

Underground or Overhead?

Exploring Issues of Cost and Reliability

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In the early 1900s, utilities and municipalities began putting medium-voltage paper-insulated lead-covered cables and rubber-insulated low-voltage cables in ducts below city streets. In the mid-1950s, a cost-effective and easier to install alternative was introduced—polyethylene-insulated underground cable. Since then, significant improvements have been made to where service life of overhead and underground systems are now on par.

Anyone who has experienced a lengthy power outage from storm damage understands that underground power delivery systems are more reliable than overhead systems, but when an underground system fails, locating the failure is more difficult and repairs can take much longer, especially if there is no contingency power source. Repair can mean digging up lawns, gardens, and streets. In fact, a large southeast utility company discovered that while underground systems do significantly reduce outages from hurricane winds, damage to the underground system from flooding was extremely costly. It now limits underground services to new construction only.

There is increasing public sentiment and pressure from special interest groups to move power lines underground—out of sight, out of mind. Aside from aesthetics, property values are higher in neighborhoods where utilities are placed underground. There is also a safety aspect—the risk of injury from fallen power lines is eliminated.

Commonly accepted estimates put the initial cost of underground systems at five to ten times more than overhead construction, while overhead systems have higher operation and maintenance costs (e.g., tree trimming). Depending on whether it is new or old construction, utilities have several programs to recover some of the initial expense of underground systems. In new construction, utilities will often require developers to pay the expense since they will likely recuperate the cost because of higher property values. However, it is ratepayers who eventually foot the bill. Looking at key decision factors for overhead versus underground systems, there is clearly a dilemma of cost versus benefit.

Various factors such as site access, soil conditions, vegetation, and routing will influence installation cost and reliability of

Overhead	Underground
1. Falling trees and limbs	1. Physical damage from dig-ins (≈90%)
2. Storm damage (high winds)	2. Physical damage from installation
3. Ice buildup (regional issue)	3. Poor workmanship
4. Animal contact	4. Voltage surges

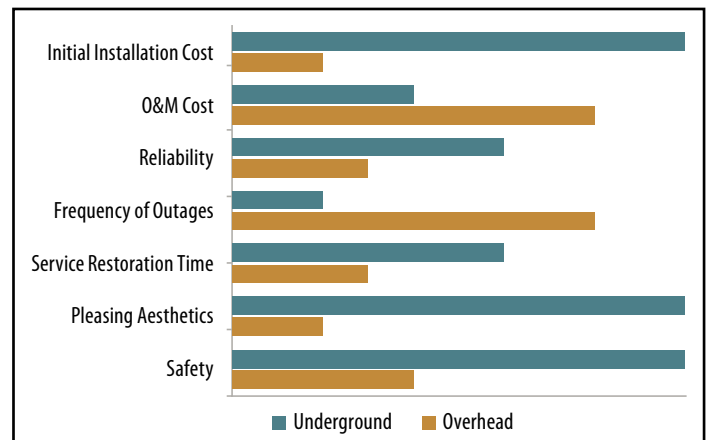
Top Four Reliability Risks for Overhead and Underground Systems

* based on general knowledge and limited published data

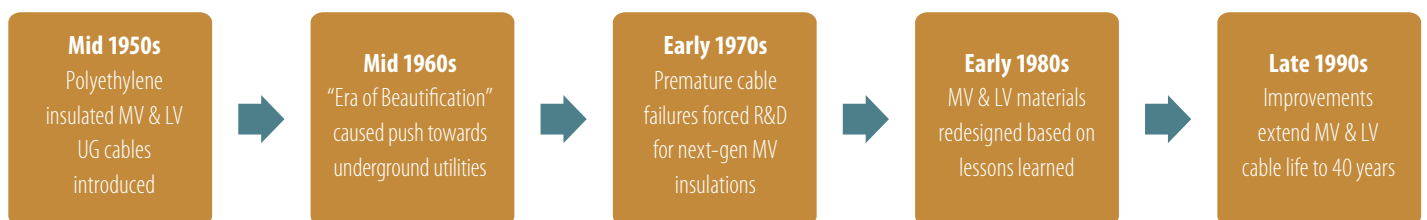
underground systems. When the cost of an underground system is low and benefits are high, “undergrounding” may be the right decision. But it is no silver bullet. The cost of putting cables underground is still magnitudes higher than overhead systems. While underground systems are more reliable, when outages do occur, they tend to last much longer.

The push to put utilities underground is driven by the voice of the ratepayer through discussions with public utility commissions—the same groups of people who have to ultimately fund the increased costs. ☹

Mr. Doss has 15 years of experience as standards engineer at a southeastern electric utility, and 25 years at General Cable Corporation as senior product engineer, director of product engineering, and now technical marketing director.



Relationships are for a specific set of circumstances and will vary for each location



Underground Cable Evolution since the 1950s