trends related to species density and right-of-way land use characteristics.

It is important to note and classify the average density of incompatible vegetation as one of the following:

0. No incompatible vegetation
1. Very Light approx. 100 stems per acre or less
2. Light up to 30 percent of the canopy
3. Medium 30 to 70 percent of the canopy
4. Dense more than 70 percent of the canopy

Relevant information regarding the average density of compatible vegetation is also important in developing the work plan and can be categorized as one of the following:

0. No incompatible vegetation
1. Light up to 30 percent of the canopy
2. Medium 30 to 70 percent of the canopy
3. Dense more than 70 percent of the canopy

8.5.2.5. Prescribed/Actual Treatment

A site-specific maintenance technique will be assigned to each site during the work planning and inventory process that addresses site concerns and vegetation management goals. The technique may be changed by the maintenance contractor, in consultation with the Utility Foresters if site conditions warrant an alternate technique at the time of treatment. The approved vegetation management techniques are discussed in further detail in section 8.7 and 8.7.3.

8.5.2.6. Edge Condition

The field inventory process should also review and identify the extent of forest edge on either side of the right-of-way, and indicate if edge encroachment reclamation, hazard tree removal or side pruning is required, and the typical crew compliment needed to complete the work.

8.5.2.7. Other Site Conditions

The inventory shall also note areas of significant erosion, failed stream crossing or drainage devices, damaged fences or gates, dumping, trespass, or other incompatible use. The Utility Foresters shall promptly report all damage, dumping and trespass to the other appropriate departments for investigation and remediation where required.

The inventory should note information related to sensitive customer concerns or prior notification requirements, in order to effectively communicate known concerns to the vegetation management crews. A separate herbicide pre-notification registry will be developed to identify adjacent landowners that have requested notification before herbicides are applied.

When the site includes a state-regulated wetland, the DEC wetland number shall be included in the special notes as a means of communicating special work restrictions and reporting requirements to the field crews, and as a reminder for future maintenance activities. Other site sensitivities such as critical habitat or endangered species should be included in the special notes.

8.5.2.8. Plant Communities

While species information is not collected in the inventory process, the following species lists have been developed by the New York utilities in concert with the NYS PSC to identify typical compatible and non-compatible species for various areas of the right-of-way. Generally, tall-growing tree species are not permitted within the cleared limits of the right-of-way except in cases of unusually high conductor-to-ground clearance or sites with removal restrictions. Communities of small shrubs, herbs and grasses are best suited for the wire zone, while taller shrubs and small tree species may be allowed along the right-of-way edge in the border zone, provided they do not grow tall enough to endanger system reliability or safety.

Within the limits of the right-of-way, easement, or environmental constraints may restrict Central Hudson's ability to remove all incompatible vegetation. The long-term objective remains to eventually remove all taller growing species capable of invading the wire security zone or affecting the right-of-way from along its edges, while retaining and fostering smaller compatible species already present within the site.

Central Hudson does not generally provide replanting of vegetation along its transmission corridor and takes each request for planting on a case-by-case basis. In determining if replanting is warranted, Central Hudson would consider current and future land use of the area affected by vegetation management practices, current and future vegetation management activities required at the site to maintain regulatory compliance, proximity to transmission facilities, extent of work conducted at the location, anticipated re-growth/regeneration of affected site during vegetation management cycle, if property was owned in fee or easement rights, restrictions associated with said easements, the potential impact of invasive species introduction, topography of site, general soil conditions, along with regulatory and permit compliance. If plantings are determined necessary and/or required within the transmission corridor, only low growing shrub and/ or tree species approved by Central Hudson will be planted.

8.5.2.9. Incompatible Tall Growing Species

Appendix 15 lists tall growing species that are considered incompatible with most right-of-way situations and should be removed wherever practicable, to the extent permitted by fee ownership, easement, public or environmental constraints. A primary goal of the long-range management plan is to effectively remove these species from the floor of the right-of-way and prevent or minimize their re-growth and reinvasion.

8.5.2.10 Tall Shrubs and Small to Medium Trees

Appendix 16 lists tall shrubs and small to mid-size trees that may be compatible along the edge of the right-of-way within the border zone, except on narrow or low profile lines. They will be removed from the wire zone in most cases, unless their mature height will not invade the wire security zone. They are only compatible in a wire zone location when the conductor-to-ground clearance is high enough to allow them to reach maturity and still have the full wire security zone clearance at the time of maintenance. Any plant that grows tall enough to invade the wire security zone will normally be removed. The typical mature heights for each species are included in Appendix 16, together with their maximum known height.[2]

The smaller tree species may be preferred for retention in road screens, buffers and other sensitive sites rather than taller growing tree species. However, the ultimate goal is stable, low-growing compatible species at all locations, and Central Hudson will strive to remove all non-compatible species over time and eventually convert each site to compatible vegetation.

8.5.2.11 Woody Shrub Species

Appendix 17 lists shrub species commonly found on rights-of-ways in New York. While they are nearly always compatible in the border zone, several may grow tall enough to invade the wire security zone and hide other tall-growing species within their canopy. The typical mature height is listed for each species together with the maximum known height as identified in the *Northeastern Shrub and Short Tree Identification* book.

The conductor-to-ground clearance, wire security zone requirements, and the mature height of each species are key factors in determining which shrubs may be retained in the wire zone, and which shrubs are compatible in just

[2] "Northeastern Shrub and Short Tree Identification: A Guide for Right-of-way Vegetation Management", B. D. Ballard, H. L. Whittier, Dr. C. A. Nowak, 2004, Research Foundation of the State University of New York, Albany, N.Y., SUNY College of Environmental Science and Forestry, Syracuse, New York.

the border zone. For example, a 345 kV line on steel poles may have mid-span conductor-to-ground clearances of 38 feet, while a 345 kV line on wood pole H-frame structures may have mid-span ground clearances of just 28 feet. With a wire security zone standard of 15.7 feet for the 303 Line and up to 18.1 feet for the 301 Line for the 345 kV Lines, shrubs with a mature height of up to 12 feet could remain in the wire zone on the steel pole line, while only the smallest shrubs could be kept under the wires on the wood pole line.

Any plant that grows tall enough to invade the wire security zone should be removed. Best practices suggest that no more than 30 percent of the shrub cover may be removed from the line in any treatment cycle, unless current and/or future growth will interfere with maintaining vegetation clearances associated with both State and Federal regulations. Shrubs that have already invaded the wire security zone will be targeted first for removal. As total shrub densities become dense in the wire zone, even smaller shrubs may be targeted in order to keep openings and paths through the shrubs, to maintain the values and benefits of a mixed shrub/herbaceous community and insure maximum control of tall-growing species.

8.6 Integrated Vegetation Management-IVM

Integrated Vegetation Management, or IVM, identifies an evolving set of ideas and concepts, which incorporates industry recognized best management practices, together with the latest research and advances in treatment technology into sound vegetation management principles and practices.

The New York investor-owned utilities have collectively been at the forefront of right-of-way vegetation management research since the 1970s. They first began to use this research to adopt the term Integrated Vegetation Management from the term Integrated Pest Management (IPM) used in agriculture, to help define right-of-way vegetation in New York in the 1980s. Subsequently, the terminology has evolved into a "position paper" for the members of the Environmental Energy Alliance of New York (EEANY). A copy of that paper, titled *Applications of Integrated Pest Management to Electric Utility Rights-of-way Vegetation in New York State* is included in Appendix 9.

The roots of IVM in New York can be traced to the adoption of vegetation management strategies in the 1970s that were designed to selectively treat and control tall-growing trees species while fostering and encouraging the retention and development of stable, compatible plant communities. For the most part, this meant compatible shrub communities. Since then, through research we have come to recognize the important role herbaceous (forbs and grass) communities play in natural seed and seedling predation, competition, long-term right-of-way stability, accessibility and system reliability. Today's strategies are based in science, and have been developed over time, with input from society. The ultimate goal is to provide system reliability together with worker, public and environmental risk reduction. For the most part, high volume broadcast applications have given way to low-volume, stem specific applications following multiple cycles of integrated methods. Cost and herbicide use have also declined, and system reliability has improved.

8.6.1. Vegetation Dynamics

Most rights-of-ways cross a variety of land use and land management practices, including areas of active management (e.g. cultivated fields, pastures, orchards, and other managed landscapes), as well as areas of less active management (e.g. abandoned fields, wetlands, shrub lands and adjacent forest). At times, the activities of others increase the need for intervention to keep trees and shrubs out of the conductor area, especially in managed landscape environments, while other areas require little monitoring or maintenance to insure trees and tall shrubs are removed and controlled within the right-of-way. Typically, there are more acres that require intervention than acres that are trouble free due to existing activity. Additionally, most areas that require intervention exist in some state of early plant succession, where low-growing communities of herbs and shrubs are gradually giving way to taller growing species.

IVM is defined in the EEANY paper as a system or resource (vegetation) management that minimizes interaction between pests (tall-growing trees) and the management system (safe and reliable electric service) through the integrated use of cultural (mechanical and manual methods) that physically remove tree stems, biological (low growing plants and herbivory), and chemical (herbicides) controls." Traditionally, cultural methods included the multiple use activities of others that keep the right-of-way in a compatible condition such as active crop production, grazing, orchards and Christmas tree plantations, and other managed landscapes. Biologic controls incorporate the natural competition of low-growing plant communities, predation and herbivory by small mammals, and perhaps some naturally occurring biochemical interactions among plants known as allelopathy. Physical controls relate to mechanical and manual methods for removing undesirable vegetation, while chemical methods include all herbicide related activities.

Central Hudson was the primary sponsor of the *"Right-of-way Vegetation Dynamics Study"* conducted from 1985 to 1991 by the Empire State Electric Energy Research Corporation (ESEERCo). The purpose of this study was to conduct basic ecological research on vegetation dynamics along rights-of-ways, with specific emphasis on an understanding of the processes that inhibit the invasion of trees in communities dominated by shrubs and herbaceous species. This study was especially helpful in identifying the extent of natural seed and seedling mortality within the right-of-way, and the role that predation and herbivory, that is, the consumption of seeds and seedlings by small mammals plays in controlling incompatible vegetation. It also identified the important role a mosaic of herb and shrub species has on incompatible densities and long-term vegetation stability.

More than a quarter of a century of vegetation management research in New York State has helped us better understand vegetation dynamics, and how compatible communities can effectively inhibit and reduce invasion by non-compatible species. However, once undesirable stems gain a foothold, the most effective means of eliminating these species and preventing their uncontrolled re-growth from either stump and/or root system, remains some type of herbicide treatment. Effective IVM combines cultural and biological methods to minimize re-growth and reinvasion of non-compatible species, helping to keep their densities low at the time of routine, cyclical maintenance. It incorporates selective, stem specific applications of approved herbicide products to eradicate those stems that become established, and IVM minimizes environmental intrusion and perpetuates a herbicide reduction strategy through regular monitoring, cyclical scheduling, prescriptive programming, highly selective stem-specific treatments, and utilizing the latest chemistry and application technology to target and control incompatible stems.

Central Hudson also acknowledges and endorses the core principles of the Edison Electric Institute's "Environmental Stewardship Strategy for Electric Utility Rights-of-way," and believes the tenants of this long-range plan fully implement the principles of both the EEANY and EEI documents. A copy of the EEI stewardship strategy is included in Appendix 18.

8.7. Vegetation Management Techniques: Selection Criteria and Descriptions

Central Hudson recognizes five basic treatment techniques for removing incompatible vegetation growing within the right-of-way. A description of each method and the site conditions under which a technique is most appropriate are discussed in this section. The methods include:

- High Volume Hydraulic foliar
- Back pack foliar
- Basal
- Hand clearing
- Mechanical clearing

Site and species conditions may vary considerably over the length of a right-of-way. The following guidelines have been adopted to tailor treatment prescriptions to site needs in a cost-effective manner that balances system reliability, cycle length, and public and environmental constraints. The basis of

the IVM program is recognition that each technique is suited to certain site conditions and that, given the wide variation in field conditions; no one technique is suitable for all sites.

8.7.1. Buffer Zones

Central Hudson, in concert with the NYS PSC and other investor owned utilities has agreed to establish the following minimum buffer zones for treatment with herbicides adjacent to aquatic resources such as lakes, ponds, rivers, streams with flowing water, or non-jurisdictional wetlands with standing water.

- High volume hydraulic foliar – no closer than 50 feet
- Low volume backpack – no closer than 15 feet
- Basal – no closer than 15 feet
- Cut, stump treatment – no closer than 5 feet

No herbicides will be used within five feet of these aquatic resources, except that approved products and mixtures may be applied in proximity to isolated puddles caused by recent rains.

Herbicides shall not be used within 100 feet of a potable water supply or DEC-regulated wetland, unless otherwise allowed by permit, rule or regulation. The location of known wells, water supplies and wetlands will be identified in the field inventory data and/or transmission line drawings, and will be provided to field treatment crews.

Low-volume foliar and cut and stump treat methods are allowed within regulated wetlands and their adjacent buffer areas to control incompatible vegetation. All work shall be done in accordance with DEC wetlands permits, using herbicide products that have been approved and labeled for aquatic and/or wetland use.

Buffer zones and no treat zones may also be utilized as appropriate around active residences, businesses, croplands, orchards, organic farms, schools, active parks and public recreation areas including golf courses and athletic fields. **Note that no work may be completed on the property of a public or private school, or a registered day care facility without advance pre-notification of the facility under NYS DEC pesticide notification regulations.**

In all cases the Utility Foresters may increase the buffer zone distance needed to address specific site sensitivities, including aesthetic, public or environmental concerns identified during the field inventory process or other input up to the time of treatment. This procedure also allows the Utility Foresters to consider site specifics such as slope, rock outcrops, soil conditions, vegetation densities, wire security zone clearances, natural buffers and barriers, and any other off right-of-way sensitivity that may impact buffer zone requirements.

8.7.2. Environmental Impacts

The range of environmental impacts common to all vegetation management techniques are discussed below. The impacts associated with a particular method are discussed within the assessment of the individual techniques.

The procedures of this long-range plan are designed to identify, assess, and avoid or minimize any potentially adverse impacts associated with maintenance activities. It has been shown that adverse impacts to adjacent land, water resources and off right-of-way vegetation can be minimized or completely avoided using prescriptive programming, proper buffer zones, appropriate supervision, and responsible, careful herbicide application.

8.7.2.1. Off-Site Herbicide Movement

Off-site herbicide movement primarily occurs in one of four ways: overland flow, leaching, drift and volatility.

In 1985, Calocerinos & Spina Consulting Engineers conducted and published a *Herbicide Mobility Study* for Niagara Mohawk Power Corp. They

investigated herbicide persistence in soils for three herbicides: triclopyr, picloram and 2,4-D, and analyzed their movement from overland flow, soil leaching and drift.

They found the linear extent of herbicide movement within the right-of-way was minimal, and when it occurred, herbicide degradation was rapid. Following application, there was no indication that off right-of-way overland flow was occurring. Instead, the trend was toward degradation to undetectable levels. Entry into streams was highly unlikely when appropriate buffer zones were established adjacent to water resources.

It also found that movement into wells or ground water through leaching is highly unlikely. Leaching to a depth of 10 inches to 15 inches in treated sites was rare, but did occur on three sites. The circumstances for leaching on these sites were (1) rainfall immediately after treatment and before the product had fully dried, (2) heavy rainfall within a day following application, and (3) basal applications using high

volumes of conventional oil based products used to treat high densities of incompatible vegetation.

Off-site drift did not occur during the study because non-volatile products were used and they were carefully applied using proper techniques to control drift. (It should be noted that the use of low-pressure, low-volume foliar techniques greatly reduces or eliminates the risk of drift, and the use of drift control additives in the mix are effective drift control measures for high volume foliar for hydraulic treatments.)

The development of low-volume backpack foliar methods has effectively eliminated the need for high volume foliar applications, and has even replaced most basal treatments today.

The *Study of Environmental Fates of Herbicides in Wetlands on Electric Utility Rights-of-ways in Massachusetts over the Short Term*, conducted by the University of Massachusetts in 1994, investigated the fate of triclopyr and glyphosate herbicides when applied in wetlands. That study found low-volume foliar treatments with glyphosate to be the treatment of choice for controlling targeted trees in wetlands. It also found there was no lateral movement of glyphosate in the soil, nor was there any herbicide accumulation in the soil. Since that study, triclopyr has received aquatic labeling consistent with the glyphosate label.

The NYS DEC has recently approved the use of low volume foliar applications with a mixture of glyphosate and imazapyr as well. The *Herbicide Handbook, Weed Science Society of America, Seventh Edition, 1994* identifies that imazapyr, and another common right-of-way herbicide fosamine have little to no mobility in soil following application.

8.7.2.2. Soils

The impacts to soils most commonly include rutting and compaction caused by maintenance equipment. The persistence of herbicides within soils is another consideration.

The *Herbicide Mobility Study* discussed earlier also found that foliar applied mixtures with triclopyr, picloram, and/or 2,4-D did not persist for more than 10 weeks in the soil, while basal applied formulations of triclopyr persisted for up to 18 weeks. Typically, these are not significant or lengthy adverse impacts when weighed against the vegetation management alternatives and long-range management goals.

The ESEERCo study 80-5 titled *Cost Comparison of Right-of-way Treatment Methods* found compaction from wheeled maintenance equipment occurs. However, the extent of compaction is minor and considered inconsequential due to the once through nature of vegetation maintenance operations.

Rutting occurs when heavy equipment traverses the right-of-way under saturated ground conditions. The risk of rutting is greater during wet spring and fall conditions and less common during summer periods. Typically wetlands have a high risk of rutting while upland sites are considered low risk. The risk for rutting is usually higher with mowing, that requires narrow passes back and forth along the right-of-way, and shorter maintenance cycles to control rapid regrowth. Other treatments that rely on heavier mechanical clearing or treatment equipment also have a higher risk for rutting to occur than methods that rely on lighter, smaller or low ground pressure units designed specifically for soft soil conditions. Methods such as low volume backpack or cut and stump treatment, that rely on crews entering the site on foot have virtually no risk for rutting or soil compaction.

8.7.2.3. Wildlife

The research of Drs. Bramble and Byrnes on the Game Lands 33 Project in Central Pennsylvania was one of the first studies specifically designed to investigate the effects of herbicide use on wildlife. From their work, and that of others over the years, it has become increasingly clear that a wide range of wildlife species use the right-of-way habitat for nesting, food, bedding and cover. While it may be nearly impossible to meet the needs of every species, it has also become increasingly clear that a sound, integrated vegetation management program greatly increases wildlife habitat values for the widest range of species when compared to other non-herbicide methods.

As discussed, the wire-zone – border zone model promoted by Brambles and Byrnes fosters the development of compatible shrub communities along the edge of the right-of-way. This not only increases competition with taller growing trees, it improves a phenomenon known as edge effect. Edge effect is a term used to describe the transition zone between field and forest that is often favored by wildlife. The benefits of the countless miles of right-of-way edge are enhanced even further when the transition is softened by the retention and development of compatible shrub communities along the forest edge. In turn, this greatly increases wildlife habitat and cover values when compared to a right-of-way with sharp transitions from a grassed and/or herbaceous right-of-way immediately into the adjacent forest.

Research has also demonstrated that, instead of having a significant adverse impact, selective maintenance techniques generally increase the abundance and diversity of plant, mammal, bird, and other species within the right-of-way. In fact, a number of studies in New York have found that threatened or endangered species such as the Karner Blue butterfly, may have survived within the rights-of-ways of New York because of past broadcast herbicide activities. Likewise, numerous rare and threatened plant species have been shown to exist in rights-of-ways with a history of broadcast herbicide work. In cases such as these, treatments may have replicated essential wildfire disturbance of the site, making survival of these species possible in the right-of-way, while natural plant succession chocked them out in untreated off right-of-way areas. This underscores the need to work closely with the wildlife agencies to identify sensitive habitat and understand ways in which selective IVM may have helped create conditions favorable to these species within the right-of-way, and how future maintenance can continue this past success.

In contrast, mowing is known to cause an immediate loss of cover, and reduce or eliminate many food sources for smaller mammals and birds.

While the loss of cover may be short term, it can be far more disruptive in the short-term than a selective herbicide method.

A 2000 and 2001 study by the SUNY College of Environmental Science and Forestry, titled *Effects of Vegetation Management on the Avian Community of a Power Line Right-of-way* investigated the site effects of vegetation management on songbird communities. This study found increased predation of nests as shrub densities became dense, and began to suggest an upper limit for shrub densities of 70 percent for shrub-nesting species. As shrub densities increase in the right-of-way, the opportunity for field-nesting species also declines. The study found that once established, the permanence of the plant community that is produced through selective herbicide application might be better for relatively short-lived bird species than the regular destruction of habitat caused by regular mowing.

Clearly the balanced wire zone/ border zone model presented by Drs. Bramble and Byrnes that encourages a rich, diverse blend of grasses and forbs (herbs), shrubs and small compatible tree species across the right-of-way is the optimum vegetation management model for reliability, right-of-way stability and wildlife.

8.7.3. Description of Techniques

Each vegetation management technique is discussed in detail in this section, including a full description of the treatment method, equipment and herbicide requirements, limitations, buffer zones, drift and visual effects.

8.7.3.1. High Volume Hydraulic Foliar

Hydraulic foliar refers to the type of equipment used to complete a foliar treatment of tall-growing, incompatible vegetation in the right-of-way. Typically, this method uses all-terrain type equipment that is rubber tired or tracked, mounted with a hydraulically operated pump and a mix tank with a capacity of 100 to 1,000 gallons. Applicators may either ride on the spray unit treating downward or walk beside the unit and pull spray hose to reach the targeted vegetation.

Central Hudson has not used the larger hydraulic spray units to complete foliar treatments since the early 1990s, when low-volume backpack applications were developed. However, the method is highly effective when treating sites with medium to high densities of taller-growing, incompatible vegetation, and actually may require less herbicide per acre than backpack methods to control these conditions. In addition, historic high-volume methods have been modified to incorporate low-volume principles to the hydraulic unit, strengthening the role of this technique and equipment in meeting the needs of today's vegetation manager.

Description: High volume foliar applications made from a hydraulic unit are especially effective for sites with higher densities of incompatible target vegetation. The higher pressure helps insure adequate plant coverage on these sites, while the dilute mixtures help reduce the quantities of herbicide concentrate needed to provide effective control. While high-volume foliar applications remain a cost effective tool to control higher density sites, the incompatible densities normally associated with this method are rarely encountered today, and the method is not often required.

Conventional high volume applications use operating pressures of 100 to 150 psi at the nozzle, to apply an average of 60 to 120 gallons per acre of herbicide mixture. Rates of 300 to 400 mix gallons per acre have been used to treat tall, dense stands of incompatible tree species in the past.

While application rates are higher, the herbicide mixture rate for high-volume treatments is very dilute. Typically, the mix rate is about one gallon of concentrate per hundred gallons of mix (aka 1 percent solution). As a result, the application rates may be lower with this method than for other low volume methods when measured in terms of herbicide concentrate per acre, rather than mix gallons per acre. Low-volume methods require mixes with a higher herbicide concentration.

The spray mixture includes surfactants to reduce surface tension between the water and the leaf after application, and improve movement of the herbicide into the plant. It also includes drift control agents designed to thicken the spray mix and reduce or eliminate drift.

The herbicide mixture is directed at the target vegetation to wet all leaves, branches and stems to the point of runoff. The spray unit should travel up and down the right-of-way, with the applicator treating stems that are within 10 feet either side of the unit. When treating rights-of-ways with considerable shrub cover, it is more effective for the applicator to ride the unit. In this elevated position they can better see and treat stems that are down inside the shrub cover, and better access those that have emerged above a dense shrub layer.

The higher pressures associated with this method also insure that the spray pattern penetrates the canopy of dense clumps to provide full coverage. By comparison, low-volume backpack methods do not provide enough pressure to insure full coverage, and smaller stems that are contained in the shadow of taller, denser stems may escape control and require follow-up for effective control.

Site Conditions: The technique is most effective when the treated portion of the right-of-way consists of:

- A right-of-way with medium to dense incompatible densities (30 percent to 100 percent) where low-volume back pack applications would require high herbicide use rates and the more dilute, high volume mix would result in lower application rates **or**

- Sites with medium to dense incompatible densities (30 percent to 100 percent), where the height and density of the compatible shrub layer require treatment from an elevated position in order to effectively control taller incompatible stems emerging above the shrub layer. Hydraulic foliar applications may be used to treat target vegetation up to an average of 12 feet to 15 feet in height, **or**

- The site is accessible to ground equipment, and is sufficiently removed from environmentally sensitive sites so as to minimize potential adverse impacts.

Environmental Considerations: High-volume applications have the greatest risk for drift due to the higher operating pressures. Mix additives including surfactants and drift control agents are required to keep small droplets from forming as the mixture comes out of the spray nozzle, and prevent drift. Restricting crews from treating stems more than 10 feet from the unit, and limiting treatment height help to prevent the crews from boosting pressure to reach distant stems. Allowing applicators to ride the unit and treat from an elevated level also helps eliminate the problems of crews spraying up into the air to control taller stems. Typically, Central Hudson strives to schedule and treat right-of-way vegetation before it reaches a height of 12 feet. Applicators working from the unit will be permitted to occasionally treat stems up to 15 feet tall with this technique, provided the unit is close to the target stem and the spray pattern directed so as to keep it within the right-of-way limits.

The short-term visual effect associated with this technique is the variable brownout condition caused by dead and dying foliage. The preservation of compatible, non-target, vegetation that remains green within the site helps to mitigate the overall effect of brownout. A longer-term visual impact associated with this technique may be the site of dead stems within the site for a year or two after treatment.

The following buffer zones should be applied when prescribing high volume foliar applications. While these buffer zones are recommended minimums, the Utility Foresters may elect to increase buffer zone distances based on site-specific considerations:

- 50 feet from streams, ponds, lakes and unregulated wetlands with standing or flowing water
- 100 feet from potable water supplies, or wells
- 100 feet from regulated wetlands unless otherwise allowed by permit. (Note: This method may only be used when treating seasonally dry wetlands or the regulated 100-foot wetland adjacent area using products that are approved for aquatic or wetland application, in accordance with approved DEC wetland permits. Low-volume hydraulic methods will be preferred to high volume methods whenever practicable.)
- 100 feet from schools and athletic fields
- 100 feet from active residences, businesses or ornamental/landscape plantings
- 100 feet of active croplands, orchards, etc.
- 100 feet from golf courses and active parks

8.7.3.2. Low-Volume Radiarc

A highly specialized variation of the low-volume hydraulic method is the Radiarc nozzle. The Radiarc unit consists of a 15 to 30 gallon tank, a small pump and a special spray head that can be mounted on the back of a small tractor, or even an ATV.

The unit uses 1 percent to 2 percent mixtures similar to the low-volume foliar methods with the hydraulic unit, produces a uniform flow rate of coarse droplets through the nozzles, and treats approximately a 20-foot swath. The unit is especially effective for treating the access path, tower sites, narrow gas rights-of-ways, low-profile wire zone sites and similar areas requiring non-selective control of woody brush, while striving to effectively maintain or convert the site to herbaceous communities.

8.7.3.3. Low-Volume Backpack Foliar

Description: Low-volume backpack foliar applications have been the preferred treatment method on sites with low sensitivity at Central Hudson since the early 1990s. Backpack applications are especially effective on narrow rights-of-ways with very light to light densities, where compatible shrub densities are low enough to allow crews to walk along the right-of-way, locate and treat undesirable stems. The technique is also preferred for treatment in sensitive buffer areas, and is especially effective for seasonally dry wetlands. As discussed, research by SUNY College of Environmental Science and Forestry has shown that less herbicide reaches the soil surface when using low-volume backpack than the cut and stump treat methods.

Low-volume foliar applications by backpack crews are highly effective at selectively controlling incompatible species, at the lowest cost. In addition, the high selectivity and absence of large application equipment result in far less environmental or public intrusion than other effective control measures.

A pickup truck is used to transport workers to the right-of-way, where small two- to three-person crews walk the right of way. Application equipment usually consists of a 3-gallon backpack with a hand pump, a spray wand and a two-way nozzle. The backpack produces very low pressures, in the range of 25 to 30 psi, which requires the applicator to be very close to the target stem at the time of treatment.

The herbicide mixture is directed at individual stems, to lightly wet the leaf surface, especially in the area of growing tips and terminal leader. One nozzle of the spray head produces a wide-angle cone pattern that enables the applicator to work very close to smaller stems and quickly treat the leaf surface. The other nozzle provides a stream pattern that allows the applicator to reach the tops of taller stems, up to approximately 10 feet to 12 feet tall. Due to the low delivery pressures of this system, 12 feet is about the maximum height for effective coverage on most species. Central Hudson has selected the 5-year cycle to insure that treatment densities remain in the very light to light condition at the time of maintenance, and heights will generally remain below 10 feet to 12 feet.

The herbicide mix for low volume backpack is typically a 4 percent to 6 percent, water-borne solution that is applied at an average of 3 to 6 mix gallons per acre in light densities. Ultra-low applications can be made using a 5 percent to 10 percent solution in a carrier known as Thinvert, rather than water. Surfactants are added to conventional water-borne mixtures to reduce surface tension between the water-borne mixture and the leaf surface, and improve herbicide movement into the leaf. However, additional surfactants are not required when the Thinvert carrier is substituted for water in the ultra-low-volume mixtures, since the Thinvert carrier already includes a surfactant.

Site Conditions: The technique is most effective for controlling incompatible vegetation when the right-of-way is:

- Very-light to light (0 percent to 30 percent) densities for incompatible stems with an average height of 10 feet to 12 feet or less, and light to medium (0 percent to 70 percent) compatible species densities that have not become overgrown. The right-of-way needs to be easily covered by walking in order to locate and treat the non-compatible stems that are mixed in among the shrub communities. As shrub communities become overgrown they tend to conceal scattered tall-growing stems until after they emerge above the shrub layer, **or**

- The site consists of any density of non-compatible species where the only access to the site is on foot, **and**

- It is sufficiently removed from environmentally sensitive sites so as to minimize potential impacts. The method is the preferred method for treatment of DEC regulated wetlands and the wetland adjacent area, due to reduced herbicide application rates associate with this method, and the very low rates of product that reach the soil at the base of the target stem.

Environmental Considerations: The low pressures and coarse spray patterns of the backpack technique effectively eliminate drift.

The reduced pressures and light wetting, together with the applicator working in close proximity to the target stem greatly reduce the zone of effect when compared to other methods. Nearly all of the over spray that inadvertently falls on the understory is intercepted by the surrounding shrub or herbaceous layer. While there may be some temporary dieback, re-vegetation by herbaceous understory species often begins the same growing season and is complete by the following growing season. Very little herbicide actually reaches the soil beneath the target stem in most situations.

The short-term visual effects for this treatment are brownout of the treated foliage. However, the high selectivity of this technique preserves the greatest amount of compatible vegetation to minimize the impact.

The technique should be avoided in tall, dense conditions where the low pressures and light applications will result in poor coverage. Herbicide use increases significantly when this technique is used to treat dense conditions, and alternate methods will be considered to minimize the amount of herbicide concentrate that is required for effective control.

The following buffer zones should be observed when prescribing low volume foliar applications with backpacks. While these buffer zones are recommended minimums, the Utility Foresters may elect to increase these distances based on site-specific considerations.

- 15 feet from streams, ponds, lakes, and unregulated wetlands with standing or flowing water
- 100 feet from potable water supplies, or wells
- 100 feet from regulated wetlands unless otherwise allowed by permit. (Note: this method is the preferred method for treating seasonally dry wetlands or the regulated 100-foot wetland adjacent area using products that are approved for aquatic or wetland application, when approved through the DEC wetland permitting process.)
- 100 feet from active residences, businesses or ornamental/landscape plantings
- 100 feet from schools, athletic fields, golf courses and active parks
- No buffer zone is required next to crop fields or orchards when the treatment can be directed away from the crop area

8.7.3.4. Basal

Description: Basal applications use highly selective, stem specific treatments to target incompatible, tall-growing stems while preserving nearly all adjacent, compatible shrub species. In the early days of selective treatments and integrated vegetation management, basal applications and cut and stump treatment were the preferred methods of many utilities in sensitive buffer areas where high selectivity was required. Today, most basal applications have been replaced by low-volume backpack foliar methods.

Basal applications have evolved over the last 30 years. In the 1970s and 1980s conventional basal applications used 1 percent to 4 percent mixtures of herbicides diluted in fuel oil. They were applied to the lower 12 inches to 18 inches of the stem, wetting the base of the stem and all exposed roots to the point of rundown and pooling at the base of the stem, in the root collar zone.

Oil-based mixtures are required for basal applied products to penetrate waxy substances in the bark of the tree, and carry the herbicide into the underlying

cambium area. However, once the mixture penetrates the bark, polarity differences arise between the oil-borne herbicide and the water-based systems of the plant that reduce movement from the treatment site into the crown and roots. The stem is actually controlled by girdling the cambium at the point of contact and shutting down the nutrient supply from the roots to the leaves. The low solubility and translocation problems result in poor control of root sprouting species.

Basal also requires exacting application to avoid spotty control of most other species. For example, if the crew fails to treat a small portion of the backside of the stem, the herbicide will not move and it will not control the cambium for its entire circumference of the stem, leaving an uncontrolled green streak. This effectively allows the continued movement of food and nutrients between the roots and the leaves. Additionally, even the best crews have misses and skips when trying to locate and treat every stem in high-density sites resulting in costly retreat operations. Concerns with poor control, high application rates, and the unnecessary introduction of fuel oil into the environment limited the use of this technique.

Basal applications can be made any time of year except when snow covers the lower stem, and were often used to extend treatments of buffer areas into the dormant season. However, they are most effective from April to October, during the plant's active growing season. Trees treated in the dormant season often leaf out the following year because buds were already formed, and then wilt and die once food reserves are consumed.

In the mid to late 1980s, basal applications using special bark penetrants were developed. Today they include both pre-mixed and ready-to-use formulations that are applied as a fine mist to lightly wet the bark and exposed roots, eliminating the need for wetting to the point of rundown and pooling at the root collar. While low-volume basal methods reduce the amount of material applied to the ground around the stem, the amount of concentrate that reaches the soil still exceeds the amount for low volume foliar applications.

Mix rates vary from 10 percent to 50 percent dependent upon the formulation, with 1 gallon of concentrate basal replacing approximately 10 gallons of conventional basal. The new mixtures penetrate the bark better and are more mobile within the plant, increasing their range of control and reducing the problem with green streaks.

A two- to three-person crew is typically used for basal applications. Larger sites may be treated with Indian style, 1- to 5-gallon backpacks while isolated stems or small areas may be treated with small, handheld squirt bottles. Low pressures using a solid cone or flat fan nozzle are used to treat the lower 12 inches to 15 inches. The treatment is effective on stems up to six inches in diameter. Larger stems should be cut and stump treated.

Site Conditions: The technique is most effective for controlling incompatible vegetation when the right-of-way is:

- A relatively small area, such as a hedgerow, road crossing, or similar buffer zone, where incompatible densities are very light to light and compatible densities are low. The crew should be able to easily move through the site, to identify, locate and treat target stems dispersed between the compatible shrub and herbaceous communities.

Environmental Considerations: The low pressure and application close to the ground eliminates drift and greatly reduces the zone of effect on adjacent understory vegetation.

The zone of effect is higher for basal applications than cut and stump treatment due to higher application rates and finer spray mist. The amount of herbicide concentrate that reaches the soil is higher for basal applications than all other

treatments, since more material is required to effectively treat target stems than any other method, resulting in the greatest opportunity for incidental overspray onto adjacent vegetation. This, in turn, creates the greatest opportunity for lateral movement and/or greater leaching depth than associated with other methods.

The short-term visual effects are brownout associated with growing season treatments, as well as brownout during the next growing season when treatments are made in the dormant season. A longer visual impact may be the dead stems that remain standing in the site for one to two seasons after treatment. However, the high selectivity and high retention of compatible vegetation help to minimize this impact.

Highly selective basal techniques may be used within or immediately adjacent to croplands and orchards. It may be used right up to the edge of active pastures, but not within the pasture unless specifically permitted by label grazing requirements. It may also be used to treat within or immediately adjacent to buffer areas for residential and commercial sites; and athletic fields, golf courses, schools, and active parks in accordance with DEC pre-notification requirements.

The following buffer zones should be observed when prescribing basal applications. While these buffer zones are recommended minimums, the Utility Foresters may elect to increase the distances based on site-specific considerations.

- 15 feet from streams, ponds, lakes, and unregulated wetlands with standing or flowing water
- 100 feet from potable water supplies, or wells
- 100 feet from regulated wetlands unless otherwise allowed by permit. (Note: this method is NOT approved for treating seasonally dry wetlands or the regulated 100-foot wetland adjacent area through the DEC wetland permitting process.)

8.7.3.5 Hand Cutting

Hand cutting is primarily used to clear incompatible species in areas of high sensitivity, such as residential and commercial sites, and near schools, athletic fields, golf courses and active parks where foliar and other methods cannot be used. It may also be used in buffer zones for roads, streams, ponds, lakes and wetlands. Small, two- to three-person crews typically use chain saws or brush saws to cut and remove incompatible stems, while not clearing compatible stems. The slash or debris from cutting is disposed of in a variety of ways, dependent upon site conditions, including cutting it up and leaving it lay where it falls, hand piling or windrowing along the edge of the right-of-way, and chipping or hauling all the material to remove it from the site.

Hand cutting is one of the most costly forms of right-of-way vegetation management, but is required to control incompatible growth in highly sensitive areas. Costs increase as the need to hand pile, or chip and removed debris from the site increases. Sites that require hand cutting may be stump treated using approved herbicides, or the site may remain untreated.

8.7.3.5.1. Cut with Stump Treatment

While most conifers do not re-sprout from the stump after cutting, deciduous trees and shrubs re-grow prolifically from the stump and/or roots following clearing. Herbicides are the only cost-effective method to prevent and eliminate that re-growth once an incompatible stem has survived the natural processes of predation and competition, and begin to emerge above the

compatible layer. Stump treatment to supplement hand cutting is the preferred method in order to achieve effective control.

