Attachment 11

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MON-FAYETTE TOWER RELOCATIONS PROJECT
DUQUESNE LIGHT'S DESIGN CRITERIA, ELECTROMAGNETIC FIELD POLICY AND APPLICATION, AND SAFETY PRACTICES

The National Electrical Safety Code (NESC) is a set of rules to safeguard people during the installation, operation, and maintenance of electric power lines. The NESC contains the basic provisions considered necessary for the safety of employees and the public. Although it is not intended as a design specification, its provisions establish minimum design requirements. Duquesne Light Company ("Duquesne Light") has developed design specifications and safety rules which meet or surpass all provisions specified by the NESC.

Engineering Design Criteria and Parameters

The NESC includes loading requirements and clearances for the design, construction, and operation of power lines. The "loads" on conductors and supporting structures are the forces that develop from the weight of the conductors, the weight of ice on the conductors, plus wind pressure on the conductors and supporting structures. Loading requirements are the loads on the conductors and structures that are anticipated assuming certain ice and wind conditions. Loading requirements always contain "safety factors" to allow for unknown or unanticipated contingencies. The clearances and loading requirements contained in the NESC were developed to ensure public safety and welfare.

Duquesne Light transmission line design standards meet or surpass the NESC standards. For example, the relative order of grades of construction for conductors and supporting structures is B, C, and N; Grade B being the highest. According to the NESC standards, construction Grades B, C, or N may be used for transmission lines (except at crossings of railroad tracks and limited access highways where Grade B construction is specified). However, Duquesne Light designs all of its transmission lines for Grade B construction. The use of Grade B design and construction specifies such things as larger-minimum crossarm dimensions, larger-minimum conductor size, and increased safety factors.

Duquesne Light also surpasses the NESC standards in the clearance requirements. Duquesne Light designs 138 kV and 345kV transmission lines to meet 30 feet of ground clearance under the worst-case load scenario, 9.4 feet more than the NESC minimum of 20.6 feet for new construction on 138kV transmission lines and 5.2 feet more than the NESC minimum of 24.8 feet for new construction on 345kV transmission lines. For reconductor projects and spans with new structures on 138kV and 345kV transmission lines, Duquesne Light strives to obtain either 30 feet of ground clearance or NESC+10%, modifying existing structures as necessary to meet this criteria. For all other types of clearances on new lines, NESC+10% is used.

Duquesne Light also surpasses the NESC standards in the structure overload or multiplying factors. The guideline for structural load factors for transmission structures can be found in the NESC Code. Duquesne Light applies overload factors of 1.1 for NESC 250C and NESC 250D loads compared to the NESC requirement of using 1.0 overload factors for NESC 250C and NESC 250D loads.

Electromagnetic Field Management Practices for New Transmission Lines

a. Transmission Line Planning

All electric currents, including those running within electric transmission lines, generate electric and magnetic fields (sometimes referred to jointly as electromagnetic fields or EMF). Electric and magnetic fields share some similarities but have differences as well. Magnetic fields are directly related to the flow of electrical current in wires and devices. Electric fields are directly related to voltage, which creates the force to make electrical current flow. Both fields decrease quickly with distance from the source.

A large body of scientific evidence does not demonstrate that exposure to EMF are harmful, although guidelines have been set. The EMF exposure standard for the United States is the IEEE Standard C95.6 “Safety Levels with Respect to Human Exposure to Electromagnetic Fields, 0-3 kHz,” which specifies maximum permissible exposure (MPE) limits for the general public of 9040mG (60 Hz) for magnetic fields and 10kV/m (60 Hz) for electric fields within in the right-of-way and 5 kV/m off the right-of-way. Internally, the World Health Organization does not produce an EMF standard, but recognizes the International Council on Non-Ionizing Radiation Protection (ICNIRP) standard. The 2010 ICNIRP standard “ICNIRP Guidelines for Limiting Exposure to

Time-varying Electric and Magnetic Fields (1 hZ to 100 kHz)" lists general public reference levels of 2000mG (60Hz) for magnetic fields and 4.167 kV/m (60Hz) for electric fields. Duquesne Light's transmission lines have EMF levels that are under the reference levels as indicated in these standards and guidelines. Duquesne Light also takes additional steps in its transmission line planning and design processes to identify and minimize any potential EMF impacts on the surrounding area.

Because EMF decrease significantly with distance from the source, any potential EMF emitted by a new transmission line is highly localized. Duquesne Light therefore first identifies the point(s) in a new transmission line with highest potential for EMF exposure. This point is usually a span with (i) lowest ground clearance, (ii) in densely populated neighborhoods; and (iii) in close proximity to publically-accessible areas (such as public sidewalks).

Second, because magnetic fields are a function of current, the next step is to determine the load current along that point of the transmission line. For this, Duquesne Light uses its power flow models, which are based upon projected load growth ten years into the future. Duquesne Light examines two load scenarios: (i) the "50/50" expected peak load forecast (i.e., projections indicate 50% chance the peak will be less than the scenario, and 50% chance the peak will be greater), and (ii) the "90/10" high load condition (i.e., projections indicate 90% chance the peak will be less than the scenario, and 10% the peak will be greater). These power flow studies also consider various contingencies, such as a generators being offline and other transmission lines being out of service. After evaluating the scenarios and contingencies, the greatest load currents on the transmission lines being studied are used for the EMF study. Where Duquesne Light plans to replace an existing transmission line with a new transmission line, it calculates the load in the same way for the existing transmission line as though the new line were not built, so that the net effect on the EMF levels can be determined.

Third, as part of its design process, Duquesne Light adjusts the line design to minimize the potential for exposure to EMF. For example, where a line has two 138 kV circuits, Duquesne Light balances circuit loads where practical to maximize the EMF-mitigating effects of reverse phasing.

b. Mon-Fayette Tower Relocations Project

Duquesne Light followed the above process for 138 kV transmission lines to design the Mon-Fayette Tower Relocations Project, employing several design and planning characteristics to mitigate their EMF propagation and impacts.

First, wherever possible, the lines are predominantly routed through unoccupied parcels; where the route would approach occupied areas, it would run around their edges.

Second, the above-ground lines have been designed with a minimum conductor clearance of 30 feet. This establishes a wide "buffer area" in which EMF emitted by the line will rapidly dissipate.

Overall, these design features of the new 138 kV transmission facilities are expected to yield generally decreased EMF impacts compared to the existing facilities. Duquesne Light's preliminary analysis suggests that EMF field intensity at the right-of-way edge will be similar to or less than the new facilities compared to existing facilities. EMF emissions of all facilities will be below applicable reference levels.

Periodic Maintenance Program on All Transmission Lines

Duquesne Light ensures the continued public safety from our transmission line infrastructure by implementing various maintenance and inspection programs. One program is the routine inspection of as-built conditions to meet clearance requirements described above through advanced surveying technology referred to as "LiDAR". This technology allows Duquesne Light to model its transmission system three-dimensionally to analyze clearances from the conductors to the world around them, including vegetation, homes, pools, roads, and more. This program provides Duquesne Light with accurate as-built records to ensure compliance with designs while also identifying any new or changing conditions to surrounding landscape.

Other Duquesne Light maintenance programs for inspected towers include:

a. Ground inspections, performed by Duquesne Light mobile workers walking around the base of the structure, on approximately 350 structures annually. These inspections focus heavily on foundations, structure integrity, and failed hardware, though additional information may be noted.

b. Aerial inspections, performed by a Duquesne Light subcontractor from a helicopter on approximately 500 structures annually. These inspections focus heavily on hardware and structural defects in tower members, though additional information may be noted.

Personnel Safety Rules

Duquesne Light follows OSHA regulations to ensure safe practices. These regulations are incorporated into the Duquesne Light employee Safety Handbook. Duquesne Light safety rules and good practices include the following:

1. Only qualified employees and trainees working under their direct supervision may work on or with exposed energized lines or parts of equipment operating at 50 volts or more and must be familiar with the minimum approach distances as indicated by OSHA regulations.

2. Before work is commenced, a job briefing will be held with all employees to orient each employee as to:
    a. The hazards associated with the job.
    b. The work procedures involved.
    c. Any special precautions to be taken.
    d. All energy source controls.
    e. Personal protective equipment required.

3. When working in elevated locations, above four feet, employees shall use appropriate fall protection systems. Each employee working from an aerial lift, bucket truck, or man lift shall use a full body harness and either a shock absorbing lanyard or self-retracting lanyard. Duquesne Light ensures that all fall protection follows the OSHA regulations.

4. Prior to climbing towers and other similar structures a documented visual inspection shall be conducted by a competent person to:
    a. Determine type or work, materials, and construction methods required.
    b. Determine whether ground access, without climbing a structure, is possible through use of access roads and bucket trucks.

c. Determine physical condition of the structure.
d. Contact Engineering to determine if a structural analysis has been performed to identify tie-off and anchorage points for construction activities.
e. Tie-off and anchorage points follow the OSHA regulations, in which the anchorage points can support 5,000 lbs per employee or a twice the impact load per employee.
f. Determine the type of fall protection systems to be used, appropriate anchorage points and complete documented fall safety analysis. All work is to be inspected prior to construction to evaluate the site conditions.

If there are any concerns about the integrity of a structure, Duquesne Light Engineering is engaged to perform the appropriate investigation and analysis to provide guidance for safely completing the job.