BRIEFING

Underground vs. Overhead Transmission Lines

MEA is often asked why it doesn’t simply bury its transmission lines. While burying transmission lines is an intuitively desirable approach, many people don’t recognize the technical difficulties and significant cost increase of installing transmission infrastructure underground.

Smaller distribution lines that feed our homes and businesses can economically and safely be placed underground. Nationwide, however, burying the larger transmission lines is uncommon. Of the more than 200,000 miles of transmission lines in the U.S., less than 3 percent are underground. Why?

Significantly Higher Costs
Unlike distribution power lines that deliver power to homes, high-voltage power lines are extremely expensive to build underground. Underground construction of transmission lines often costs 5 to 10 times more than overhead construction.

Insulated cables, underground surveying and excavation, splicing vaults and concrete-encased conduits to protect lines from dig-ins contribute to higher costs. The lifespan of underground lines is 30 to 35 years, about half that of overhead lines.

Those costs must be passed along to our members through rates.

Longer Outages
While underground lines are less susceptible to storm-related outages than overhead lines, when outages do occur, it takes an average of a week or more to locate and repair the problem, compared to a few hours for overhead lines. That’s an important reliability concern since tens of thousands of customers can be affected by a transmission line outage. A study done in North Carolina from 1998-2002 found that while underground lines had approximately half as many outages as overhead lines, repairing outages took about 58% longer. The delays would increase exponentially with the frozen ground, icing conditions, and deep snow cover we deal with in Alaska a large part of the year. Earthquakes pose the potential for a catastrophic loss, especially with lead time to obtain replacement cable between 6 and 12 months.
Significant Impact During Construction
Underground transmission lines are almost 5 times as large as above-ground lines. The underground cables may be direct buried or placed in conduit. Direct burial of the cable is a less costly construction method, but the cable has a shorter operational life and is difficult to replace in the event of a fault. Installation in conduit is more expensive to construct but has a longer operational life. Even then conduit replacement is costly and time consuming. To minimize costly replacement, companies will either install an additional cable in conduit as a replacement, or install additional empty conduits for a replacement circuit, which further increases the construction cost. Differential settling, frozen conduits and earthquakes increase the risk that spare conduits may not be usable when needed.

A 16 feet wide and 9 feet deep trench is required to install buried transmission lines; digging this trench and installing support structures is several times the construction cost of an overhead line. This trenching must contend with other buried utilities and road-access cutting. Large structures are needed at each end for transition from below ground to above ground transmission lines. These transition structures may require up to a one acre site at each end.

MEA has evaluated the costs and benefits of constructing underground lines. The negative impact on our daily lives and the economic vitality of the area resulting from the disruptions caused by a car length trench across driveways, entrances to businesses and the roads that lead to our homes, schools and areas of commerce cannot be underestimated or ignored.

Right of Way Considerations:
The perception is undergrounding transmission lines will require less right of way and reduce the amount of vegetation clearing. In reality trench depth and excavation stockpiling widths

Matanuska Electric Association, Inc., Alaska’s oldest and second-largest electric cooperative, is owned and operated by its members. MEA’s service area covers more than 4,000 miles of power lines in Southcentral Alaska, and the co-op leads projects statewide to provide customers with affordable, reliable energy.

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for underground lines require similar right of way widths to overhead lines for construction, maintenance and repair. Vegetation clearing for construction, maintenance and repair activities access, as well as protection of the cables from root systems, precludes most vegetation growth within the right of way.

**Safety Concerns**
Transmission lines carry a significant amount of energy. A fault in the line could transfer that high voltage energy into a nearby structure, utility system or water source, putting people and animals in danger.

**Maintenance is Disruptive and Expensive**
Underground line maintenance is more expensive. Differential settling from poor soil conditions and the annual freeze-thaw cycle regularly increase the risk damage to the cable, splices and joint connections. Since the lines are underground, additional digging and disruption occurs, especially since the lifetime of an underground line is only about half that of an overhead line. Underground lines also complicate access for neighboring property owners for the lifetime of the line. In addition, construction and maintenance require breaking ground and will likely impact other utility infrastructure like pipes or fiber lines. Above-ground factors like traffic and vegetation must also be considered.

**Where Does MEA Stand?**
Based on the facts, it is not in the best interest of our members to build transmission lines underground.

- Underground options are too costly and would result in increased rates
- They are in most cases technically inconsistent with industry practices.
- The disruption caused by installation and maintenance is not in the best interest of our members or communities.
- The issues experienced in the Lower-48 are increased significantly with Alaska’s arctic climate and higher costs.