

Technical Committee

February 14, 2013



Selection Criteria for Undergrounding Power Lines

- The Technical Committee developed both primary and secondary selection criteria to aid in analysis and the selection of feeders;
 - **Primary Selection Criteria** – these were quantitative reliability metrics that provided an objective means of screening feeders;
 - **Secondary Selection Criteria** – these were both quantitative and qualitative criteria that aided in determining the sequencing of feeders selected from the primary criteria.
- Using both primary and secondary criteria enabled the Technical Committee to apply a rigorous analytical basis for feeder selection while also considering other factors such as:
 - Other reliability enhancement programs already underway;
 - Coordination with future economic and infrastructure developments in feeder area;
 - Coordination with other utilities' and governments' infrastructure projects;
 - Evaluation of the level of construction being performed at any one time within a Ward;
 - Consideration of the number of customers served by each feeder.



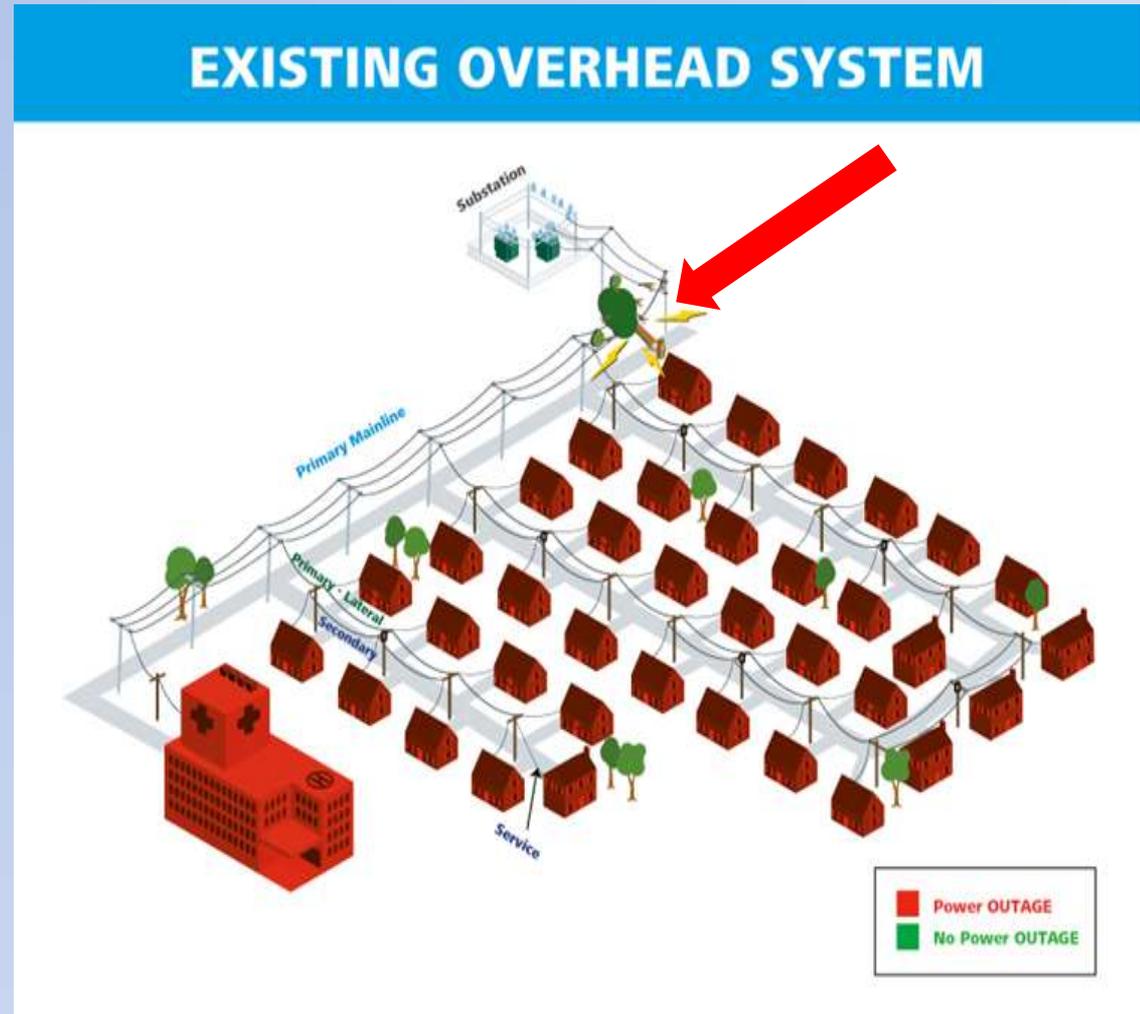
- Primary selection criteria are based on reliability benefits;
- Combination of ranking methods select feeders that improve both frequency and duration of outages and obtain the largest reduction in the minutes of interruption for the dollars spent to underground;
- Primary selection criteria will develop a ranking of all feeders so that the feeders with the greatest overall benefits are undergrounded first.