There are two different methods for mixing and applying stump treatments. The most common method is to apply a water-borne mixture directly to the cut surface of the stump immediately after cutting. The herbicide may be pre-mixed from the manufacturer or a herbicide supplier, or it may be field mixed by the application crew, depending upon the products selected. The mix rates are typically 50 percent solutions, and they are applied to the outer growth cambium and growth rings of the freshly cut stump. The application equipment is usually a small hand-held squirt bottle or small capacity (1 gallon) hand sprayer.

The advantage of water-borne applications is that they are readily absorbed into the exposed water system of the stump. However, drying occurs if the application is delayed more than a few minutes, when air bubbles form in the xylem and phloem at the cut surface. This blocks absorption into the plants water systems and prevents movement into the roots. The effectiveness of some water-borne treatments decrease as the plants shut down and move into winter dormancy.

Water-borne applications commonly allow treatment of tall-growing vegetation near water and in wetlands using aquatically approved herbicides.

The other method of stump treatment utilizes the oil-borne mixtures of low volume basal to lightly wet the exposed bark and roots on stumps at any time following cutting.

Oil-borne applications are especially effective to treat stems that may have been cut during periods of winter snow cover, or during spring sap flow. The application of oil-borne products can actually occur days or months after cutting.

While stump treatments can be used to lengthen the treatment year into the dormant season, the effectiveness of dormant season applications can be unreliable at times. Seasonal differences in plant physiology, together with a slowing and shutdown of the plant's transport systems during fall, winter, and spring can dramatically affect performance of various products. Human error can further reduce the effectiveness of stump treatment when skips and misses occur.

Clearly, the most effective applications are growing season applications, when the plant's nutrients and food transportation systems are working. Water-borne applications are also more effective during this time of year. As treatments move from summer into fall, stump treatments with glyphosate products become less effective, and crews should shift to other water-borne formulations. When treatments are scheduled during full dormancy in winter conditions, crews should consider shifting to oil-borne mixes, or returning in the spring to treat with oil-borne mixes if there is snow cover.

Site Conditions: Cut and stump treatment is most effective when the site is:

- Within the shut off area or buffer zone for the foliar methods, **or**
- An area of high visual sensitivity, such as busy highways or parks, where tall-growing, incompatible stems require removal, **or**
- An area juxtaposed to residential, commercial or other high use public sites where, due to intense land use practices, hand cutting is warranted over foliar application to preserve site quality and aesthetics, **or**

- Within the limits of a public water supply or immediately adjacent to a domestic water supply, and an approved aquatic herbicide can be prescribed for use, **or**

- Within a regulated DEC wetland, and the regulated adjacent area, and aquatic products are approved in the wetlands permitting process, **or**

- A site where individual stems are too tall for foliar treatment.

Environmental Considerations: Drift is almost non-existent due to the low pressures and the fact that treatments are made at ground level.

There is virtually no damage to non-target shrub species unless they are so close to the treated stem that exposed stems or roots are incidentally treated with an oil-borne herbicide as the target stump is treated. Off-target herbicide movement may occur when using water-borne products on root suckering, clone type species such as black locust or poplar, or where root grafting has occurred.

The zone of effect for stump treatment ranges from a few inches up to two feet. It is caused when the herbicide mixture splashes off the stump surface during squirt bottle applications, or when the light mist from oil-borne applications falls on herbaceous understory next to the stump. Once again, the impact is temporary, with full re-vegetation later the same growing season or early in the next season, depending upon when the treatment is made.

The applications rates of herbicide concentrate per acre are nearly the same for water-borne stump treatments and low volume, backpack foliar treatments. However, stump treatments apply a more concentrated solution, close to the soil level while backpack foliar applies a more dilute mixture that is largely intercepted by the herbaceous understory vegetation, as discussed earlier. While neither method creates a significant environmental risk, there may be a slight advantage for using low-volume backpack foliar application in wetlands where there is concern for applying herbicide at the ground level.

Hand cutting and stump treatment create the lowest visual impact, since incompatible stems are cut down, reducing or eliminating the problem of brownout.

Stump treatment applications will not be made within five feet of streams, ponds or lakes.

8.7.3.5.2. Cut without Stump Treat

Hand cutting without herbicides is used to clear incompatible species in areas with:

- Very high public sensitivity, such as lawns, parks, and schools **or**

- Immediately adjacent to streams, ponds and lakes **or**

- Adjacent to registered organic farm fields; **or**

- Other buffer zones as deemed necessary by the Utility Foresters

It is reserved for sites with deep public concern about herbicides, or where easement or regulatory constraints prevent the use of herbicides.

Hand cutting is very labor intensive. The lack of herbicide treatment to control re-growth greatly reduces the long-term effectiveness by increasing density over time, and requiring frequent off-cycle review and remediation to maintain clearance and insure reliability. These methods should be

considered as a last resort when other, more effective IVM methods cannot be used.

The heavy resurgence of stump and root sprouts, combined with competition and shading by taller-growing species may also cause the loss of more compatible shrub and herbaceous species from hand cut and/or trim sites where herbicide is not used.

The visual impacts may be an accumulation of brush and debris within the site, forcing more expensive chipping, cleanup and disposal costs on some sites.

8.7.3.6. Mowing

Mowing is a non-selective, mechanical method of cutting all vegetation within the right-of-way, using large all-terrain vehicles equipped with specialized mowing attachments. They range in size from 4x4 farm tractors with rear mounted 6 to 8-foot bush-hog type mowers that will cut and mulch small diameter trees and shrubs, up to large heavy duty equipment with front mounted 8 to 10-foot cutter heads that will cut and mulch trees up to 10 inches in diameter.

While the operator may be able to avoid an occasional clump of small vegetation, this is not practical on a large scale. Selectivity down to the plant level, like what can be achieved with other IVM methods, is simply not possible with mowing. The frequent stopping, turning and backing required to work around and retain patches of compatible species add greatly to the cost, and far outweigh the benefits from trying to retain them. The problem is magnified when the operator is working in close to poles, towers, guy wires, fences and other obstructions.

Mowing is limited to flat, gently rolling to moderate terrain, with dry soil conditions that will support the equipment without significant rutting. It should not be used in the spring or fall under wet soil conditions, or in wetlands where serious rutting occurs. Mowing cannot be used during periods of significant snow cover either.

The site must be free of large stones, logs and large stumps, and mowing should be closely monitored adjacent to homes and buildings, and along highways where the risk of flying debris could cause personal injury or property damage. Pastures require special attention to insure cherry species are not mowed and left in the pasture during the growing season, and to avoid damaging fences. The stubble and on site slash disposal of mowing can sometimes be a problem as well.

Site Conditions: Mowing becomes most cost-effective when:

- The site has an easement or regulatory restriction, or public concerns exist that make the site too sensitive for even highly selective herbicide methods. At the same time hand cutting without stump treatment would be more expensive than mowing and the site is accessible to mowing equipment.

- Clearing upland sites on the electric transmission rights-of-way that have become overgrown with dense, incompatible woody vegetation due to lack of past herbicide application, and although the site can now be treated, mowing will help reduce herbicide use requirements.

- Reclaiming sites that have become overgrown with tall-growing shrubs in the wire zone, and although the site can be treated to prevent re-growth mowing will help reduce herbicide use requirements.

- Establishing, widening or reclaiming an access path within the right-of-way that has become overgrown with woody vegetation and the site will be treated to prevent re-growth.

- The site is a border zone site where mowing could encourage dense re-growth of compatible species, thereby increasing future competition.

- Maintaining gas rights-of-ways, where the management objectives require the complete removal of woody growth for cathodic testing and leak patrols. Woody growth can mask a leak from the view of routine aerial patrols on gas, and can block access to ground personnel seeking to enter the narrow rights-of-ways to perform inspection and repair activities. Central Hudson's goal is to maintain its gas transmission rights-of-ways in conjunction with the annual leak inspections. The high safety standards and requirements for gas rights-of-ways, together with the need for increased accessibility justify the increased cost of this technique. The short rotation mowing cycle is generally effective in controlling most woody re-growth, and establishing stable herbaceous communities.

Environmental Considerations: Mowing equipment should not be used in sensitive wetland or stream areas where significant rutting could occur.

Work buffer areas should be maintained when working along highways and other high use public sites to maintain public safety from flying debris.

Mowing can create sharply defined right-of-way edges by eliminating the smaller shrubs and herbaceous growth, as well as taller-growing stems. The shredded brush, debris and stubble sometimes create visual problems with adjacent residences as well.

Mowing can dramatically alter short-term vegetation conditions and significantly affect wildlife habitat by eliminating nesting cover and forage plants. Other, more selective IVM methods can control these target stems while retaining nesting sites through the current nesting season, and therefore reduce the overall impacts when compared to mowing activities. While the adverse habitat impacts from mowing are not long lasting, they create a distinct disadvantage for mowing during the year maintenance is performed. The effects can be minimized by limiting mowing activities to a portion of the right-of-way wherever possible, such as around towers, the access road, and to reclaim the wire zone.

Mowing equipment increases the risk of soil compaction from repeated traffic by heavy equipment. It also increases risk of erosion on moderate to steep slopes with light herbaceous cover. The mower may also scuff the soil surface removing protective litter and duff layers, temporarily exposing soils to erosion. Rutting and compaction can be minimized if mowing is done when the site is dry and more stable. However, this in turn means mowing during the drier summer months when nesting of songbirds and small mammals may be at its peak.

Mowing equipment presents a significant risk of oil spills and leaks from hydraulic lines and fittings due to heavy vibration. These lines and fittings should be regularly maintained and closely monitored to guard against rupture.

8.7.3.6.1. Mowing Without Herbicide Treatment

Mowing operations will typically result in dense, prolific re-sprouting from stumps and roots of all deciduous tree and shrub species unless the site is treated with herbicides, or the mowing cycle is frequent enough to diminish root reserves and starve the plant. Mowing without herbicide treatment becomes very cost prohibitive for most electric transmission sites.

8.7.3.6.2. Mowing with Follow-Up Foliar Treatment

There are currently two effective methods for completing a follow up herbicide treatment after mowing. The first uses follow up foliar methods, including conventional high-volume hydraulic on high-density sites, and

low-volume backpack on lower density sites. The preferred method of follow-up foliar at Central Hudson is low-volume backpack.

However, the choice between conventional high-volume and low-volume methods is based on site densities. High-volume methods, using higher pressures to apply more dilute mixtures will insure proper coverage of all stems, while using less concentrate per acre than low-volume treatments of more concentrated mixes.

Treatments are generally made one growing season after mowing, once the stems have had time to re-sprout and become woody. If they are treated too soon after sprouting, while the stems are fleshy, there is a risk that the herbicide will not translocate into the roots.

8.7.3.6.3. Mowing With Cut Stubble

One method of applying herbicide after mowing is to use low-volume basal methods and mixtures to treat the cut stubble after mowing. Applications can be made at any time after mowing, including during the dormant season, making this method effective in sites with higher sensitivity to the brownout associated with low-volume foliar treatments.

This method includes all the benefits and concerns for basal operations, including higher overall application rates with oil-borne products, and application to the ground immediately adjacent to the target stem and exposed roots.

The development of a mower known as the Brown Brush Monitor is enabling treatment of the freshly cut stubble with 4 percent to 6 percent water-borne mixtures, and the mixture is applied at 15 to 30 gallons per acre. The mower attaches behind a heavy-duty 4X4 farm tractor, and contains a special herbicide treatment chamber located directly behind the mowing compartment.

The stubble is scarified with special knives that scratch the surface of the stem as it passes through the treatment chamber, after mowing. A small quantity of a water-borne mixture is immediately wiped onto the stem and cut surface of the stubble, helping to reduce the over-spray onto the ground common with basal applications.

The unit can mow brush up to approximately three inches in diameter, and is especially effective for controlling undesirable woody growth on gas rights-of-ways, in access routes and around tower or pole sites, for converting low profile mid-span wire zone sites to compatible herbaceous communities, and for eliminating costly follow-up basal or foliar treatments in other areas where mowing is required.

Environmental Considerations: A buffer zone of at least 25 feet should be observed when using the Brown Brush Monitor adjacent to sensitive aquatic resources. This buffer should be increased in moderate to steep terrain to insure adequate separation from water resources and minimize the risk of overland movement if there is a sudden rainfall immediately after treatment and before the material can dry on the surface. There may be a greater risk of wash-off with this method due to the removal of any herbaceous or shrub over story species during mowing.

8.8. Regulatory Approval and Permits

Central Hudson policy requires compliance with all applicable federal, state and local laws, rules, and regulations; and this requirement is included in the terms, conditions, and specifications for all

contracts. More specifically, several state and federal agencies have regulations that govern or affect wetlands, threatened and endangered species, public notification and public health.

The program further incorporates the specific environmental and vegetation management requirements of Article VII electric and gas projects into the management goals and objectives of the long-range plan. In addition, Central Hudson will strive to uniformly and consistently apply industry best management practices for environmental and vegetation management to all transmission facilities.

8.8.1. Permitting Activities in Wetlands and Other Regulated Waterways

Article 24 of the NYS Environmental Conservation Law (ECL) regulates right-of-way maintenance activities in wetlands, and Article 15 of the ECL addresses activities in other regulated water bodies. A standard activity permit for herbicide applications and individual activity, or a general permit for other minor maintenance activities is required by the NYS DEC for compliance with these regulations. In addition, the US Army Corps of Engineers, Nationwide Permits may be necessary before completing certain maintenance activities affecting wetlands, streams or other water bodies.

The Environmental Affairs Division is responsible for all permitting. They complete all annual or periodic permit applications for vegetation management activities in wetlands, and provide expertise and act as liaison on endangered species and other environmental permitting issues.

The Director of Line Clearance and the Utility Foresters will coordinate closely with the Environmental Affairs Division once the annual schedule is finalized to identify right-of-ways that require maintenance in the schedule year, and expedite the permitting process. They also are responsible for identifying the type and extent of maintenance activity planned that may require permitting. The Utility Foresters are responsible for insuring any public posting, public or regulatory notification, or other permit requirements are implemented in the field.

The Utility Foresters are responsible for data entry and maintenance regarding sensitive resources in the field inventory and work reporting systems, while the Environmental Affairs Division maintains other databases and systems that identify, locate and protect sensitive natural and cultural resources and facilitate permitting.

8.8.1.1. Corps of Engineers Nationwide Permit

The United States Army Corps of Engineers does not require a permit for herbicide application or routine vegetation maintenance activities when clearing in wetlands is done by hand. Clearing by mechanical methods requires a Nationwide Permit #12. A Nationwide Permit #3 is also required for fill activities associated with the operation or maintenance of the line, including maintenance, repair, or replacement of culverts or other stream crossing devices and other fill activities in wetlands streams or other regulated water bodies. New electric line installations may require a Nationwide Permit #12, or even an individual permit.

8.8.1.2. NYS DEC Wetlands Permit for Herbicide Application

The Environmental Affairs Division prepares the annual submittal for Standard Activities Permit to apply herbicides within NYS DEC regulated wetlands and adjacent areas. The submittal includes the proposed schedule of lines, together with adequate maps and supporting documentation to facilitate permitting. Environmental Affairs also coordinates publishing any public notice announcements required by the permitting process.

Environmental Affairs also maintains coverage under the State Pollutant Discharge Elimination System (SPDES) General Permit for Point Source

Discharges to Surface Water of New York for Pesticide Applications. Environmental Affairs submits the Notice of Intent for coverage under the permit and maintains a list if regulated wetlands along the transmission lines that are covered by this permit.

The Utility Foresters are responsible for communicating any special terms and conditions of these permits to the contractor once field operations begin. The Utility Foresters also insure that DEC Regional personnel are regularly updated about scheduled and completed field activities, where required by permit conditions.

8.8.1.3. NYS DEC Streams and Wetlands Permits for Other Activities

The NYS DEC also requires a General Activities Permit for other minor construction or maintenance activities in or adjacent to streams, lakes, wetlands and other waterways. The permit authorizes activities including construction or maintenance of stream crossing devices, excavation or fill activities and other site disturbances beyond the special requirements for herbicide activities. Consistent with that permitting process, Central Hudson agrees to use equipment with low ground pressure and to implement industry recognized best management practices (BMPs) when completing these activities.

8.8.1.4. NYS DEC

The NYS DEC requires a Temporary Revocable Permit (TRP) for the removal of trees from state lands under the jurisdiction of the Division of Lands and Forests. On state lands where Central Hudson maintains a valid easement, no TRP should be required for routine maintenance within the right-of-way. For work outside the right-of-way (i.e. Danger tree removal) or for situations where the easement rights are not clear, Central Hudson shall apply for a TRP where required, through the appropriate Regional DEC offices.

8.8.2. NYS DEC Endangered Species Notification

The New York investor-owned utilities agreed to prepare a voluntary, annual submittal to the NYS DEC Natural Heritage Program, to provide them with the annual schedule and an electronic GIS or equivalent map file that identifies the line route, road crossings, and other pertinent land features. The submittal shall be sent to DEC at the same time as its wetland permit application, but no later than March 31 of each year. The Natural Heritage Program will use this information to identify known populations of rare, threatened or endangered species that may be found within 150 feet of the right-of-way and communicate those locations to the utilities.

Central Hudson's Environmental Affairs Division, and the Director of Line Clearance along with the Utility Foresters shall work collaboratively with the DEC Endangered Species Unit to determine risks and potential benefits of vegetation maintenance activities within the right-of-way, and to the extent practicable strive to schedule proposed maintenance at a time when it might pose the least risk to the individuals or the population. Central Hudson's policy, practices and procedures strive to protect known populations of threatened and endangered species so as to avoid and prevent incidental take. The program is committed to a philosophy that most right-of-way management activities will either have a slight positive impact, or can be modified slightly to protect critical resources and minimize impacts.

Once a plan of action has been agreed upon, it is the responsibility of the Utility Foresters to communicate and supervise contractor activities to insure the action plan is fully implemented.

Central Hudson acknowledges its role as a good steward of the right-of-way resources it manages. However, it has been agreed through discussions with the NYS PSC and various DEC groups that under the conditions of this plan, it is not the responsibility of each utility to perform searches for unknown populations on behalf of the state as a condition for permitting.

8.8.3. NYS Department of Health Notification

The New York investor-owned utilities agreed to prepare a voluntary, annual submittal to the NYS DEC Department of Health. The submittal shall include the annual schedule, together with an electronic GIS or equivalent map file that identifies the line route, road crossings, and a list of herbicide mixtures that are approved for the planned application. Copies of the specifications will be made available upon request.

The submittal shall be sent to DOH no later than March 31 of each year. The purpose of the submittal is to provide the DOH with enough information about the line route that DOH can determine the location of known water supplies in close proximity to scheduled work. The Utility Foresters shall serve as a communication point to the DOH officer for questions concerning the proposed work and to help communicate information about known well points to the contractor.

Typically, Central Hudson observes a 100 foot no treatment zone around known public or private water supplies, or utilizes mixtures with approved aquatic herbicides to cut and stump treat within this 100 foot buffer area.

In addition, Central Hudson requires the contractor to insure that a clean water supply truck is used by field crews to re-supply foliar units. The re-supply truck is not allowed to transport herbicides or other application materials or equipment. In addition, any equipment used to draw water from streams, ponds, lakes, or other water sources shall have an effective, working anti-siphon device or water break that prevents back flow.

8.8.4. NYS DEC Public Notification and Posting for Herbicide Use

The New York State Code of Rules and Regulations (NYSCRR), Part 325 and 326 pertain to herbicide application for right-of-way management activities. This program and its specifications require compliance with all DEC pesticide notification, posting, and annual reporting requirements, together with requirements for business registration by commercial pesticide application contractors and the certification of various levels of individual pesticide applicators.

The Utility Foresters shall be familiar with all requirements associated with Category 6 herbicide application. All contractor supervision associated with transmission herbicide operations shall be NYS DEC Certified Pesticide Applicators in Category 6. In addition, all other application personnel are required to be qualified at the apprentice, technician or fully certified applicator levels, as required by NYS DEC pesticide regulations.

8.9 Landowner Notification

While most of Central Hudson's transmission right-of-way is acquired through easements, a small portion is owned in fee. The easements typically grant the right to conduct routine maintenance activities, including vegetation management, danger tree removal, and ingress and egress. All easement and fee ownership agreements are documented and retained by the Real Property Services Department.

The company strives to maintain good public relations with all underlying and adjacent landowners, to the extent practicable. As a matter of courtesy, the contractor is required to make reasonable attempts to contact and/or notify nearby residents of crew or equipment movements, or work operations that would directly impact them.

As indicated in 8.8.4 above, Central Hudson requires all vegetation personnel to comply with NYSCRR Part 325 relating to the notification and posting requirements for rights-of-ways. These requirements are incorporated into the specification language of the contracts as well. In addition, Central Hudson is developing a list of customers that object to herbicide use activities and/or request separate pre-notification prior to treatment. This database will also be used to identify activities that may require special herbicide use consideration such as water supplies or organic farming.

8.10 Program Implementation and Monitoring

8.10.1 Determining Work Force

Central Hudson contracts all transmission right-of-way management activities. The proposed work is released for bid as soon as the preliminary work inventory has been prepared. Copies of the specifications, inventories and maps are provided to the contractor in the bid process to assist them in locating and assessing the extent of work. Bids are received and evaluated considering unit pricing as well as time and equipment pricing provided. Multi-year pricing is typically requested to stabilize year to year pricing and assist in preparing preliminary cost estimates based on the established rates , so that work requirements and priorities may be aligned with final budget figures. All contracts are awarded in accordance with system purchasing procedures.

Since most of the routine right-of-way maintenance work is released to contract on a firm price or unit price basis, the actual staffing levels necessary to complete the work to the requirements outlined in the specification, and within the time limits of the contract are determined by the contractor. Hourly (time and material) crews are utilized for danger tree removals, edge encroachment reclamation and off-cycle remedial work. Historic spending, field patrol reports, and the Utility Foresters' assessments determine staffing levels for this work.

8.10.2 Crew Training

The emphasis of training is to educate and inform contractor supervision and field personnel in the goals, objectives and strategies of this long-range plan, and to insure the successful implementation of the plan and its requirements. Good communication between the Utility Foresters and the contractor personnel is essential to achieve these goals.

Central Hudson requires start up training each year for contractor crews working on the system, and especially new employees, to review changes to the specifications, application methods, herbicide mixtures, criteria for treatment, and/or regulations. This training emphasizes special areas of concern such as buffer zones, sensitive customers or areas, environmental or permitting matters, areas of high visual sensitivity, etc. It may also discuss areas of concern from previous years' maintenance. Training will incorporate information about the wire security zone clearance requirements, steps to successfully implement the wire zone – border zone concepts, as well as how to identify and remove tall-growing shrub species from mid-span and other wire zone areas. A copy of the Annual Transmission Right-Of-Way Crew Training Outline and attendance sheet is provided in Appendix 19.

In addition, each certified applicator is required to complete regular re-certification training in order to renew their applicators license. Central Hudson encourages all certified contractor personnel to participate in the annual Category 6 pesticide training workshops.

The Utility Foresters continuously monitor the success of the program, and regularly implements remedial training through the appropriate contractor supervision when required to

improve crew performance, knowledge and skills. The success of the program in achieving these training goals is also incorporated into the annual PSC field review and audit.

8.10.3 Contract Specifications

The transmission vegetation maintenance specification is the document that communicates the terms and conditions of this long-range right-of-way management plan to ensure that the contractor fully understands the purpose of the work and the methodologies that will be utilized to complete the work. A copy is included in Appendix 20. The specifications are periodically revised to reflect ongoing program enhancements. Changes are communicated to the contractor through the pre-bid process, and explained down to the crew level through the training process. Various levels of in-house and contractor personnel closely monitor day-to-day operations to insure that field activities are conducted in compliance with the specifications.

8.10.4 Supervision

The program requires various levels of supervision and responsibility to insure successful implementation. It requires all levels of supervision to be actively involved in field training, and program implementation and monitoring. The roles and responsibilities of various levels are discussed below.

8.10.4.1. Director of Line Clearance

The Director of Line Clearance, with input from the Utility Foresters and senior management is responsible for development and implementation of system vegetation management policies and procedures, as defined by this long-range plan.

8.10.4.2. Utility Foresters

The Utility Foresters are responsible for field implementation of the policies, procedures and practices of this long-range plan, together with on-going field monitoring of crew activities and performance to insure full compliance. The frequency of day-to-day field visits and direct crew communication depend upon the type and complexity of work, and the site location and site sensitivity.

The Utility Foresters provide input to the Director of Line Clearance for short- and long-term scheduling and budget requirements. The Utility Foresters provide the primary communication to the contractor's supervision and work force.

8.10.4.3. Contractor Supervisor

Each vegetation management contractor shall provide trained and competent supervision, who fully understand the goals, objectives and strategies of this program, together with all pertinent laws, rules and regulations. The supervisor is responsible for assuring that each crew foreman and applicator is properly trained in the duties and responsibilities of their job. The supervisor closely monitors crew activities to insure all IVM methods and techniques are implemented properly, and in accordance with the specifications and this plan. The supervisor regularly communicates field activities and concerns from the crews to the Utility Foresters.

8.10.4.4. Crew Foreman

Each vegetation management crew is led and directed by an on-site crew foreman. This foreman shall be a fully certified pesticide applicator. If the crew foreman is not

physically available with the spray crew he must be readily available via telephone at any time. Crew foreman must be fully knowledgeable in species identification and the selective IVM principles and practices. The crew foreman is responsible for training individual applicators, and insuring that they are proficient in implementing the treatments and methods assigned. They are the key to communication down to the applicator level and to supervision.

8.10.4.5. Individual Crew Members/Applicators

The crew foreman is required to spend sufficient time with each new employee/applicator when they start to insure they are trained in and fully understand the correct application procedures, identification techniques, and generally understand the objectives of selective IVM. Applicators receive continuous, on-the-job training and are constantly monitored and supervised by their crew foreman and the contractor supervisor.

This method of training has widespread use in the industry and has been proven highly effective. The degree of effectiveness may vary with the level of emphasis placed on performance by the foreman and contract supervisor. Central Hudson is committed to insure a high level of performance from its vegetation management contractors.

8.11 Customer Inquiry and Complaint Resolution

Customer inquiries and complaints are initially received through the call center, and forwarded to the Utility Foresters for prompt resolution. Urgent concerns are often handled via telephone from the customer service representative to the Utility Foresters. The Utility Foresters and contractor crews are equipped with cell phones to enable prompt communication at all levels.

Once a call is received, the Utility Forester is responsible for promptly contacting the customer to assess the nature and urgency of the concern. If required the Utility Forester may schedule a site visit with the customer or may request the appropriate contractor personnel to meet with the customer in order to resolve the issue. When an inquiry is handed off to the contractor, the Utility Foresters insures that the customer's concerns are promptly, properly and courteously handled

Most inquires and concerns, including minor property damage are promptly resolved in the field through this process. However, when a customer concern or problem cannot be resolved in this manner, or the complaint involves significant property damage or personal injury, a field investigation is completed and a claims report is forwarded to a Claims Adjuster, within Risk Management. The contractor is immediately contacted as well, to coordinate assessment and resolution with the customer, Claims, and the designated Utility Forester. If the claim involves significant property damage, alleged herbicide misapplication or personal injury, the Utility Forester immediately notifies the Director of Line Clearance as well. If the complaint involves regulatory agencies, the Utility Forester shall immediately notify the Manager of Electric T & D and Environmental Affairs, and the EAD becomes the lead department and point of contact between the company and the regulatory agency.

Complaints or problems with unauthorized dumping are referred to the Security Director for investigation and follow-up.

8.12 Field Completion and Reporting

Contractor work completions are reported to the Utility Foresters for final field review and audit prior to payment. Site-by-site completion data is reported by the contractor through the field inventory report, and includes date complete, treatment method and herbicide used. The

contractor's work completion reports may be submitted electronically or in paper form for database entry by Central Hudson personnel.

The computerization of this information, combined with the field inventory data, has better equipped Central Hudson to track work completions, automate the year-end PSC reporting process, develop accurate baseline data, monitor future effectiveness of vegetation management activities and develop herbicide use trends. The system also provides a hierarchy of reports that summarize information pertinent to the program from the right-of-way level up to total system reports.

Central Hudson will submit annual reports to the PSC, in the required format by March 31 of each year. The reports shall include the following:

- A summary of acres scheduled for each year, and the actual acres treated by line
- A summary of acres treated by technique
- A summary of cost per acre by technique
- A summary of herbicide use for each technique that identifies both mix gallons per acre and concentrate gallons per acre
- A summary of danger tree work and off-cycle hot spot activities by line
- A summary of environmental restoration and access road activities by line
- A summary of all vegetation caused outages in the preceding calendar year

8.13 Program Effectiveness

The program effectiveness is continually monitored, tracked and reported on through a number of indices including reliability, cost, herbicide use and vegetation densities of both compatible and incompatible species. Reliability is a key goal, and a number of enhancements have been developed to maximize system-reliability performance. Costs will be measured on a cost-per-brush acre basis to better monitor actual maintenance costs against historic performance and industry benchmarks. Herbicide use will be measured in gallons of herbicide mix and gallons of herbicide concentrate applied per acre, by technique. Treatment costs and herbicide use trends will help determine the most effective techniques or combination of methods to achieve the long-term goals of the program.

8.14 Testing of New Materials and Mixtures

Central Hudson is committed to use federal and state approved herbicides in a manner consistent with label directions, in an economically sound and environmentally conscious manner. Central Hudson is dedicated to continuous improvement and refinement of integrated vegetation management techniques to achieve a long-term herbicide reduction strategy. This includes proper storage, handling and application of herbicides in accordance with label directions and ongoing evaluation of treatment methods and mix rates to insure reliable, cost-effective electric transmission right-of-way maintenance.

Central Hudson will continually monitor technological and product advances that may reduce herbicide use requirements and/or environmental risk while maintaining or improving efficiencies and effectiveness. As new products, equipment or treatment innovations become available; Central Hudson will first utilize small test plots and research to evaluate their field performance. Those products, mixtures or methods that show promise at the test plot level would next be tested on more of an operational basis, to evaluate performance on larger sites, over a broader range of species before being fully introduced into the program. The Director

of Line Clearance and the Utility Foresters will cooperate with suppliers, researchers, and others to design, apply and evaluate field tests.

8.15 Research

Central Hudson has a history that spans more than two decades of partnership and participation in Integrated Vegetation Management research in New York State. Central Hudson will continue to stay abreast of regional and national research developments by participating in local, regional and national workshops such as Category 6, the Utility Arborist Association, the International Arborist Association, and periodic right-of-way management symposiums.

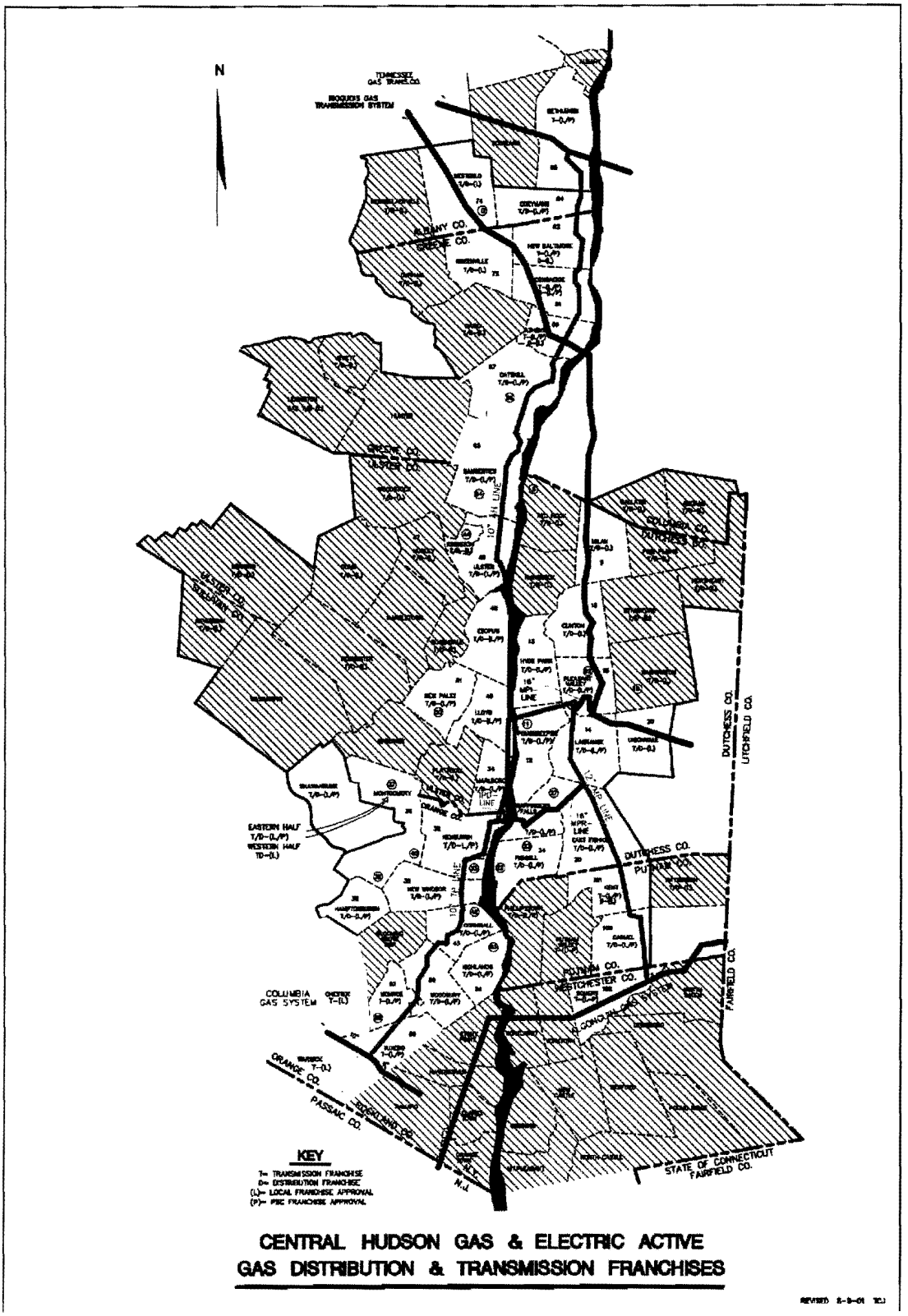
Where gaps in vegetation management knowledge and data exist that could improve long-term program performance, Central Hudson will seek strategic partners, or join with ongoing partnerships to share and equitably distribute the benefits and economic burdens of research.

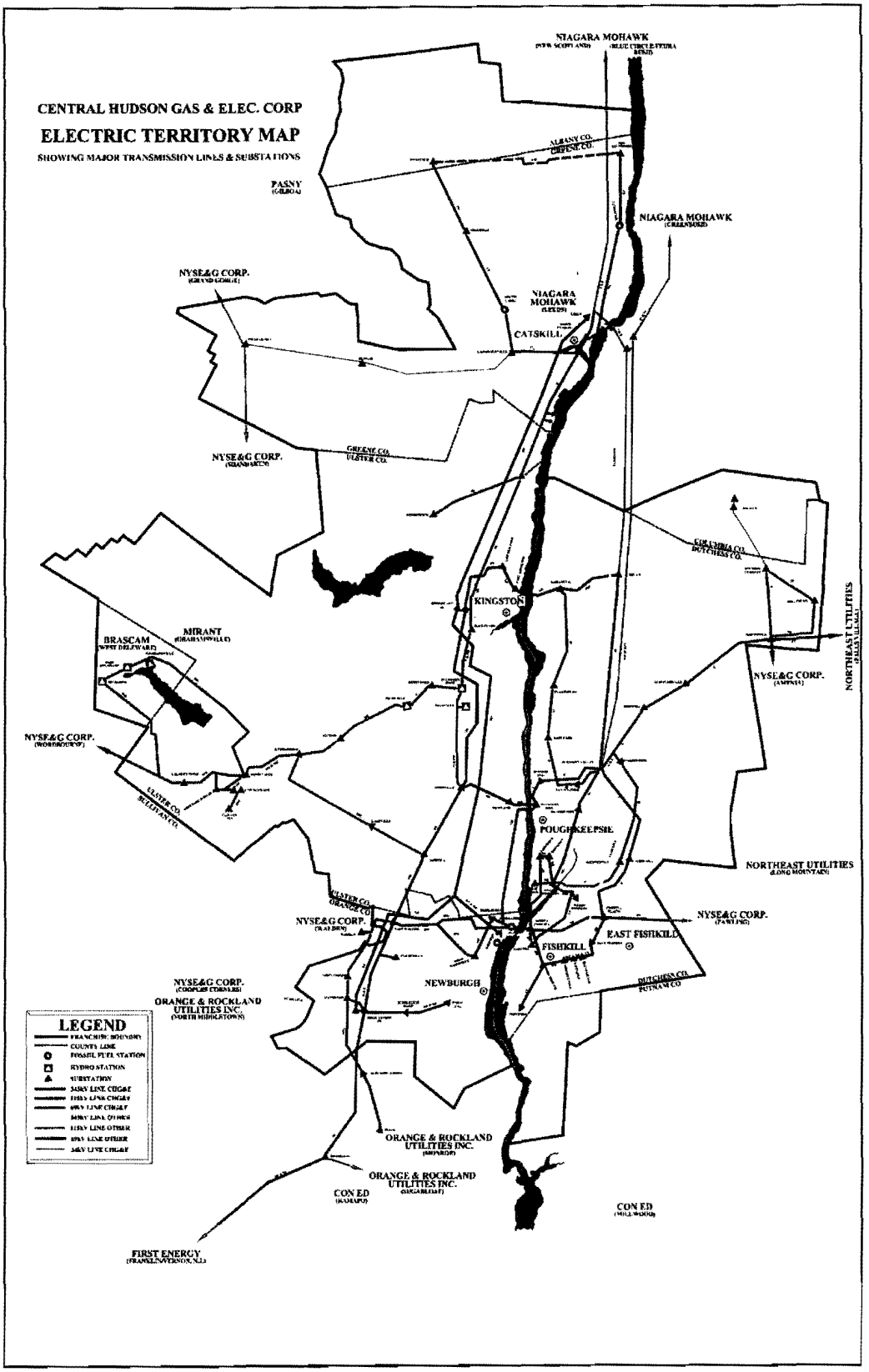
8.16 Program Review

Continual review of the performance, effectiveness and benefits of the program is conducted to identify opportunities for improvement and risk reduction. Central Hudson performs a full review of past performance to reevaluate goals and strategies at least once every six years. Areas of assessment will include reliability, cost, accessibility, vegetation heights and density conditions, herbicide use trends and customer concerns.

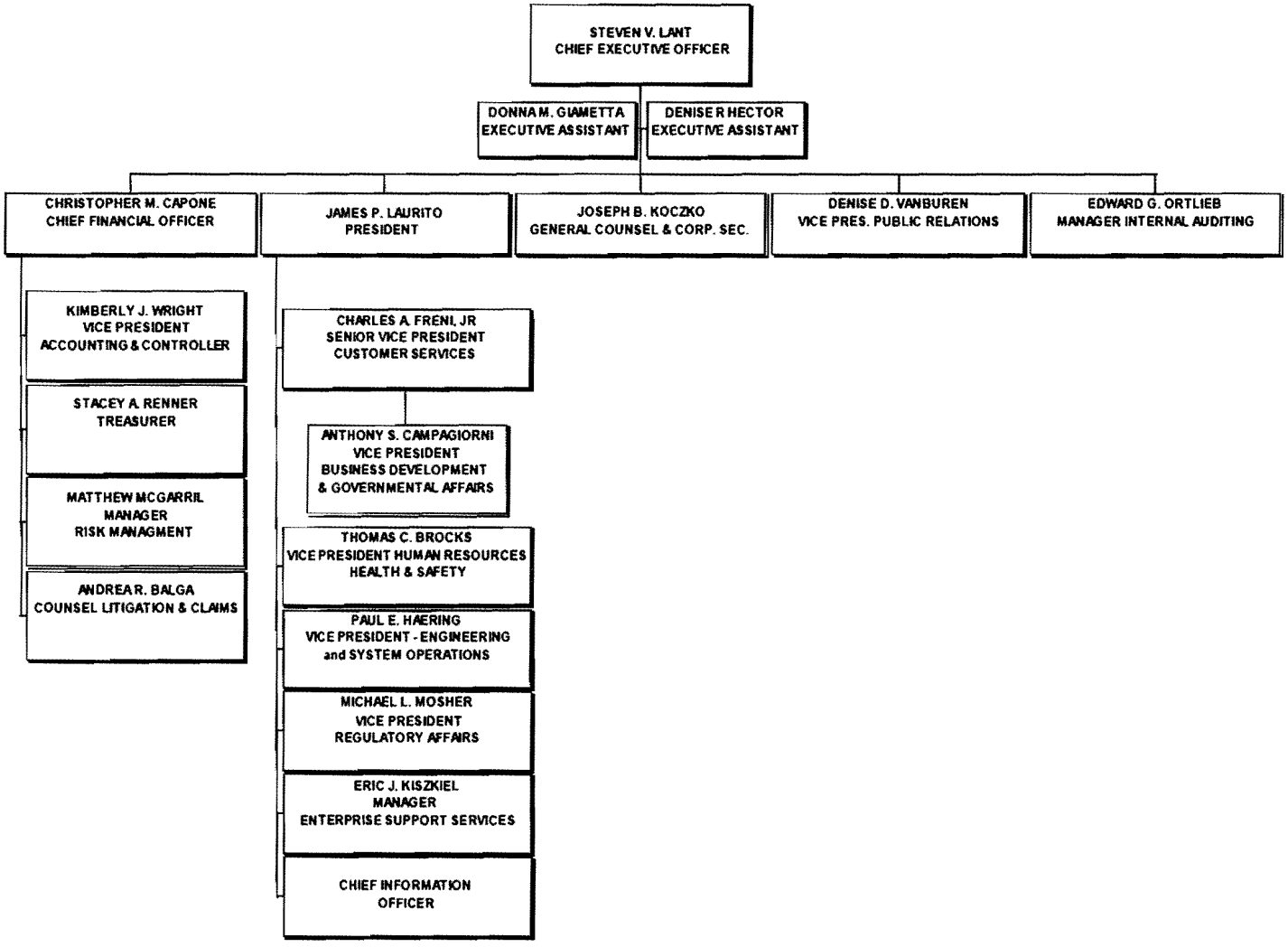
Proposed changes to the plan shall be brought to the attention of PSC Environmental staff. Staff will refer minor changes that will not cause significant adverse impacts to the environment (including public health) or reliability to the Secretary of the Public Service Commission for approval. All other changes will be considered major changes that will be referred to the Commission for action pursuant to the State Administrative Procedure Act. The plan will be reviewed annually to determine if changes are warranted (Appendix 22-Annual Long Range Vegetation Management Plan Review Sign-off Sheet).

Appendix 1 – An Overview of the Electric and Gas Transmission Systems (Maps)



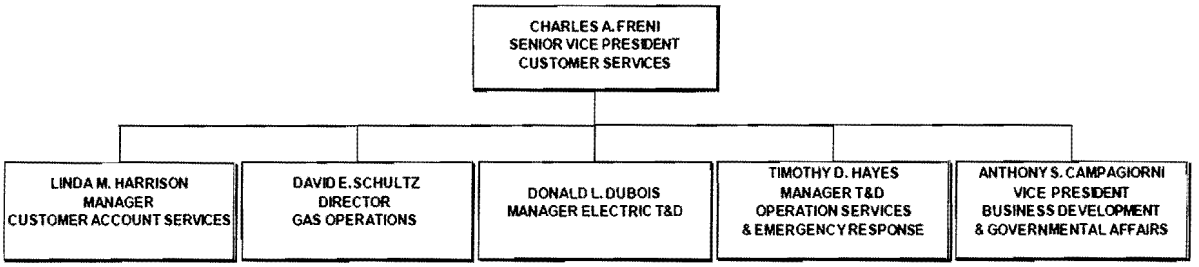

CENTRAL HUDSON GAS & ELEC. CORP
ELECTRIC TERRITORY MAP
SHOWING MAJOR TRANSMISSION LINES & SUBSTATIONS
NIAGARA MOHAWK
PASNY
NIAGARA MOHAWK
NYSE&G CORP.
NIAGARA MOHAWK
CATSKILL
NYSE&G CORP.
KINGSTON
MIRANT
BRASCAM
NYSE&G CORP.
NYSE&G CORP.
NORTHEAST UTILITIES
POUGHKEEPSIE
NORTHEAST UTILITIES
NYSE&G CORP.
NYSE&G CORP.
EAST FISHKILL
FISHKILL
NYSE&G CORP.
NEWBURGH
ORANGE & ROCKLAND UTILITIES INC.
ORANGE & ROCKLAND UTILITIES INC.
ORANGE & ROCKLAND UTILITIES INC.
CON ED
CON ED
FIRST ENERGY
LEGEND
FRANCHISE BOUNDRY
COUNTY LINE
FOSSIL FUEL STATION
HYDRO STATION
SUBSTATION

CENTRAL HUDSON GAS & ELECTRIC CORPORATION

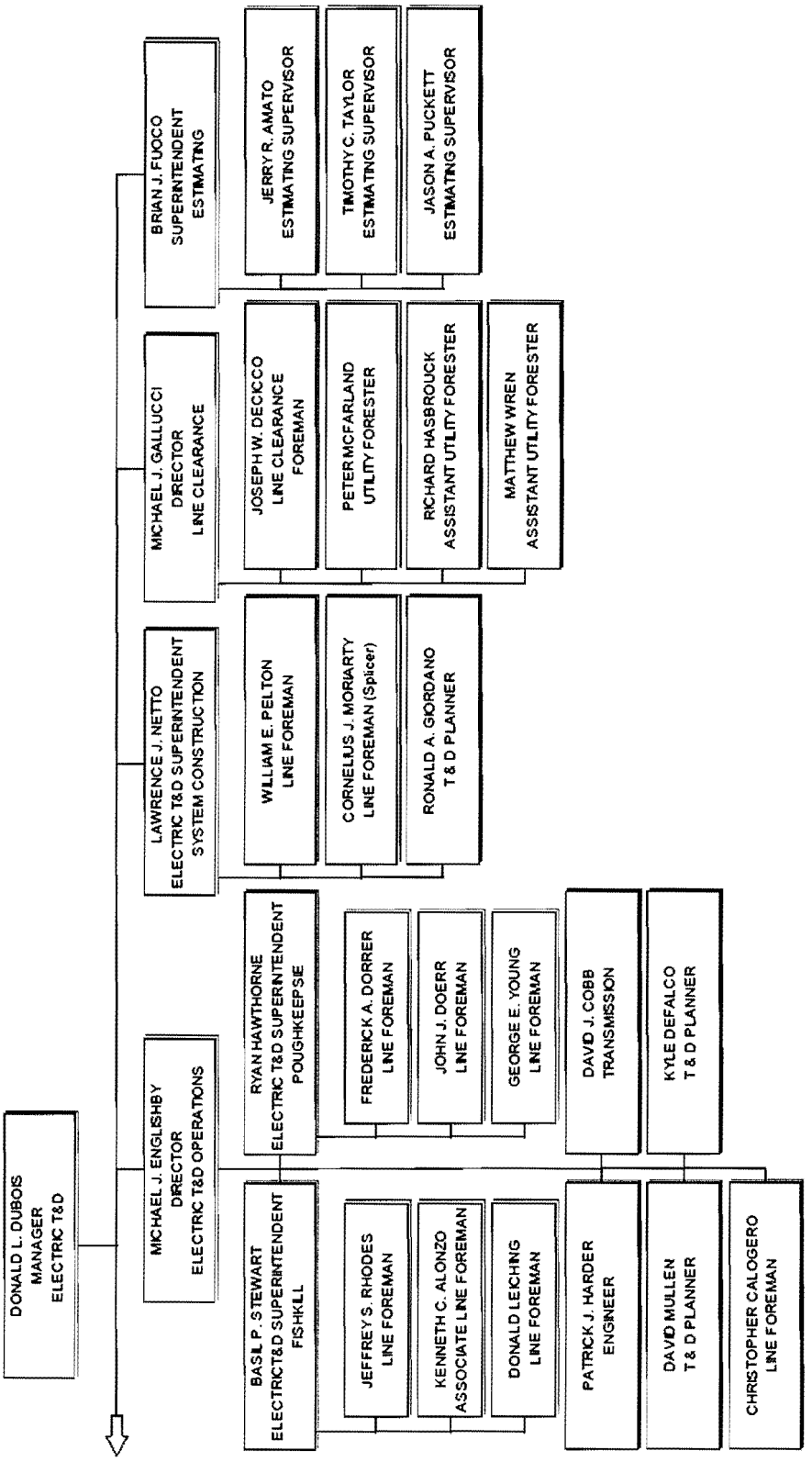


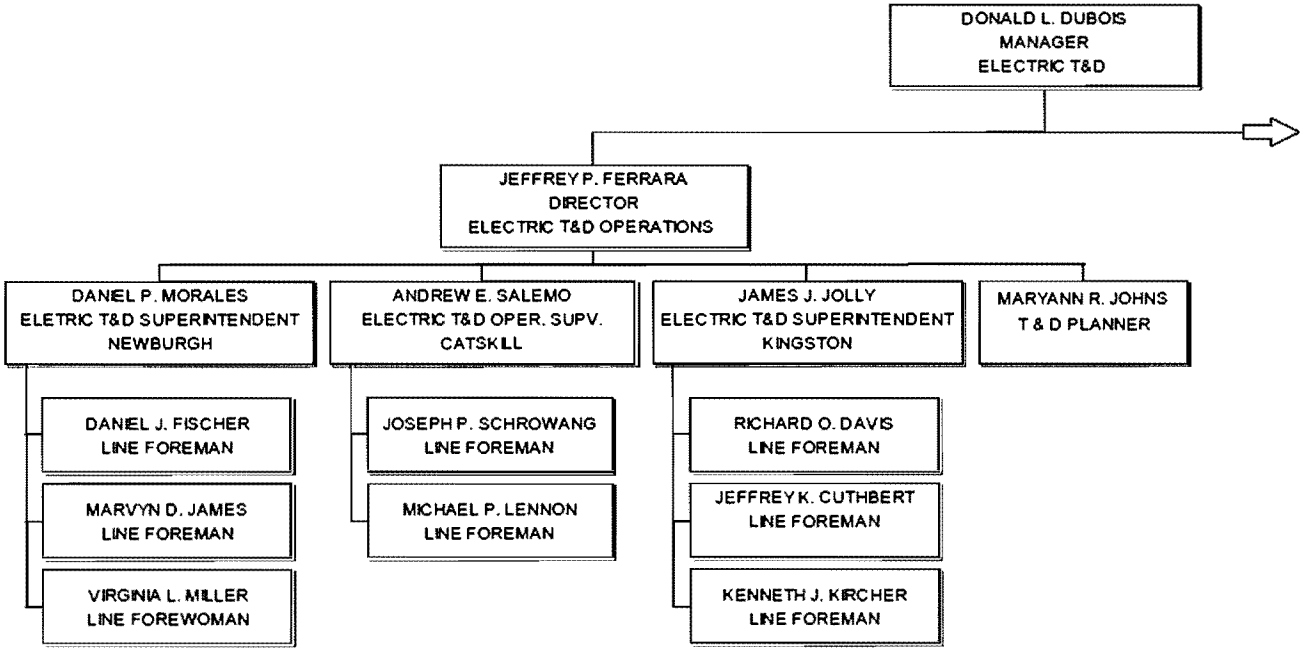
Appendix 3 – Customer Services Group

CUSTOMER SERVICES



Appendix 4 – Electric T & D and Quality/Productivity Initiatives Division




DONALD L. DUBOIS
MANAGER
ELECTRIC T&D
JEFFREY P. FERRARA
DIRECTOR
ELECTRIC T&D OPERATIONS
DANIEL P. MORALES
ELETRIC T&D SUPERINTENDENT
NEWBURGH
ANDREW E. SALEMO
ELECTRIC T&D OPER. SUPV.
CATSKILL
JAMES J. JOLLY
ELECTRIC T&D SUPERINTENDENT
KINGSTON
MARYANN R. JOHNS
T & D PLANNER
DANIEL J. FISCHER
LINE FOREMAN
MARVYN D. JAMES
LINE FOREMAN
VIRGINIA L. MILLER
LINE FOREWOMAN
JOSEPH P. SCHROWANG
LINE FOREMAN
MICHAEL P. LENNON
LINE FOREMAN
RICHARD O. DAVIS
LINE FOREMAN
JEFFREY K. CUTHBERT
LINE FOREMAN
KENNETH J. KIRCHER
LINE FOREMAN

Appendix 5 – Electric Transmission Master List

Central Hudson Transmission Right-of-way Management Program

Master List

FERC and NERC Designated Transmission Facilities

Line Designation	Name	Voltage	Article VII (Y/N)	Radial (Y/N)	Common (Y/N)	Common Lines	Construction Type	Fee Owned or Easement	% Fee Owned	% Easement	ROW Top (ft)	ROW Bottom (ft)	Length (miles)	Total Acres
301	Hurley Avenue to Leeds	345	N	N	N		HF	Fee Owned	95.18%	4.82%	100-225	75-175	28.59	886.88
303	Roseton to Hurley	345	N	N	Y	311,HP	HF	Fee Owned	84.72%	15.28%	87.5-275	75-87.5	30.3	841.39
311	Roston to Rock Tavern	345	N	N	Y	303,J	HF	Fee Owned	79.54%	20.46%	75-200	50-250	17.19	601.54
FP	Fishkill Plains to Sylvan Lake	115	N	N	N		WP	Fee Owned	59%	41%	75-125	60-75	7.1	137.77
FV	Smithfield to Conn. State Line	69	N	N	N		ST	Easment	0%	100%	50	25-100	4.99	84.95
												Totals	88.17	2,552.53
												345 kV	76.08	2,329.81
												115 kV	7.1	137.77
												69 kV	4.99	84.95

Central Hudson Transmission Right-of-way Management Program

Master List

Non-designated Transmission Facilities

Line Designation	Name	Voltage	Article VII (Y/N)	Radial (Y/N)	Common (Y/N)	Common Lines	Construction Type	% Fee Owned	% Easement	ROW Top	ROW Bottom	Length (miles)	Total Acres
FT	Forgebrook - Tioronda	115	N	Y	N		WP	0%	100%	25	50-75	5.36	49.97
A	Fishkill Plains to Todd Hill	115	N	N	Y	G	HF	9.94%	90.06%	50-106	44-170	5.28	105.9
AC	Danskammer to N Chelsea	115	N	N	Y	DC	HF	100%	0%	106	44	0.96	17.59
C	Pleasant Line - Todd Hill	115	N	N	Y	G	WP	0%	100%	44-69	81-131	5.6	104.84
CW	East Walden - Coldenham	115	N	N	N		HF/WP	25.76%	74.24%	45	105	1.62	35.94
D	East Walden - Rock Tavern	115	N	N	Y	J	ST	3.23%	96.77%	50	50-75	7.5	113.21
DB	Danskammer - Marlboro	115	N	N	Y	W,DR	ST	38.85%	61.15%	50	50	2.17	26.46
DB	Marlboro - West Balmville	115	N	N	Y	W,DR	ST	17.96%	82.04%	50	50	4.69	57.25
DC	North Chelsea - Danskammer	115	N	N	Y	AC	HF	71.78%	28.22%	100	50	0.96	17.54
DR	East Terminal - Reynolds Hill	115	N	N	Y	DW,DB	HF	0.00%	100.00%	50	50	0.18	2.18
DR	Danskammer - Marlboro	115	N	N	Y	DW,DB	ST	16.91%	83.09%	44-73	62-126	2.29	44.03
DR	Marlboro - East Terminal	115	N	N	Y	DW,DB	WP	7.76%	92.24%	50	50	9.71	122.41
DW	Chadwick Lake - Danskammer	115	N	N	Y	311	HF	2.79%	97.21%	100-125	50-75	7.21	145.59
DW	Chadwick Lake - East Walden	115	N	N	Y	311	ST & WP	0.00%	100.00%	100-175	50-100	4.11	91.68
DW	Chadwick Lake - West Balmville	115	N	N	Y	311	ST	0.00%	100.00%	50	50	3.92	47.84
EF	East Fishkill - Shenandoah	115	N	N	N		WP	47.23%	52.77%	50-80	25-50	1.72	25.94
EM	Modena - East Walden	115	N	N	N		ST	13.34%	86.66%	50	50	6.05	73.83
FO	N Chelsea to Forgebrook	115	N	N	N		WP	1.70%	98.30%	50-75	50-75	3.06	55.19
FS	Wiccopee - Shenandoah	115	N	N	N		WP	92.25%	7.75%	50	50	1.3	15.87
HF	Fishkill Plains to East Fishkill	115	N	N	Y	Con Edison	WP	92.57%	7.43%	38-100	38-100	2.07	28.81
HP	Hurley Avenue to Lincoln Park	115	N	N	Y	303	WP	1.21%	98.79%	50	50	5.61	68.51
HR	Highland to Reynolds Hill	115	N	N	N		SP/WP	0%	100%	50	50	0.9	10.95
J	East Walden to Rock Tavern	115	N	N	Y	311,D	WP&ST	2.37%	97.63%	50	75	6.86	104.59
KB & KC	Sand Dock - Barnegat - Knapps Corner	115	N	N	Y	SC	HF	59.63%	40.37%	35-100	30-75	2.87	52.79
LR	Lincoln Park to East Kingston	115	N	N	N		WP	5.21%	94.79%	50	50	2.08	25.33
LR	E Kingston to Rhinebeck	115	N	N	N		WP	3.17%	96.83%	50	50	3.41	42.32
M	Manchester to Pleasant Valley	115	N	N	N		HF	17.31%	82.69%	50-78	50-62	5.47	80.21
MC	Manchester to Knapps Corners	115	N	N	N		WP	21.08%	78.92%	50-75	50-75	4.97	65.41
MR	Milan - Rhinebeck	115	N	N	N		WP	90.39%	9.61%	50	50-175	6.77	86.23
NF	Fishkill Plains to N Chelsea	115	N	N	N		HF	12.46%	87.54%	106	44	5.94	117.14
OR	Ohioville to Hurley Ave.	115	N	N	Y	O,OB,N	WP	11.92%	88.08%	50-100	50-100	14.78	208.23
OR	Highland to Ohioville	115	N	N	Y	O,OB,N	WP	12.52%	87.48%	40-50	40-50	5.63	65.2
PX	Ohioville - Modena	115	N	N	N		ST	0%	100%	50	50	7.45	90.93
RD	Rock Tavern - Bethlehem Road	115	N	N	Y	RJ	HF	100%	0%	100	100	5.48	100.31
RJ	Rock Tavern - Union Avenue	115	N	N	Y	RD	HF	100%	0%	50	50	9.3	169.72
SC	Sand Dock - North Chelsea	115	N	N	Y	KB	WP	33.30%	66.70%	50	50	6.99	95.52
SL	Rock Tavern - Sugar Loaf	115	N	N	N		ST	98.64	1.36	50	75	11.93	181.95
T	North Catskill to Athens Tap	115	N	N	Y	Partly V	ST	0%	100%	50-100	50	2.85	39.68
UB	Bethlehem Road - Union Avenue	115	N	N	Y	RD/RJ	HF	15.11%	84.89%	75	75	3.76	68.84
V	North Catskill to Niagara Mohawk Tap	115	N	N	Y	Partly T	ST	0%	100%	50-75	50-75	1.79	25.57
WF	Forgebrook - Merritt Park	115	N	N	N		WP	89.50%	10.50%	50	50	2.54	30.96
WP	Merritt Park - Wiccopee	115	N	N	N		WP	74.17%	25.83%	50	50	2.12	25.9
X	Van Wagner - Pleasant Valley	115	N	N	N		ST	95.15%	4.85%	50	100	1.98	36.3
X	Reynolds Hill - Inwood	115	N	N	N		ST	100%	0.00%	34-46	20-66	1.96	18.01
X	Inwood - Van Wagner	115	N	N	N		ST	100%	0.00%	34	66	2.94	35.88
SJ/SD	Sugarloaf to N.J	115	N	N	N		ST	0%	100.00%	75	50	10.34	157.71

Central Hudson Transmission Right-of-way Management Program

Master List

Non-designated Transmission Facilities

Line Designation	Name	Voltage	Article VII (Y/N)	Radial (Y/N)	Common (Y/N)	Common Lines	Construction Type	% Fee Owned	% Easement	ROW Top	ROW Bottom	Length (miles)	Total Acres
CF	S Cairo to Freehold	69	N	Y	N		WP	0%	100%	50	50	6.32	77.07
CL	Catskill to Laurenceville	69	N	Y	N		WP	0.11%	99.89%	50	50	6.59	86.65
CL	Lawrenceville to S Cairo	69	N	Y	N		WP	0.06%	99.94%	25-100	25-50	5.06	62.67
CN	Coxsackie - New Baltimore	69	N	Y	N		WP	1.80%	98.20%	30-38	38-70	7.02	65.42
E	Stanfordville to Smithfield	69	N	Y	Y		ST	0%	100.00%	50	100	7.62	139.45
E	Pleasant Valley to Hibernia	69	N	Y	Y		ST	0%	100.00%	50	100	6.61	121.06
E	Hibernia - Stanfordville	69	N	Y	Y		ST	0%	100.00%	50	100	4.15	75.9
FW	Freehold to Westerloo	69	N	Y	N		WP	0.68%	99.32%	50	50	7.02	85.66
NC	N Catskill to Coxsackie	69	N	Y	N		WP	5.69%	94.31%	50	25-75	8.63	96.12
SR	Saugerties to Woodstock	69	N	Y	N		WP	0%	100%	30-38	6270	8.43	102.35
G	Knapps Corners - LaGrangeville	69	N	N	Y	KM,A, C	WP	0%	100%	30-50	30-50	7.67	65.91
G	LaGrangeville - Tinkertown	69	N	N	Y	KM,A, C	WP	0%	100%	25	75	7.38	90.02
G	Tap - Fishkill Plains	69	N	N	Y	KM,A, C	WP	0%	100%	25	75	1.62	19.76
G	Tinkertown - Pleasant Valley	69	N	N	Y	KM,A, C	WP	0%	100%	25	75	4.13	50.46
GE	Smithton to Millerton	69	N	N	N		ST	0%	100%	38	38	4.78	43.79
GE	Millerton to Pulvers Corners	69	N	N	N		WP	0%	100%	30-50	30-55	4.81	38.19
GM	Greenfield to Clinton Ave	69	N	N	N		WP	0%	100%	3-30	23-30	2.65	18.25
GM	Tap - Honk Falls	69	N	N	N		WP	0%	100%	30	30	1.69	12.35
H	Saugerties - North Catskill	69	N	N	N		ST	0%	100%	50-100	50-100	12.36	221.76
HG	Grahamsville - Neversink	69	N	N	N		WP	0%	100%	50-75	50-75	2.53	34.32
HG	Honk Falls - NYBWS	69	N	N	N		WP	0%	100%	30-50	30-50	1.86	19.98
HG	NYBWS - Grahamsville	69	N	N	N		WP	0%	100%	30-75	30-75	12.4	134.72
HK	Kerhonkson to Honk Falls	69	N	N	Y	MK	WP	0%	100%	50	100	5.23	95.74
I	Hurley Ave to Boulevard	69	N	N	N		ST	0.50%	99.50%	40-50	23-50	3.84	33.93
KM	Knapps Corners to Myers Corners	69	N	N	Y	G,TV	WP	0.65%	99.35%	45-80	45-50	2.91	37.56
MK	Modena to Galeville	69	Y	N	Y	HK	WP	0%	100%	50	50	5.49	67.02
MK	Kerhonkson to Honk Falls	69	Y	N	Y	HK	WP	0%	100%	100	50	5.17	94.6
MK	Galeville to Kerhonkson	69	Y	N	Y	HK	WP	0%	100%	50	50	9.08	110.83
N	N Sturgeon Pool to Boulevard (Poughkeepsie to Hudson)	69	N	N	Y	OB,OR	ST	0%	100%	50	50	5.18	60.79
O	Ohioville to Sturgeon Pool (Poughkeepsie to Ohioville)	69	N	N	Y	OB,OR	ST	0%	100%	0-50	50-100	7.58	143.1
OB	Ohioville to Boulevard	69	N	N	Y	O,OR,N	ST	1.60%	98.40%	50	50	12.48	146.36
OB	Dashville - Tap	69	N	N	Y	O,OR,N	WP	0.00%	100.00%	50	50	0.31	3.82
HK	Accord to Kerhonkson	69	Y	N	N		WP	0%	100%	50	50	3.88	47.36
HK	High Falls - Accord	69	Y	N	N		WP	0%	100%	50	50	6.22	75.97
P	Sturgeon Pool to High Falls	69	Y	N	N		WP	0%	100%	50	50	5.69	69.4
Q	East Park to Staatsburg	69	N	N	N		ST	39.49%	60.51%	50	50	4.34	52.97
Q	Van Wagner - Pleasant Valley	69	N	N	N		ST	0	100%	50	100	1.98	36.3
Q	Staatsburg to Rhinebeck	69	N	N	N		WP	2.28%	97.72%	50	50	7.76	94.65
Q	Van Wagner - East Park	69	N	N	N		WP	2.42%	97.58%	50	50-100	6.37	105.87
S	Smithfield - Pulvers Corners	69	N	N	N		WP	0%	100%	16-30	16-30	5.56	39.36
SB	Hurley Avenue - Saugerties	69	N	N	N		ST	0%	100%	50	100	11.33	207.41
TR	NY Trap Rock to Knapp's Corner	69	N	N	N		WP	0%	100%	30-50	30-50	2.38	22.81
TV	Myers Corners to Wappingers	69	N	N	Y	KM	WP	0.59%	99.41%	30-50	30-50	3.54	38.86
TV	Wappingers - Chelsea	69	N	N	Y	KM	WP	28.22%	71.78%	50	50	3.41	41.57
WH	Woodbourne Tap - Neversink	69	N	N	N		HF	0%	100%	50-100	50-100	7.5	145.78
WH 1 & 2	Ellenville Tap	69	N	N	N		HF	0.73%	99.27%	75	75	1.13	20.65
WH 1 & 2	Honk Falls - Woodbourne	69	N	N	N		HF	40.54%	59.46%	50	50	10.43	127.27
WM	East Walden - Montgomery	69	N	N	N		WP	0%	100%	38	38	5.86	53.65

Central Hudson Transmission Right-of-way Management Program

Master List

Non-designated Transmission Facilities

Line Designation	Name	Voltage	Article VII (Y/N)	Radial (Y/N)	Common (Y/N)	Common Lines	Construction Type	% Fee Owned	% Easement	ROW Top	ROW Bottom	Length (miles)	Total Acres
WM	Maybrook - Rock Tavern	69	N	N	N		WP	0%	100%	38	38	4.17	38.18
WM	Rock Tavern Tap - Rock Tavern	69	N	N	N		WP	0%	100%	38-50	38-50	1.88	25.94
WM	Montgomery - Maybrook	69	N	N	N		WP	0%	100%	38	38	2.97	27.15
NW	New Baltimore - Westerlo	69	N	N	N		WP	3%	97%	50	50	14.49	179.89
										Totals		511.97	7,092.91
										69kV		299.49	3,906.65
										115 kV		212.48	3,186.26

Appendix 6 – Special Article VII Requirements on Electric Transmission ROW's

Special Conditions

P and MK Electric Transmission 115kV (Case 91-E-0529)

Item 1: Order No. 17 restricts clearing outside the boundaries of the certified facility to just the removal of danger trees.

Action: The company shall comply.

Item 2: Order 22 – requires the company to conduct soils and subterranean conditions studies between Binnewater and Cottekill Roads in the Town of Rosendale.

Action: Studies completed for EM&CP submittal found Accord herbicide (or equivalent) could be used in this area.

Item 3: Order 23 requires the company to minimize disruption to DEC wetlands along the certified route.

Action: The company will comply.

Item 4: Order 24 restricts vegetation maintenance within 100 feet of regulated wetlands and 50 feet of other water bodies. Order 27 establishes no herbicide buffer zones for water bodies and wetlands. The order further restricts herbicide treatment methods adjacent to these no treat buffers to cut and stump treatment or basal application.

Action: The company proposes that future maintenance will comply with the goals, objectives and strategies contained in this long-range Vegetation Management Plan. The company shall comply with the minimum buffer zone distance and maintenance procedures established by this Plan, and shall comply with DEC wetlands permitting requirements required for the use of approved pesticides within regulated wetlands.

Item 5: Order 25 prohibits equipment washing within any watercourse, or the run-off of wash water into any watercourse or wetland.

Action: The company shall comply.

Item 6: Order 26 prohibits storing or mixing pesticides, chemicals with labeled toxic, or petroleum products or refueling equipment within 100 feet of a watercourse.

Action: The company will comply.

Item 7: Order 41 requires the submittal of a long-term, right-of-way management plan.

Action: This long-range ROW Vegetation Management Plan replaces all previous submittals. The company further incorporates all special provisions for the future maintenance of the ROW as described herein, into this long-range ROW Vegetation Management Plan.

Item 8: Agreements among the parties in the hearing process included the following special provisions for herbicide application in Minnewaska State Park Preserve.

"In the event that the density of undesirable vegetative species on the right-of-way reaches the moderate level as defined in Central Hudson's *Long-Range Vegetation Management Plan,* Central Hudson may, upon provision of notice to the parties, apply herbicides selectively to encourage the development of natural, primarily indigenous, low-growing plant communities. Cutting with stump treatment or basal application with hand held back pack sprayers may be authorized."

If cutting with stump treatment or basal treatment is to be used, Central Hudson will:

a. Provide prior notice to the PIPC of the specific site(s) or locations to be treated, and the anticipated time frame for treatment.

b. Post DEC approved form of sign for herbicide application at the intersections of trails and the right-of-way.

c. Adhere to prohibitions on use of herbicides in buffer areas around water bodies and wetlands, including buffers of 100 feet around all DEC wetlands and 100 feet of all surface waters.

d. Dwarf pitch pines, which are characteristic of the Shawangunk Ridge, are species to be preserved on the right-of-way, and will not be treated with herbicides.

The Plan and Profile drawings for the facility may include important right-of-way information related to the construction and maintenance of the line, including detailed access information. The company will review these documents for pertinent data at each treatment cycle and incorporate ongoing issues or concerns into the maintenance documents for that cycle.

Appendix 7 - Master List of Gas Transmission

Central Hudson Gas Right-of-way Management Program
Master List

Pipeline	Pipe Diameter	Pressure	Article VII	Miles	ROW Width	Acres	Average ROW Width Maintained	ROW Acres Maintained
AH	10 "	618	No	69.4	15' to 150'	477.7	10'	84.1
TP	10 "	565	Partial *	46.5	100' to 300'	144	10'	56.4
MP	12 "	750	No	36.6	5' to 550'	883.9	10'	44.4
MPI	16 "	750	Yes	3.3	60' to 400'	106.1	10'	4
MPR	16 "	750	Yes	7.7	6' to 100'	108.5	10'	9.3
				163.5		1720.2		198.2

* Note that 6.3 miles of the 46.5 mile TP Pipeline was constructed under Article VII

Appendix 8 - Special Article VII Requirements on Gas Transmission ROW's

Central Hudson Article VII Gas Cases

Special Conditions

MPR and MPI Gas Pipelines (Case 89-T-032)

Item 1: Order No. 39 limits permanent right-of-way to no more than 60 feet.

Item 2: Order 40 - restricts vegetation maintenance activities within the permanent right-of-way to primarily mowing with brush hogs and hydroaxe type equipment, with annual mowing of no more than ten (10) feet of right-of-way centered over the pipe. Limits maintenance activities in the remainder of the right-of-way to 5-year cycle.

Action: The company will adhere to the objectives and criteria of this long-range ROW Vegetation Management Plan, which identifies periodic mowing as the primary maintenance method for gas transmission rights-of-ways.

Action: The company will mow no more than 10 feet of the right-of-way centered over the pipeline on an annual basis. The remainder of the right-of-way shall be scheduled for maintenance in accordance with the long-range vegetative requirements of the pipeline, in order to insure the accessibility and reliability of the facility.

Item 3: Order 40 restricts routine maintenance activities from mid-summer through late fall.

Action: Mowing activities will be restricted to the times of year specified. Other selective methods, including approved integrated vegetation management techniques may occur at any time of year, in accordance with this long-range ROW Vegetation Management Plan.

Item 4: Order 40 restricts the use of herbicides following initial clearing.

Action: The company proposes the limited use of herbicides for future maintenance in accordance with the conditions of this long-range ROW Vegetation Management Plan.

Item 5: Order 40 restricts the use of herbicides within 100 feet of a water body or wetland.

Action: The Company shall comply with the buffer zone distances and DEC wetlands permitting requirements of this long-range ROW Vegetation Management Plan.

Item 6: Order 40 requires the applicant to consult with and cooperate with reasonable interests of other utilities where the right-of-way parallels or crosses other facilities.

Action: The company will comply.

Item 7: Order 40 requires special consideration of environmentally sensitive resources.

Action: The following list of stream, wetland and other sensitive resources identified during initial construction is incorporated into this document for future reference.

Action: The company shall continue the procedure established in the original long-term plan submitted on Sept 25, 2003 requiring an annual review of the MPR and MPI rights-of-ways to assess environmental conditions, including river and stream crossing signs to ensure these signs are properly maintained.

MPR and MPI Pipelines
Case 89-T-032

Access Restrictions

Sprout Creek	Do not drive
Wetlands - Sprout Creek to Vorndran	Do not drive
Wetland west of last property on Alpert Drive	Do not drive
Wetland west of Water Tower	Do not drive
Wetland with stream west of Cedar Hill	Do not drive
Large wetland east of Route 9	Use NYPA road in this area
Two small wetlands along NYPA ROW	Use NYPA road in this area
Four wetlands, one stream west of Route 9	Use NYPA road in this area
Wetlands east of Ketchamtown Rd with stream	Do not cross
Large DEC wetland west of Ketchamtown Rd (after gate)	Do not cross
Wetland east of station	Use access road around area
Large DEC wetland west of Route 9	Do not drive
Two wetlands west of Old State Rd	Do not drive
River frontage	Obtain access approval from Metro North to enter railroad
Stream 1000 ft. from station	Use access road to cross
Wetland at end of hayfield	Do not cross
Large DEC wetland east of Traver Rd	Do not drive
Pond at Bilmar Nursery	Use access road through nursery
Large DEC wetland east of Forest Valley Rd	Use access road through area
Intermittent stream 1000 ft west of Forest Valley Rd	Do not drive when wet
Intermittent stream at Howe and stream north of intersection	Use Freedom and Plass Rds for access
Pond with Stream, Plass Rd to MP Line	No access or Drive past, requires walking surveys

Unique or Sensitive Resources

Large DEC wetland east of Forest Valley Rd (endangered species identified)	Do not drive, use access road around area

Item 8: Order 41 requires the Company to submit a long-term right-of-way management plan for this facility.

Action: This long-range ROW Vegetation Management Plan replaces all previous submittals. The company further incorporates all special provisions for the future maintenance of the ROW as described herein, into this long-range ROW Vegetation Management Plan.

Item 9: Order 42 directs to undertake all reasonable measures, to the extent it is legally able to do so, to prevent intrusion by unauthorized third parties along the right-of-way.

Action: The company shall comply in accordance with the measures described in this long-range ROW Vegetation Management Plan.

TP Gas Pipeline (Case 94-T-0316)

The Order for the TP Pipeline did not place specific limits or restrictions on future maintenance activities. However, Central Hudson's *Environmental Management and Construction Standards and Practices for Natural Gas Transmission Facilities* (EM&CS&P) makes specific reference to Pipeline Operation and ROW Maintenance, in section VII, beginning on page 45.

Item 1: The EM&CS&P commits to the development of a long-term ROW management plan.

Action: This long-range ROW Vegetation Management Plan replaces language in the EM&CS&P related to ROW maintenance policies, procedures and practices.

Item 2: The EM&CS&P restricts vegetation maintenance activities within the permanent right-of-way from late winter through early spring.

Action: This requirement is in direct conflict with the requirement to clear vegetation directly over the pipeline to meet leak detection and inspection requirements. In order to be consistent, the company will follow the schedule prescribed for the MPR and MPI project, by restricting mowing from mid-summer to late fall.

