V.Q
Transmission Line
Wildlife Protection & Mitigation

PJM INTERCONNECTION

Transmission and Substation Subcommittee

J. Daniels	Amp Transmission
V. DeGiusto Jr.	UGI Utilities, Inc.
T. Laios	Appalachian Power Company
G. W. Lang	PPL Electric Utilities
A. Lousos	Amp Transmission
B. May	Baltimore Gas and Electric Company
S. Patel	Public Service Electric and Gas Company
D. Repice	PECO Energy Company
B. Riedl	Commonwealth Edison Company

Table of Contents

1 General Requirements

1. All new transmission lines operating at 69kV and above should consider wildlife impacts and appropriate mitigation techniques during the design of the project.
2. Nothing in this document shall supersede any Federal, State, and/or Local requirements for wildlife protection.
3. It is recommended that the Transmission Owner (TO) have and maintain an Avian Protection Plan (APP). The Avian Power Line Interaction Committee (APLIC) has guidance on developing an APP.

2 Wildlife Impacts

Typical wildlife impacts on transmission lines comes from avian interference. Impacts may be direct or indirect: Direct impacts cause line operations while indirect impacts are those that do not immediately create a line operation.

2.1 Direct Impacts

Direct impacts include avian electrocutions (phase-to-phase or phase-to-ground) and nest-related operations. These events usually involve an unplanned interruption or emergency operation of the transmission circuit.

2.2 Indirect Impacts

Indirect impacts include avian collisions to shield wires or phase conductors that typically do not lead to line operations. Indirect impacts may also include exclusion zones or buffer zones around active nests of protected species that prevent non-emergency work (routine maintenance or project work).

3 Mitigation

All projects should assess potential wildlife conflicts through studies performed during the early project design phases. The intent of the studies is to identify potential conflict species and their locations along a potential project route. For greenfield projects, all feasible route segments should be studied, and the results incorporated into the assessment and selection of primary and alternate routes. For brownfield projects, the assessment may indicate a change in wildlife presence along a route that should be incorporated into the new project design.

Addressing issues on existing lines may require the support of wildlife biologists or other environmental scientists. These individuals can support identification of species, attractants, and habits that may help the TO mitigate issues the wildlife may be creating.

Resources available to the TO to assist in these studies would include APLIC and some of their guidance documentation and consultants who specialize in environmental topics, specifically those involving wildlife. State and Federal resources may also be of assistance, including the US Fish & Wildlife Service (USFWS) and the US Department of

Agriculture – Animal & Plant Health Inspection Service (USDA-APHIS). In addition, local and national conservation organizations, such as the National Audubon Society, may be valuable resources. These resources can help to identify species along a route and constraints around managing those species.

3.1 Avoidance

The best way to manage wildlife issues is to avoid them. During project route studies, consider routes with the least active or potential impacts from wildlife, such as avoiding nature preserves, parklands, riversides, or other habitats. Use input from professionals and local hobbyists such as bird watching organizations.

Avoiding wildlife issues can also be accomplished through structure design. Relatively small adjustments in standard design can be incorporated into a structure design that have little to no added cost but can contribute to improved wildlife issue management.

3.2 Device Installations

When it is not possible or practical to avoid conflicts, management of the potential conflicts can be achieved using different devices. Devices may be commercially available or developed internally. It is possible that the local utility already has options available for distribution avian mitigation that can be directly applied or modified for transmission mitigation.

4 Impacts to consider

The following sections will briefly identify potential impacts from several avian-related interactions. These are examples of the typical impacts from avian-related issues. Other impacts may be experienced and can be understood and mitigated through working with wildlife experts.

4.1 Nest impacts

1. Nest material and debris can fall off or hang close to conductors and can create a line operation, potentially also damaging the nest and its occupants.
2. Nests can be built in an unsafe location – on/between strain insulators.
3. Active nest of protected species can prevent access to a structure or multiple structures and potentially create an exclusion zone around the structure (species-dependent), preventing routine maintenance or project activities from occurring.
4. Some nest issues may be considered “emergent” and, through working with the TO Environmental Management organization and Transmission Operations, may require emergency outages to mitigate before they become an unplanned event and/or create a “take” event.
5. Mitigation techniques for nesting impacts may include either deterrents or relocations of the nest to an acceptable location.
    a. Nesting deterrents can include pole top cones in lieu of flat pole tops, angled shields at arm box connections, or plastic devices (typically a type of polyethylene) shaped like cones or spikes that prevent birds from landing and building nests. Some of these can be incorporated into the initial structure

design while others are usually added after a history of wildlife interaction has been established.

b. Nest relocation platforms can be commercially purchased or developed internally and are placed in locations that encourage safe nesting. Eagles and osprey may take advantage of these safe platforms which keeps nesting materials away from the energized conductors. Typically, these devices are installed on an adjacent structure at a height equal to or higher than the transmission structure, but due to the generally taller nature of transmission versus distribution, this can be impractical. Reserving safe nesting space on the existing transmission structure may be the only practical approach.

