

33 70 00 – 44kV Loop Easement Work Approval Process

1. Introduction

Duke University and Duke Energy require project review and approval prior to any excavation around the 44kV Underground Loop on campus, due to critical concerns about the safety and reliability of the underground system. All proposed excavations within the 30ft. easement of the 44kV UG loop shall be reviewed by FMD-DUES prior to final review by Duke Energy's Asset Protection group and before planning any constructions activities.

2. General Utility Requirements

Utilities shall cross the Duke Energy easement from one side to the other at an angle not less than 30 degrees to the center line of the Duke Energy easement.

All crossings shall be installed with a minimum of 24" of clearance from the 44kV system.

Manholes, transformers, telephone/cable pedestals (and associated equipment), fire hydrants, water valves, water meters, backflow preventers and irrigation heads shall not be located within the easement.

Any grading, backfilling or other activities which impact the installed depth of the existing 44kV line must be reviewed and approved.

3. Design Drawing Requirements

An encroachment request must be initiated by the project manager to FMD-DUES for review and approval. A design must be submitted that includes the following information:

- A. The requestor shall have the Duke Energy 44kV transmission line field located and then shown on a drawing(s), along with dotted lines denoting the easement of 15ft. on each side, from the center line of the located facilities.
- B. The drawing(s) shall show all existing condition within and adjacent to the easement to include any existing encroachments. All utilities shall be labeled with type, size and elevation.
- C. The drawing(s) shall clearly show the location of any proposed encroachments with each encroachment labeled with type, size and elevation.
- D. The drawing(s) shall contain a north arrow and key plan to properly locate the proposed work along the 44kV easement.
- E. The drawing(s) shall include profiles or cross-sections that clearly indicate the relationship between the 44kV, surrounding existing utilities and the proposed utilities.

- F. The drawing(s) shall specify that any excavation within 5 feet on either side of the 44kV sand bed must be hand dug.
- G. The drawing(s) must be signed, sealed, and dated.
- H. A work plan for construction must be included as a separate document.

The design drawing is then submitted to Duke University FMD-DUES and reviewed for completeness. Once all requirements are met, Duke University FMD-DUES submits the documents to the designated Engineering firm for technical evaluation and copies Duke Energy's Asset Protection Specialist. Duke Energy's Asset Protection Specialist will respond to Duke University FMD-DUES as to whether the proposed encroachment is acceptable to Duke Energy, or is denied and will require adjustments.

4. Technical Evaluation

Technical evaluation (conducted by the designated Engineering firm and approved by Duke Energy Transmission Line Engineering) is required to insure that the proposed encroachments do not impact the capacity or other electrical characteristics of the 44kV facilities. This is especially critical when heat sources (i.e. Steam Lines, Electrical Cable, etc...) are proposed for encroachment.

For this technical evaluation, the following information is required:

- A. If the encroachment contains any heat sources (i.e. electric, steam, hot water, etc...) their proposed location along with specifics about type and temperature will be required.
 - 1. A cross-sectional drawing of any proposed duct bank identifying all proposed utilities that it will contain.
 - 2. For electric circuits, the duct bank cross-sectional should show cable locations within the duct bank along with the anticipated maximum operating temperatures and peak electric loads for each electric cable.
 - 3. A cut sheet showing the cross section of the electric cables to be installed showing how the cable itself is constructed.
 - 4. For non-electric heat sources, please provide type, temperature, and any other technical information to quantify its potential thermal impact
 - 5. Indicate the future plans for any spare ducts shown within the duct bank
 - 6. Data on the duct bank concrete specifications (i.e. thermally designed mix? Density? R-Value? etc...)
- B. If no duct bank or heat producing utilities are a part of the encroachment, you will either be informed that no technical evaluation is required, or specific information about your project will be requested.

For projects requiring technical evaluation, Duke University FMD-DUES will collect the required information and submit it to the designated Consulting Engineer to verify that the proposed crossings will not thermally reduce the rated capacity of the 44kV system. This engineering review and results shall include, but not be limited to:

- Thermal analysis with calculations to verify results
- Confirmation design meets crossing angle requirements
- Confirmation design maintains a minimum of two (2) feet vertical separation from the 44kV pipe

Once the technical review is complete, the designated Engineering firm will provide the review materials to Duke Energy (via the Asset Protection Specialist) for approval by Duke Energy Transmission Line Engineering.

5. Plan Approval Phase

Once all requested information has been submitted and the review is completed, Duke Energy (via the Asset Protection Specialist) will respond in writing to the requestor as to whether the final drawing plan is acceptable to Duke Energy, or is denied and will require adjustments. If the drawing plan is approved, the official approval response may also include other requirements Duke Energy has for your project. After the drawing plan is approved by Duke Energy, the Plan Approval Phase is complete. The Construction Approval Phase can begin.

NOTE: The construction written work plan and schedule may be required to be submitted together with the completed technical review documents as per FMD-DUES.

6. Construction Approval Phase

The written work plan and schedule must be approved by Duke Energy before any construction work is scheduled. The requester submits the written work plan and schedule to Duke Energy (via Senior Account Representative) for construction approval. If the written work plan and schedule is denied, the requested must resubmit a revised work plan and schedule to Duke Energy with all reasons for denial resolved.

The work plan should include, but not be limited to the following:

- Specific requirements to coordinate with Duke Energy and Duke University FMD-DUES to de-energize the 44 kV system prior to working inside the easement
- Details on methods used to locate the 44 kV system prior to excavation
- Details on method of excavation to be done inside the easement (including hand digging required within 5 feet of the 44 kV system)

- Details on plans to support the 44kV system for any excavation required under the pipes
- Verification that any disturbed sand protecting and surrounding the 44kV pipe shall be replaced with sand of equal thermal rho

Care shall be taken at all times to insure that construction in and around the 44kV facilities do not cause harm or degradation to their function. For instance, the maximum vibration that the 44kV line should be exposed to should be limited to a peak particle velocity of 2.0 inches per second to insure no impact to the facilities. In addition, the 44kV should be protected from excessive weight or load bearing over or across the cable.

7. Follow-up

Once the project is complete, Duke University FMD-DUES will provide Duke Energy (via the Senior Account Representative) with a set of as built drawings of the encroachment

8. Contacts

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- B. **Jeff Koone**, Duke Energy Senior Account Representative
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9. Appendix

- A. **Duke University FMD-DUES Approval Process Diagram for 44kV Encroachments**

Duke Energy 44 kV Encroachments: DUES Approval Process