| Primary Selection Criteria | |
|---|---|
| SAIDI | Selection of feeders that result in the greatest reduction in duration of outages once the feeder is undergrounded |
| SAIFI | Selection of feeders that result in the greatest reduction in frequency of outages once the feeder is undergrounded |
| Customer Minutes of Interruptions per Cost of Undergrounding | Achieve the greatest reduction in the minutes of interruptions for every dollar spent to underground |

- Secondary evaluation is used to determine the sequence of undergrounding the feeders selected by the primary selection process;
- This is important so that proper coordination is made with other infrastructure projects and so that communities are not impacted with multiple construction projects at the same time;
- Secondary criteria helps to select the feeders that benefit the community and take into consideration the non-reliability criteria.

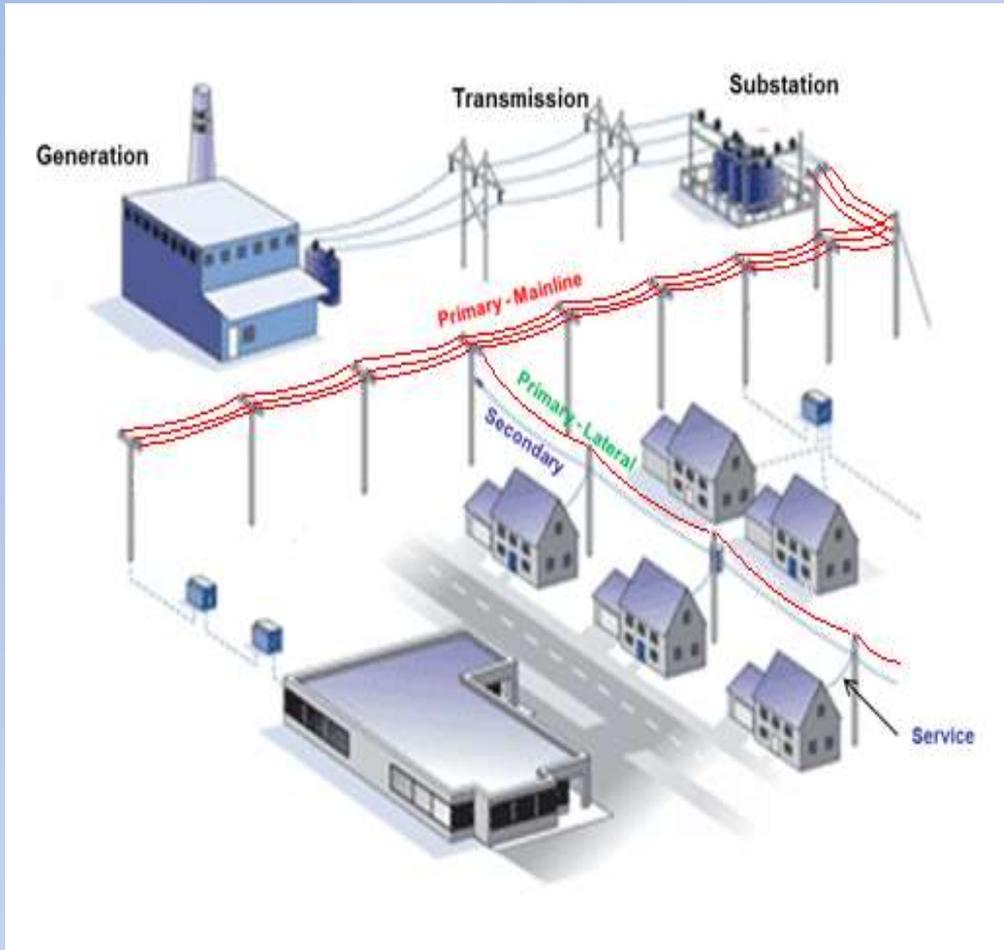
| Secondary Evaluation Criteria | |
|---------------------------------------|--|
| Value of Service | When two or more feeders within a ward are scheduled for undergrounding, the order or sequence to perform that work can take into consideration the economic benefits of reduced outages – the feeders with the highest economic impact during an outage would be the first to be undergrounded |
| Utility Coordination with DDOT | Coordination of undergrounding projects with major road reconstruction work and other utility projects to achieve cost reduction benefits from reduced paving cost and efficiencies of scale in work being performed |
| Community Impact | Major road or utility construction work can have a significant impact on a community and economic impact on businesses. Limiting feeder undergrounding projects at any one time to no more than one project per ward can help to reduce this impact |
| Customer Impact | Evaluation of customer supplied from each feeder so that the prioritization of work takes into consideration the number of public service facilities (fire and police), health care and customers with special needs for electric service are considered when scheduling the order of feeders to be undergrounded. |

