PJM DEDSTF Lines Sub-group

Environmental/General

Ambient Temperature Range

No mention in the NESC. The PJM TSDS Guidelines state (-30 C to + 40 C, from -40 CN&W of Blue Mountain)

Status: validate closed

Keranuic Level

PJM TSDS = 40.

Conversation at 4/14/16 meeting centered around viability of this parameter as there is better data available as described below:

The **keraunic number** is a system to describe lightning activity in an area based upon the audible detection of thunder. It is defined as the average number of days per year when thunder can be heard in a given area, and the likelihood thereby of a thunderstorm. An isokeraunic map plots contours of equal keraunic number. The keraunic number has been used to set standards for safe design of electrical systems in structures connected to the local power grid.

Before technology was developed to accurately detect and record lightning flashes, keraunic measurements were the standard means to assess the probability of lightning at a location. However, a keraunic number does not distinguish between forms of lightning, such as cloud-to-cloud, or cloud-to-ground, and is limited by the requirement for the thunder to be audibly detected. For these reasons, the keraunic number has been replaced by more accurate Flash Density maps, which collect data from both ground-based and satellite lightning detectors.

Status – Use software based programs such as TFlash which utilize flash density data to model performance.

Minimum Extreme Wind Loading

NESC and PJM TSDS recommend NESC 250C WIND MAP

Status: Still in discussion – (5/16/16) suggested use of new wind map in ASCE. Dave Parrish to determine permission to use? The values are 100 yr return.

Heavy Ice Load (No Wind)
NESC = 1"
PJM TSDS = as required by the TO

Status = there was discussion regarding the use of other values in specific geographic areas – especially mountainous terrain. The sub – group will need to discuss how to address capturing the incumbent TO knowledge in these instances. To be discussed at 5-16-16 mtg.

5/16/16 Suggestion to use/develop an altitude based methodology as there are areas where > 1-1/2" ice is used by the incumbent – especially in mountainous areas. Jay Lenhart/Dave Parrish/R. Crouch to develop.

Code Requirements
NESC = NESC Grade "B" Heavy
PJM TSDS = NESC Grade "B" Heavy

Status = accepted

Provisions for Live Line Maintenance
NECS = NESC Rule 441

PJM TSDS = as required by the TO

Status = following discussion there was a recommendation that all new overhead line construction shall be live line compatible. However, additional discussion is needed to identify what should be included in the standard.
5/16/16 – further discussion is needed to identify what is meant by "live line". R.Crouch & D. Parrish to host call to discuss/determine scope.

Access Requirements
No mention in codes. PJM TSS states "construction and maintenance access is required to each structure"

Status: accepted.

Line crossings

PJM TSS = line crossings should be avoided if possible, but when line crossings are unavoidable they should be configured such that the most important circuits to the transmission network are on top. Additionally, crossings must be configured such that a single component failure will not outage more than one other circuit (beyond the circuit with the failed component). This is in accordance with MAAC criteria.

Status – group agreed that higher voltage should be on top and that the clearance plus a specific adder is the preferred method. There needs to be an agreed upon condition for the analysis and a recommendation to use maximum sag for the upper conductor and no sag, ie, -10 degree F initial for the line being crossed.

Line cascade mitigation

From PJM TSS - Transmission line failures that cascade beyond the original structural failure must be avoided. To accomplish this, the design of a new or modified line shall incorporate dead-end strain structures routinely employed along the line. An alternative is to utilize suspension structures that are longitudinally guyed to resist full line tension if all wires on one side were broken. For wood construction, the strain structures shall also have in-line storm guys utilized to provide the structural strength. The line tensions assumed for this condition are the NESC Heavy loadings on one side of the structure as defined above, and no tension on the other. The structures shall be placed routinely along the line to resist a line cascade, but in no case shall these structures be placed farther than 5 miles apart.

Status – the discussion amongst the group was that the addition of full tension dead-end structures could be a high cost/estimate driver, that there are other methods to address line cascade, and that the 5 mile limitation may not be applicable to some lines that traverse long distances over relatively flat terrain and where other means are being used to mitigate cascading. Suggested language for DEDSTF standard submitted by Drew Pizzo:

"Transmission line failures that cascade beyond the original structure failure must be avoided. The line shall be designed so that a cascading event does not result in failure or severe damage to structures extending beyond a distance of "X" miles from the point of origin. Preventative measures may include, but are not limited to, routine placement of dead-end structures, longitudinal guying, etc., along the alignment. Documentation shall be provided upon request by the line designer proving the design meets these requirements. Line restoration strategy should be considered when selecting the appropriate interval for line cascading mitigation"

Structure Finish

Status -
The group was ok with the statement from PJM Design and Application document :
"Above grade steel will be protected from corrosion using a coating acceptable to the TO. Typical alternatives that have been used include weathering steel, galvanized steel, or painted steel."

Radio Interference at edge of right-of-way

PJM Design and Application guide:
"The transmission line system is to be designed so that radio and TV interference is just perceptible at the edge of the right-of-way. This is typically the case with radio signal to noise ratios above 20 db, and TV signal to noise ratios above 40 db. The achievement of this level of performance is more of a problem for lines above 230 kV, so a radio frequency survey and investigation should be performed to measure actual radio and TV signal strength and calculate the signal to noise ratio."
300 uV @ 1 MHz (350 kV to gnd) for 500kV and 300uV @ 1 MHz (230 kV to gnd) for 345kV is what is in the existing Table 1 Transmission Line Design Parameters table.

Status – additional review with electrical SME's needed.

Switching Surge

PJM TSS
2.2 per unit (500kV), 2.4 per unit (345kV), 2.5 per unit (230kV), 3.0 per unit (138kV), 3.0 per unit (115kV), 3.5 per unit (69kV)

Status: IEEE 516 and OSHA both have the proper switching surge values required.
Need to locate and identify the documents section, etc to be referenced in DEDSTF document.

Critical Impulse Flashover

PJM TSS
500kV = 2145kV, 345kV= 440kV, 230kV=1105kV, 138kV=860kV, 115kV=670kV, 69kV=440 kV
5.7 **Insulation Requirements**
The insulation system for the transmission line shall have values in excess of the leakage distance, 60 Hz wet, and Critical Impulse flashover specified in Table 1. These values shown are minimum conditions and may need to be increased in specific locations such as coastal environments, industrial smokestack sites, or high altitudes. (BIL values are not included here as they are associated with substation insulation and not transmission line insulation,)

Status: