



# Underground transmission lines 69kV and above

At first glance, it may seem that burying high voltage transmission lines underground is an easy solution, particularly in cases where landowners are concerned about overhead lines disrupting the landscape. However, there actually are many drawbacks to burying transmission lines underground, for both property owners and utilities.

Electric utilities build high voltage power lines underground only in very rare circumstances, where there is no viable overhead corridor, such as near airports or dense urban areas. Approximately 1% of all transmission lines across the country are underground. Great River Energy does not build transmission lines underground.

## **Costs are significantly higher**

Due to differences in equipment, materials and construction costs, terrain and construction season, building transmission lines underground is up to 16 times more costly than building overhead. Underground lines must be routed to avoid other underground installations such as water, gas and sewer lines. Unstable slopes, hazardous material sites and bedrock must be avoided. Going under a road, highway or river requires expensive construction techniques such as directional boring. High cost is only one drawback to burying lines underground, but it is a significant one.

## **Outages can last much longer**

While outages are less frequent, underground transmission line faults are more difficult to locate and can take much longer to repair than overhead lines. Overhead lines can generally be repaired in a matter of hours or days after a fault occurs, while underground repairs may take several weeks or months. When repairs need to be made to an underground transmission line, the utility often needs to dig and disrupt the land to access the problem area and specialized crews are often needed. In addition, underground transmission lines in cold climates pose significant challenges for materials and access during frozen conditions.



*Burying high voltage transmission lines is extremely disruptive to property. An open trench is required throughout the construction process.*

## **Construction is extremely disruptive to property**

When building underground, utilities must dig an open trench through the entire right of way so protective concrete duct banks can be installed. The trench needs to remain open throughout construction. Construction for underground transmission takes about 5 times as long. To allow for regular inspection and maintenance, splice boxes (approximately 8 x 8 x 25-feet in size) and manholes also must be installed every 1,500-2,000 feet. When building overhead lines, only the areas where poles will be set into the ground (approximately 25 square feet) are disrupted. Overhead lines allow for spanning sensitive environmental areas whereas undergrounding requires specialized construction techniques, such as horizontal directional drilling to minimize impacts.

## Underground transmission vs distribution

Undergrounding lower voltage distribution lines is a commonly used construction technique and in those cases the cable is directly buried as opposed to the use of a duct bank for transmission. The core difference between transmission and distribution power lines is that transmission power lines are for long-distance, high-voltage electricity transportation, whereas distribution power lines are for moving lower voltage electricity across shorter distances and are commonly direct buried.

## Land use is more restricted

Any use of the land above an underground system is strictly limited to ensure safety and maintain the integrity of the transmission system. The right of way area needs to be free of vegetation and obstructions that may hamper restoration, repair or endanger the system. Grade changes are strictly enforced for underground lines, additional above ground signage may be required as notification of an underground system.

## Large structures are needed

Underground transmission lines still require overhead structures as part of the overall system. "Riser structures," large structures with attachments, are needed to transition from underground to overhead. An additional easement area will be required to accommodate riser structures.

## Impact on environmental resources, public

During underground construction, local wildlife will be disrupted. Underground construction causes more significant impact as initial construction and maintenance takes longer and requires more equipment and ground disturbance than overhead lines, leading to more disruption during construction.



*A solid dielectric underground cable is significantly larger than a standard conductor that hangs from an overhead structure.*



*Riser structures are required in some areas when burying transmission lines underground.*



*FAR LEFT: A large amount of space is required throughout the construction process while burying transmission lines underground. LEFT: A large section of roadway is blocked off while cables are installed. In urban areas, underdeveloped rights-of-way may require extensive grading to support the construction activities and equipment.*



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