Item 3: The EM&CS&P restricts annual mowing activities to no more than 10 feet centered over the pipeline.

Action: The company will mow no more than 10 feet of the right-of-way centered over the pipeline on an annual basis. The remainder of the right-of-way shall be scheduled for maintenance in accordance with the long-range vegetative requirements of the pipeline, in order to insure the accessibility and reliability of the facility.

Item 4: The EM&CS&P restricts herbicide use within 100 feet of a water body or wetland.

Action: The company proposes the use of selective, integrated vegetation management techniques, including the periodic use of herbicides to effectively manage woody growth within the right-of-way that may not be controlled through routine mowing activities.

Action: The company will utilize the selective application of herbicides in accordance with the buffer zone distances and DEC wetlands permitting requirements of this long-range ROW Vegetation Management Plan.

Item 5: The EM&CS&P require annual field surveys to identify portions of the ROW where erosion control measures may be required, or where existing measures may not be adequate:

Action: The company will comply with this measure.

Item 6: The EM&CS&P requires the annual field surveys monitor unauthorized access, especially ATV's, and seek reasonable measures to restrict their use.

Action: The company will comply with this measure.

Item 7: The order discussed various areas with significant sensitive resources.

Action: These resources are listed below.

TP Pipeline
Case 94-T-0316

Unique or Sensitive Resources

Endangered Species Habitat

The pipeline crosses through a forage area, near a den for the timber rattlesnake in the southern end of the project area.	1. Comply with annual DEC notification process for endangered species, as outlined in this long-range plan.

Appalachian Trail

Concerns for conflict with trail use	1. No slash, chipping or debris disposed on NPS lands 2. No equipment refueling within boundaries of the Trail 3. If necessary, erect barriers to impede ATV access to corridor lands and Trail. 4. Preserve integrity of local spring ½ mile south of pipeline crossing

Harriman State Park

No special provisions noted.

Appendix 9 – EEANY Position Paper "Application of IPM to Electric Utility ROW's in NYS"

Final Draft: March 7, 2002

APPLICATIONS OF INTEGRATED PEST MANAGEMENT TO ELECTRIC UTILITY RIGHTS-OF-WAY VEGETATION MANAGEMENT IN NEW YORK STATE

Environmental Energy Alliance of New York
Land Use Subcommittee Committee
Position Paper

The Environmental Energy Alliance of New York is an association of electric and gas Transmission and Distribution (T&D) companies and electric generating companies that provide energy services in the State of New York. This position paper was prepared by the Land Use Subcommittee of the T&D Committee, which currently represents the following members: Central Hudson Gas & Electric Corporation, Consolidated Edison Company of New York, Long Island Power Authority, New York Power Authority, New York State Electric & Gas Corporation, Niagara Mohawk, Orange & Rockland Utilities, and Rochester Gas & Electric Corporation. For more information about this Position Paper, please contact Kevin T. McLoughlin, the System Forester for the New York Power Authority at P.O. Box 200, Gilboa, New York 12076. Tel. (607) 588-6061 ext. 6903, Fax (607) 588-9826 or e-mail Kevin.Mcloughlin@nypa.gov.

Executive Summary

As a matter of public safety and system reliability, electric utility rights-of-way (ROW) vegetation managers have a continuing need to preclude the establishment and subsequent growth of tree and tall woody shrub species that are capable of growing up into or even close to overhead electric lines. The members systems of the Environmental Energy Alliance of New York (EEANY) Transmission & Distribution (T&D) Committee employ the process of Integrated Pest Management (IPM) to ensure that tall-growing trees and woody shrubs do not interfere with these critically important electric power transmission facilities. IPM balances the use of cultural, biological, physical and chemical procedures for controlling undesirable tall-growing woody species on utility ROW. These IPM procedures, as practiced by the New York State electric utility industry, can be more appropriately referred to as an Integrated Vegetation Management (IVM) strategy. One of the important components of the IPM/IVM process is the selective use of herbicides to curtail the growth of undesirable tall growing species while preserving, to the extent practical, the lower growing vegetation on the ROW to act as a biological deterrent to the future re-establishment of trees.

The EEANY Land Use Subcommittee members have been practicing IVM policies and programs for well over two decades on those portions of the approximately 15,000 circuit miles encompassing over 130.000 acres of overhead transmission line ROW that require the vegetation to be managed. IVM is an environmentally compatible activity that is cost effective and has all the elements of a conscientiously applied IPM strategy. This paper discusses the application of IPM to contemporary electric utility ROW vegetation management practices in New York State today as a truly ecologically based approach to pest management.

APPLICATION OF INTEGRATED PEST MANAGEMENT TO ELECTRIC UTILITY RIGHTS-OF-WAY VEGETATION MANAGEMENT

Integrated Pest Management (IPM) is a process that balances the use of cultural, biological, physical and chemical procedures for reducing pest populations to tolerable levels. Rather than relying solely on chemicals (or eliminating chemicals completely), IPM seeks to produce a combination of pest control options that are compatible with the environment, economically feasible and socially tolerable. The control of vegetation, (i.e., the contemporary management of vegetation on electric utility line rights-of-way (ROW)[1]) readily accommodates itself to an IPM process. This paper describes how the member electric systems of EEANY T&D Committee have been actually practicing an IPM strategy for about two decades. However, that strategy can be more appropriately referred to as an Integrated Vegetation Management (IVM) strategy.

[1] Electric utility ROW are strips of land, from 30 yards to over 300 yards in width that are used by electric utilities as corridors for the transmission of electric energy.

BACKGROUND

In New York state after a forested landscape is cleared, or when a cultivated field is abandoned, the natural vegetation type that will ultimately re-occupy the site and dominate the area will be tall-growing trees. When the cleared area is an electric utility ROW, these resurgent trees can grow too close to the overhead electric lines. When this occurs, there is the potential for an electrical discharge from the electric line through the air to the tree and then to the ground. This is known as a line to ground fault or flash-over. The result of a line to ground fault is an instantaneous break in electric service and a potentially very dangerous situation on the ground in the immediate vicinity of the high voltage discharge. Therefore, as a matter of public safety and system reliability, utility ROW vegetation managers have a continuing need to preclude the establishment and subsequent growth of those tree species including some tall growing woody shrubs that are capable of growing into or even close to the electrical lines.[2] Utilities ensure that tall growing species do not interfere with electric lines by committing to a long-term ROW vegetation management program.

INTEGRATED VEGETATION MANAGEMENT AS AN IPM STRATEGY

IPM has been described as a system of resource management that attempts to minimize the interaction between the pest and the management system through the integrated use of cultural, biological, physical and chemical controls. Implementation of an IVM program utilizing modern ROW vegetation management techniques meets this definition completely; IVM is a system of resource (vegetation) management that minimizes interaction between the pest (tall growing trees) and the management system (safe and reliable electric service) through the integrated use of cultural (mechanical and manual methods that physically remove tree stems), biological (low-growing plants and herbivory), and chemical (herbicides) controls.

Utilities use three general routine procedures for removing tall-growing trees from the ROW: (1) mechanical methods such as mowing with large machines and hand cutting with chainsaws, (2) chemical treatments, i.e., the selective application of herbicides, and (3) combinations of both mechanical and chemical methods.

Mechanical methods of tree removal alone will clear the ROW of tree stems temporarily. However, employment of these mechanical methods allows trees to physiologically respond by regenerating quickly from the energy reserves contained in their undisturbed root systems. This tree regrowth occurs through such mechanisms as stump sprouting and/or in some species root suckering. This regenerative capacity is characteristic of virtually all hardwoods,[3] (e.g., maple, beech, birch, aspen, oak, ash, cherry, etc.) and is particularly pronounced in the juvenile or sapling stage of tree maturation resulting in the eventual production of many more stems than were originally cut. By drawing upon the food reserves in their undisturbed root systems, and through a series of complex

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[2] The electrical facilities being discussed herein are for the most part high voltage transmission lines and only those lower voltage distribution lines that have a discernible cleared ROW. There are more than 15,000 circuit miles of overhead transmission lines at or above 34.5kV belonging to the member systems of EEANY. ROW vegetation management under these electric transmission facilities is quite distinct from roadside tree trimming around distribution lines and these street tree-pruning operations are not the subject of this paper.

[3] Hardwood is a conventional term for all deciduous (broad-leaved) trees belonging to the botanical class "Angiosperm." Softwoods, also commonly referred to as evergreens and conifers, belong to the botanical class "Gymnospermae" (and are practically confined to the order "Coniferae") do not posses this regenerative trait (with one lone partial exception in the northeast – young pitch pine), and once cut below the lowest whorl of live branches will not resprout.

compensatory physiological plant responses, the resurgent growth from the remaining portions of the tree (stump and/or roots) is actually enhanced when a tree stem is severed. It is through the production within the plant of naturally occurring stimulatory substances, together with the loss of growth inhibitors (caused by the removal of the above ground growth centers), which then exert their influence on the remaining vegetative structure to promote excessive new tree growth. These new, more numerous stems, growing much faster than when left uncut, (e.g., five to ten feet or more the first year after cutting) makes subsequent tree removal from the ROW more frequent, laborious, hazardous and costly.

The selective application of herbicides to only the tall-growing target tree species can, in most instances, eliminate completely the resurgent tree growth problem. This is because the herbicide when properly deposited on the target species, translocates throughout the tree (including the root system) and arrests all future growth and development, i.e., killing the entire target plant not just temporarily removing the above ground portion. Selective herbicide application involves two general techniques:[4] a basal application to the lower stem of the tree and a foliar application to the leaves. Selective application of herbicides only to the targeted tall-growing species allows retention of nearly all the desirable low-growing vegetation on the ROW. The elimination of the tall-growing trees from the ROW will also encourage the further growth and development of all the indigenous low growing woody shrubs, herbs (forbs and grasses), ferns, etc. by removing the trees that would otherwise begin to directly compete with and eventually crowd out the low-growing species over time. With effective minimally disruptive tree removal, these lower-growing desirable plant species will expand into the ROW areas formerly occupied by trees and produce a thick dense plant cover that will discourage the invasion of new tree seedlings and/or the future growth of any remaining tree seedlings. These desirable low-growing plant communities act as the biological controls in this IPM/IVM scenario. The establishment and the preservation of these low-growing plant communities on ROW serve to reduce over time the amount of work required and cost incurred by the utility to maintain the ROW each treatment cycle, while coincidentally diminishing the amount of herbicide necessary for adequate coverage of the target species.

Mechanical and chemical controls are often used together with favorable synergistic results. For instance, a tree is manually cut with a chain saw and the resulting freshly severed stump is treated with a herbicide formulation to prevent resprouting. This procedure removes the immediate physical threat to the overhead electrical line as well as the future tree growth with little disruption to the surrounding desirable plant cover while requiring very limited use of herbicides in a highly efficacious spot application.

ESSENTIAL ELEMENTS OF AN IPM STRATEGY
ILLUSTRATIONS & EXAMPLES

Traditional IPM programs consist of five basic elements: (1) preventive measures, (2) biological controls, (3) monitoring, (4) assessment, and (5) control measures. These essential elements of a sound IPM/IVM program are illustrated in the following examples.

[4] Many variations of these two techniques exist.

1. Preventive Measures

When the land use of a ROW is altered to preclude the establishment and growth of trees, the utility has little, if any, ROW vegetation management activities to perform. This advantageous situation occurs when a ROW fee owner or adjacent land owner productively uses the ROW in a manner compatible with the electrical facilities, and this use usurps the potential development of tall-growing trees. The most common ROW multiple uses often involve various types of agricultural[5] activities, i.e., crop production, pastures for grazing livestock, and within certain height limitations even Christmas tree plantations and some types of orchards. Those agrarian activities, as well as many other types of allowable industrial, commercial and residential multiple uses, which effectively curtail the opportunity for any tall growing vegetation to become established can thus eliminate completely the burden for any ROW vegetation management by the utility. However, any use of the ROW that allows even one tree capable of growing up into the electrical lines, e.g., hedgerows between cultivated fields, requires due diligence by the utility to prevent an electrical discharge.

2. Biological Controls

One of the principle goals of ROW vegetation management is to promote low-growing, relatively stable (long lived) plant communities, which consist of numerous species of woody shrubs, herbs (forbs and grasses), ferns, etc. on the ROW. These low-growing plant communities are a very desirable ROW accessory in that they inhibit both tree establishment and their subsequent growth by directly competing with the tall growing species for the available site resources (sunlight, water, and nutrients). Thick low-growing plant communities, which hinder tree seed germination and the early development of the undesirable tree seedlings and small tree saplings, act as the biological control agents in this IPM/IVM strategy.

There may even be some indirect biochemical interactions, called allelopathy, occurring among various plants that result in a chemical competition of sorts between certain lower growing desirable ROW species and some of the tall growing tree species. Allelopathy has been defined as the influence of one plant on another via the production of natural growth inhibitors. Currently there exists only a limited understanding of this ability of plants to produce and release phytotoxic substances that can then be translocated to other plants and used to curtail certain critical physiological plant functions such as growth and reproduction. These naturally occurring herbicides offer yet another potentially beneficial aspect of the biological controls in assisting the ROW vegetation manager to curb the spread of the undesirable tall growing trees.

In addition to their immediate benefits to the utility of reducing the undesirable tree population, these low-growing plant communities offer an assemblage of plant species that provide diverse and productive habitat conditions for a wide variety of wildlife, e.g., birds and mammals. Managed ROW creates habitats that provide wildlife food and cover values that are remarkably different, and oftentimes surpassing, those of the neighboring forest. Also, this juxtaposition of two different, but complementary plant communities (one perpetually kept in a low-growing condition

[5] It should be noted that most agricultural pursuits require the use of significant amounts of various pesticides, e.g., insecticides, fungicides, herbicides, etc. on an annual basis. Thus, the total quantities of pesticide applications will often dramatically increase on those ROW areas converted to farmland as compared to the spot treatments of herbicides every four to seven years by the utility.

and the other usually a forest) produces what is known as the edge effect. This effect enhances wildlife profusion, i.e., abundance and diversity, in the boundary area transition zone (ecotone) between these two distinct habitat types. Some of the new and more numerous wildlife species attracted to these enhanced ROW-created habitats provide yet another beneficial function of further reducing tree establishment and growth through their collective herbivory, e.g., browsing by deer and rabbits on young trees, girdling of tree seedlings by voles, and tree seed predation by mice.

3. Monitoring

As explicitly called for in an IPM program, monitoring of the pest population involves the following items:

- Regularly checking the area
- Early detection of pests
- Proper identification of pests
- Noting the effectiveness of biological controls

The ROW vegetation managers of the EEANY member systems routinely carry out all of these monitoring activities as an integral part of their electric utility ROW vegetation management programs. Monitoring procedures have been integrated into the NYS Public Service Commission approved Long-Term ROW Management Plans developed by each member system. Monitoring activities include an evaluation of the previous treatments to determine overall program effectiveness, as well as the current condition of the ROW so as to ascertain when the next treatment should occur and by what means. All of these procedures are part of a sound IPM/IVM strategy. ROW throughout New York State are regularly inspected to determine the height and density of the tall-growing target tree species as well as the condition of the lower growing vegetation. Inspection results help determine, to a large extent, the timing and type of ROW vegetation treatment that the utility implements.

These field inspections also serve another important function, i.e., the fulfillment of a quality assurance/quality control (QA/QC) program. This QA/QC component of the ROW vegetation management program provides feedback as to the conduct of the field crews regarding their adherence to the work specifications as well as to determine the longer-term efficacy of the treatments. In addition to the routine utility monitoring, the Department of Public Service staff annually inspects the results of the company ROW vegetation management programs to insure compliance with all applicable regulatory mandates.

Identifying the undesirable tree species is a critical component of an IPM/IVM program. With hundreds of species present on a ROW, all vegetation treatment personnel must be sufficiently knowledgeable of plant species to enable them to readily distinguish between target trees to be treated, and all non-target desirable low-growing species to be left as undisturbed as possible. Based upon field inspections, the type of vegetation treatment will also be determined, in large part, by the distribution and abundance of the lower growing species. For instance, when thickets of shrubs, such as viburnums or dogwoods, are present together with only a few target tree stems, the highly selective stem specific application of herbicides would produce the most acceptable results. The extensive use of mowing, for example, over such a ROW segment containing only a few target species, would be quite disruptive to the existing desirable low growing vegetative cover. Such an ecological disturbance would unnecessarily leave the ROW in a much more open and vulnerable

condition, thereby actually enhancing the ROW site conditions for the eventual re-establishment of undesirable trees as well as significantly reduce its aesthetic and wildlife values.

4. Assessment

Assessment is the process of determining the potential for pest populations (target trees) to reach an intolerable level. For ROW vegetation managers, the most opportune time to eradicate target trees is well before they reach the height of the overhead electrical lines. From an assessment perspective, an effective IPM/IVM strategy needs to: (a) prevent any interruption of electrical service and avoid risk of injury to the public, (b) treat the target species at their optimum height range as they emerge from the lower growing plant cover (at this stage they can be conveniently treated with limited amounts of herbicide so as to achieve the highest degree of control possible), (c) cause the removal of the target tree species before they become tall and dense enough to begin to crowd out and adversely alter the composition, structure and density of the desirable lower growing vegetative cover, and (d) minimize any direct disruption by the treatments themselves to the existing desirable ROW plants so they continue to occupy the ROW and function as biological controls.

5. Control Measures

IPM strategy dictates that once a pest population has reached the intolerable level action should be taken. Typically, under an IPM program, chemical pesticides are used as a control measure when no other strategies will bring the pest population back under the economic threshold. In fact, the success of IPM often occurs by waiting until a pest population reaches this threshold, and then often hinges on the availability of a pesticide to bring the pest population back under control quickly. For ROW vegetation management, the pest population consists of only the target tree species that meet certain critical height[6] characteristics. Only those trees that have emerged from the lower growing plant "canopy" need to be selectively removed; thus, many very small tree seedlings may remain untreated, submerged within the low-growing plant community on the ROW. Most of these small tree seedlings, left fully submerged within the dense low growing understory vegetation, will never fully develop into trees as they will succumb to the surrounding competitive pressures of the lower growing desirable vegetation and its associated biotic agents, e.g., animal herbivory. An additional positive attribute of this biological control feature occurs when those few remaining target trees that finally escape from the low growing plant communities only do so after a considerably longer time period than would normally happen under relatively (open) unencumbered circumstances. This helps to extend the duration between ROW vegetation treatments.

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[6] This "critical tree height" is determined "electrically" by the distance between the tip of the tree and the overhead electric line with consideration for the voltage of the transmission facility, at any given point on the ROW. The higher the line voltage the more clearance that is necessary around the conductors which is often referred to as the wire security zone. For instance, a 765 kV line requires a greater wire security zone distance (about 10 feet more) than a 345 kV line needs. Also, as the voltage of the transmission facility increases the minimum wire distance from the ground likewise increases. The minimum conductor sag at mid-span allowed for a 765 kV line is about 50 feet from the ground whereas a 345 kV line only requires a height of around 30 feet from the ground. Finally, the location of the tree on the ROW will determine the distance to the conductors and the resulting allowable maximum tree height that can be tolerated at that particular point. Trees located near the edge of the ROW or close to tall towers can be allowed to grow taller than their compatriots located in the center portions of the ROW near conductor mid-span which is within the area of maximum line sag, i.e., where the line is closest to the ground.

The choice of treatment technique as well as the explicit mode of application to ensure adequate control of the target tree species are also important aspects of selective ROW vegetation management that uniquely qualifies IVM as an IPM approach. As part of an IPM/IVM program, herbicides are used only to treat individual tree stems or groups of target trees, and no aerial or indiscriminate ground broadcast (blanket) applications (uniformly spraying the entire ROW) are used in New York State today. Herbicides that are used on ROW are matched to site-specific characteristics and target species, and the products are selected from dozens of commercially available materials based upon various attributes such as efficacy, toxicity, cost, etc. Furthermore, once a specific herbicide(s) is selected for application, its efficacy can be further enhanced (and its environmental impact minimized) by proper timing and selection of the most suitable method(s) of treatment (including integration with mechanical controls) together with choosing the most appropriate formulation and dosage rate.

The option of non-chemical mechanical clearing of the ROW, by hand cutting with chainsaws, mowing with large machines like a hydro-ax or even using massive earth moving equipment in a stump/soil shearing operation, is most always an available alternative. These physical methods of tree species removal are used for those ROW segments occupied by or located close to sensitive land uses, or containing special resources that have been determined to be vulnerable to the application of herbicides. These designated ROW locations can be granted this extra protection through the judicious use of no spray zones or set back distances which are often referred to as buffer zones where herbicide use is not allowed. The determination not to use herbicides can be made by the ROW manager on a site-specific basis or through general company policy even when law, regulation, and label conditions allow such herbicide use. The discretion to employ buffer zones as well as the selection of the appropriate set back distances, must be made in a prudent manner since all the mechanical alternatives will inevitably cause an increase in the number and vigor of incompatible tree species on those portions of the ROW so treated. However, the opportunity to employ mechanical clearing of the ROW is an available option for the ROW manager on specifically chosen ROW segments with certain predetermined characteristics that warrant this treatment. Herbicide usage can be restricted in deference to specific notable ROW resources or as a consideration to particularly sensitive land use conditions while still maintaining the overall goals of a sound, long term, and effective IVM program when viewed from a system-wide perspective.

Even in certain ecologically sensitive areas, the selective use of herbicides may be apropos, provided the appropriate precautions are taken. For instance, when treating vegetation in or adjacent to designated wetlands, a herbicide with the appropriate characteristics, e.g., an aquatic or wetland label could be selected. However, to assure that virtually no surface water contamination occurs (irrespective of any allowable label statements) buffer zones can be prescribed around streams, lakes, wetlands, and other sensitive water resources. Studies have shown that buffer zones of only 5 feet to 25 feet can effectively curtail the deposition of airborne spray particles and the movement of the herbicide by runoff into surface water resources. A dense stand of vegetation in the buffer zone will further reduce the linear distance of buffer zone necessary, as will very stem specific treatment techniques. Conversely, sparse vegetation in the buffer zone and high volume treatments will increase the distance of the buffer zone required to insure abatement of any herbicide movement. All established EEANY member system specifications for their buffer zones meet or exceed these threshold conditions.

ROW CONVERSION

One quite unique aspect of IPM, as applied to the management of ROW vegetation, is the relative long-term nature of the desired effects and the timeframe required to assess the consequences of actions taken. Although, mechanical removal of the tall growing trees will physically eliminate the immediate threat to electrical reliability and public safety, this method only serves to perpetuate the long-term tree problem and exacerbate future ROW maintenance requirements. Typically, mechanical tree removal will result in the need for more cutting as frequently as every two, or at most, about four years. After several mechanical treatments, (i.e., over a number of ROW treatment cycles), the collection of tree stems requiring control can readily increase to over 20,000 stems per acre. Similarly, when a new ROW is cleared and all vegetation is allowed to grow back naturally, the target tree densities will likewise increase to very high levels in only a few years after the initial tree removal operations and prior to any herbicide application. In fact the term ROW Reclamation is customarily used to describe the extreme actions that must often occur to treat very high tree stem densities that are frequently found on a routinely mechanically treated ROW.

When herbicides are used over several treatment cycles, the period of time between treatments can usually be elongated from three or four to six or seven or even more years, and concurrently the number of stems to treat each cycle becomes fewer. Herein lies the truly unique aspect of ROW vegetation management from an IPM/IVM perspective; the treatment of vegetation with herbicides must be viewed over the long term to fully grasp the significance of this system in reducing the target tree population that will also reduce the use of chemicals and concurrently increase the effectiveness of the biological controls, i.e., all the lower growing plants that volunteer to occupy the ROW. For example, when a new ROW (or an older ROW that has received only mechanical treatments) is first treated, the amount of herbicide needed for proper coverage of the numerous target trees may be in the order of about two to four gallons of concentrate per acre. The following treatment, in the next cycle, may require about half that amount because the number of target species has been reduced and the lower growing desirable vegetation is beginning to exert it's influence on the ROW vegetation dynamics. Subsequent treatments will continue this downward trend in herbicide usage that produces nearly a tree-free ROW requiring a minimum of judiciously applied herbicide to produce the desired effect. At this stage, the low-growing vegetation is firmly established and offers a relatively stable condition that effectively inhibits the rapid resurgence of trees. However, in order to perpetuate this highly desirable minimum maintenance ROW condition, when new trees begin to emerge (as they most certainly will from the tree seed sources off the ROW) these target trees must still be controlled through the diligent efforts of the ROW vegetation manager to preclude their full development and ultimate dominance over their lower-growing associates.

This process of conversion from a ROW that is literally filled with trees to one that is dominated by lower-growing vegetation with only a few remaining tree stems capable of growing into the overhead electric lines is not a simple one-step process, but requires an extended program commitment and adherence to a long-range vegetation management plan. Each phase in the ROW conversion process can be quite complex depending in large part upon the target species mix coupled with tree height and density together with the abundance and distribution of the low-growing vegetation, as well as other site specific characteristics. As the stem density of the target species is reduced with each passing treatment cycle, the type of treatment chosen can then become more selective. Finally, after several treatment cycles when the ROW is occupied by a low density of target trees and the conversion process virtually completed, some continuing herbicide use will still be required, but the focus at this stage shifts to selecting techniques which offer the minimum amount of disturbance to the desirable lower growing vegetation, i.e., the biological controls.

GENERAL CONSIDERATIONS

The use of herbicides by the EEANY member systems is subject to regulation under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) administered by the U.S. Environmental Protection Agency (EPA) and Article 33 of the New York Environmental Conservation Law (ECL) administered by the Department of Environmental Conservation (DEC). Pursuant to FIFRA regulations, no herbicide may be marketed, distributed, sold or advertised until the EPA registers it. After many years of product development, advanced toxicology studies and field testing, the pesticide manufacturers submit to EPA thousands of pages of research data that are compiled into a registration application. From this voluminous registration package, the manufacturer develops a proposed product label that identifies the pest or pests that the product will be effective in controlling and provides complete instructions for correct use, handling, and disposal of the product as well as other information required by FIFRA. In New York State, the DEC has the responsibility for establishing regulations and standards for the registration of pesticides, the certification of pesticides applicators, and all other matters pertaining to pesticide use, as well as the responsibility for enforcement of all it's regulations and standards.

Other federal, state and even local laws and their resulting regulations may impinge on the manner in which ROW vegetation management activities will occur. As mentioned previously, wetland protection requirements can have a pronounced effect on the types of vegetation management techniques chosen. Considerations for the protection of endangered or threatened species and their habitats can similarly become a dominant concern on some ROW. For instance, the nurturing of the endangered Karner blue butterfly and its requisite host plant, the blue lupine, has resulted in considerable evaluation of selected ROW herbicide use in the preservation and enhancement of the habitat conditions necessary for the survival of this endangered species of butterfly. Even the state requirements for management of river corridors under the Wild and Scenic Rivers Act provide definitions and requirements for IPM. Local ordinances, zoning mandates, as well as property owner concerns may sometimes play a critical role in the selection of ROW vegetation management techniques, e.g., the control of poisonous plants, invasive weeds, and allergy producing pollinators. In some instances, voluntary compliance with provisions of the Federal Noxious Weed Act may require action on the part of utility ROW vegetation managers to prevent the spread of listed deleterious weeds and other alien invasive species. For example, the control of infestations of the introduced weed, purple loosestrife, which threatens the biological integrity of North American wetland ecosystems by displacing native vegetation is a goal shared by the electric utility industry with both state and federal environmental agencies.

Prevention of Non-Point Sources of Pollution & Storm Water Discharge Requirements

Another important regulatory program that can directly affect the choice of ROW vegetation management practices available under IPM/IVM is found within the authority of the Clean Water Act as amended by the Water Quality Act of 1987 and involves the control of non-point sources of water pollution along with some aspects of the permit requirements for stormwater discharges for point sources resulting from construction activities. These regulatory programs focus on water quality issues, i.e., the prevention and control of water pollution. In both programs, as they apply to the ROW maintenance situation, the focus is on using management practices to prevent, reduce, minimize or otherwise control the availability, release, or transport of substances that adversely affect surface and ground waters. They both act generally to diminish the generation of potential water pollution emanating from sources on the ROW.

The control of non-point sources of pollution is accomplished through the identification of best management practices (BMPs) and their implementation on a site-specific basis using best professional judgment and experience. The control of stormwater discharges which can be considered as point sources due to their collection of runoff into a single outlet, e.g., a culvert or ditch, are similarly treated by the requirement to prepare a Stormwater Pollution Plan under the auspices of a SPDES (State Pollutant Discharge Elimination System) General Permit. This plan essentially enumerates the BMPs that will be used to prevent and/or control polluted runoff from occurring. Neither of these programs imposes effluent limits for specific substances, rather they provide for an effective means of reducing or preventing the impact of pollution generated from land management activities. In addition to the ROW managers primary concern of minimizing pesticide related impacts within the context of an IPM strategy, these two somewhat interrelated regulatory programs broaden the environmental concerns arising from IVM to encompass other pollution control objectives. Thus, both of these clean water related programs could directly influence the decision-making process of the ROW vegetation manager and, in some cases, virtually dictate the menu of treatment choices available.

The most common potential source of pollution arising from a ROW is erosion and the resulting generation of sediment causing siltation in streams and other water bodies. Sedimentation from all sources is a major water quality degradation issue in New York state. Also, the loss of soil nutrients and their entryway into surface watercourses or groundwater by excessive leaching or as attached to sediment particles, is likewise an important water quality concern. Both of these major sources of water pollution can be generated from ROW if bare soils are present or insufficient plant cover occurs. Therefore, in choosing ROW vegetation management techniques, particularly on steep slopes or other areas of high erosive potential, e.g., riparian zones, the ROW vegetation manager must be concerned with their effects on the local hydrology. Vegetative disturbances resulting in bare surfaces or exposed soils and the degree to which vehicular traffic movement occurs causing rutting can become limiting factors in the selection of target tree control methods. For instance, mowing with a hydro-ax on a steep slope or along a streambank could cause erosion by vehicular rutting as well as through denuding the site by excessive removal of vegetation.

The imposition of these regulatory programs to prevent and/or control sources of potential degradation of water resources arising from ROW vegetation management activities results in the following two general precepts: (1) maintain as complete a vegetative cover as possible at all times, and (2) keep exposed soil and any soil disturbance/compaction operations to a minimum especially in critical areas. By keeping these two relatively simple fundamental principles, a host of positive attributes can be ascribed to the ROW vegetation management program including: (1) dense low-growing vegetation on the ROW will act as filter strips for the surrounding area, thereby decreasing overland flow, increasing soil water percolation and removing pollutants, (2) complete vegetative cover on the ROW will stabilize soils and prevent erosion and sediment transfer, (3) minimizing soil compaction by restricting heavy vehicular traffic on the ROW decreases the amount of surface water generated on a given area, and thus reduces the volume of stormwater runoff, and (4) avoidance of any soil disturbance on the ROW will reduce or eliminate the need for amelioration activities that would otherwise be required under these clean water programs to restore the disturbed area to its original slope, soil compaction, ground cover, and hydrologic condition.

ROW Management Research

IPM is never a finished or static process. As fresh data become accessible and new knowledge is obtained about the pests in question and the various control treatments available, the specifics and details of the currently acceptable IPM strategies will naturally be altered and thus subject to constant modification. IPM practitioners can aid and abet this dynamic adaptation and improvement process through conducting basic ecological research on the pests in question as well as applied research in new and promising control strategies. Also needed is the constant reappraisal of existing techniques in order to modify them to produce even more efficacious results. The member systems of the EEANY have individually conducted research into IPM related ROW management matters, but even moreso collectively, through the auspices of the former Empire State Electric Energy Research Corporation (ESEERCO)[7], have collaborated on numerous research projects over a 25-year span of time involving many diverse aspects of ROW vegetation management. These studies were conducted on a wide range of subjects and a host of issues important to utility ROW managers in their execution of ecologically sound and cost effective IPM/IVM programs.

Beginning with a literature review in 1973, this extended ESEERCO ROW management research program has included projects on ROW treatment cost comparisons, long term effectiveness, ROW treatment cycles, herbicide fate and mobility, allelopathy, ROW multiple uses, buffer zones, soil compaction and mitigation, repeated mechanical cutting effects on vegetation, and costs and the effects of ROW treatments on wildlife. Two of the more recent multi-year studies have recently been published in the mid 1990s; ROW Vegetation Dynamics conducted by the Institute of Ecosystem Studies and ROW Stability by the State University of New York College of Environmental Science and Forestry. The final ROW research product to come out of ESEERCO program in 2000 involves a risk assessment and environmental evaluation of the use of tree growth regulators. These numerous and diverse research projects have greatly assisted the New York State electric utility industry to focus their ROW Vegetation Management Programs on the most cost effective and least disruptive techniques while also allowing them to tailor the research results to their own individual company circumstances. The latest ROW research efforts currently being undertaken by the electric utility industry are now found within the bailiwick of the Electric Power Research Institute (EPRI). EPRI has picked up where ESEERCO left off and has created a new research target, ROW Environmental Management & Development which is currently being subscribed to by 44 electric utilities across the nation.

Summary

The overall goal of a utility ROW vegetation management program is to provide for the safe and reliable transmission of electric power in an economic and environmentally compatible manner. This lofty goal translates on the ground into the vegetative conversion of a strip of land, i.e., the ROW, often initially found filled with tree saplings to a ROW corridor that harbors mainly a profusion of lower-growing species. This goal is currently being achieved in New York state by the implementation of sound IPM/IVM programs at each of the electric transmission and distribution systems of the EEANY members. To paraphrase applicable IPM terminology; ROW vegetation managers use multiple tactics to prevent pest (tree) buildups that could endanger electric system reliability and public safety by: monitoring pest (tree) populations, assessing the potential for damage (system reliability, public safety, preservation of the biological controls), and making professional management and control decisions, considering that all pesticides (herbicides) should be used

[7] ESEERCO ceased to exist in 1999 due to the increased economic pressures of a deregulated competitive electric market

judiciously. ROW management decisions depend in large part upon the mix of target species, the height and density of the dominate individual stems, and the abundance and distribution of the low-growing desirable species. As the number of different target species is reduced and their stem density decreases with each passing treatment cycle, the type of vegetation treatment performed can become more selective with the attendant benefit of reducing the amount of herbicide needed to maintain the ROW. Thus, after several treatment cycles, when the ROW is occupied by a greatly reduced number of target trees, some minimum herbicide use will still be required, but the focus now shifts to selecting techniques with the least amount of disturbance to the lower-growing vegetation.

It should be stressed in closing that these ideal ROW conditions of a minimum maintenance ROW (composed almost entirely of low-growing plants) to be achieved through the attentive implementation of an IPM/IVM program, is simply just that: minimum not zero maintenance. Although the low-growing plants will help immensely in precluding the growth of trees, due to the pressures of natural plant community succession that ultimately will occur, (the close proximity to an abundant tree seed sources in the surrounding forest) these voluntary biological controls can never be expected to fully exclude trees alone over long periods of time from invading the ROW and exploiting their well-defined ecological niches. Even after many treatment cycles using herbicides, when the ideal ROW condition is seemingly achieved, if the ROW is left untreated or if mechanical methods are resorted to, the ROW will revert rather quickly to a tree-dominated landscape, and all the attendant benefits of a stable low-growing mosaic of desirable ROW vegetation will be lost. These attendant benefits include species diversity in an aesthetically pleasing setting with increased wildlife abundance while protecting soil and water quality values. Thus, IVM is truly an ecologically based approach to pest management.