4.2 Bird presence

1. If clearances are not maintained, electrocutions can occur. At medium-level transmission voltages (115-230kV), clearance may not be adequate to allow a bird between a phase conductor and the grounded structure. For some 69kV and 115kV compact construction, phase-to-phase may also be too tight to allow birds to pass safely between conductors.
2. Birds may also contaminate insulation. Exposure is increased with vee-string configurations, particularly in the centers of bridge towers, which is a wider area with more steel to allow for a higher concentration of birds and more rapid contamination accumulation between natural washing events from rain.
3. Mitigation techniques include clearance improvements (best in new design), perch deterrents, insulation configuration changes, and insulation shields.
    a. Clearance improvements – providing additional clearances between phases and phase-to-ground can help eliminate electrocutions. APLIC has guidelines for such clearance adders. Wing span (wing tip to wing tip) is not typically used for horizontal clearance adders but instead the wrist-to-wrist dimensions are used. For vertical clearance, the head-to-foot dimension is typically used for clearance adders. Species-specific clearances can be used or a “typical” or “maximum” for known species in an area can be used.
    b. Perch deterrents – these are used to keep the birds away from critical areas on a structure – either areas of inadequate clearance or areas above insulators to prevent contamination. Deterrents can be purchased products or custom-designed deterrents. Such off-the-shelf products include spikes (metal or plastic) or barriers that keep the birds physically away, or products designed to scare the birds away, such as lasers, sound generators, or effigies.
    c. Insulator configuration changes – for contamination-related issues, converting from suspension to strain/floating dead end or from pin insulators to strain may move the insulation out of the way enough to avoid contamination. The jumper loops may still pass through an area subjected to streamer activity or falling nest debris but operations due to those situations will be more intermittent than contamination tracking and flashing every time it gets foggy. In addition, converting from suspension arms to post assemblies (braced post, pivoting horizontal vee, etc.) may eliminate nesting, perching, and roosting opportunities that lead to those contamination type events but may be limited by the strength of the assemblies and the ability to modify the structure.

4.3 Bird collisions

1. Collision issues usually occur early in the morning or late in the evening when light levels are low and bird activity is increasing near nesting, roosting, and perching sites. It is also more of an issue with smaller diameter wires such as small phase conductors and shield wires, including Optical Ground Wire (OPGW).
2. Opportunities for collisions are increased when there are unobstructed flight paths near the lines, and even more so in known flyways. River crossings, large field and farmland crossings, and lines elevated significantly above surrounding vegetation and buildings present the most exposure to avian collisions.
3. Mitigation techniques generally involve making the wires more obvious to birds by use of marking devices.
    a. All small conductors in exposed or known risk areas should be marked, however transmission phase conductors are usually large enough to be seen, leaving the shield wires as the main exposure to collision risk requiring mitigation.
    b. Many marking devices require significant installation efforts, such as installation every 15-30 feet along the length of the span. Installation spacing can typically be alternated along wires at the same elevations to ease the installation burden, as determined by manufacturer guidance, i.e. every 30 feet on dual shield wires, offset from each other by 15 feet.
    c. Some marking devices may perform better than others in different conditions. Some have glowing tapes applied that provide some additional visibility at dusk or more reflective tapes that help capture any ambient light at dawn and dusk.
    d. Some objects may have dual performance – aviation marker spheres may also act as avian collision deterrents.

4.4 Device Requirements:

Due to the significant installation requirements of some devices and the access issues that may arise, limited maintenance opportunities or significant costs may occur for more frequent maintenance. The expected lifespan of any installed devices needs to be factored into the selection and application such that the devices do not create additional challenges. If devices are easily accessible, then a shorter lifespan may be acceptable, provided that the potential failure modes of the devices do not jeopardize the reliable operation of the line(s). This may include nesting platforms where access to the structure by bucket is not challenged by other constraints.

5 Species of special note:

In the United States, the Bald and Golden Eagle Protection Act (BGEPA) takes the rules and policies of the Migratory Bird Treaty Act (MBTA) a step further in the protection of both bald and golden eagles. Some of these more enhanced protections include limiting any activity within a buffer around an active site. This limitation includes any maintenance, construction or vegetation management activities, so identification and management of nest sites is important to maintain compliance with the Federal law.

6 Additional Resources

For additional information on avian-related topics, the following resources are available:

1. Migratory Bird Treaty Act (MBTA): US Code Title 16, Chapter 7, Subchapter II: https://uscode.house.gov/view.xhtml?path=/prelim@title16/chapter7/subchapter2&edition=prelim
2. Bald and Golden Eagle Protection Act (BGEPA): Code of Federal Register (CFR) 50 Part 22 - https://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&tpl=/ecfrbrowse/Title50/50cfr22_main_02.tpl
3. Avian Power Line Interaction Committee (APLIC): https://www.aplic.org/
4. TO-specific Avian Protection Plan, if one exists. These are generally managed by the TO Environmental Management department.
5. US Department of Agriculture – Animal & Plant Health Inspection Service (USDA-APHIS): https://aphis.usda.gov
6. US Fish & Wildlife Service: https://www.fws.gov
7. National Audubon Society: https://www.audubon.org