External Talk Points

Subject: Burying Entergy's Electrical Lines Underground
Date: September 5, 2008
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Background:

In the aftermath of Hurricane Gustav, questions have been raised about whether the Entergy system's overhead transmission and distribution lines should be buried underground to protect them from damage from wind, vegetation, debris or ice. But studies have repeatedly shown that "undergrounding" the lines would be a hugely expensive proposition for customers and taxpayers. Even if the lines were buried, there would be no guarantee that storm outages would not keep occurring or that outages would be shorter.

Key Messages:

- Entergy is not opposed to all undergrounding projects. Power lines in some downtown business districts and many neighborhoods in our service area are already underground, usually where the lines were buried during the original construction, as in the case of many newer housing subdivisions. However, customers – especially those in communities with existing overhead service – need to understand the advantages and disadvantages of both types of service if they are considering paying for a change.

- Undergrounding electrical lines could be prohibitively expensive for utility customers or taxpayers, costing 10 times what it costs to install overhead distribution or transmission lines.

- Numerous studies by state regulatory agencies have found that the costs of burying power lines can dwarf the benefits provided.

- Opinion surveys often suggest that electric customers are prepared – in theory – to pay more to move their power lines underground. When faced with the real costs of undergrounding, however, most are not willing to pay the substantially higher electric bills or monthly payments required.

- Research indicates that reliability does not necessarily improve when lines are buried. The frequency of outages decreases but the length of outages increases.

- As underground cables approach their end of life, failure rates increase significantly and these failures are extremely difficult to locate and repair.

- Underground lines require specialized equipment and crews to locate a fault, a separate crew with heavy equipment to dig up a line and a specialized crew to repair the fault. This greatly increases the cost and the time to repair a fault.

The Pros and Cons of Underground Electric Lines:

- Overhead lines can easily be upgraded and maintained at a lower cost, while underground systems are more difficult to access and cost more to upgrade.

- While overhead lines are exposed to damage from airborne debris, trees and public interference, outages typically take less time to restore than underground outages.

- Underground systems tend to have fewer power outages than overhead systems, but the duration of those outages tends to be much longer.

- Underground lines are less susceptible to damage caused by wind, trees and ice, but face outages from trees collapsing on above-ground transformers and switch boxes or from tree-root systems uprooting buried cable when trees fall.

- Lightning events reduce the life-span of underground lines, either through direct or indirect strikes.

- Storm-related flooding – particularly salt-water flooding – can cause and prolong outages in underground systems, and can shorten the life and increase the ongoing maintenance of the underground system.

Studies of Undergrounding Costs and Benefits:

- A 2006 study of the pros and cons of undergrounding electrical **distribution** lines by the Edison Electric Institute (EEI) found that "burying overhead power lines has a huge price tag, costing about $1 million a mile on average, or about 10 times what it costs to install overhead power lines." The "bottom line," EEI concluded, is that "reliability benefits associated with burying existing overhead [distribution] power lines are uncertain and in most instances do not appear to be sufficient to justify the high price tag that undergrounding carries."

- A 2007 study by Entergy Texas, made at the request of the Public Utility Commission of Texas, also showed that the construction of underground **transmission** lines is roughly 10 times more expensive than overhead construction. On a per mile basis, it costs $5 million to build an underground transmission line versus $500,000 for overhead construction, the study indicated.

- That means it would cost 1,000 percent more to construct underground **distribution or transmission** lines, compared to overhead lines, in order to avoid the average of 3 percent damage done to transmission systems by a "typical" hurricane.

- Studies of statewide undergrounding proposals in North Carolina in 2002 and Florida in 2003 suggest that undergrounding **distribution** lines would require rate increases ranging from 80 percent to 125 percent.