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Appendix 10 - List of Electric Sites for Mid-Cycle Review

Central Hudson Electric Transmission System
Vegetation Management Program
List of Sites for Mid-Cycle Inspection

Line	Voltage	From	To	Near Structure(s)	Site Location	Length	Condition	Inspection Frequency
301	345	Hurley Ave	Leeds	111709-111711	South of Hurley Mountain Road	2 Spans	Towers Located Outside Of RoW	Annual
301	345	Hurley Ave	Leeds	111728-111729	West of City View Terrace	1 Span	No Rights For Portion Of RoW Mid-Span	Annual
301	345	Hurley Ave	Leeds	108309-108310	North of Old Route 32	1 Spans	Unclear Title For Parcel In RoW	Annual
301	345	Hurley Ave	Leeds	108400-108406	Cauterskill Road	3 Spans	5' Deficiency Along South Side Of Row	Annual
303	345	Roseton	Hurley Ave	111361-111362	North of East Road	1 Span	No Deeded Rights On Parcel 108.3-4-8.2	Annual
303	345	Roseton	Hurley Ave	111367-111368	South of Huckleberry Turnpike	1 Span	75' Gap In Deeded Rights Along RoW	Annual
303	345	Roseton	Hurley Ave	111371-111372	South of Huckleberry Turnpike	1 Span	No Rights On Parcels Owned By State Of New York / Work To Be Performed Under TRP	Annual
303	345	Roseton	Hurley Ave	111476-111479	South of Hurds Road	2 Spans	25' Deficiency On East Side Of Row	Annual
303	345	Roseton	Hurley Ave	111685-111693	Along Thruway / Wiltwyck Golf Club	9 Spans	Limited Rights / Trimming By Mutual Agreement	Annual
311	345	Rock Tavern	Roseton	111196-111195	North of I-84	1 Span	No Rights Obtained	Annual
311	345	Rock Tavern	Roseton	111130-111129	East of Plains Road	1 Span	No Rights On DEP Land	Annual
311	345	Rock Tavern	Roseton	111105	East of North Plank Road	1 Span	12' Deficiency Around North Side Of Corner Structure	Annual
311	345	Rock Tavern	Roseton	111094-111093	East of Quaker Street	1 Span	Between 25' And 35' Deficiency Along North Side Of RoW	Annual
311	345	Rock Tavern	Roseton	111088-111085	West of Mountain View Avenue	2 Spans	25' Deficiency Along North Side Of Row	Annual
311	345	Rock Tavern	Roseton	111344-111343	West of Frozen Ridge Road	1 Span	20' Deficiency On Parcel 108.3-4-23.12	Annual
311	345	Rock Tavern	Roseton	111343	West of Frozen Ridge Road	1 Span	20' Deficiency On Parcel 108.3-4-23.14	Annual
311	345	Rock Tavern	Roseton	111313	West of Route 9W	1 Span	10' Deficiency Around North Side Of Corner Structure	Annual

Appendix 11 – Compatible Species for Wire-Zone and/or Border-Zone

Woody Shrubs

Olive	8 - 12' (16')	Laurel, Sheep	1.5 - 3.5'
Azalea, Swamp	4 - 10' (15')	Leather leaf	2 - 4'
Barberry, Common	10'	New Jersey Tea	2 - 3' (4')
Blueberry, Highbush	3 - 10' (13')	Privet	5 - 15'
Dewberry	1 - 3'	Rose, Multiflora	6 - 12' (15')
Dogwood, Red Osier	3 - 10' (12')	Rubus sop.	3 - 6' (10')
Dogwood, Grey/Stiff	3 - 10' (16')	Snowberry	2 - 3' (6')
Dogwood, Silky	3 - 10' (16')	Spicebush, Common	8 - 12' (16')
Dogwood, Roundleaf	3 - 10' (12')	Spirea, Meadowsweet	2 - 5' (6.5')
Elderberry	5 - 10' (12')	Spirea, Steeple Bush	2 - 4' (6')
Gooseberry	3- - 5' (10')	Sweet fern	2 - 3' (5')
Hazelnut, American	5 - 10' (12')	Sweet Gale/Meadowfern	2 - 5'
Hazelnut, Beaked	5 - 12' (14')	Vibernum, Arrowwood	6 - 12' (16')
Hemlock, Ground/Yew	2 - 3' (6')	Vibernum, Highbush Cranberry	5 - 15'
Huckleberry	2 - 4' (6')	Vibernum, Northern Wild Raisin	6 - 12' (16')
Juniper, Creeping/Trailing	<1' (3')	Vibernum, Hobblebush	3 - 6' (10')

Small to Medium Trees and Tall Shrubs

Apple	20 - 30' (50')	Hawthorne	10 - 30' (40')
Alder, Speckled	10 - 15' (35')	Juniper (Red Cedar)	15 - 35 (60')
Alder, Smooth	10 - 20' (40')	Mountain/Striped Maple	10 - 20' (35')
Buckthorn, Common	10 - 15' (25')	Olive, Russian	20 - 35' (46')
Buckthorn, European	10 - 15' (23')	Pear	20 - 35' (50')
Dogwood, Alternate Leaf	10 - 25' (35')	Shadbush/Serviceberry	15 - 30' (50')
Dogwood, Flowering	10 - 30' (40')	Shrub Willow	6 - 20 (35')
Cedar, White	30 - 50' (90')	Sumac	8 - 20' (35')
Witch Hazel	8 - 20' (35')		
Hornbeam, American	20 - 35 (50')		

Appendix 12 – Electric and Gas Transmission Aerial & Ground Patrol Basic Reports

20XX Central Hudson Pre-Peak Load Inspection Report – FERC Regulated Electric Transmission Lines								
Inspection Date	Line	Location			Vegetation Condition	High Priority (Y/N)	Work Completed (Y/N)	Clearion Work Ticket ID Number
		Structure	to	Structure				
301-Line								
303-Line								
311-Line								

Inspectors: _____

Utility Forester

_____

Assistant Utility Forester

Date: _____

20XX XXX QUARTER ELECTRIC/GAS TRANSMISSION AERIAL PATROL							
Line/ Voltage	Structure/Span	Component Description	Problem Description	Inspection Date	Inspection Team	Critical	Accessible

GAS TRANSMISSION LINE
GROUND PATROL AND INSPECTION REPORT

Date: _____

Line _____

Division _____

Sheet No. _____ of _____

This Sheet Covers Line Section:

From _____ to _____

ITEMS	NATURE & DETAIL LOCATION OF REPORTABLE ITEMS Report Items Below -- If In Good Condition, Write "Good or None". If More Room is Needed, Write on Back
Construction within 100' of Line	
Washouts or other damage to R/W	
Foreign material on R/W. Public encroachment (buildings, swimming pools, shrubs, etc.)	
Condition of line markers vents & test stations	
Accessibility and condition of line valves and structures	
Condition of Vegetation	
F.I. Leak Survey Results (all positive readings to be reported to supervision as soon as the leak is detected.)	

Remarks or Additional Data: _____

_____

Repairs: W.O. or D.O. # _____

_____
Inspector

Date Completed _____

_____
Gas Foreman

_____
Operating Supervisor

Appendix 13 – NERC Mandatory Reliability Standards – Standard FAC-003-03

Effective Dates

There are two effective dates associated with this standard.

The first effective date allows Generator Owners time to develop documented maintenance strategies or procedures or processes or specifications as outlined in Requirement R3.

> In those jurisdictions where regulatory approval is required, Requirement R3 applied to the Generator Owner becomes effective on the first calendar day of the first calendar quarter one year after the date of the order approving the standard from applicable regulatory authorities where such explicit approval for all requirements is required. In those jurisdictions where no regulatory approval is required, Requirement R3 becomes effective on the first day of the first calendar quarter one year following Board of Trustees' adoption or as otherwise made effective pursuant to the laws applicable to such ERO governmental authorities.

The second effective date allows entities time to comply with Requirements R1, R2, R4, R5, R6, and R7.

> In those jurisdictions where regulatory approval is required, Requirements R1, R2, R4, R5, R6, and R7 applied to the Generator Owner become effective on the first calendar day of the first calendar quarter two years after the date of the order approving the standard from applicable regulatory authorities where such explicit approval for all requirements is required. In those jurisdictions where no regulatory approval is required, Requirements R1, R2, R4, R5, R6, and R7 become effective on the first day of the first calendar quarter two years following Board of Trustees' adoption or as otherwise made effective pursuant to the laws applicable to such ERO governmental authorities.

Effective dates for individual lines when they undergo specific transition cases:

1. A line operated below 200kV, designated by the Planning Coordinator as an element of an Interconnection Reliability Operating Limit (IROL) or designated by the Western Electricity Coordinating Council (WECC) as an element of a Major WECC Transfer Path, becomes subject to this standard the latter of: 1) 12 months after the date the Planning Coordinator or WECC initially designates the line as being an element of an IROL or an element of a Major WECC Transfer Path, or 2) January 1 of the planning year when the line is forecast to become an element of an IROL or an element of a Major WECC Transfer Path.

2. A line operated below 200 kV currently subject to this standard as a designated element of an IROL or a Major WECC Transfer Path which has a specified date for the removal of such designation will no longer be subject to this standard effective on that specified date.

3. A line operated at 200 kV or above, currently subject to this standard which is a designated element of an IROL or a Major WECC Transfer Path and which has a specified date for the removal of such designation will be subject to Requirement R2 and no longer be subject to Requirement R1 effective on that specified date.

4. An existing transmission line operated at 200kV or higher which is newly acquired by an asset owner and which was not previously subject to this standard becomes subject to this standard 12 months after the acquisition date.

5. An existing transmission line operated below 200kV which is newly acquired by an asset owner and which was not previously subject to this standard becomes subject to this standard 12 months after the acquisition date of the line if at the time of acquisition the line is designated by the Planning Coordinator as an element of an IROL or by WECC as an element of a Major WECC Transfer Path.

A. Introduction

1. **Title:** Transmission Vegetation Management

2. **Number:** FAC-003-3

3. **Purpose:** To maintain a reliable electric transmission system by using a defense-in-depth strategy to manage vegetation located on transmission rights of way (ROW) and minimize encroachments from vegetation located adjacent to the ROW, thus preventing the risk of those vegetation-related outages that could lead to Cascading.

4. **Applicability**

   4.1. Functional Entities:

   4.1.1. Applicable Transmission Owners

   4.1.1.1 Transmission Owners that own Transmission Facilities defined in 4.2.

   4.1.2 Applicable Generator Owners

   4.1.2.1 Generator Owners that own generation Facilities defined in 4.3

   4.2. Transmission Facilities: Defined below (referred to as "applicable lines"), including but not limited to those that cross lands owned by federal[1], state, provincial, public, private, or tribal entities:

   4.2.1 Each overhead transmission line operated at 200kV or higher.

   4.2.2 Each overhead transmission line operated below 200kV identified as an element of an IROL under NERC Standard FAC-014 by the Planning Coordinator.

   4.2.3 Each overhead transmission line operated below 200 kV identified as an element of a Major WECC Transfer Path in the Bulk Electric System by WECC.

   4.2.4 Each overhead transmission line identified above (4.2.1 through 4.2.3) located outside the fenced area of the switchyard, station or substation and any portion of the span of the transmission line that is crossing the substation fence.

   4.3. Generation Facilities: Defined below (referred to as "applicable lines"), including but not limited to those that cross lands owned by federal[2], state, provincial, public, private, or tribal entities:

   4.3.1 Overhead transmission lines that (1) extend greater than one mile or 1.609 kilometers beyond the fenced area of the generating station switchyard to the point of interconnection with a Transmission Owner's Facility or (2) do not have a clear line

[1] EPAct 2005 section 1211c: *"Access approvals by Federal agencies."*
[2] *Id.*

of sight[3] from the generating station switchyard fence to the point of interconnection with a Transmission Owner's Facility and are:

4.3.1.1 Operated at 200kV or higher; or

4.3.1.2 Operated below 200kV identified as an element of an IROL under NERC Standard FAC-014 by the Planning Coordinator; or

4.3.1.3 Operated below 200 kV identified as an element of a Major WECC Transfer Path in the Bulk Electric System by WECC.

Enforcement:

The Requirements within a Reliability Standard govern and will be enforced. The Requirements within a Reliability Standard define what an entity must do to be compliant and binds an entity to certain obligations of performance under Section 215 of the Federal Power Act. Compliance will in all cases be measured by determining whether a party met or failed to meet the Reliability Standard Requirement given the specific facts and circumstances of its use, ownership or operation of the bulk power system.

Measures provide guidance on assessing non-compliance with the Requirements. Measures are the evidence that could be presented to demonstrate compliance with a Reliability Standard Requirement and are not intended to contain the quantitative metrics for determining satisfactory performance nor to limit how an entity may demonstrate compliance if valid alternatives to demonstrating compliance are available in a specific case. A Reliability Standard may be enforced in the absence of specified Measures.

Entities must comply with the "Compliance" section in its entirety, including the Administrative Procedure that sets forth, among other things, reporting requirements.

The "Guideline and Technical Basis" section, the Background section and text boxes with "Examples" and "Rationale" are provided for informational purposes. They are designed to convey guidance from NERC's various activities. The "Guideline and Technical Basis" section and text boxes with "Examples" and "Rationale" are not intended to establish new Requirements under NERC's Reliability Standards or to modify the Requirements in any existing NERC Reliability Standard. Implementation of the "Guideline and Technical Basis" section, the Background section and text boxes with "Examples" and "Rationale" is not a substitute for compliance with Requirements in NERC's Reliability Standards."

5. **Background:**

This standard uses three types of requirements to provide layers of protection to prevent vegetation related outages that could lead to Cascading:

[3] "Clear line of sight" means the distance that can be seen by the average person without special instrumentation (e.g., binoculars, telescope, spyglasses, etc.) on a clear day.

a) Performance-based — defines a particular reliability objective or outcome to be achieved. In its simplest form, a results-based requirement has four components: *who, under what conditions (if any), shall perform what action, to achieve what particular bulk power system performance result or outcome*?

b) Risk-based — preventive requirements to reduce the risks of failure to acceptable tolerance levels. A risk-based reliability requirement should be framed as: *who, under what conditions (if any), shall perform what action, to achieve what particular result or outcome that reduces a stated risk to the reliability of the bulk power system*?

c) Competency-based — defines a minimum set of capabilities an entity needs to have to demonstrate it is able to perform its designated reliability functions. A competency-based reliability requirement should be framed as: *who, under what conditions (if any), shall have what capability, to achieve what particular result or outcome to perform an action to achieve a result or outcome or to reduce a risk to the reliability of the bulk power system*?

The defense-in-depth strategy for reliability standards development recognizes that each requirement in a NERC reliability standard has a role in preventing system failures, and that these roles are complementary and reinforcing. Reliability standards should not be viewed as a body of unrelated requirements, but rather should be viewed as part of a portfolio of requirements designed to achieve an overall defense-in-depth strategy and comport with the quality objectives of a reliability standard.

This standard uses a defense-in-depth approach to improve the reliability of the electric Transmission system by:

- Requiring that vegetation be managed to prevent vegetation encroachment inside the flash-over clearance (R1 and R2);
- Requiring documentation of the maintenance strategies, procedures, processes and specifications used to manage vegetation to prevent potential flash-over conditions including consideration of 1) conductor dynamics and 2) the interrelationships between vegetation growth rates, control methods and the inspection frequency (R3);
- Requiring timely notification to the appropriate control center of vegetation conditions that could cause a flash-over at any moment (R4);
- Requiring corrective actions to ensure that flash-over distances will not be violated due to work constrains such as legal injunctions (R5);
- Requiring inspections of vegetation conditions to be performed annually (R6); and
- Requiring that the annual work needed to prevent flash-over is completed (R7).

For this standard, the requirements have been developed as follows:

Performance-based: Requirements 1 and 2

Competency-based: Requirement 3

Risk-based: Requirements 4. 5. 6 and 7

R3 serves as the first line of defense by ensuring that entities understand the problem they are trying to manage and have fully developed strategies and plans to manage the problem. R1. R2. and R7 serve as the second line of defense by requiring that entities carry out their plans and manage vegetation. R6. which requires inspections. may be either a part of the first line of defense (as input into the strategies and plans) or as a third line of defense (as a check of the first and second lines of defense). R4 serves as the final line of defense. as it addresses cases in which all the other lines of defense have failed.

Major outages and operational problems have resulted from interference between overgrown vegetation and transmission lines located on many types of lands and ownership situations. Adherence to the standard requirements for applicable lines on any kind of land or easement. whether they are Federal Lands. state or provincial lands. public or private lands. franchises. easements or lands owned in fee. will reduce and manage this risk. For the purpose of the standard the term "public lands" includes municipal lands. village lands. city lands. and a host of other governmental entities.

This standard addresses vegetation management along applicable overhead lines and does not apply to underground lines. submarine lines or to line sections inside an electric station boundary.

This standard focuses on transmission lines to prevent those vegetation related outages that could lead to Cascading. It is not intended to prevent customer outages due to tree contact with lower voltage distribution system lines. For example. localized customer service might be disrupted if vegetation were to make contact with a 69kV transmission line supplying power to a 12kV distribution station. However. this standard is not written to address such isolated situations which have little impact on the overall electric transmission system.

Since vegetation growth is constant and always present. unmanaged vegetation poses an increased outage risk. especially when numerous transmission lines are operating at or near their Rating. This can present a significant risk of consecutive line failures when lines are experiencing large sags thereby leading to Cascading. Once the first line fails the shift of the current to the other lines and/or the increasing system loads will lead to the second and subsequent line failures as contact to the vegetation under those lines occurs. Conversely. most other outage causes (such as trees falling into lines. lightning. animals. motor vehicles. etc.) are not an interrelated function of the shift of currents or the increasing system loading. These events are not any more likely to occur during heavy system loads than any other time. There is no cause-effect relationship which creates the probability of simultaneous occurrence of other such events. Therefore these types of events are highly unlikely to cause large-scale grid failures. Thus. this standard places the highest priority on the management of vegetation to prevent vegetation grow-ins.

B. Requirements and Measures

R1. Each applicable Transmission Owner and applicable Generator Owner shall manage vegetation to prevent encroachments into the MVCD of its applicable line(s) which are either an element of an IROL, or an element of a Major WECC Transfer Path, operating within their Rating and all Rated Electrical Operating Conditions of the types shown below[4] [*Violation Risk Factor: High*] [*Time Horizon: Real-time*]:

1. An encroachment into the MVCD as shown in FAC-003-Table 2, observed in Real-time, absent a Sustained Outage,[5]
2. An encroachment due to a fall-in from inside the ROW that caused a vegetation-related Sustained Outage.[6]
3. An encroachment due to the blowing together of applicable lines and vegetation located inside the ROW that caused a vegetation-related Sustained Outage[7].
4. An encroachment due to vegetation growth into the MVCD that caused a vegetation-related Sustained Outage.[8]

M1. Each applicable Transmission Owner and applicable Generator Owner has evidence that it managed vegetation to prevent encroachment into the MVCD as described in R1. Examples of acceptable forms of evidence may include dated attestations, dated reports containing no Sustained Outages associated with encroachment types 2 through 4 above, or records confirming no Real-time observations of any MVCD encroachments. (R1)

R2. Each applicable Transmission Owner and applicable Generator Owner shall manage vegetation to prevent encroachments into the MVCD of its applicable line(s) which are <u>not</u> either an element of an IROL, or an element of a Major WECC Transfer Path, operating within its Rating and all Rated Electrical Operating Conditions of the types shown below[9] [*Violation Risk Factor: High*] [*Time Horizon: Real-time*]:

1. An encroachment into the MVCD, observed in Real-time, absent a Sustained Outage.[10]

---

[4] This requirement does not apply to circumstances that are beyond the control of an applicable Transmission Owner or applicable Generator Owner subject to this reliability standard, including natural disasters such as earthquakes, fires, tornados, hurricanes, landslides, wind shear, fresh gale, major storms as defined either by the applicable Transmission Owner or applicable Generator Owner or an applicable regulatory body, ice storms, and floods; human or animal activity such as logging, animal severing tree, vehicle contact with tree, or installation, removal, or digging of vegetation. Nothing in this footnote should be construed to limit the Transmission Owner's or applicable Generator Owner's right to exercise its full legal rights on the ROW.

[5] If a later confirmation of a Fault by the applicable Transmission Owner or applicable Generator Owner shows that a vegetation encroachment within the MVCD has occurred from vegetation within the ROW, this shall be considered the equivalent of a Real-time observation.

[6] Multiple Sustained Outages on an individual line, if caused by the same vegetation, will be reported as one outage regardless of the actual number of outages within a 24-hour period.

[7] *Id.*

[8] *Id.*

[9] *See* footnote 4.

[10] *See* footnote 5.

2. An encroachment due to a fall-in from inside the ROW that caused a vegetation-related Sustained Outage.[11]
3. An encroachment due to blowing together of applicable lines and vegetation located inside the ROW that caused a vegetation-related Sustained Outage.[12]
4. An encroachment due to vegetation growth into the line MVCD that caused a vegetation-related Sustained Outage[13]

M2. Each applicable Transmission Owner and applicable Generator Owner has evidence that it managed vegetation to prevent encroachment into the MVCD as described in R2. Examples of acceptable forms of evidence may include dated attestations, dated reports containing no Sustained Outages associated with encroachment types 2 through 4 above, or records confirming no Real-time observations of any MVCD encroachments. (R2)

R3. Each applicable Transmission Owner and applicable Generator Owner shall have documented maintenance strategies or procedures or processes or specifications it uses to prevent the encroachment of vegetation into the MVCD of its applicable lines that accounts for the following:

3.1 Movement of applicable line conductors under their Rating and all Rated Electrical Operating Conditions;

3.2 Inter-relationships between vegetation growth rates, vegetation control methods, and inspection frequency.

[*Violation Risk Factor: Lower*] [*Time Horizon: Long Term Planning*]

M3. The maintenance strategies or procedures or processes or specifications provided demonstrate that the applicable Transmission Owner and applicable Generator Owner can prevent encroachment into the MVCD considering the factors identified in the requirement. (R3)

R4. Each applicable Transmission Owner and applicable Generator Owner, without any intentional time delay, shall notify the control center holding switching authority for the associated applicable line when the applicable Transmission Owner and applicable Generator Owner has confirmed the existence of a vegetation condition that is likely to cause a Fault at any moment [*Violation Risk Factor: Medium*] [*Time Horizon: Real-time*].

M4. Each applicable Transmission Owner and applicable Generator Owner that has a confirmed vegetation condition likely to cause a Fault at any moment will have evidence that it notified the control center holding switching authority for the associated transmission line without any intentional time delay. Examples of evidence

[11] *See* footnote 6.

[12] *Id.*

[13] *Id.*

may include control center logs, voice recordings, switching orders, clearance orders and subsequent work orders. (R4)

R5. When a applicable Transmission Owner and applicable Generator Owner is constrained from performing vegetation work on an applicable line operating within its Rating and all Rated Electrical Operating Conditions, and the constraint may lead to a vegetation encroachment into the MVCD prior to the implementation of the next annual work plan, then the applicable Transmission Owner or applicable Generator Owner shall take corrective action to ensure continued vegetation management to prevent encroachments [*Violation Risk Factor: Medium*] [*Time Horizon: Operations Planning*].

M5. Each applicable Transmission Owner and applicable Generator Owner has evidence of the corrective action taken for each constraint where an applicable transmission line was put at potential risk. Examples of acceptable forms of evidence may include initially-planned work orders, documentation of constraints from landowners, court orders, inspection records of increased monitoring, documentation of the de-rating of lines, revised work orders, invoices, or evidence that the line was de-energized. (R5)

R6. Each applicable Transmission Owner and applicable Generator Owner shall perform a Vegetation Inspection of 100% of its applicable transmission lines (measured in units of choice - circuit, pole line, line miles or kilometers, etc.) at least once per calendar year and with no more than 18 calendar months between inspections on the same ROW[14] [*Violation Risk Factor: Medium*] [*Time Horizon: Operations Planning*].

M6. Each applicable Transmission Owner and applicable Generator Owner has evidence that it conducted Vegetation Inspections of the transmission line ROW for all applicable lines at least once per calendar year but with no more than 18 calendar months between inspections on the same ROW. Examples of acceptable forms of evidence may include completed and dated work orders, dated invoices, or dated inspection records. (R6)

R7. Each applicable Transmission Owner and applicable Generator Owner shall complete 100% of its annual vegetation work plan of applicable lines to ensure no vegetation encroachments occur within the MVCD. Modifications to the work plan in response to changing conditions or to findings from vegetation inspections may be made (provided they do not allow encroachment of vegetation into the MVCD) and must be documented. The percent completed calculation is based on the number of units actually completed divided by the number of units in the final amended plan (measured in units of choice - circuit, pole line, line miles or kilometers, etc.) Examples of reasons for modification to annual plan may include [*Violation Risk Factor: Medium*] [*Time Horizon: Operations Planning*]:

[14] When the applicable Transmission Owner or applicable Generator Owner is prevented from performing a Vegetation Inspection within the timeframe in R6 due to a natural disaster, the TO or GO is granted a time extension that is equivalent to the duration of the time the TO or GO was prevented from performing the Vegetation Inspection.

- Change in expected growth rate/ environmental factors
- Circumstances that are beyond the control of an applicable Transmission Owner or applicable Generator Owner[15]
- Rescheduling work between growing seasons
- Crew or contractor availability/ Mutual assistance agreements
- Identified unanticipated high priority work
- Weather conditions/Accessibility
- Permitting delays
- Land ownership changes/Change in land use by the landowner
- Emerging technologies

M7. Each applicable Transmission Owner and applicable Generator Owner has evidence that it completed its annual vegetation work plan for its applicable lines. Examples of acceptable forms of evidence may include a copy of the completed annual work plan (as finally modified), dated work orders, dated invoices, or dated inspection records. (R7)

C. Compliance

1. Compliance Monitoring Process

1.1 Compliance Enforcement Authority

The Regional Entity shall serve as the Compliance Enforcement Authority unless the applicable entity is owned, operated, or controlled by the Regional Entity. In such cases the ERO or a Regional entity approved by FERC or other applicable governmental authority shall serve as the CEA.

For NERC, a third-party monitor without vested interest in the outcome for NERC shall serve as the Compliance Enforcement Authority.

1.2 Evidence Retention

The following evidence retention periods identify the period of time an entity is required to retain specific evidence to demonstrate compliance. For instances where the evidence retention period specified below is shorter than the time since the last audit, the Compliance Enforcement Authority may ask an entity to provide other evidence to show that it was compliant for the full time period since the last audit.

The applicable Transmission Owner and applicable Generator Owner retains data or evidence to show compliance with Requirements R1, R2, R3, R5, R6 and R7, Measures M1, M2, M3, M5, M6 and M7 for three calendar years unless directed by its Compliance Enforcement Authority to retain specific evidence for a longer period of time as part of an investigation.

[15] Circumstances that are beyond the control of an applicable Transmission Owner or applicable Generator Owner include but are not limited to natural disasters such as earthquakes, fires, tornados, hurricanes, landslides, ice storms, floods, or major storms as defined either by the TO or GO or an applicable regulatory body.

The applicable Transmission Owner and applicable Generator Owner retains data or evidence to show compliance with Requirement R4, Measure M4 for most recent 12 months of operator logs or most recent 3 months of voice recordings or transcripts of voice recordings, unless directed by its Compliance Enforcement Authority to retain specific evidence for a longer period of time as part of an investigation.

If a applicable Transmission Owner or applicable Generator Owner is found non-compliant, it shall keep information related to the non-compliance until found compliant or for the time period specified above, whichever is longer.

The Compliance Enforcement Authority shall keep the last audit records and all requested and submitted subsequent audit records.

1.3 Compliance Monitoring and Enforcement Processes:

Compliance Audit

Self-Certification

Spot Checking

Compliance Violation Investigation

Self-Reporting

Complaint

Periodic Data Submittal

1.4 Additional Compliance Information

Periodic Data Submittal: The applicable Transmission Owner and applicable Generator Owner will submit a quarterly report to its Regional Entity, or the Regional Entity's designee, identifying all Sustained Outages of applicable lines operated within their Rating and all Rated Electrical Operating Conditions as determined by the applicable Transmission Owner or applicable Generator Owner to have been caused by vegetation, except as excluded in footnote 2, and including as a minimum the following:

- The name of the circuit(s), the date, time and duration of the outage; the voltage of the circuit; a description of the cause of the outage; the category associated with the Sustained Outage; other pertinent comments; and any countermeasures taken by the applicable Transmission Owner or applicable Generator Owner.

A Sustained Outage is to be categorized as one of the following:

- Category 1A — Grow-ins: Sustained Outages caused by vegetation growing into applicable lines, that are identified as an element of an

IROL or Major WECC Transfer Path, by vegetation inside and/or outside of the ROW;

- Category 1B — Grow-ins: Sustained Outages caused by vegetation growing into applicable lines, but are not identified as an element of an IROL or Major WECC Transfer Path, by vegetation inside and/or outside of the ROW;
- Category 2A — Fall-ins: Sustained Outages caused by vegetation falling into applicable lines that are identified as an element of an IROL or Major WECC Transfer Path, from within the ROW;
- Category 2B — Fall-ins: Sustained Outages caused by vegetation falling into applicable lines, but are not identified as an element of an IROL or Major WECC Transfer Path, from within the ROW;
- Category 3 — Fall-ins: Sustained Outages caused by vegetation falling into applicable lines from outside the ROW;
- Category 4A — Blowing together: Sustained Outages caused by vegetation and applicable lines that are identified as an element of an IROL or Major WECC Transfer Path, blowing together from within the ROW.
- Category 4B — Blowing together: Sustained Outages caused by vegetation and applicable lines, but are not identified as an element of an IROL or Major WECC Transfer Path, blowing together from within the ROW.

The Regional Entity will report the outage information provided by applicable Transmission Owners and applicable Generator Owners, as per the above, quarterly to NERC, as well as any actions taken by the Regional Entity as a result of any of the reported Sustained Outages.

Table of Compliance Elements

R#	Time Horizon	VRF	Violation Severity Level			
			Lower	Moderate	High	Severe
R1	Real-time	High			The responsible entity failed to manage vegetation to prevent encroachment into the MVCD of a line identified as an element of an IROL or Major WECC transfer path and encroachment into the MVCD as identified in FAC-003-Table 2 was observed in real time absent a Sustained Outage.	The responsible entity failed to manage vegetation to prevent encroachment into the MVCD of a line identified as an element of an IROL or Major WECC transfer path and a vegetation-related Sustained Outage was caused by one of the following: • A fall-in from inside the active transmission line ROW • Blowing together of applicable lines and vegetation located inside the active transmission line ROW • A grow-in
R2	Real-time	High			The responsible entity failed to manage vegetation to prevent encroachment into the MVCD of a line not identified as an element of an IROL or Major WECC transfer path and encroachment into the MVCD as identified in FAC-003-Table 2 was observed in real time absent a Sustained Outage.	The responsible entity failed to manage vegetation to prevent encroachment into the MVCD of a line not identified as an element of an IROL or Major WECC transfer path and a vegetation-related Sustained Outage was caused by one of the following: • A fall-in from inside the active transmission line

						ROW • Blowing together of applicable lines and vegetation located inside the active transmission line ROW • A grow-in
R3	Long-Term Planning	Lower		The responsible entity has maintenance strategies or documented procedures or processes or specifications but has not accounted for the inter-relationships between vegetation growth rates, vegetation control methods, and inspection frequency, for the responsible entity's applicable lines. (Requirement R3, Part 3.2)	The responsible entity has maintenance strategies or documented procedures or processes or specifications but has not accounted for the movement of transmission line conductors under their Rating and all Rated Electrical Operating Conditions, for the responsible entity's applicable lines. Requirement R3, Part 3.1)	The responsible entity does not have any maintenance strategies or documented procedures or processes or specifications used to prevent the encroachment of vegetation into the MVCD, for the responsible entity's applicable lines.
R4	Real-time	Medium			The responsible entity experienced a confirmed vegetation threat and notified the control center holding switching authority for that applicable line, but there was intentional delay in that notification.	The responsible entity experienced a confirmed vegetation threat and did not notify the control center holding switching authority for that applicable line.
R5	Operations Planning	Medium				The responsible entity did not take corrective action when it was constrained from performing planned vegetation work where an applicable line was put at potential risk.
R6	Operations	Medium	The responsible entity	The responsible entity failed	The responsible entity failed to	The responsible entity failed to

	Planning		failed to inspect 5% or less of its applicable lines (measured in units of choice - circuit, pole line, line miles or kilometers, etc.)	to inspect more than 5% up to and including 10% of its applicable lines (measured in units of choice - circuit, pole line, line miles or kilometers, etc.).	inspect more than 10% up to and including 15% of its applicable lines (measured in units of choice - circuit, pole line, line miles or kilometers, etc.).	inspect more than 15% of its applicable lines (measured in units of choice - circuit, pole line, line miles or kilometers, etc.).
R7	Operations Planning	Medium	The responsible entity failed to complete 5% or less of its annual vegetation work plan for its applicable lines (as finally modified).	The responsible entity failed to complete more than 5% and up to and including 10% of its annual vegetation work plan for its applicable lines (as finally modified).	The responsible entity failed to complete more than 10% and up to and including 15% of its annual vegetation work plan for its applicable lines (as finally modified).	The responsible entity failed to complete more than 15% of its annual vegetation work plan for its applicable lines (as finally modified).

D. Regional Differences
None.

E. Interpretations
None.

F. Associated Documents
Guideline and Technical Basis (attached).

Guideline and Technical Basis

Effective dates:

The first two sentences of the Effective Dates section is standard language used in most NERC standards to cover the general effective date and is sufficient to cover the vast majority of situations. Five special cases are needed to cover effective dates for individual lines which undergo transitions after the general effective date. These special cases cover the effective dates for those lines which are initially becoming subject to the standard, those lines which are changing their applicability within the standard, and those lines which are changing in a manner that removes their applicability to the standard.

Case 1 is needed because the Planning Coordinators may designate lines below 200 kV to become elements of an IROL or Major WECC Transfer Path in a future Planning Year (PY). For example, studies by the Planning Coordinator in 2011 may identify a line to have that designation beginning in PY 2021, ten years after the planning study is performed. It is not intended for the Standard to be immediately applicable to, or in effect for, that line until that future PY begins. The effective date provision for such lines ensures that the line will become subject to the standard on January 1 of the PY specified with an allowance of at least 12 months for the applicable Transmission Owner or applicable Generator Owner to make the necessary preparations to achieve compliance on that line. The table below has some explanatory examples of the application.

Date that Planning Study is completed	PY the line will become an IROL element	Date 1	Date 2	Effective Date The latter of Date 1 or Date 2
05/15/2011	2012	05/15/2012	01/01/2012	05/15/2012
05/15/2011	2013	05/15/2012	01/01/2013	01/01/2013
05/15/2011	2014	05/15/2012	01/01/2014	01/01/2014
05/15/2011	2021	05/15/2012	01/01/2021	01/01/2021

Case 2 is needed because a line operating below 200kV designated as an element of an IROL or Major WECC Transfer Path may be removed from that designation due to system improvements, changes in generation, changes in loads or changes in studies and analysis of the network.

Case 3 is needed because a line operating at 200 kV or above that once was designated as an element of an IROL or Major WECC Transfer Path may be removed from that designation due to system improvements, changes in generation, changes in loads or changes in studies and analysis of the network. Such changes result in the need to apply R1 to that line until that date is reached and then to apply R2 to that line thereafter.

Case 4 is needed because an existing line that is to be operated at 200 kV or above can be acquired by an applicable Transmission Owner or applicable Generator Owner from a third party

such as a Distribution Provider or other end-user who was using the line solely for local distribution purposes, but the applicable Transmission Owner or applicable Generator Owner, upon acquisition, is incorporating the line into the interconnected electrical energy transmission network which will thereafter make the line subject to the standard.

Case 5 is needed because an existing line that is operated below 200 kV can be acquired by an applicable Transmission Owner or applicable Generator Owner from a third party such as a Distribution Provider or other end-user who was using the line solely for local distribution purposes, but the applicable Transmission Owner or applicable Generator Owner, upon acquisition, is incorporating the line into the interconnected electrical energy transmission network. In this special case the line upon acquisition was designated as an element of an Interconnection Reliability Operating Limit (IROL) or an element of a Major WECC Transfer Path.

Defined Terms:

Explanation for revising the definition of ROW:
The current NERC glossary definition of Right of Way has been modified to include Generator Owners and to address the matter set forth in Paragraph 734 of FERC Order 693. The Order pointed out that Transmission Owners may in some cases own more property or rights than are needed to reliably operate transmission lines. This modified definition represents a slight but significant departure from the strict legal definition of "right of way" in that this definition is based on engineering and construction considerations that establish the width of a corridor from a technical basis. The pre-2007 maintenance records are included in the revised definition to allow the use of such vegetation widths if there were no engineering or construction standards that referenced the width of right of way to be maintained for vegetation on a particular line but the evidence exists in maintenance records for a width that was in fact maintained prior to this standard becoming mandatory. Such widths may be the only information available for lines that had limited or no vegetation easement rights and were typically maintained primarily to ensure public safety. This standard does not require additional easement rights to be purchased to satisfy a minimum right of way width that did not exist prior to this standard becoming mandatory.

The Project 2010-07 team further modified that proposed definition to include applicable Generator Owners.

Explanation for revising the definition of Vegetation Inspections:

The current glossary definition of this NERC term is being modified to include Generator Owners and to allow both maintenance inspections and vegetation inspections to be performed concurrently. This allows potential efficiencies, especially for those lines with minimal vegetation and/or slow vegetation growth rates.

The Project 2010-07 team further modified that proposed definition to include applicable Generator Owners.

Explanation of the definition of the MVCD:

The MVCD is a calculated minimum distance that is derived from the Gallet Equations. This is a method of calculating a flash over distance that has been used in the design of high voltage transmission lines. Keeping vegetation away from high voltage conductors by this distance will prevent voltage flash-over to the vegetation. See the explanatory text below for Requirement R3 and associated Figure 1. Table 2 below provides MVCD values for various voltages and altitudes. Details of the equations and an example calculation are provided in Appendix 1 of the Technical Reference Document.

Requirements R1 and R2:
R1 and R2 are performance-based requirements. The reliability objective or outcome to be achieved is the management of vegetation such that there are no vegetation encroachments within a minimum distance of transmission lines. Content-wise, R1 and R2 are the same requirements; however, they apply to different Facilities. Both R1 and R2 require each applicable Transmission Owner or applicable Generator Owner to manage vegetation to prevent encroachment within the MVCD of transmission lines. R1 is applicable to lines that are identified as an element of an IROL or Major WECC Transfer Path. R2 is applicable to all other lines that are not elements of IROLs, and not elements of Major WECC Transfer Paths.

The separation of applicability (between R1 and R2) recognizes that inadequate vegetation management for an applicable line that is an element of an IROL or a Major WECC Transfer Path is a greater risk to the interconnected electric transmission system than applicable lines that are not elements of IROLs or Major WECC Transfer Paths. Applicable lines that are not elements of IROLs or Major WECC Transfer Paths do require effective vegetation management, but these lines are comparatively less operationally significant. As a reflection of this difference in risk impact, the Violation Risk Factors (VRFs) are assigned as High for R1 and High for R2.

Requirements R1 and R2 state that if inadequate vegetation management allows vegetation to encroach within the MVCD distance as shown in Table 2, it is a violation of the standard. Table 2 distances are the minimum clearances that will prevent spark-over based on the Gallet equations as described more fully in the Technical Reference document.

These requirements assume that transmission lines and their conductors are operating within their Rating. If a line conductor is intentionally or inadvertently operated beyond its Rating and Rated Electrical Operating Condition (potentially in violation of other standards), the occurrence of a clearance encroachment may occur solely due to that condition. For example, emergency actions taken by an applicable Transmission Owner or applicable Generator Owner or Reliability Coordinator to protect an Interconnection may cause excessive sagging and an outage. Another example would be ice loading beyond the line's Rating and Rated Electrical Operating Condition. Such vegetation-related encroachments and outages are not violations of this standard.

Evidence of failures to adequately manage vegetation include real-time observation of a vegetation encroachment into the MVCD (absent a Sustained Outage), or a vegetation-related encroachment resulting in a Sustained Outage due to a fall-in from inside the ROW, or a vegetation-related encroachment resulting in a Sustained Outage due to the blowing together of

the lines and vegetation located inside the ROW, or a vegetation-related encroachment resulting in a Sustained Outage due to a grow-in. Faults which do not cause a Sustained outage and which are confirmed to have been caused by vegetation encroachment within the MVCD are considered the equivalent of a Real-time observation for violation severity levels.

With this approach, the VSLs for R1 and R2 are structured such that they directly correlate to the severity of a failure of an applicable Transmission Owner or applicable Generator Owner to manage vegetation and to the corresponding performance level of the Transmission Owner's vegetation program's ability to meet the objective of "preventing the risk of those vegetation related outages that could lead to Cascading." Thus violation severity increases with an applicable Transmission Owner's or applicable Generator Owner's inability to meet this goal and its potential of leading to a Cascading event. The additional benefits of such a combination are that it simplifies the standard and clearly defines performance for compliance. A performance-based requirement of this nature will promote high quality, cost effective vegetation management programs that will deliver the overall end result of improved reliability to the system.

Multiple Sustained Outages on an individual line can be caused by the same vegetation. For example initial investigations and corrective actions may not identify and remove the actual outage cause then another outage occurs after the line is re-energized and previous high conductor temperatures return. Such events are considered to be a single vegetation-related Sustained Outage under the standard where the Sustained Outages occur within a 24 hour period.

The MVCD is a calculated minimum distance stated in feet (or meters) to prevent spark-over, for various altitudes and operating voltages that is used in the design of Transmission Facilities. Keeping vegetation from entering this space will prevent transmission outages.

If the applicable Transmission Owner or applicable Generator Owner has applicable lines operated at nominal voltage levels not listed in Table 2, then the applicable TO or applicable GO should use the next largest clearance distance based on the next highest nominal voltage in the table to determine an acceptable distance.

Requirement R3:
R3 is a competency based requirement concerned with the maintenance strategies, procedures, processes, or specifications, an applicable Transmission Owner or applicable Generator Owner uses for vegetation management.

An adequate transmission vegetation management program formally establishes the approach the applicable Transmission Owner or applicable Generator Owner uses to plan and perform vegetation work to prevent transmission Sustained Outages and minimize risk to the transmission system. The approach provides the basis for evaluating the intent, allocation of appropriate resources, and the competency of the applicable Transmission Owner or applicable Generator Owner in managing vegetation. There are many acceptable approaches to manage vegetation and avoid Sustained Outages. However, the applicable Transmission Owner or applicable Generator Owner must be able to show the documentation of its approach and how it conducts work to maintain clearances.

An example of one approach commonly used by industry is ANSI Standard A300, part 7. However, regardless of the approach a utility uses to manage vegetation, any approach an

applicable Transmission Owner or applicable Generator Owner chooses to use will generally contain the following elements:

1. *the maintenance strategy used (such as minimum vegetation-to-conductor distance or maximum vegetation height) to ensure that MVCD clearances are never violated.*
2. *the work methods that the applicable Transmission Owner or applicable Generator Owner uses to control vegetation*
3. *a stated Vegetation Inspection frequency*
4. *an annual work plan*

The conductor's position in space at any point in time is continuously changing in reaction to a number of different loading variables. Changes in vertical and horizontal conductor positioning are the result of thermal and physical loads applied to the line. Thermal loading is a function of line current and the combination of numerous variables influencing ambient heat dissipation including wind velocity/direction, ambient air temperature and precipitation. Physical loading applied to the conductor affects sag and sway by combining physical factors such as ice and wind loading. The movement of the transmission line conductor and the MVCD is illustrated in Figure 1 below. In the Technical Reference document more figures and explanations of conductor dynamics are provided.

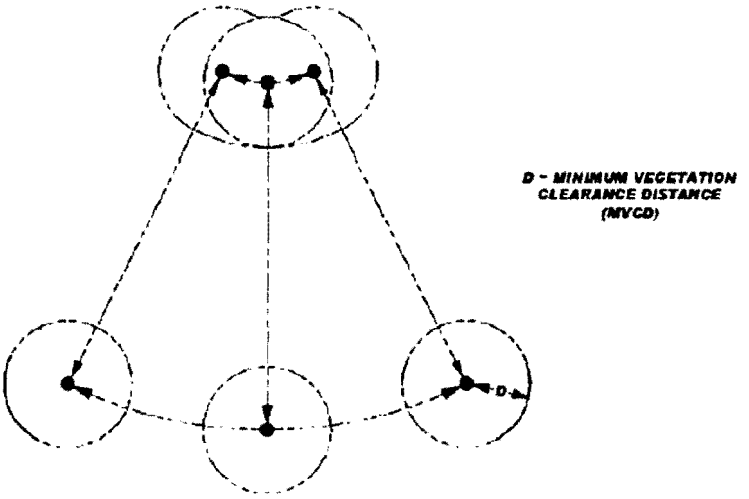

Figure 1

A cross-section view of a single conductor at a given point along the span is shown with six possible conductor positions due to movement resulting from thermal and mechanical loading.

Requirement R4:

R4 is a risk-based requirement. It focuses on preventative actions to be taken by the applicable Transmission Owner or applicable Generator Owner for the mitigation of Fault risk when a vegetation threat is confirmed. R4 involves the notification of potentially threatening vegetation conditions, without any intentional delay, to the control center holding switching authority for that specific transmission line. Examples of acceptable unintentional delays may include

communication system problems (for example, cellular service or two-way radio disabled), crews located in remote field locations with no communication access, delays due to severe weather, etc.

Confirmation is key that a threat actually exists due to vegetation. This confirmation could be in the form of an applicable Transmission Owner or applicable Generator Owner employee who personally identifies such a threat in the field. Confirmation could also be made by sending out an employee to evaluate a situation reported by a landowner.

Vegetation-related conditions that warrant a response include vegetation that is near or encroaching into the MVCD (a grow-in issue) or vegetation that could fall into the transmission conductor (a fall-in issue). A knowledgeable verification of the risk would include an assessment of the possible sag or movement of the conductor while operating between no-load conditions and its rating.

The applicable Transmission Owner or applicable Generator Owner has the responsibility to ensure the proper communication between field personnel and the control center to allow the control center to take the appropriate action until or as the vegetation threat is relieved. Appropriate actions may include a temporary reduction in the line loading, switching the line out of service, or other preparatory actions in recognition of the increased risk of outage on that circuit. The notification of the threat should be communicated in terms of minutes or hours as opposed to a longer time frame for corrective action plans (see R5).

All potential grow-in or fall-in vegetation-related conditions will not necessarily cause a Fault at any moment. For example, some applicable Transmission Owners or applicable Generator Owners may have a danger tree identification program that identifies trees for removal with the potential to fall near the line. These trees would not require notification to the control center unless they pose an immediate fall-in threat.

Requirement R5:
R5 is a risk-based requirement. It focuses upon preventative actions to be taken by the applicable Transmission Owner or applicable Generator Owner for the mitigation of Sustained Outage risk when temporarily constrained from performing vegetation maintenance. The intent of this requirement is to deal with situations that prevent the applicable Transmission Owner or applicable Generator Owner from performing planned vegetation management work and, as a result, have the potential to put the transmission line at risk. Constraints to performing vegetation maintenance work as planned could result from legal injunctions filed by property owners, the discovery of easement stipulations which limit the applicable Transmission Owner's or applicable Generator Owner's rights, or other circumstances.

This requirement is not intended to address situations where the transmission line is not at potential risk and the work event can be rescheduled or re-planned using an alternate work methodology. For example, a land owner may prevent the planned use of chemicals on non-threatening, low growth vegetation but agree to the use of mechanical clearing. In this case the applicable Transmission Owner or applicable Generator Owner is not under any immediate time

constraint for achieving the management objective, can easily reschedule work using an alternate approach, and therefore does not need to take interim corrective action.

However, in situations where transmission line reliability is potentially at risk due to a constraint, the applicable Transmission Owner or applicable Generator Owner is required to take an interim corrective action to mitigate the potential risk to the transmission line. A wide range of actions can be taken to address various situations. General considerations include:

- Identifying locations where the applicable Transmission Owner or applicable Generator Owner is constrained from performing planned vegetation maintenance work which potentially leaves the transmission line at risk.
- Developing the specific action to mitigate any potential risk associated with not performing the vegetation maintenance work as planned.
- Documenting and tracking the specific action taken for the location.
- In developing the specific action to mitigate the potential risk to the transmission line the applicable Transmission Owner or applicable Generator Owner could consider location specific measures such as modifying the inspection and/or maintenance intervals. Where a legal constraint would not allow any vegetation work, the interim corrective action could include limiting the loading on the transmission line.
- The applicable Transmission Owner or applicable Generator Owner should document and track the specific corrective action taken at each location. This location may be indicated as one span, one tree or a combination of spans on one property where the constraint is considered to be temporary.

Requirement R6:
R6 is a risk-based requirement. This requirement sets a minimum time period for completing Vegetation Inspections. The provision that Vegetation Inspections can be performed in conjunction with general line inspections facilitates a Transmission Owner's ability to meet this requirement. However, the applicable Transmission Owner or applicable Generator Owner may determine that more frequent vegetation specific inspections are needed to maintain reliability levels, based on factors such as anticipated growth rates of the local vegetation, length of the local growing season, limited ROW width, and local rainfall. Therefore it is expected that some transmission lines may be designated with a higher frequency of inspections.

The VSLs for Requirement R6 have levels ranked by the failure to inspect a percentage of the applicable lines to be inspected. To calculate the appropriate VSL the applicable Transmission Owner or applicable Generator Owner may choose units such as: circuit, pole line, line miles or kilometers, etc.

For example, when an applicable Transmission Owner or applicable Generator Owner operates 2,000 miles of applicable transmission lines this applicable Transmission Owner or applicable Generator Owner will be responsible for inspecting all the 2,000 miles of lines at least once during the calendar year. If one of the included lines was 100 miles long, and if it was not inspected during the year, then the amount failed to inspect would be 100/2000 = 0.05 or 5%. The "Low VSL" for R6 would apply in this example.

Requirement R7:
R7 is a risk-based requirement. The applicable Transmission Owner or applicable Generator Owner is required to complete its an annual work plan for vegetation management to accomplish the purpose of this standard. Modifications to the work plan in response to changing conditions or to findings from vegetation inspections may be made and documented provided they do not put the transmission system at risk. The annual work plan requirement is not intended to necessarily require a "span-by-span", or even a "line-by-line" detailed description of all work to be performed. It is only intended to require that the applicable Transmission Owner or applicable Generator Owner provide evidence of annual planning and execution of a vegetation management maintenance approach which successfully prevents encroachment of vegetation into the MVCD.

For example, when an applicable Transmission Owner or applicable Generator Owner identifies 1,000 miles of applicable transmission lines to be completed in the applicable Transmission Owner's or applicable Generator Owner's annual plan, the applicable Transmission Owner or applicable Generator Owner will be responsible completing those identified miles. If a applicable Transmission Owner or applicable Generator Owner makes a modification to the annual plan that does not put the transmission system at risk of an encroachment the annual plan may be modified. If 100 miles of the annual plan is deferred until next year the calculation to determine what percentage was completed for the current year would be: 1000 – 100 (deferred miles) = 900 modified annual plan, or 900 / 900 = 100% completed annual miles. If an applicable Transmission Owner or applicable Generator Owner only completed 875 of the total 1000 miles with no acceptable documentation for modification of the annual plan the calculation for failure to complete the annual plan would be: 1000 – 875 = 125 miles failed to complete then. 125 miles (not completed) / 1000 total annual plan miles = 12.5% failed to complete.

The ability to modify the work plan allows the applicable Transmission Owner or applicable Generator Owner to change priorities or treatment methodologies during the year as conditions or situations dictate. For example recent line inspections may identify unanticipated high priority work, weather conditions (drought) could make herbicide application ineffective during the plan year, or a major storm could require redirecting local resources away from planned maintenance. This situation may also include complying with mutual assistance agreements by moving resources off the applicable Transmission Owner's or applicable Generator Owner's system to work on another system. Any of these examples could result in acceptable deferrals or additions to the annual work plan provided that they do not put the transmission system at risk of a vegetation encroachment.

In general, the vegetation management maintenance approach should use the full extent of the applicable Transmission Owner's or applicable Generator Owner's easement, fee simple and other legal rights allowed. A comprehensive approach that exercises the full extent of legal rights on the ROW is superior to incremental management because in the long term it reduces the overall potential for encroachments, and it ensures that future planned work and future planned inspection cycles are sufficient.

When developing the annual work plan the applicable Transmission Owner or applicable Generator Owner should allow time for procedural requirements to obtain permits to work on federal, state, provincial, public, tribal lands. In some cases the lead time for obtaining permits may necessitate preparing work plans more than a year prior to work start dates. Applicable Transmission Owners or applicable Generator Owners may also need to consider those special landowner requirements as documented in easement instruments.

This requirement sets the expectation that the work identified in the annual work plan will be completed as planned. Therefore, deferrals or relevant changes to the annual plan shall be documented. Depending on the planning and documentation format used by the applicable Transmission Owner or applicable Generator Owner, evidence of successful annual work plan execution could consist of signed-off work orders, signed contracts, printouts from work management systems, spreadsheets of planned versus completed work, timesheets, work inspection reports, or paid invoices. Other evidence may include photographs, and walk-through reports.

FAC-003 — TABLE 2 — Minimum Vegetation Clearance Distances (MVCD)[16] For Alternating Current Voltages (feet)

(AC) Nominal System Voltage (kV)	(AC) Maximum System Voltage (kV)[17]	MVCD (feet) Over sea level up to 500 ft	MVCD (feet) Over 500 ft up to 1000 ft	MVCD feet Over 1000 ft up to 2000 ft	MVCD feet Over 2000 ft up to 3000 ft	MVCD feet Over 3000 ft up to 4000 ft	MVCD feet Over 4000 ft up to 5000 ft	MVCD feet Over 5000 ft up to 6000 ft	MVCD feet Over 6000 ft up to 7000 ft	MVCD feet Over 7000 ft up to 8000 ft	MVCD feet Over 8000 ft up to 9000 ft	MVCD feet Over 9000 ft up to 10000 ft	MVCD feet Over 10000 ft up to 11000 ft
765	800	8.2ft	8.33ft	8.61ft	8.89ft	9.17ft	9.45ft	9.73ft	10.01ft	10.29ft	10.57ft	10.85ft	11.13ft
500	550	5.15ft	5.25ft	5.45ft	5.66ft	5.86ft	6.07ft	6.28ft	6.49ft	6.7ft	6.92ft	7.13ft	7.35ft
345	362	3.19ft	3.26ft	3.39ft	3.53ft	3.67ft	3.82ft	3.97ft	4.12ft	4.27ft	4.43ft	4.58ft	4.74ft
287	302	3.88ft	3.96ft	4.12ft	4.29ft	4.45ft	4.62ft	4.79ft	4.97ft	5.14ft	5.32ft	5.50ft	5.68ft
230	242	3.03ft	3.09ft	3.22ft	3.36ft	3.49ft	3.63ft	3.78ft	3.92ft	4.07ft	4.22ft	4.37ft	4.53ft
161*	169	2.05ft	2.09ft	2.19ft	2.28ft	2.38ft	2.48ft	2.58ft	2.69ft	2.8ft	2.91ft	3.03ft	3.14ft
138*	145	1.74ft	1.78ft	1.86ft	1.94ft	2.03ft	2.12ft	2.21ft	2.3ft	2.4ft	2.49ft	2.59ft	2.7ft
115*	121	1.44ft	1.47ft	1.54ft	1.61ft	1.68ft	1.75ft	1.83ft	1.91ft	1.99ft	2.07ft	2.16ft	2.25ft
88*	100	1.18ft	1.21ft	1.26ft	1.32ft	1.38ft	1.44ft	1.5ft	1.57ft	1.64ft	1.71ft	1.78ft	1.86ft
69*	72	0.84ft	0.86ft	0.90ft	0.94ft	0.99ft	1.03ft	1.08ft	1.13ft	1.18ft	1.23ft	1.28ft	1.34ft

* Such lines are applicable to this standard only if PC has determined such per FAC-014 (refer to the Applicability Section above)

[16] The distances in this Table are the minimums required to prevent Flash-over; however prudent vegetation maintenance practices dictate that substantially greater distances will be achieved at time of vegetation maintenance.

[17] Where applicable lines are operated at nominal voltages other than those listed, the applicable Transmission Owner or applicable Generator Owner should use the maximum system voltage to determine the appropriate clearance for that line.

TABLE 2 (CONT) — Minimum Vegetation Clearance Distances (MVCD)[7]
For Alternating Current Voltages (meters)

(AC) Nominal System Voltage (KV)	(AC) Maximum System Voltage (kV)[8]	MVCD meters Over sea level up to 152.4 m	MVCD meters Over 152.4 m up to 304.8 m	MVCD meters Over 304.8 m up to 609.6m	MVCD meters Over 609.6m up to 914.4m	MVCD meters Over 914.4m up to 1219.2m	MVCD meters Over 1219.2m up to 1524m	MVCD meters Over 1524 m up to 1828.8 m	MVCD meters Over 1828.8m up to 2133.6m	MVCD meters Over 2133.6m up to 2438.4m	MVCD meters Over 2438.4m up to 2743.2m	MVCD meters Over 2743.2m up to 3048m	MVCD meters Over 3048m up to 3352.8m
765	800	2.49m	2.54m	2.62m	2.71m	2.80m	2.88m	2.97m	3.05m	3.14m	3.22m	3.31m	3.39m
500	550	1.57m	1.6m	1.66m	1.73m	1.79m	1.85m	1.91m	1.98m	2.04m	2.11m	2.17m	2.24m
345	362	0.97m	0.99m	1.03m	1.08m	1.12m	1.16m	1.21m	1.26m	1.30m	1.35m	1.40m	1.44m
287	302	1.18m	0.88m	1.26m	1.31m	1.36m	1.41m	1.46m	1.51m	1.57m	1.62m	1.68m	1.73m
230	242	0.92m	0.94m	0.98m	1.02m	1.06m	1.11m	1.15m	1.19m	1.24m	1.29m	1.33m	1.38m
161*	169	0.62m	0.64m	0.67m	0.69m	0.73m	0.76m	0.79m	0.82m	0.85m	0.89m	0.92m	0.96m
138*	145	0.53m	0.54m	0.57m	0.59m	0.62m	0.65m	0.67m	0.70m	0.73m	0.76m	0.79m	0.82m
115*	121	0.44m	0.45m	0.47m	0.49m	0.51m	0.53m	0.56m	0.58m	0.61m	0.63m	0.66m	0.69m
88*	100	0.36m	0.37m	0.38m	0.40m	0.42m	0.44m	0.46m	0.48m	0.50m	0.52m	0.54m	0.57m
69*	72	0.26m	0.26m	0.27m	0.29m	0.30m	0.31m	0.33m	0.34m	0.36m	0.37m	0.39m	0.41m

* Such lines are applicable to this standard only if PC has determined such per FAC-014 (refer to the Applicability Section above)

TABLE 2 (CONT) — Minimum Vegetation Clearance Distances (MVCD)[7]
For Direct Current Voltages feet (meters)

(DC) Nominal Pole to Ground Voltage (kV)	MVCD meters Over sea level up to 500 ft (Over sea level up to 152.4 m)	MVCD meters Over 500 ft up to 1000 ft (Over 152.4 m up to 304.8 m	MVCD meters Over 1000 ft up to 2000 ft (Over 304.8 m up to 609.6m)	MVCD meters Over 2000 ft up to 3000 ft (Over 609.6m up to 914.4m	MVCD meters Over 3000 ft up to 4000 ft (Over 914.4m up to 1219.2m	MVCD meters Over 4000 ft up to 5000 ft (Over 1219.2m up to 1524m	MVCD meters Over 5000 ft up to 6000 ft (Over 1524 m up to 1828.8 m)	MVCD meters Over 6000 ft up to 7000 ft (Over 1828.8m up to 2133.6m)	MVCD meters Over 7000 ft up to 8000 ft (Over 2133.6m up to 2438.4m)	MVCD meters Over 8000 ft up to 9000 ft (Over 2438.4m up to 2743.2m)	MVCD meters Over 9000 ft up to 10000 ft (Over 2743.2m up to 3048m)	MVCD meters Over 10000 ft up to 11000 ft (Over 3048m up to 3352.8m)
±750	14.12ft (4.30m)	14.31ft (4.36m)	14.70ft (4.48m)	15.07ft (4.59m)	15.45ft (4.71m)	15.82ft (4.82m)	16.2ft (4.94m)	16.55ft (5.04m)	16.91ft (5.15m)	17.27ft (5.26m)	17.62ft (5.37m)	17.97ft (5.48m)
±600	10.23ft (3.12m)	10.39ft (3.17m)	10.74ft (3.26m)	11.04ft (3.36m)	11.35ft (3.46m)	11.66ft (3.55m)	11.98ft (3.65m)	12.3ft (3.75m)	12.62ft (3.85m)	12.92ft (3.94m)	13.24ft (4.04m)	13.54ft (4.13m)
±500	8.03ft (2.45m)	8.16ft (2.49m)	8.44ft (2.57m)	8.71ft (2.65m)	8.99ft (2.74m)	9.25ft (2.82m)	9.55ft (2.91m)	9.82ft (2.99m)	10.1ft (3.08m)	10.38ft (3.16m)	10.65ft (3.25m)	10.92ft (3.33m)
±400	6.07ft (1.85m)	6.18ft (1.88m)	6.41ft (1.95m)	6.63ft (2.02m)	6.86ft (2.09m)	7.09ft (2.16m)	7.33ft (2.23m)	7.56ft (2.30m)	7.80ft (2.38m)	8.03ft (2.45m)	8.27ft (2.52m)	8.51ft (2.59m)
±250	3.50ft (1.07m)	3.57ft (1.09m)	3.72ft (1.13m)	3.87ft (1.18m)	4.02ft (1.23m)	4.18ft (1.27m)	4.34ft (1.32m)	4.5ft (1.37m)	4.66ft (1.42m)	4.83ft (1.47m)	5.00ft (1.52m)	5.17ft (1.58m)

Notes:

The SDT determined that the use of IEEE 516-2003 in version 1 of FAC-003 was a misapplication. The SDT consulted specialists who advised that the Gallet Equation would be a technically justified method. The explanation of why the Gallet approach is more appropriate is explained in the paragraphs below.

The drafting team sought a method of establishing minimum clearance distances that uses realistic weather conditions and realistic maximum transient over-voltages factors for in-service transmission lines.

The SDT considered several factors when looking at changes to the minimum vegetation to conductor distances in FAC-003-1:

- avoid the problem associated with referring to tables in another standard (IEEE-516-2003)
- transmission lines operate in non-laboratory environments (wet conditions)
- transient over-voltage factors are lower for in-service transmission lines than for inadvertently re-energized transmission lines with trapped charges.

FAC-003-1 uses the minimum air insulation distance (MAID) without tools formula provided in IEEE 516-2003 to determine the minimum distance between a transmission line conductor and vegetation. The equations and methods provided in IEEE 516 were developed by an IEEE Task Force in 1968 from test data provided by thirteen independent laboratories. The distances provided in IEEE 516 Tables 5 and 7 are based on the withstand voltage of a dry rod-rod air gap. or in other words. dry laboratory conditions. Consequently. the validity of using these distances in an outside environment application has been questioned.

FAC-003-01 allowed Transmission Owners to use either Table 5 or Table 7 to establish the minimum clearance distances. Table 7 could be used if the Transmission Owner knew the maximum transient over-voltage factor for its system. Otherwise. Table 5 would have to be used. Table 5 represented minimum air insulation distances under the worst possible case for transient over-voltage factors. These worst case transient over-voltage factors were as follows: 3.5 for voltages up to 362 kV phase to phase: 3.0 for 500 - 550 kV phase to phase: and 2.5 for 765 to 800 kV phase to phase. These worst case over-voltage factors were also a cause for concern in this particular application of the distances.

In general. the worst case transient over-voltages occur on a transmission line that is inadvertently re-energized immediately after the line is de-energized and a trapped charge is still present. The intent of FAC-003 is to keep a transmission line that is *in service* from becoming de-energized (i.e. tripped out) due to spark-over from the line conductor to nearby vegetation. Thus. the worst case transient overvoltage assumptions are not appropriate for this application. Rather. the appropriate over voltage values are those that occur only while the line is energized.

Typical values of transient over-voltages of in-service lines. as such. are not readily available in the literature because they are negligible compared with the maximums. A conservative value for the maximum transient over-voltage that can occur anywhere along the length of an in-

service ac line is approximately 2.0 per unit. This value is a conservative estimate of the transient over-voltage that is created at the point of application (e.g. a substation) by switching a capacitor bank without pre-insertion devices (e.g. closing resistors). At voltage levels where capacitor banks are not very common (e.g. Maximum System Voltage of 362 kV), the maximum transient over-voltage of an in-service ac line are created by fault initiation on adjacent ac lines and shunt reactor bank switching. These transient voltages are usually 1.5 per unit or less.

Even though these transient over-voltages will not be experienced at locations remote from the bus at which they are created, in order to be conservative, it is assumed that all nearby ac lines are subjected to this same level of over-voltage. Thus, a maximum transient over-voltage factor of 2.0 per unit for transmission lines operated at 302 kV and below is considered to be a realistic maximum in this application. Likewise, for ac transmission lines operated at Maximum System Voltages of 362 kV and above a transient over-voltage factor of 1.4 per unit is considered a realistic maximum.

The Gallet Equations are an accepted method for insulation coordination in tower design. These equations are used for computing the required strike distances for proper transmission line insulation coordination. They were developed for both wet and dry applications and can be used with any value of transient over-voltage factor. The Gallet Equation also can take into account various air gap geometries. This approach was used to design the first 500 kV and 765 kV lines in North America.

If one compares the MAID using the IEEE 516-2003 Table 7 (table D.5 for English values) with the critical spark-over distances computed using the Gallet wet equations, for each of the nominal voltage classes and identical transient over-voltage factors, the Gallet equations yield a more conservative (larger) minimum distance value.

Distances calculated from either the IEEE 516 (dry) formulas or the Gallet "wet" formulas are not vastly different when the same transient overvoltage factors are used; the "wet" equations will consistently produce slightly larger distances than the IEEE 516 equations when the same transient overvoltage is used. While the IEEE 516 equations were only developed for dry conditions the Gallet equations have provisions to calculate spark-over distances for both wet and dry conditions.

While EPRI is currently trying to establish empirical data for spark-over distances to live vegetation, there are no spark-over formulas currently derived expressly for vegetation to conductor minimum distances. Therefore the SDT chose a proven method that has been used in other EHV applications. The Gallet equations relevance to wet conditions and the selection of a Transient Overvoltage Factor that is consistent with the absence of trapped charges on an in-service transmission line make this methodology a better choice.
The following table is an example of the comparison of distances derived from IEEE 516 and the Gallet equations.

Comparison of spark-over distances computed using Gallet wet equations vs. IEEE 516-2003 MAID distances

(AC) Nom System Voltage (kV)	(AC) Max System Voltage (kV)	Transient Over-voltage Factor (T)	Clearance (ft.) Gallet (wet) @ Alt. 3000 feet	Table 7 (Table D.5 for feet) IEEE 516-2003 MAID (ft) @ Alt. 3000 feet
765	800	2.0	14.36	13.95
500	550	2.4	11.0	10.07
345	362	3.0	8.55	7.47
230	242	3.0	5.28	4.2
115	121	3.0	2.46	2.1

Rationale:

During development of this standard, text boxes were embedded within the standard to explain the rationale for various parts of the standard. Upon BOT approval, the text from the rationale text boxes was moved to this section.

Rationale for Applicability (section 4.2.4):
The areas excluded in 4.2.4 were excluded based on comments from industry for reasons summarized as follows: 1) There is a very low risk from vegetation in this area. Based on an informal survey, no TOs reported such an event. 2) Substations, switchyards, and stations have many inspection and maintenance activities that are necessary for reliability. Those existing process manage the threat. As such, the formal steps in this standard are not well suited for this environment. 3) Specifically addressing the areas where the standard does and does not apply makes the standard clearer.

Rationale for Applicability (section 4.3):
Within the text of NERC Reliability Standard FAC-003-3, "transmission line(s) and "applicable line(s) can also refer to the generation Facilities as referenced in 4.3 and its subsections.

Rationale for R1 and R2:
Lines with the highest significance to reliability are covered in R1; all other lines are covered in R2.

Rationale for the types of failure to manage vegetation which are listed in order of increasing degrees of severity in non-compliant performance as it relates to a failure of an applicable Transmission Owner's or applicable Generator Owner's vegetation maintenance program:

1. This management failure is found by routine inspection or Fault event investigation, and is normally symptomatic of unusual conditions in an otherwise sound program.

2. This management failure occurs when the height and location of a side tree within the ROW is not adequately addressed by the program.

3. This management failure occurs when side growth is not adequately addressed and may be indicative of an unsound program.

4. This management failure is usually indicative of a program that is not addressing the most fundamental dynamic of vegetation management, (i.e. a grow-in under the line). If this type of failure is pervasive on multiple lines, it provides a mechanism for a Cascade.

Rationale for R3:
The documentation provides a basis for evaluating the competency of the applicable Transmission Owner's or applicable Generator Owner's vegetation program. There may be many acceptable approaches to maintain clearances. Any approach must demonstrate that the applicable Transmission Owner or applicable Generator Owner avoids vegetation-to-wire conflicts under all Ratings and all Rated Electrical Operating Conditions. See Figure

Rationale for R4:
This is to ensure expeditious communication between the applicable Transmission Owner or applicable Generator Owner and the control center when a critical situation is confirmed.

Rationale for R5:
Legal actions and other events may occur which result in constraints that prevent the applicable Transmission Owner or applicable Generator Owner from performing planned vegetation maintenance work.
In cases where the transmission line is put at potential risk due to constraints, the intent is for the applicable Transmission Owner and applicable Generator Owner to put interim measures in place, rather than do nothing.
The corrective action process is not intended to address situations where a planned work methodology cannot be performed but an alternate work methodology can be used.

Rationale for R6:
Inspections are used by applicable Transmission Owners and applicable Generator Owners to assess the condition of the entire ROW. The information from the assessment can be used to determine risk, determine future work and evaluate recently-completed work. This requirement sets a minimum Vegetation Inspection frequency of once per calendar year but with no more than 18 months between inspections on the same ROW. Based upon average growth rates across North America and on common utility practice, this minimum frequency is reasonable. Transmission Owners should consider local and environmental factors that could warrant more frequent inspections.

Rationale for R7:
This requirement sets the expectation that the work identified in the annual work plan will be completed as planned. It allows modifications to the planned work for changing conditions, taking into consideration anticipated growth of vegetation and all other environmental factors, provided that those modifications do not put the transmission system at risk of a vegetation encroachment.

Version History

Version	Date	Action	Change Tracking
3	September 29, 2011	Using the latest draft of FAC-003-2 from the Project 2007-07 SDT, modified proposed definitions and Applicability to include Generator Owners of a certain length.	Revision under Project 2010-07
3	May 9, 2012	Adopted by Board of Trustees	
3	September 19, 2013	A FERC order was issued on September 19, 2013, approving FAC-003-3. This standard becomes enforceable on July 1, 2014 for Transmission Owners. For Generator Owners, R3 becomes enforceable on January 1, 2015 and all other requirements (R1, R2, R4, R5, R6, and R7) will become enforceable on January 1, 2016.	
3	November 22, 2013	Updated the VRF for R2 from "Medium" to "High" per a Final Rule issued by FERC.	

Appendix 14 – Master Schedule for Electric Transmission

Central Hudson Transmission Right-of-Way Program
Master Schedule

Year	District	Line #	Name	Voltage	Line Miles	ROW Acres
			Non-Designated Transmission Facilities			
2014	**Fishkill**	**A**	**Fishkill Plains to Todd Hill**	**115**	**5.28**	**105.9**
	Poughkeepsie	MC	Manchester to Knapps Corners	115	4.97	65.41
	Poughkeepsie	**M**	**Manchester to Pleasant Valley**	**115**	**5.47**	**80.21**
	Poughkeepsie	C	Pleasant Valley - Todd Hill	115	5.6	104.84
	Poughkeepsie	**G**	**Knapps Corners - LaGrangeville**	**69**	**7.67**	**65.91**
	Poughkeepsie	G	LaGrangeville - Tinkertown	69	7.38	90.02
	Poughkeepsie	**G**	**Tap - Fishkill Plains**	**69**	**1.62**	**19.76**
	Poughkeepsie	G	Tinkertown - Pleasant Valley	69	4.13	50.46
	Poughkeepsie	**E**	**Stanfordville to Smithfield**	**69**	**7.62**	**139.45**
	Poughkeepsie	E	Pleasant Valley to Hibernia	69	6.61	121.06
	Poughkeepsie	**E**	**Hibernia - Stanfordville**	**69**	**4.15**	**75.9**
	Poughkeepsie	S	Smithfield - Pulvers Corners	69	5.56	39.36
	Poughkeepsie	**GE**	**Smithfield to Millerton**	**69**	**4.78**	**43.79**
	Poughkeepsie	GE	Millerton to Pulvers Corners	69	4.81	38.19
	Poughkeepsie	**Q**	**East Park to Staatsburg**	**69**	**4.34**	**52.97**
	Poughkeepsie	Q	Van Wagner - Pleasant Valley	69	1.98	36.3
	Poughkeepsie	**Q**	**Staatsburg to Rhinebeck**	**69**	**7.76**	**94.65**
	Poughkeepsie	Q	Van Wagner - East Park	69	6.37	105.87
	Poughkeepsie	**X**	**Van Wagner - Pleasant Valley**	**115**	**1.98**	**36.3**
	Poughkeepsie	X	Reynolds Hill - Inwood	115	1.96	18.01
	Poughkeepsie	**X**	**Inwood - Van Wagner**	**115**	**2.94**	**35.88**
	Poughkeepsie	MR	Milan to Rhinebeck	115	6.77	86.23
	Poughkeepsie	**HR**	**Highland to Reynolds Hill**	**115**	**0.9**	**10.95**
	Poughkeepsie	FV*	Smithfield to Conn. State Line	69	4.99	84.95
	Poughkeepsie	**LR**	**East Terminal to Rhinebeck**	**115**	**2.21**	**37**
	Cycle Year 1			**Totals**	**117.85**	**1639.37**

* FERC and NERC Designated Transmission Facility

Central Hudson Transmission Right-of-Way Program

Master Schedule

2015	Kingston	HP	Hurley Avenue to Lincoln Park	115	5.61	68.51
	Kingston	SB	Hurley Avenue - Saugerties	69	11.33	207.41
	Kingston	H	Saugerties - North Catskill	69	12.36	221.76
	Catskill	CL	Catskill to Laurenceville	69	6.59	86.65
	Catskill	CL	Lawrenceville to S Cairo	69	5.06	62.67
	Kingston	HK	Accord to Kerhonkson	69	3.88	47.36
	Kingston	HK	High Falls - Accord	69	6.22	75.97
	Kingston	P	Sturgeon Pool to High Falls	69	5.69	69.4
	Kingston	HK	Kerhonkson to Honk Falls	69	5.23	95.74
	Kingston	MK	Modena to Galeville	69	5.49	67.02
	Kingston	MK(HK)	Kerhonkson to Honk Falls	69	0	0
	Kingston	MK	Galeville to Kerhonkson	69	9.08	110.83
	Newburgh	PX	Ohioville - Modena	115	7.45	90.93
	Kingston	I	Hurley Ave to Boulevard	69	3.84	33.93
	Kingston	OR	Ohioville to Hurley Ave.	115	14.78	208.23
	Kingston	OR	Highland to Ohioville	115	5.63	65.2
	Kingston	N(OB)	N Sturgeon Pool to Boulevard	69	0	0
	Kingston	O(OB)	Ohioville to Sturgeon Pool	69	0	0
	Kingston	OB	Ohioville to Boulevard	69	12.48	146.36
	Kingston	OB	Dashville - Tap	69	0.31	3.82
	Cycle Year 2					
				Totals	121.03	1661.79

2016	**Kingston**	**LR**	**Lincoln Park to East Kingston**	**115**	**2.08**	**25.33**
	Kingston	LR	E Kingston to West Terminal	115	1.27	16.5
	Kingston	**SR**	**Saugerties to Woodstock**	**69**	**8.43**	**102.35**
	Kingston	HG	Grahamsville - Neversink	69	2.53	34.32
	Kingston	**HG**	**Honk Falls - NYBWS**	**69**	**1.86**	**19.98**
	Kingston	HG	NYBWS - Grahamsville	69	12.4	134.72
	Kingston	**GM**	**Greenfield to Clinton Ave**	**69**	**2.65**	**18.25**
	Kingston	GM	Tap - Honk Falls	69	1.69	12.35
	Kingston	**WH**	**Woodbourne Tap - Neversink**	**69**	**7.5**	**145.78**
	Kingston	WH 1 & 2	Ellenville Tap	69	1.13	20.65
	Kingston	**WH 1 & 2**	**Honk Falls - Woodbourne**	**69**	**10.43**	**127.27**
	Catskill	CF	S Cairo to Freehold	69	6.32	77.07
	Catskill	**FW**	**Freehold to Westerlo**	**69**	**7.02**	**85.66**
	Catskill	NC	N Catskill to Coxsackie	69	8.63	96.12
	Catskill	**CN**	**Coxsackie - New Baltimore**	**69**	**7.02**	**65.42**
	Catskill	T	North Catskill to Athens Tap	115	2.85	39.68
	Catskill	**V**	**North Catskill to Niagara Mohawk Tap**	**115**	**1.79**	**25.57**
	Catskill	NW	New Baltimore to Westerlo	69	14.49	175.64
	Cycle Year 3					
				Totals	100.09	1222.66

Central Hudson Transmission Right-of-Way Program
Master Schedule

FERC and NERC Designated Transmission Facilities

2017	Catskill	301	Hurley Avenue to Leeds	345	28.59	886.88
	Kingston	303	Roseton to Hurley	345	30.3	841.39
	Newburgh	311	Roseton to Rock Tavern	345	17.19	601.54
	Cycle Year 4					
				Totals	76.08	2329.81

Non-Designated Transmission Facilities

2017	Newburgh	SL	Rock Tavern - Sugar Loaf	115	11.93	181.95
	Newburgh	D	East Walden - Rock Tavern	115	7.5	113.21
	Newburgh	J	East Walden to Rock Tavern	115	6.86	104.59
	Newburgh	DW	Chadwood Lake to East Walden	115	4.11	91.6
	Newburgh	DW	Danskammer to Chadwood Lake	115	7.21	145.59
	Newburgh	SJ/SD	Sugarloaf to N.J.	115	10.34	157.71
	Cycle Year 4					
				Totals	47.95	794.65