- A 2004 study by the Virginia Corporation Commission calculated the annual cost of a statewide undergrounding initiative at approximately $3,500 per customer. Based on the projected costs and benefits for undergrounding much of its state's electric system, the Virginia commission calculated that the benefits would offset only about 38 percent of total costs and concluded that a comprehensive statewide effort to bury the state's electric distribution system appears "unreasonable."

- In 1998 Australian officials completed what may be the most comprehensive research to date to quantify the benefits and costs related to undergrounding. The Australian study reached a conclusion similar to the Virginia study and estimated that the benefits of undergrounding would offset only about 11 percent of the costs.

- A five-year survey (1998-2002) of underground and overhead reliability comparisons for North Carolina's investor-owned electric utilities – Duke Energy, Progress Energy Carolinas and Dominion North Carolina Power – indicated that the frequency of outages on underground systems was 50 percent less than for overhead systems, but that the average duration of an underground outage was 58 percent longer than for an overhead outage.

- While a neighborhood may be locally served by underground lines, all electric service eventually comes back above ground and connects to overhead service, either in the neighborhood next door or further down the street where overhead main lines and transmission lines move electricity from power plants and substations into our neighborhoods. Thus, exposure of above-ground and overhead service to problems such as weather or trees cannot fully be eliminated. In fact, after Hurricane Wilma struck South Florida in 2004, the media reported that 97 or 98 percent of Florida Power & Light customers in Broward County lost power, even though 54 percent of them were served by underground lines.

- A 2000 study by the Maryland Public Service Commission looked at the reliability of "comparable" overhead and underground feeders and concluded that the impact of undergrounding the lines was, at best, "unclear." As underground cables approach their end of life, the Maryland report showed, failures increase significantly and are extremely difficult to locate and repair. Maryland utilities say their underground cables become unreliable after 15 to 20 years and reach their end of life after 25 to 35 years.

- Potomac Electric Power Company (Pepco) found that customers served by 40-year-old overhead lines had better reliability than customers served by 20-year-old underground lines. Two Maryland utilities, Choptank and Conectiv, even have replaced underground distribution systems with overhead systems to improve reliability.

- A 2002 report to the North Carolina Utilities Commission stated that "it is relatively easy to locate a fault on an overhead line and repair it. A single line worker, for example, can locate and repair a fuse. This results in shorter duration outages. Underground lines require specialized equipment and crews to locate a fault, a separate crew with heavy equipment to dig up a line, and a specialized crew to repair the fault. This greatly increases the cost and the time to repair a fault on an underground system."

The North Carolina experience:

In early December 2002, a major ice storm blanketed much of North Carolina with up to one inch of ice, causing an unprecedented power outage to approximately two million electric utility customers. In the immediate aftermath of the storm, the public expressed considerable interest in burying all overhead power lines in the state. A special Natural Disaster Preparedness Task Force investigated the issue for the North Carolina Utilities Commission, however, and unequivocally recommended against the step.

The task force study "determined that replacing the existing overhead distribution lines of the (state's investor-owned) utilities with underground lines would be prohibitively expensive. Such an undertaking would cost approximately $41 billion, nearly six times the net book value of the utilities' current distribution assets, and would require approximately 25 years to complete. The ultimate impact of the capital costs alone on an average residential customer's monthly electric bill would be an increase of more than 125 percent."

Rates would also be impacted by the higher operating and maintenance costs associated with direct-buried underground systems, particularly in urban areas, where underground conductors are four times more costly to maintain than overhead facilities, the task force found. "In addition to the impact on the cost of providing utility service, conversion to underground would impose costs on individual customers, municipalities, and other utilities," it added. "While these costs have not been quantified, they could be significant."

The report also determined that "underground facilities are not without their disadvantages. Although underground systems are more reliable than overhead systems under normal weather conditions, they are not impervious to damage, and the repair time for underground systems is almost 60 percent longer than for overhead systems when damage does occur. Consequently, the [Task Force] does not recommend that the utilities undertake the wholesale conversion of their overhead distribution systems to underground."

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