Central Hudson Transmission Right-of-Way Program

Master Schedule

2018	**Fishkill**	**FO**	**N Chelsea to Forgebrook**	**115**	**3.06**	**55.19**
	Fishkill	FT	Forgebrook - Tioronda	115	5.36	49.97
	Fishkill	**DC**	**North Chelsea - Danskammer**	**115**	**0.96**	**17.54**
	Fishkill	WF	Forgebrook - Merritt Park	115	2.54	30.96
	Fishkill	**WP**	**Merritt Park - Wiccopee**	**115**	**2.12**	**25.9**
	Fishkill	FS	Wiccopee - Shenandoah	115	1.3	15.87
	Fishkill	**EF**	**East Fishkill - Shenandoah**	**115**	**1.72**	**25.94**
	Fishkill	FP*	Fishkill Plains - Sylvan Lake (A - Spur)	115	7.1	137.77
	Fishkill	**HF**	**Fishkill Plains to East Fishkill**	**115**	**2.07**	**28.81**
	Fishkill	NF	Fishkill Plains to N Chelsea	115	5.94	117.14
	Fishkill	**TV**	**Myers Corners to Wappingers**	**69**	**3.54**	**38.86**
	Fishkill	TV	Wappingers - Chelsea	69	3.41	41.57
	Fishkill	**KM**	**Knapps Corners to Myers Corners**	**69**	**2.91**	**37.56**
	Newburgh	AC/DC	Danskammer to N Chelsea	115	0.96	17.59
	Newburgh	**DR**	**Danskammer - Marlboro**	**115**	**2.29**	**44.03**
	Newburgh	DR	Marlboro - East Terminal	115	9.71	122.41
	Newburgh	**DB**	**Danskammer - Marlboro**	**115**	**2.17**	**26.46**
	Newburgh	DB	Marlboro - West Balmville	115	4.69	57.25
	Newburgh	**DW**	**Chadwick Lake - West Balmville**	**115**	**3.92**	**47.84**
	Newburgh	CW	East Walden - Coldenham	115	1.62	35.94
	Newburgh	**RD(RJ)**	**Rock Tavern - Bethlehem Road**	**115**	**0**	**0**
	Newburgh	RJ	Rock Tavern - Union Avenue	115	9.3	169.72
	Newburgh	**UB(RJ)**	**Bethlehem Road - Union Avenue**	**115**	**0**	**0**
	Newburgh	WM	East Walden - Montgomery	69	5.86	53.65
	Newburgh	**WM**	**Maybrook - Rock Tavern**	**69**	**4.17**	**38.18**
	Newburgh	WM	Rock Tavern Tap - Rock Tavern	69	1.88	25.94
	Newburgh	**WM**	**Montgomery - Maybrook**	**69**	**2.97**	**27.15**
	Newburgh	EM	Modena - East Walden	115	6.05	73.83
	Poughkeepsie	**SC**	**Sand Dock - North Chelsea**	**115**	**6.99**	**95.52**
	Poughkeepsie	TR	NY Trap Rock to Knapp's Corner	69	2.38	22.81
	Poughkeepsie	**KB & KC**	**Sand Dock-Barnegat-Knapps Corners**	**115**	**2.87**	**52.79**
	Poughkeepsie	DR	East Terminal - Reynolds Hill	115	0.18	2.18
	Cycle Year 5			**Totals**	**110.04**	**1536.37**

* FERC and NERC Designated Transmission Facility

Appendix 15 – Incompatible Tall Growing Species

Incompatible Tall Growing Species

Ailanthus/Tree-of-Heaven	Cottonwood
Ash	Cucumber Tree
Aspens/Poplar	Elm
Balsam Fir	Hackberry
Basswood	Hemlock
Beech	Hickories
Birches	Hophornbeam
Black Gum/Tupelo	Maples
Black Locust	Mountain Ash
Black Walnut	Oaks
Box elder	Pines
Butternut	Red Mulberry
Catalpa	Sassafras
Cedar	Spruces
Cherry, Black	Sycamore
Cherry, Choke	Tamarack/Larch
Cherry, Domestic	Tulip/Yellow Poplar
Cherry, Pin	Willows
Chestnut	Other

Incompatible Climbing Vines

Bittersweet

Grape

Virginia Creeper

Appendix 16 – Tall Shrubs and Small to Medium Trees

Tall Shrubs and Small to Medium Trees

Apple	20 - 30' (50')	Hawthorne	10 - 30' (40')
Alder, Speckled	10 - 15' (35')	Juniper (Red Cedar)	15 - 35 (60')
Alder, Smooth	10 - 20' (40')	Mountain/Striped Maple	10 - 20' (35')
Buckthorn, Common	10 - 15' (25')	Olive, Russian	20 - 35' (46')
Buckthorn, European	10 - 15' (23')	Pear	20 - 35' (50')
Dogwood, Alternate Leaf	10 - 25' (35')	Shadbush/Serviceberry	15 - 30' (50')
Dogwood, Flowering	10 - 30' (40')	Shrub Willow	6 - 20 (35')
Cedar, White	30 - 50' (90')	Sumac	8 - 20' (35')
Witch Hazel	8 - 20' (35')		
Hornbeam, American	20 - 35 (50')		

Appendix 17 – Woody Shrubs

Woody Shrubs

Olive	8 - 12' (16')	Laurel, Sheep	1.5 - 3.5'
Azalea, Swamp	4 - 10' (15')	Leather leaf	2 - 4'
Barberry, Common	10'	New Jersey Tea	2 - 3' (4')
Blueberry, Highbush	3 - 10' (13')	Privet	5 - 15'
Dewberry	1 - 3'	Rose, Multiflora	6 - 12' (15')
Dogwood, Red Osier	3 - 10' (12')	Rubus sop.	3 - 6' (10')
Dogwood, Grey/Stiff	3 - 10' (16')	Snowberry	2 - 3' (6')
Dogwood, Silky	3 - 10' (16')	Spicebush, Common	8 - 12' (16')
Dogwood, Roundleaf	3 - 10' (12')	Spirea, Meadowsweet	2 - 5' (6.5')
Elderberry	5 - 10' (12')	Spirea, Steeple Bush	2 - 4' (6')
Gooseberry	3- - 5' (10')	Sweet fern	2 - 3' (5')
Hazelnut, American	5 - 10' (12')	Sweet Gale/Meadowfern	2 - 5'
Hazelnut, Beaked	5 - 12' (14')	Vibernum, Arrowwood	6 - 12' (16')
Hemlock, Ground/Yew	2 - 3' (6')	Vibernum, Highbush Cranberry	5 - 15'
Huckleberry	2 - 4' (6')	Vibernum, Northern Wild Raisin	6 - 12' (16')
Juniper, Creeping/Trailing	<1' (3')	Vibernum, Hobblebush	3 - 6' (10')

Appendix 18 – EEI "Environmental Stewardship Strategy for Electric Utility ROW's"

Washington D C 20004-2696
Telephone 202-508-5000

EDISON ELECTRIC
INSTITUTE

ENVIRONMENTAL STEWARDSHIP STRATEGY FOR ELECTRIC UTILITY RIGHTS-OF-WAY

FORWARD

This strategy was approved by the Edision Electric Institute's Vegetation Management Task Force (VMTF) on August 12, 1996. The VMTF prepared this strategy in accordance with its commitment to the *Pesticide Environmental Stewardship Program* (*PESP*). *PESP* is a voluntary partnership between pesticide users and three Federal agencies: the Environmental Protection Agency, the Department of Agriculture and the Food and Drug Administration. The goal of *PESP* is to reduce pesticide risk and to promote Integrated Pest Management programs.

For further information on this strategy contact:

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Mr. Joel Mazelis, Manager
Environmental Programs
Edison Electric Institute

VEGETATION MANAGEMENT ON RIGHTS-OF-WAY

Electric utilities are charged by state and federal regulatory agencies with the responsibility for providing safe, reliable electric service to their customers. Customers may include homeowners, businesses, municipalities and other utilities. Electricity is a product which is needed on demand and cannot be stored in large quantities. Because it is essential for domestic use, economic growth and providing vital services, the pathways for the flow of electricity must be kept open at all times.

Trees and other vegetation can cause interruptions of service by growing into, or falling through power lines. These interruptions are a major concern of electric utilities because service is not being provided to customers when needed. A loss of service is not only costly and inconvenient to customers - it can also be life-threatening to people on life support systems. For many utilities, tree related outages rank among the leading causes of interruptions of electric service during both normal operating conditions and during major storm events.

Properly maintained rights-of-way are essential to provide safety for customers and workers, minimize tree-related outages, provide access for inspection and maintenance of facilities and for timely restoration of service during emergency conditions.

The goal of right-of-way vegetation management programs is to provide safe transmission and distribution service and to minimize interruptions caused by trees and other vegetation while maintaining a harmonious relationship with varied land uses and the environment.

Most electric utilities employ a combination of control methods for right-of-way vegetation management in a process known as "Integrated Pest [1] Management" (IPM). Integrated pest management is a system of controlling pests (weeds, diseases, insects or others) in which pests are identified, action thresholds are considered, all possible control options are evaluated and selected control(s) are implemented. Control options - which include biological, chemical, cultural, manual and mechanical methods - are used to prevent or remedy unacceptable pest activity or damage. Choice of control option(s) is based on effectiveness, environmental impact, site characteristics, worker/public health and safety and economics. The goal of an IPM system is to manage pests and the environment to balance benefits of control, costs, public health and environmental quality.

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[1] In vegetation management, "pest" refers to trees and other vegetation which are capable of endangering the safety of the public and workers and the reliability of service of the lines.

As part of their IPM Program, nearly all utilities utilize some mechanical vegetation control. However, cutting or mowing vegetation perpetuates the growth of incompatible (tall growth) vegetation because of the biological response of sprouting. When a single stem is cut, multiple sprouts can grow from the severed stump or the root system (so-called "root suckering"). These sprouts are fast-growing because they are fed from the root system which is already well established. A repetitive cycle of cutting and sprouting results in an increasing density of tall growth species.

It is a common public belief that mechanical/manual methods (power saws and mowing) are safer and have less environmental impact than herbicide methods. Often overlooked are environmental and safety concerns associated with repeated cutting of vegetation such as: soil compaction from heavy equipment, damaging sensitive wetland areas, worker and environmental exposure to petroleum products (which are more toxic than many herbicides used for R/W maintenance), the potential for physical injury from sharp tools and equipment and the repeated, significant alteration of potential wildlife habitat.

In many instances, herbicides are preferred because they control the entire plant and greatly inhibit re-sprouting, thereby reducing the need for repetitive cutting. Even though most herbicides used for vegetation control have low human and animal toxicity, some utilities minimize herbicide use because they fear adverse public reaction from the use of synthetic herbicides. Improved environmental safety of available products and technology and the potential for increased competition in the utility industry may result in increased herbicide usage.

The long-term goal of a vegetation management program is to provide for public and worker safety and to provide reliability of service by converting right-of-way plant communities from predominately tall growing plant species to communities dominated by low growth plant species. This can be accomplished by selectively controlling tall growing plant species, while preserving low growing grasses, herbs and woody shrubs over a period of many years. With proper management, the low growing vegetation can eventually dominate the right-of-way and retard the growth of the tall growing vegetation, providing control of incompatible vegetation and reducing the need for future treatments.

PESTICIDE USE AND RISK REDUCTION

Most industrial herbicides used for vegetation control in rights-of-way are very low in toxicity; in fact, much lower than the petroleum products necessary to power the equipment used for cutting brush. Therefore, the use/risk reduction strategy for electric utilities is aimed at minimizing the amount of active ingredient of a particular product (or products) per acre rather than reducing the total volume of products used. Lower use per acre is both environmentally responsible and economical: by utilizing only the amount necessary to control vegetation, risks are minimized and material costs are reduced.

Most initial right-of-way vegetation applications are made using non-selective techniques. Non-selective applications are also utilized for maintenance where brush heights and/or densities are high. Mechanized applicators are frequently used for these applications.

In subsequent applications or in applications where brush heights and densities are low to moderate, low volume foliage or basal applications are generally utilized. Carriers for low volume applications are normally water for foliage treatments while synthetic or natural penetrants are used for basal treatments. These applications are referred to as "low volume" because of the lower quantities of water or penetrants used to dilute and carry the chemicals to the plant. Low volume techniques employ garden-type hand-pump or motorized applicators to apply the herbicide mixture at very low rates and pressures.

The key to reducing the amount of herbicide applied per acre is the use of selective applications; i.e., treating only those plants that are capable of growing tall enough to threaten power lines and to leave low growth plants (shrubs, herbs, grasses) untreated. This can be accomplished with any ground application method, but the selective nature of the treatment remains the same. As a result, active ingredients of herbicide applied per acre are minimized and risks are reduced.

Selective applications can also result in reduced herbicide usage as a result of species composition changes from incompatible plant species to compatible plant species. Future herbicide treatments to the same areas will require lesser amounts of herbicides due to the selective nature of the application combined with fewer target stems.

The use of non-active adjuvants can also contribute to reduced volume and, therefore, risk. Adjuvants can improve efficacy and adherence to the target plants resulting in less material being required for control, less runoff from the plant leaf surface and reduced potential for volatilization.

During applications the potential for exposure is only to the diluted herbicide mixture and that exposure is brief since workers apply the solution and then leave the area. After the herbicide is absorbed by the plant, direct exposure is virtually negligible. Any herbicide not absorbed by the plant is rapidly biodegraded by micro-organisms or light. Considering the low toxicity, rapid uptake and rapid biodegradation of most modern herbicides, re-entry times are not significant for these types of application.

CURRENT RESEARCH

The electric utility industry cooperates with manufacturers, applicators, regulators and educational institutions to field test and develop safe and effective herbicide products and application equipment. Research into improved technology is an on-going process. Included in this research are efforts to reduce worker exposure to herbicide concentrates during mixing and to reduce environmental risks associated with the disposal of containers.

Biological controls are being researched to strengthen this phase of Integrated Pest Management methods. For example, researchers have identified vegetative cover that impedes the invasion of incompatible tree species through allelopathy. Such research could lead to the development of biopesticides for use in R/W maintenance programs.

Also being studied are the application techniques and materials that are most effective in producing compatible cover types that are capable of competing for growing space in rights-of-way. Promoting similar cover types on the rights-of-way through selective herbicide applications can reduce the need for maintenance, thus reducing risk and use in the long term.

The electric utility industry will continue to support research that is based on scientifically sound risk reduction principles which benefits the environment, their customers and their employees.

BARRIERS TO ADOPTION

There are both internal and external barriers to the adoption of a use and risk reduction strategy. For example, internally, few educational pesticide stewardship programs that are specifically geared to R/W maintenance have been developed. External barriers exist because much of the public is unfamiliar with herbicides and, therefore, may not understand their use. They may be unaware of the rigorous toxicological and environmental testing that is required by the U. S. Environmental Protection Agency (USEPA) prior to registration of herbicide products. In addition, many people are unaware of the safety and environmental risks involved in other right-of-way maintenance activities; therefore, it is difficult for them to make a knowledgeable comparison of the various options available. This lack of understanding creates a knowledge barrier for the public.

STEPS TO AID IN ADOPTION OF STRATEGY

As a result of the internal and external barriers, some utilities may be reluctant to adopt new technology or follow industry standards. One effective method to induce utilities to adopt these technologies would be to produce a training video promoting pesticide stewardship that has received the endorsement of both the electric utility industry and the USEPA. The video could be shown at regional association meetings. On a national basis, the Edison Electric Institute has the potential to reach much of the electric utility industry through meetings and seminars.

As part of a policy statement regarding IPM Programs, the USEPA and state regulatory agencies should support risk reduction through the use of improved materials and technologies which are based on scientifically verified information. The utilities who utilize these materials and technologies could then be recognized by regulatory agencies for their efforts. This would encourage other utilities and would reassure the public about electric utilities' vegetation management programs.

An outreach program should be produced to educate the general public regarding utility safety and reliability concerns. The program should also address the IPM approach to R/W maintenance and the Best Management Practices that are a part of this strategy.

RIGHT-OF-WAY VEGETATION MANAGEMENT STRATEGY

The purpose of this strategy is to provide principles for current and future vegetation managers that will minimize overall risk to people and the environment while providing safe and reliable electric service. The strategy is designed to protect wildlife, groundwater, surface water, soils, utility customers, utility workers and the general public. The objectives of this strategy are:

* That program prescriptions will be selected which balance environmental concerns, public needs, safety and cost effectiveness.

* That utilities will use Integrated Pest Management methods that are supported through scientific research as minimizing risk and increasing effectiveness for use in right-of-way vegetation management programs.

* That utilities will adopt Best Management Practices (BMPs) for herbicide applications. These practices will be based on the lat st scientific research among utilities, manufacturers, applicators, regulators and universities.

* That utilities will set as a long term goal of vegetation management programs the reduction of the level of active ingredient per unit of land area. This is to be accomplished through the proper selection and use of application methods, equipment and technology which will promote and facilitate minimal application rates. Use records for each utility can be used to track application rates.

* That utilities will support research and development initiatives for reduced risk pesticides and for improved herbicide handling (storage, transport, mixing and application) that leads to improved worker protection. The utilities will, where available, adopt those developments that are proven to reduce risk and are cost effective.

* That utilities will encourage the accelerated approval of any risk reduction recommendations to be included on the labels of herbicides used for vegetation control. Utilities will encourage the streamlining of the regulatory process in order to minimize the manufacturer's costs of relabeling.

BEST MANAGEMENT PRACTICES

Best Management Practices (BMPs) are included in this strategy to assist in the planning and implementation of ground application programs. They are intended to supplement and not replace the herbicide labels. The practices should be used when the Integrated Pest Management control option indicates that herbicide applications are appropriate. The BMPs will ensure that practical measures are being taken to reduce pesticide use and risk in order to meet the objectives of the pesticide stewardship strategy.

1. The following factors should be considered in the planning of any herbicide application:
   - Target species
   - Height and density of vegetation
   - Land use: within and adjacent to the right-of-way
   - Label restrictions
   - Natural and man-made restrictions

2. Follow herbicide label directions and any other supplemental label information provided by the manufacturer. Material Safety and Data Sheets should also be reviewed.

3. Only herbicides registered by the U. S. Environmental Protection Agency and the designated responsible state agency shall be used.

4. All herbicide applications shall be performed by applicators who are qualified in accordance with the laws and regulations of appropriate regulatory agencies.

5. Selective application techniques should be used wherever practical so that compatible vegetation is not treated.

6. Where practical, herbicides should be measured and mixed with diluent prior to transfer to application site.

7. Herbicide containers must be reused, recycled or otherwise disposed of in a proper manner.

8. Where practical, transfer of herbicide mixtures should be made directly from shipping containers to holding tank and/or application equipment through closed transfer systems, where possible.

9. Appropriate techniques should be used to avoid significant off-target drift.

10. These special precautions should be observed during periods of inclement weather:

- Applications should not be made in, immediately prior to, or immediately following rain when runoff could be expected.

- Applications should not be made when wind and/or fog conditions have the potential to cause drift.

- Basal bark applications should not be made when stems are wet with rain, snow or ice.

11. When making applications near water, crops, and/or other restrictions, application personnel should put their backs to the restricted area with the treatment being directed away from the restricted area.

Appendix 19 – Annual Crew Training Outline and Attendance Sheet

ANNUAL TRANSMISSION RIGHT-OF-WAY CREW TRAINING OUTLINE

Instructors:

Central Hudson Utility Forester
Central Hudson Environmental Affairs Representative
Environmental Consultant

Training Outline:

A. Introduction (Utility Forester) a. Distribute Crew Copy of LRVMP and Regulatory Permits

B. Review Transmission Specification (Utility Forester) a. Wire Zone
b. Border Zone
c. Buffer Zones
d. ROW Clearances
e. Sensitive Areas/Areas of Concern
f. Identification and removal of vegetation

C. Herbicide application and criteria for treatment (Utility Forester) a. Application methods
b. Herbicide mixtures
c. Criteria for treatment
d. Buffer Zones

D. Regulatory Requirements (Environmental Consultant/Utility Forester) a. Public Service Commission Requirement (Utility Forester)
b. National Energy Regulatory Commission (Utility Forester)
c. NYS Department of Environmental Conservation (Environmental Consultant)

Definition of freshwater wetlands and adjacent areas
How to identify regulated areas
Regulated activities
Permit/records maintenance

d. NYS Department of Health notification requirements (Environmental Affairs Rep.)
e. U.S. Army Corps of Engineers (Environmental Consultant)

Jurisdiction and regulatory authority
Permitting program – Nationwide Permits

f. Invasive Species Best Management Practice (Environmental Consultant)

Conduct vegetation surveys for invasive species
Protocols for inspecting and cleaning vehicles and equipment

g. Endangered Species Protection (Environmental Consultant)

SECTION D. REGULATORY REQUIREMENTS DETAILED OUTLINE
(to be incorporated into PowerPoint and/or handouts)

a. Public Service Commission Requirement (Utility Forester)

b. National Energy Regulatory Commission (Utility Forester)

c. NYS Department of Environmental Conservation (Environmental Consultant)

NYSDEC Freshwater Wetlands Program

- Wetland definition (regulatory vs. three-parameter approach)
- Observation of freshwater wetlands in the field
- Adjacent area definition (Around every wetland is an 'adjacent area' of 100 feet that is also regulated to provide protection for the wetland)
- Regulated Activities
- Description of Permits/Chain of Command
- Itemized list of Wetland Dos and Don'ts (HANDOUT)
- Access
- Timing Restrictions
- Pollutants/Discharges
- Herbicide Use
- Structures
- Stream Flow
- Vegetation Removal
- Permits/Records Maintenance
- Facility and Records Inspection

NYSDEC Protection of Waters Program

- Definition
- Regulated Activities
- Permits/Records Maintenance

NYSDEC SPDES

- Description of State Pollutant Discharge Elimination System General Permit
- Regulated Activities (HANDOUT)
- Herbicide Use
- Incident Reporting
- Facility and Records Inspection

d. NYS Department of Health notification requirements (Environmental Affairs Rep.)

- Identify public drinking water sources for protection

Electric Transmission Annual Right-Of-Way Crew Training Attendance Sheet

Date: _____ Instructor (s): _____

Location: _____ _____

Training Material/Handouts: _____ _____
(Title) Dated (Title) Dated

MY SIGNATURE BELOW CERTIFIES MY ATTENDANCE AND RECEIPT OF THE TRAINING MATERIAL/HANDOUTS LISTED ABOVE.

Employee No.	Employee Name (Print)	Company Name	Employee Signature

Appendix 20 – Contract Specifications

SPECIFICATIONS FOR CLEARING
VEGETATIVE REGROWTH ALONG
ELECTRIC TRANSMISSION RIGHTS OF WAY

JANUARY 1, 2013

CENTRAL HUDSON GAS & ELECTRIC CORPORATION

POUGHKEEPSIE, NEW YORK

INDEX

SPECIFICATIONS FOR CLEARING VEGETATION REGROWTH ALONG ELECTRIC TRANSMISSION RIGHTS OF WAY

I. SCOPE (General)

These specifications cover the selective brush cutting, tree trimming and herbicide spraying and removal of vegetation along existing electric transmission line rights of way subsequent to the initial clearing of these lines. The primary objective of the Transmission Right-of-Way Management Program is to sustain the long-term stability of vegetation within the right-of-way by effectively controlling the re-growth and encroachment of undesirable tall-growing species, while retaining and fostering compatible low-growing plant communities.

II. INTENT

2.01 Define the responsibilities of contractors and to present instructions and guidelines which they are to follow in performing all work within the scope of these specifications.

2.02 Define the minimum clearance between conductors and trees acceptable to the owner in maintaining reliable electric transmission line continuity.

2.03 Maintain transmission rights-of-way in a manner, which is compatible with their surroundings, and retain where possible, stabilize low growing plant communities.

III. DEFINITIONS

3.01 Owner – Central Hudson Gas & Electric Corporation

3.02 Owner's Order – the Central Hudson Gas & Electric Corporation's duly executed purchase order to the contractor authorizing the work and subsequent billing.

3.03 Contract Documents – The Contractor's signed Proposal, the Owner's Order, the specifications, and the drawings, including all modifications incorporated in any of the documents before execution of the Owner's Order.

3.04 Contractor – The bidder who has been issued the Owner's Order to execute the work.

3.05 Owner's Representative – The individual designated by the Owner to represent the Owner in the execution of the contract.

3.06 Subcontractor – Anyone other than the Contractor who furnishes at the site, under an agreement with the Contractor, labor, or labor and materials, or labor and equipment. The term does not include any person who furnishes services of a personal nature.

3.07 Brush cutting and tree trimming – Cutting and removal of trees, tree branches and brush to provide specified minimum clearances to line conductors, including wood and brush disposal.

3.08 Tree removal – Cutting and felling of trees, including wood and brush disposal. All cutting to be as close to the ground as practical.

3.09 Spraying – Treatment with an approved herbicide mixture.

3.10 Road crossing screens – The retention of vegetation growing across the right-of-way at designated improved road crossing to screen the right-of-way from public view.

3.11 Buffer zones – Areas within the right-of-way that require more selective and/or specialized maintenance activities in order to avoid or minimize potentially adverse impacts. Buffer zone vegetation shall primarily consist of compatible vegetation, but may occasionally include non-compatible species.

3.12 Improved road – Any public road that has been surfaced with concrete, asphalt or crushed stone.

3.13 Access road – The single, most usable road or pathway along the right-of-way, which was established for the purpose of constructing the line and/or has been used for line maintenance.

3.14 Mid-span – the area either side of the conductors' lowest point of sag which includes approximately the middle one third of the span distance.

3.15 Rights-of-Way Widths – The total width from R.O.W. edge to R.O.W. edge, which consist of the Wire Zone and the Border Zone. The R.O.W. width can be found on the Plan & Profile Maps supplied by Owner.

3.16 Wire Zone – The area extending from directly beneath the conductors for a distance of 15 feet beyond the conductors.

3.17 Border Zone – The remainder of the floor of the right-of-way between the wire zone and the edge of the right-of-way.

IV. EXTENT OF WORK

4.01 Work shall include selective cutting, spraying and/or trimming of incompatible tree and shrub species along the right-of-way to provide the clearances listed in Table I of these specifications, out to the full right-of-way widths as specified on the Plan and Profile Drawings.

4.02 Copies of the Plan and Profile drawings will be furnished to all prospective bidders. The drawings may be marked to show locations where clearing is required, additional trimming and tree removals and areas where chipping or complete wood and brush disposal will be required. These drawings will subsequently be incorporated into and become a part of the contract.

4.03 The Contractor shall confine their activities within the limits of the right of way as described by the Plan and Profile drawings or otherwise defined by the Owner, except for danger tree removals which will be specifically designated by the Owner. All right of way restrictions noted on the Plan and Profile drawings or contained on other contract documents shall be strictly adhered to by the Contractor.

V. CONTRACTOR'S RESPONSIBILITIES

5.01 The Contractor shall provide, at their expense, qualified supervision and all necessary labor, material and equipment for execution of all work covered by these specifications.

5.02 Access to line right of way shall be limited to public road crossings or as specified by Plan & Profile drawings. Where this is not possible, the Contractor shall obtain permission for the use of private roads, driveways and other access to the right-of-way from the property owners involved and shall be responsible for any damage thereto.

5.03 The Contractor shall leave all fences, gates, walls and roads in the same or better condition as when they commenced their work. Any trees to be removed which have fence wire attached which is part of a permanent and functional fence shall be cut off above the top strand of wire. Care shall be taken that gates are not left open or fences left in such condition that livestock can escape. If existing fences or gates along the right of way are in a state of disrepair prior to start of clearing and could allow livestock to escape, this shall be called to the attention of the property owner and the Transmission Line Foremen.

5.04 In general, vehicular traffic shall be restricted to an access route 20-feet wide along the right of way. Whenever possible, existing access roads into and along

the right-of way shall be used. When clearing or treating to establish a new access route, the contractor shall seek to use the wire zone for the access route whenever practicable. Access roads entering the right of way off improved roads shall be reviewed with the Owner's Representative prior to their clearing and use.

5.05 The Contractor shall notify the property owner of his intent to trim, spray or remove trees and brush before commencing work. The Contractor shall comply with all NYS DEC pre-notification and posting requirements related to the application of herbicides. Upon completion of the work, the Owner may require the Contractor to obtain a release from the property owner.

5.06 The Contractor shall immediately inform the Owner of any damage complaints which may arise. The contractor shall keep the Owner informed of the status of each complaint and of any settlement made with the damaged party.

5.07 The Owner strives in every way possible to maintain good relations with the public. The action of the Contractor shall reflect on the Owner; therefore, the Contractor shall give diligent consideration to the interests of property owners, tenants and the general public, wherever involved, and shall carry out the work in such a manner as to cause a minimum of inconvenience.

5.08 The Contractor shall comply with all Federal, State, County and Municipal laws, ordinances, rules and regulations and with the requirements of all permits obtained by the Owner.

5.09 In order to qualify to bid work involving application of restricted pesticides; the Contractor must be registered with the New York State Department of Environmental Conservation (D.E.C.) as a D.E.C. Commercial Pesticide Applicator. In addition, all applications shall be supervised by a certified applicator in Category 6. The Contractor shall submit their D.E.C. business certification number and expiration date, together with the applicator certification number and expiration dates for each certified applicator along with their bid proposal.

5.10 The Contractor shall provide adequate storage off the Owner's property for all herbicide materials. Contractor crews are not permitted to discard empty chemical containers, drinking cups, food wrappers or other waste materials anywhere along the right of way or property of the Owner. Contractor cannot obtain water for mixing with chemicals or perform the mixing of chemicals at the Owners' operating headquarters. There shall be no mixing or storage of pesticides, and no refueling of equipment within 100 feet of regulated wetlands, streams, lakes, ponds or other water bodies.

5.11 The Owner will be required to obtain permits when work is to be performed on properties administered by the New York State Thruway Authority, the Taconic

State Park Commission, the New York City Board of Water Supply and other municipal water supply systems. The Owner may also be required to obtain special permits when work is called for along State highways and lands or other specialized locations requiring permits for performance of work.

5.12 The Contractor shall comply with the terms and conditions of any special use permits obtained by the Owner or the Contractor, and shall provide periodic notification and/or communication to the NYS DEC and other agencies required by special permits such as the DEC wetlands permitting process.

5.13 Where the Owner's right of way parallels or crosses railroad property and the Contractor elects to gain access to the right of way from the railroad property, they shall be responsible for all applicable permissions, rules and regulations and fees pertaining thereto.

5.14 The Contractor will include the cost of clearing any and all other Central Hudson transmission or distribution lines parallel, adjacent to or existing on the same common right of way in the transmission bid price.

VI. WORK PRECAUTIONS

6.01 It shall be understood and agreed to by the Contractor that trimming and clearing near existing transmission and distribution lines shall be undertaken while the lines are presumed to be energized and operating at voltages up to and including 345 kV (nominal).

6.02 In order to insure the safety of their employees, the general public, and the continuity of service in the energized lines, the Contractor shall exercise extraordinary precautions in removing trees and tree limbs that are in such close proximity to the conductors as to constitute a hazard. Such trees and limbs shall be removed in accordance with the minimum clearance distances from energized parts as set forth in Federal Occupational Safety and Health Act requirements.

6.03 The Contractor shall contact the Owner's Transmission Line Foremen and Order Dispatcher in the District in which they are working each day before starting work and shall notify them of their work locations and intended work hours for that day. Each crew shall have a cellular phone for communication and the crew leader name and their phone numbers will be provided to the Owner's Representative.

VII. METHODS OF CLEARING

7.01 Selective Clearing

(a) Selective clearing, consisting chiefly of spraying and/or cutting, shall be required along all sections of transmission rights of way. Locations where selective clearing is called for will usually be indicated on the Plan and Profile drawings provided at time of bidding.

(b) It is intended that all tall growing tree species shall be selectively cut and/or treated so as to remove them from the full width of the right-of-way, as described in Exhibit A. All tall-growing species of trees up to 8" D.B.H. shall be removed or sprayed for the full width of the right of way or as shown on the Plan and Profile drawings provided. In selective clearing areas where spraying is prohibited, all tall-growing species of trees shall be hand cut or mechanically cut.

(c) Tall shrubs and small to medium size tree species as identified in Exhibit A, may be retained within the border zone and/or road screen and other visual buffer zones, provided they are compatible with the conductor-to-ground and conductor-to-edge clearance requirements of the line. These species shall be removed from the wire zone whenever their mature height would invade the wire security zone as defined in Table 1. All low-growing species of trees, as listed in Exhibit A, which have grown to within the applicable clearances specified in Table I shall be removed.

(d) Low growing shrubs shall be retained within the right-of-way as described in Exhibit A. In addition, up to 30 percent of the low growing shrub community may be removed from the right-of-way in any treatment cycle if their densities exceed 70 percent in the wire zone.

(e) The Contractor shall strive to selectively foster and preserve herbaceous plant communities within the right-of-way, and minimize the off target effect of over spray.

(f) Hazardous or dangerous trees or tree limbs, on or adjacent to the right of way, shall be brought to the attention of the Company Representative for consideration for removal.

(g) All trimming will be performed in accordance with accepted tree work practices. Trees shall be trimmed in a manner, which will best preserve the natural form of the tree and appearance of the right of way in accordance with the ANSI A300 and Z133.1-2001 standards.

(h) All cuts shall be made at the branch bark collar of a parent branch or trunk so that no stubs remain. Cuts shall be made without tearing the bark, providing positive drainage and desirable shape for healing. When cutting back a branch that cannot be removed completely, the cut shall be made at a lateral at least 1/3 the diameter of the parent branch.

(i) No cutting, spraying or tree removals shall be undertaken in ravines or other low areas along the right of way, as described by Exhibit A, where the vertical of horizontal conductor clearances are well in excess of those identified in Tables I, assuming all trees reach maturity. Cutting of access roads in these areas will be specified.

(j) All trees and shrubs growing on the maintenance road along the right of way shall be removed or sprayed to provide a **15'** road width. Where there is no established access road, a route will be approved by the Owner's Representative and the Contractor shall clear the road and treat the stumps of cut trees and brush when use of herbicide(s) is not restricted elsewhere in these specifications or by applicable Federal and State regulations and herbicide label restrictions. Wherever practicable, the route to be cleared should utilize the wire zone.

(k) All trees and shrubs growing within **15'** of all poles and towers and all vines growing on guys, poles and towers shall be cut and removed and the stumps treated unless otherwise directed by Owner's Representative.

(l) Stumps of woody vegetation (trees and brush) shall be cut as close to the ground as possible. Unless used as support for a fence, in general, stump height shall not exceed three inches when manually cut.

VIII. WOOD AND BRUSH DISPOSAL

8.01 General

(a) Brush in improved areas i.e. (lawns, driveways, maintained fields) shall be removed or chipped.

(b) Brush from side trimming will be windrowed and piled along the edge of the right of way to provide wildlife habitat. Individual trees being selectively cut shall be cut and scattered or piled along the right of way, as designated by the Transmission Line Foremen.

(c) In no case will wood or brush be piled within view of public road crossings or other areas exposed to public view or where piles interfere with accessibility to the right of way.

(d) In visually sensitive areas of selective clearing, brush may be disposed of by chipping. Chips may be scattered over the right-of-way as mulch, the depth of which shall not exceed three inches. Unchipped trimmings and wood may be taken from the area by the contractor and disposed of or moved to a location along the right of way as directed by Owners Representative.

(e) No burning of wood or brush will be permitted unless specifically authorized by the Owner.

(f) Disposal of cleared vegetation and all other work performed by the Contractor shall be closely coordinated so that the duration of the work at any given location will be kept to a minimum.

(g) All species including but not limited to wild cherry (prunus serotina, or virginiana, or pennsylvanica), which may become toxic to livestock when it is cut, shall be removed immediately after cutting from pastures or any area along the right-of-way if, in the opinion of the Owner's Representative, this may present a hazard.

(h) When cutting and scattering of brush is specified, fallen trees will have all the limbs slashed and scattered in the right of way. Tree trunks shall be cut into 8' lengths. All such debris will be cleared from right of way maintenance roads.

8.02 Manual Clearing

(a) In remote areas removed from public view, cut off brush may be left laying in contact with the ground for natural decay provided it does not interfere with subsequent accessibility required for line or right of way maintenance.

(b) The Contractor shall chemically treat all cut stumps of species to be removed as set forth elsewhere in these specifications.

8.03 Machine Cutting

(a) In general, brush which has been mowed may be left as discharged from the mowing machine.

(b) All mowed areas shall receive a follow up foliar treatment unless otherwise specified.

IX. CHEMICAL CONTROL OF VEGETATION

9.01 Chemical Control with Herbicides (See Table 2)

(a) General

1. All herbicides treatments for the control of vegetation on transmission rights of way shall be done with the maximum selectivity practical within the method of application and in compliance with federal and state environmental regulations and manufacturers label specifications.

2. The Contractor, when treating around sensitive aquatic resources, including streams, ponds, lakes and ditch banks with standing or flowing water, shall establish the following minimum buffer zones.

    - Minimum of 50 feet for high volume hydraulic foliar
    - Minimum of 25 feet for low volume hydraulic foliar
    - Minimum of 15 feet for low volume foliar
    - Minimum of 15 feet for basal
    - Minimum of 5 feet for cut and stump treatment

    A minimum of five feet no treat zone shall be observed immediately adjacent to flowing streams, lakes or ponds. These buffer zone distances are minimums. Buffer zones may be increased adjacent to sensitive resources as determined by site conditions and in consultation with the Owner's Representative.

    Herbicides will not be applied within 100 feet of a designated public water supply, unless otherwise approved by the Owner.

    In addition, no herbicide application shall be made within 100 feet of a residence, school, park, public playground or athletic field unless otherwise specified by the Owner's Representative. No applications may be made to the property of a public or private school or registered day care facility without prior notification in accordance with NYS DEC notification and posting requirements.

    The Contractor shall bring questionable areas to the attention of the Owner's Representative. No herbicide application of any kind may be

applied within 100 feet of an inhabited structure unless notification and posting is completed in accordance with NYS DEC regulations.

3. Herbicides mixtures that are approved for use will be specified at the time of bidding. Use of herbicides shall be in strict adherence to the manufacturer's directions as specified on the product label. Contractor is also responsible for supplying labels of herbicides being used to landowners who request information.

4. The Contractor shall use all necessary precautions to avoid damaging desirable vegetation on and off the right of way due to herbicide drift. They shall also be responsible for any herbicide caused damage off the right of way caused by, but not limited to, improper application, failure to follow directions on the herbicide label or negligence.

5. The Owner shall consider unskilled or careless application by the Contractor just cause for stopping the work and termination of the contract.

6. The Contractor shall keep all required daily records of herbicide application and furnish the Owner with dated and signed reports on a weekly basis that show the name of the line, right of way sections treated located by line structure number or other landmark shown on the Plan and Profile lines.

7. The Contractor shall guarantee a 95 percent kill per acre of all undesirable species of trees and brush.

8. The Owner reserves the right to remove samples of the herbicide mixture from the Contractor's sprayers for the purpose of analysis to determine the nature and concentration of the mixture.

9. Herbicide applications made within one hour prior to onset of rain are to be re-treated when weather conditions permit and before proceeding into new work, in accordance with the manufacturer's label.

10. Stems and foliage must be dry before treatment is commenced.

11. The Owner will designate if treatment will be confined to specific sites and/or times of the year in order to control brownout in sensitive locations.

12. The Contractor shall make every effort to prevent herbicide spillage on or off the right-of-way. Equipment shall be regularly inspected and leaking equipment must be repaired immediately. Evidence of spill or

of herbicide materials leaking from the Contractor equipment may be cause for cancellation of contract.

13. The Contractor shall cut and stump treat any trees more than 15 feet tall in a hydraulic foliar site, or 12 feet tall in a backpack foliar site, within the designated clearance zone. This shall include hand cutting and stump treatment of taller stems encroaching into the right-of-way along the edges. **In addition, the applicator shall be within 10 feet of the target stem when treating from a hydraulic unit.**

(b) Selective Basal Treatment

1. Basal applications may be made in any season providing accurate species identification and proper application is possible unless seasonal restrictions are set forth elsewhere in these specifications.

2. Basal application may be permitted where there is snow on the ground, provided a "well" is created around the stem to completely remove snow cover from the area around the stem, down to bare ground.

3. The spray mixture shall be directed only at the lower 12 inches to 15 inches of each stem of tall-growing species. (Note that it may be necessary to treat up to two feet on larger diameter stems. Stems over six inches d.b.h. should be cut and stump treated.) The spray stream shall be directed downward in order to avoid spraying adjacent desirable species. The entire circumference shall be wet in accordance with the manufactures label directions, with special attention given to treating the root collar and all exposed roots.

4. The herbicide mixture shall be applied by nozzlemen walking the right-of-way. Spray nozzles shall be adjusted to produce a light misting pattern so as to lightly wet target stem. Nozzle pressures should not exceed thirty (30) pounds per square inch.

(c) Selective Stump Treatment

1. When required by terms of these specifications, the Contractor shall apply an approved and environmentally suitable herbicide mixture with a colored marking dye on all freshly cut stumps (except evergreens) immediately after cutting, except where prohibited by these specifications and applicable governmental agencies and per manufacturers label.

2. All stumps shall be cut within three inches or less from the ground.

3. In wetlands, stump treatment applications of herbicide may be applied no closer than five feet from the water's edge, provided that the herbicide has approved herbicidal aquatic labeling for such use and the Owner has obtained the necessary permits.

(d) Selective Low Volume Foliar Spray

1. Selective herbicide application to target undesirable brush and trees to a maximum height of up to 12 feet tall. This application is used to minimize damaging desirable species close to the target plant and to minimize the amount of herbicide needed to maintain the right of way.

2. The low volume application shall be done from the time leaves are mature through the active growing season. (mid June through mid September)

3. This type of application will be done with manually operated backpack sprayers. Pressures and nozzles will be maintained to control and deliver the correct amount of herbicide, and insure the proper coverage of the target stems with minimal over spray onto adjacent compatible vegetation.

4. The leaf surface must be dry at time of applications, the target will be sprayed from top to bottom and from opposite sides of the plant.

5. Proper spray techniques shall also be followed in order to avoid damage to off right-of-way plant communities along the edges.

9.02 Low Volume Hydraulic Foliar Spray

(a) Where requested by Owner, all terrain type equipment mounted with hydraulic sprayers may be used to treat brush within the R.O.W. corridor. This equipment can traverse the R.O.W. and have the applicators target and treat undesired species from above when the vegetation becomes too dense for low volume backpack applications, making walking a burden and control with backpacks less successful.

(b) Herbicide mixtures and rates will be selected and approved by the Owner based on site specific field conditions.

X. SECURITY OF SPRAY EQUIPMENT AND CHEMICALS

The Contractor shall take the following precautions to protect their equipment and materials from vandalism and unauthorized use when left unattended:

(a) Power-pack and back-pack sprayers shall be emptied or stored in locked compartments.

(b) Ignition keys shall be removed from all vehicles used for spraying, as well as all vehicles containing herbicide concentrate or adjuvants and all vehicles containing spray solution.

(c) Ignition keys shall be removed from engines, which provide power to pumps on power driven spray equipment when they are unattended. Engines without lockable ignitions systems shall have the spark plug wire removed or made inoperable in some similar fashion.

(d) The opening to the spray tank, on power driven spray units, shall be locked when they are unattended.

(e) Drains on spray tanks shall be fitted with lockable valves or threaded caps which have been mechanically tightened to prevent removal by hand.

(f) Containers carrying herbicide concentrate or adjuvants shall be securely locked or bolted to spray units.

(g) Valves or barrel pumps on containers carrying herbicide concentrate or adjuvants shall be locked or removed and replaced with threaded plugs. Threaded plugs shall be mechanically tightened to prevent removal by hand.

(h) The pressure control valve shall be closed.

(i) Any equipment used for operations involving herbicide applications shall not be left unattended within 100 feet of any stream, water body or wetland.

XI. PRESERVATION OF LOW-GROWING VEGETATION, WATERCOURSES AND WETLANDS

(a) The Contractor shall take reasonable precautions not to remove, spray or damage existing low-growing vegetation, either natural or planted, which are to be preserved on the right of way. Where road screen vegetation, either natural or planted, has been damaged beyond reasonable repair because of the Contractor's negligence, the Owner may determine it is necessary to replace this vegetation at the Contractor's expense.

(b) The Contractor shall not use bulldozer blades on the right of way to clear, move or pile wood and brush. Forklifts, grapples and winches may be permitted where their use would be advantageous to the progress of the work and not detrimental to vegetation, which is to be retained, or to the control of erosion.

(c) Machinery, other than chainsaws, shall not be used in designated road crossing screens or other designated buffer zones to cut or remove trees, unless specifically approved by the Owner's Representative. When a tree which has been cut must be removed from such an area it will first be limbed and the brush hand-carried or removed by means of a winch line taking extreme care not to injure the residual vegetation.

(d) In certain areas, where it is feasible and advantageous, the Owner's Representation may authorize the use of special aerial lift equipment in designated road crossing screens or residential or commercial yard sites to prune and top trees. In no case, however, will any vegetation be cleared or any new road be authorized, other than the approved access road through the screen, to facilitate the use of this equipment.

(e) The Contractor shall take precautions to protect watercourses and wetlands from pollution and shall avoid disturbing stream bends and banks and the low growing vegetation protecting them. Vegetation, which is cut, shall not be felled into or across streams and ponds. Brush chipping shall be performed in such a manner that the chipped material shall not enter any watercourse or wetland area, nor accumulate in excess of three inches in depth at any location. All vegetation shall be Dropped and Lopped in all designated wetlands. Machine equipment will be allowed provided such use does not significantly impact the wetland area.

(f) The Contractor shall comply with all special wetlands permitting conditions and requirements, including regular communication to the Regional DEC offices that may be required.

XII. SIDE TRIMMING

12.01 Trimming or Removal of Tree Limbs Alongside of the Right of Way

(a) General

1. Side trimming, consisting of removing limbs or parts thereof, shall be required in order to maintain the clearance between conductors and vegetation as set forth in Table I.

2. When side-trimming clearances specified in Table 1 cannot be obtained, all branches overhanging the right of way shall be removed.

TABLE 1

WIRE SECURITY ZONE
MAXIMUM HEIGHT OF VEGTATION
UNDER and BESIDE CONDUCTORS – 60°F

	Security Wire Zone	Clearance to ROW Edge at Mid-span
Transmission Line Voltage	Vertical Clearance To Conductor	Horizontal Clearance to Conductor at Mid-span
69 Kv. and Under	18 Feet	18 Feet
115 Kv.	18 Feet	18 Feet
345 Kv.	14 Feet	14 Feet

Approved Herbicide Mixtures

Note: The Contractor shall add a surfactant, and any other adjuvant recommended on the product label. Applicator must follow Manufacturer approved labels and D.E.C. regulation for mixing, storing and applying above herbicides.

Table 2 –Foliar Spray – Low Volume

Formula	Quantity Concentration	Type of Active Ingredient	Type and Quantity of Carrier	Areas of Treatment
1	5 Gallons - Krenite 32 Ounces - Arsenal 3 Ounces - Escort	Ammonium Salt Isopropylamine Salt	94.75 Gallons Water	Upland & non-sensitive sites
2	4 Gallons - Accord 48 Ounces - Arsenal	Isopropylamine Salt	96 Gallons Water	Wetland and other sensitive sites
3	4 Gallons - Accord 3 Ounces - Escort	Isopropylamine Salt	96 Gallons Water	Optional mixture for upland and non-sensitive sites, use to be determined by CH

Table 2a –Stump Treatment

Formula	Quantity Concentration	Type of Active Ingredient	Type and Quantity of Carrier
1	1 Gallon – Garlon 4	Butoxyethyl Ester	3 Gallons of approved mineral oil
	5 Ounces - Stalker	Isopropylamine Salt	
2	38 ounces - Accord	Isopropylamine Salt	85 ounces of Water, .64 Ounces of Milliken or Exacto Blue Dye
	5 Ounces - Stalker	Isopropylamine Salt	
3	2.5 Gallons - Accord	Isopropylamine Salt	2.5 Gallons of Water, .64 Ounces of Milliken or Exacto Blue Dye.

EXHIBIT "A"

SPECIES LISTS

Incompatible Tall-Growing Species

The following list of tall-growing species are considered incompatible with most right-of-way situations and should be removed wherever practicable, to the extent permitted by fee ownership, easement, public or environmental constraints. A primary goal of the long-range management plan is to effectively remove these species from the floor of the right-of-way and prevent or minimize their re-growth and reinvasion.

Incompatible Tall-Growing Species

Ailanthus/Tree-of-Heaven	Cottonwood
Ash	Cucumber Tree
Aspens/Poplar	Elm
Balsam Fir	Hackberry
Basswood	Hemlock
Beech	Hickories
Birches	Hophornbeam
Black Gum/Tupelo	Maples
Black Locust	Mountain Ash
Black Walnut	Oaks
Box elder	Pines
Butternut	Red Mulberry
Catalpa	Sassafras
Cedar	Spruces
Cherry, Black	Sycamore
Cherry, Choke	Tamarack/Larch
Cherry, Domestic	Tulip/Yellow Poplar
Cherry, Pin	Willows
Chestnut	Other

Tall Shrubs and Small to Medium Trees

The following list of tall shrubs and small to mid-size trees may be compatible along the edge of the right-of-way within the border zone, except on narrow or low profile lines. They will be removed from the wire zone in most cases, unless their mature height would **not** invade the wire security zone. They are only compatible in a wire zone location when the conductor-to-ground clearance is high enough to allow them to reach maturity and still have the full wire security zone clearance at the time of maintenance. Any plant that grows tall enough to invade the wire security zone will normally be removed. The typical mature height for each species is included in the list below, together with their maximum known height.[1]

The smaller tree species may be preferred for retention in road screens, buffers and other sensitive sites rather than taller growing tree species. However, the ultimate goal is stable, low-growing compatible species at all locations, and Central Hudson will strive to remove all non-compatible species over time and eventually convert each site to compatible vegetation.

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[1] "Northeastern Shrub and Short Tree Identification: A Guide for Right-of-way Vegetation Management", B. D. Ballard, H. L. Whittier, Dr. C. A. Nowak, 2004, Research Foundation of the State University of New York, Albany, N.Y., SUNY College of Environmental Science and Forestry, Syracuse, New York.

Small to Medium Trees and Tall Shrubs

Apple	20 - 30' (50')	Hawthorne	10 - 30' (40')
Alder, Speckled	10 - 15' (35')	Juniper (Red Cedar)	15 - 35 (60')
Alder, Smooth	10 - 20' (40')	Mountain/Striped Maple	10 - 20' (35')
Buckthorn, Common	10 - 15' (25')	Olive, Russian	20 - 35' (46')
Buckthorn, European	10 - 15' (23')	Pear	20 - 35' (50')
Dogwood, Alternate Leaf	10 - 25' (35')	Shadbush/Serviceberry	15 - 30' (50')
Dogwood, Flowering	10 - 30' (40')	Shrub Willow	6 - 20 (35')
Cedar, White	30 - 50' (90')	Sumac	8 - 20' (35')
Holly, American	15 - 40' (100')	Witch Hazel	8 - 20' (35')
Hornbeam, American "Ironwood"	20 - 35 (50')		

Woody Shrub Species

The following is a list of shrub species commonly found on rights-of-ways in New York. While they are nearly always compatible in the border zone, several may grow tall enough to invade the wire security zone and hide other tall-growing species within their canopy. The typical mature height is listed for each species together with the maximum know height as identified in the *Northeastern Shrub and Short Tree Identificatio*n book.

The conductor-to-ground clearance, wire security zone requirements, and the mature height of each species are key factors in determining which shrubs may be retained in the wire zone, and which shrubs are compatible in just the border zone. For example, a 345 kV line on steel poles may have mid-span conductor-to-ground clearances of 38 feet, while a 345 kV line on wood pole H-frame structures may have mid-span ground clearances of just 28 feet. With a wire security zone standard of 25 feet for 345 kV, shrubs with a mature height of up to 13 feet could remain in the wire zone on the steel pole line, while only the smallest shrubs could be kept under the wires on the wood pole line.

Any plant that grows tall enough to invade the wire security zone should be removed, except that no more than 30 percent of the shrub cover may be removed from the a span in any treatment cycle, unless other factors such various site and environmental conditions, elimination of an invasive species and to maintain regulatory compliance under both State and Federal requirements to meet reliability standards. Shrubs that have already invaded the wire security zone will be targeted first for removal. As total shrub densities become dense in the wire zone, even smaller shrubs may be targeted in order to keep openings and paths through the shrubs, to maintain the values and benefits of a mixed shrub/herbaceous community and insure maximum control of tall-growing species.

Woody Shrubs

Olive	8 - 12' (16')	Laurel, Sheep	1.5 - 3.5'
Azalea, Swamp	4 - 10' (15')	Leather leaf	2 - 4'
Barberry, Common	10'	New Jersey Tea	2 - 3' (4')
Blueberry, Highbush	3 - 10' (13')	Privet	5 - 15'
Dewberry	1 - 3'	Rose, Multiflora	6 - 12' (15')
Dogwood, Red Osier	3 - 10' (12')	Rubus sop.	3 - 6' (10')
Dogwood, Roundleaf	3 - 10' (12')	Spirea, Meadowsweet	2 - 5' (6.5')
Elderberry	5 - 10' (12')	Spirea, Steeple Bush	2 - 4' (6')
Gooseberry	3- - 5' (10')	Sweet fern	2 - 3' (5')
Hazelnut, American	5 - 10' (12')	Sweet Gale/Meadowfern	2 - 5'
Hazelnut, Beaked	5 - 12' (14')	Vibernum, Arrowwood	6 - 12' (16')
Hemlock, Ground/Yew	2 - 3' (6')	Vibernum, Highbush Cranberry	5 - 15'
Huckleberry	2 - 4' (6')	Vibernum, Northern Wild Raisin	6 - 12' (16')
Juniper, Creeping/Trailing	<1' (3')	Vibernum, Hobblebush	3 - 6' (10')

Climbing Vines

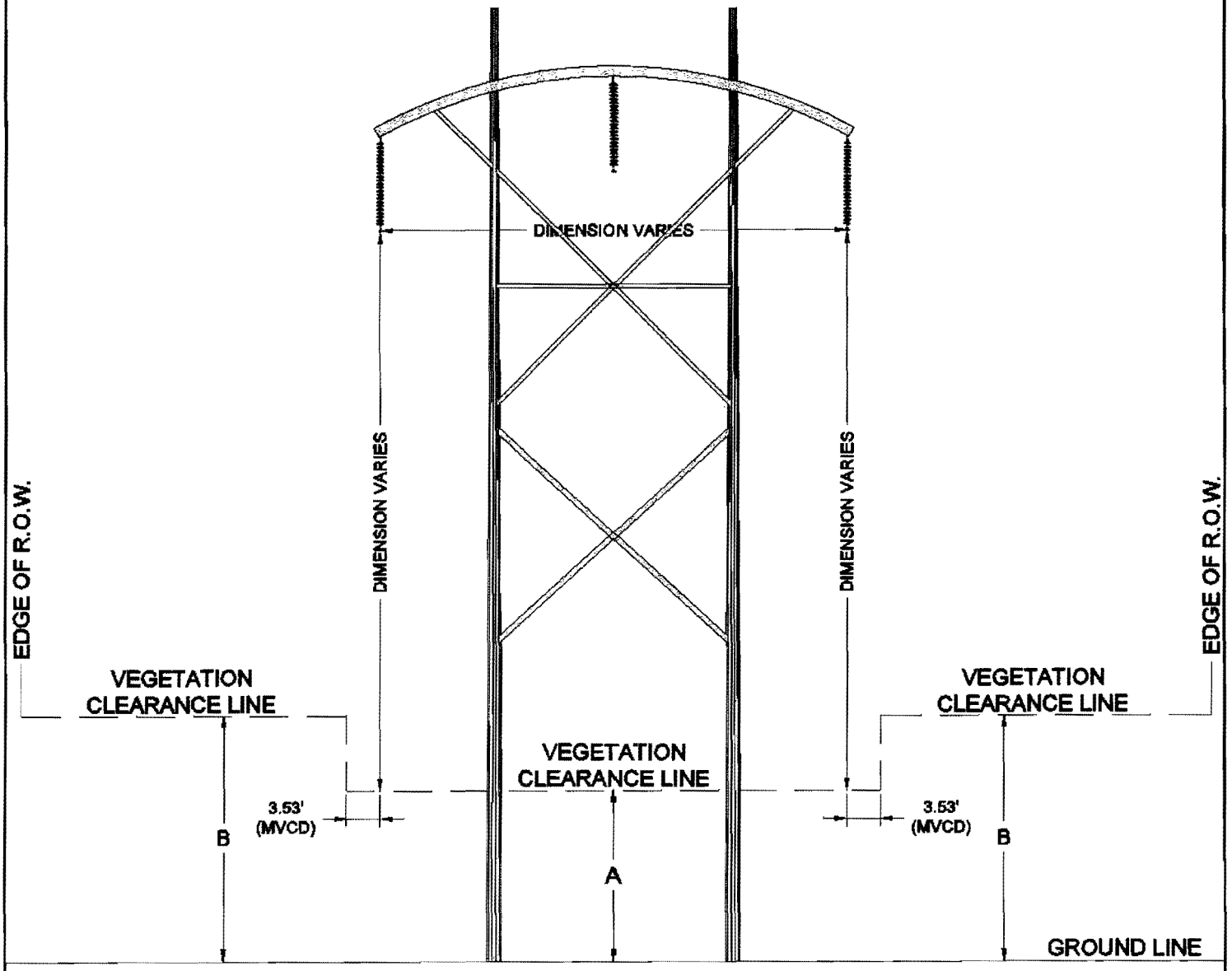
Bittersweet
Grape
Virginia Creeper

Appendix 21 – Vegetation Clearances

VEGETATION CLEARANCES
301 LINE (345KV)

"A"	"B"
18.1'	26.9'

MVCD - MINIMUM VEGETATION CLEARANCE DISTANCE

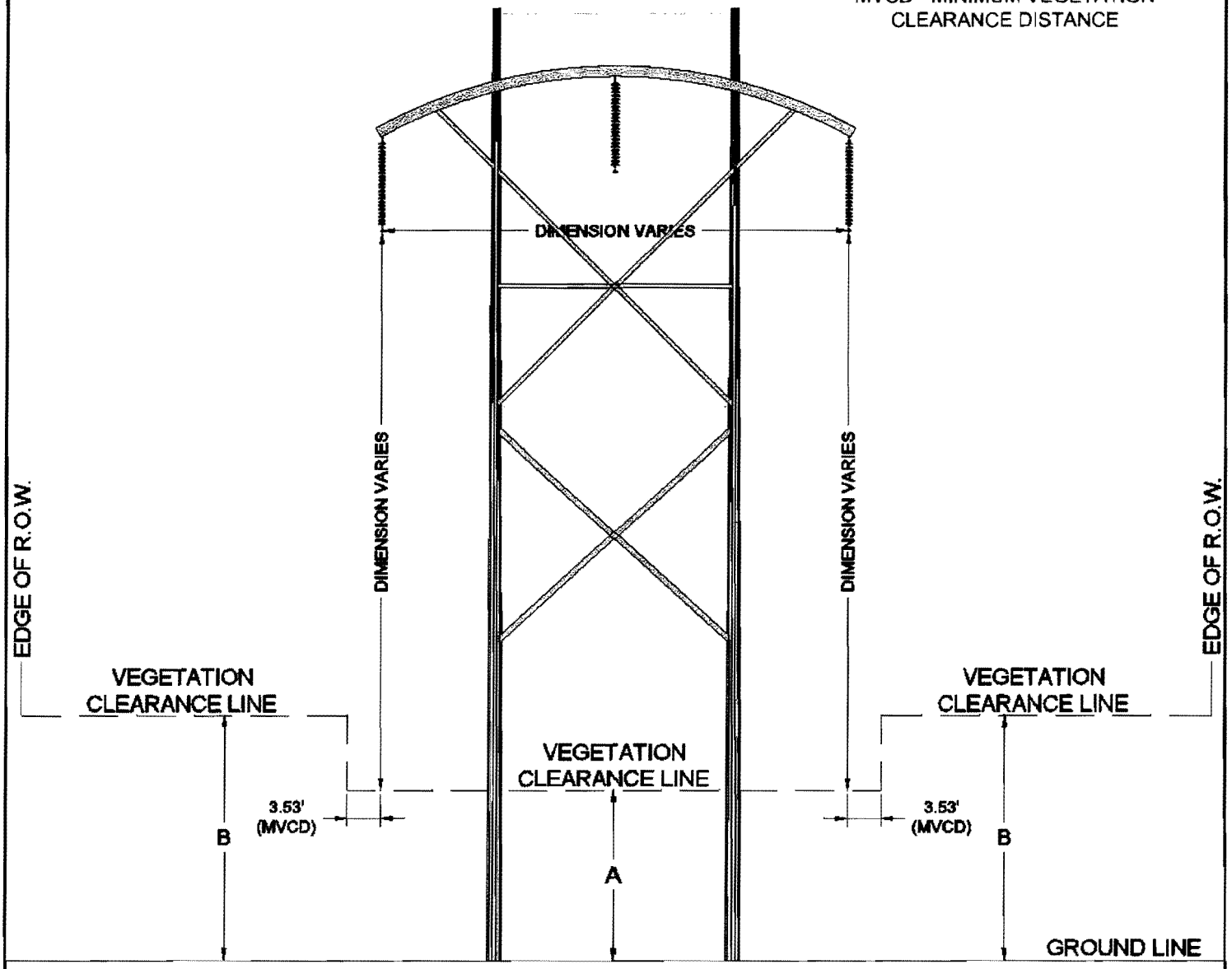


TYPICAL 301 STRUCTURE

303 LINE
CLEARANCE TABLE

FROM STRUCTURE	TO STRUCTURE	"A"	"B"
111685	111686	35.5'	38.8'
111686	111687	34.8'	42.8'
111687	111688	32.3'	39.8'
111688	111689	30.1'	40.2'
111689	111690	26.2'	35.4'
111690	111691	27.5'	34.1'
ALL OTHER SPANS		15.7'	24.8'

MVCD - MINIMUM VEGETATION
CLEARANCE DISTANCE

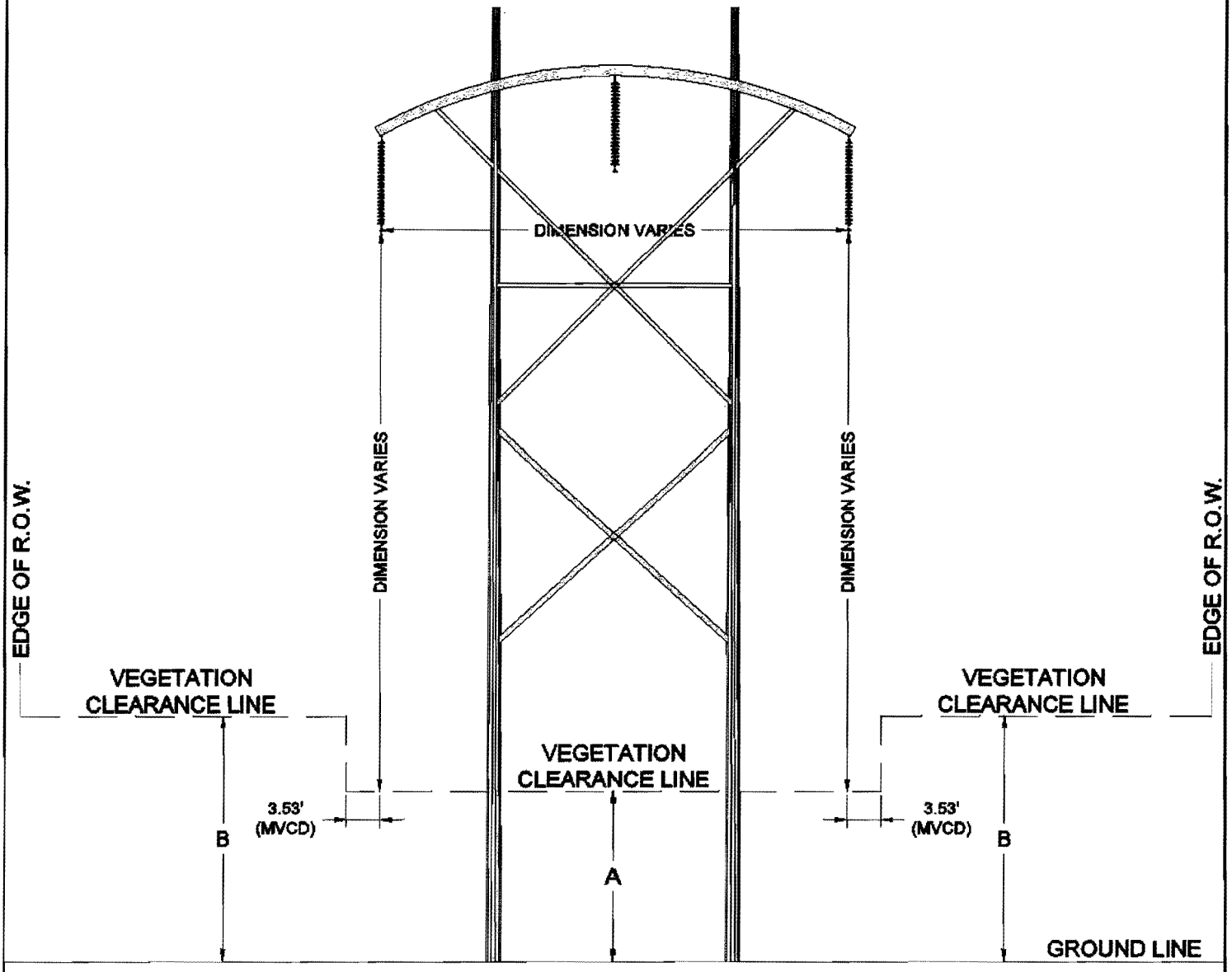


TYPICAL 303 STRUCTURE

VEGETATION CLEARANCES
311 LINE (345KV)

"A"	"B"
16.2'	24.3'

MVCD - MINIMUM VEGETATION CLEARANCE DISTANCE

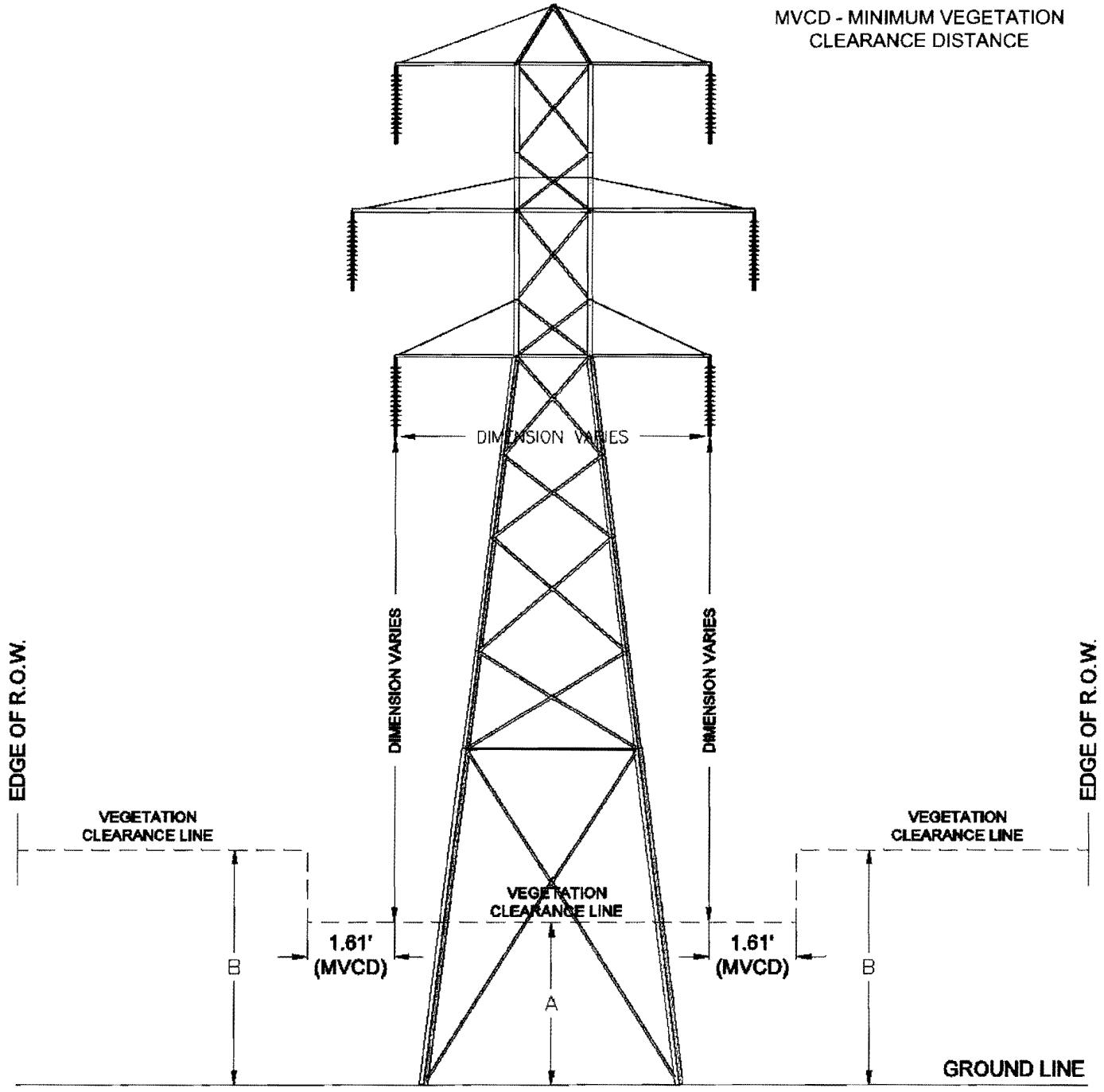


TYPICAL 311 STRUCTURE

FV LINE
CLEARANCE TABLE

FROM STRUCTURE	TO STRUCTURE	"A"	"B"
1623	1624	18.6'	28.5'
1624	1625	19.8'	27.3'
1627	1628	17.2'	27.6'
1638	1639	18.6'	24.0'
1647	1648	13.8'	23.7'
1649	1650	16.4'	25.3'
1652	1653	18.5'	26.7'
ALL OTHER SPANS		20.2'	26.8'

MVCD - MINIMUM VEGETATION
CLEARANCE DISTANCE

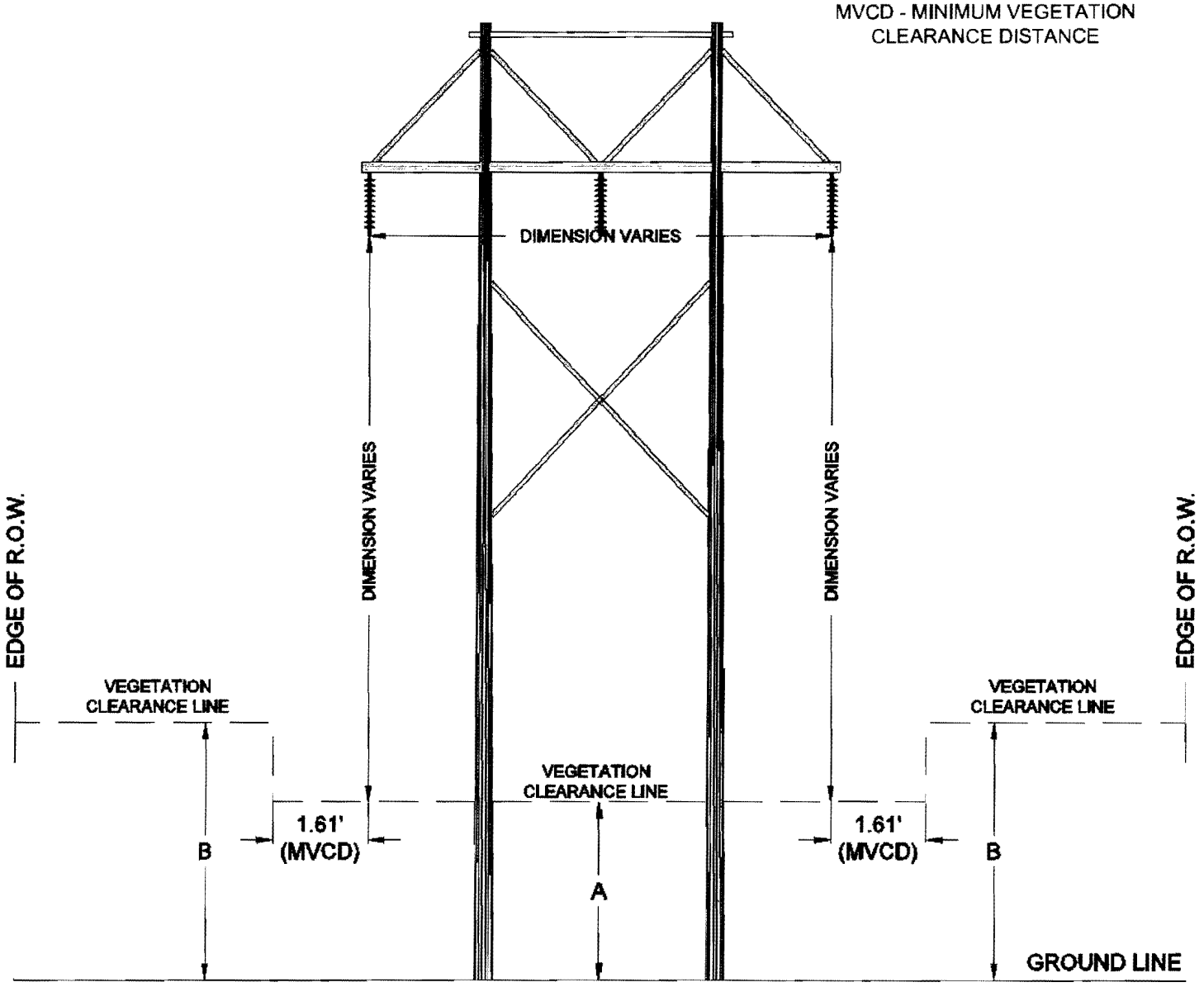


TYPICAL FV STRUCTURE

FP LINE
CLEARANCE TABLE

FROM STRUCTURE	TO STRUCTURE	"A"	"B"
74801-74802-74803	74804-74805	20.9'	23.2'
74806-74807	74808-74809	18.2'	27.9'
74814-74815	74816-74817	17.4'	20.4'
74826-74827-74828	74829-74830-74831	18.1'	24.0'
74832-74833-74834	74835-74836-74837	21.0'	24.5'
74841-74842-74843	74844-74845	18.4'	23.7'
74848-74849	74850-74851	14.0'	24.5'
74878-74879	74880-74881-74882	19.6'	23.8'
74894-74895-74896	74897-74898-74899	18.0'	29.5'
74907-74908	74909-74910	18.2'	22.8'
74923-74924	74925-74926	18.1'	26.7'
74925-74926	74927-74928-74929	18.4'	25.4'
74927-74928-74929	74930-74931	18.2'	25.4'
ALL OTHER SPANS		19.1'	25.4'

MVCD - MINIMUM VEGETATION
CLEARANCE DISTANCE



TYPICAL FP STRUCTURE

Recommended Minimum Vegetation Clearance for 115 and 69 kV lines

Severity 5 - Immediate: Schedule as soon as practicable to ensure system reliability and public safety

Voltage	Typical Span Length	Minimum Vegetation Clearance Vertical		Minimum Vegetation Clearance Horizontal	
		at Structure	at Mid-span	at Structure	at Mid-span
115	650	6	13	18	18
69	400	6	9	9	0

Severity 4 - Routine Correction: Schedule before next growing season

Voltage	Typical Span Length	Minimum Vegetation Clearance Vertical		Minimum Vegetation Clearance Horizontal	
		at Structure	at Mid-span	at Structure	at Mid-span
115	650	6-12	13-15	18-22	18-22
69	400	6-12	9-15	9-22	9-22

Note that special consideration must be given to increase the mid-span sag and sway conditions on longer spans, and to insure crew training for vegetation management supervision and crews so that they recognize the need for greater clearance in these areas.

Appendix 22 – Annual Long Range Vegetation Management Plan Review Sign-Off Sheet

Employee No.	Employee Name (Print)	Employee Signature	Date of Review