- Graphic to the right is a depiction of the current overhead system in the District;
- When an outage occurs – for example due to a tree falling on a power line – then all customers connected to that line are impacted and lose power;
- Those customers without power must wait until repairs are made and the feeder is restored.



Preferred Undergrounding Scenario

Undergrounding Mainline and Laterals with OH Secondary.



- This scenario would eliminate overhead causes of outages on the primary feeders;
- It eliminates the events that occur on blue sky days, normal storm days or during major storms on the mainline and lateral primaries;
- Padmount transformers will be used that are fed underground from the mainline and lateral switch holes and the secondary will be routed from the padmount transformers as necessary to rise up on existing poles to supply the existing overhead secondary.

- The preferred scenario has the best balance between cost and reliability improvement;
- If an outage does occur it will only impact a few customers not everyone on the feeder;
- By eliminating the larger outages on the primary wires crews will be able to respond faster to the individual outages that in the past were to longest to restore.
- An initial program over the next 5 to 7 years could provide benefits to nearly 60,000 customers.



Discussion

Recommendations

- Initial recommendations cover a number of areas, including:
 - Feeder ranking and selection process;
 - Customer outreach and communications;
 - Emergency preparedness and the coordination between various District utilities and agencies during storms;
 - Development of workforce participation strategies;
- There are two areas where recommendations are still being finalized:
 1. Financial analysis is still under review;
 2. Potential legislation necessary to implement the recommendations is still under review.

Recommendations

Proceed with 'Scenario 3' and the selective undergrounding of power lines in the District:

- Underground the primary mainline and lateral portions of the feeder ('Scenario 3'), retain the secondary lines and communication lines overhead;
- Program focused on the top 55 to 60 distribution lines;
- Coordinate where possible with other construction projects;
- Utilize joint construction techniques.

Develop public awareness and stakeholder communications plan and engage in consumer education:

- Develop and submit a timeline for the consumer education plan roll out;
- Educate District customers about benefits, costs and other program details.

Improve emergency preparedness and storm restoration processes:

- Enhance the coordination of debris removal during storms;
- Improve communication between District leaders, Pepco and other utilities.



Recommendations

Integrate a workforce participation strategy into the undergrounding program:

- Examine local workforce participation models to identify best practices that encourage and spur District hiring for capital projects.

Communication services will work with the electric utility to coordinate undergrounding and improve reliability for customers, where viable:

- Undergrounding of communication lines will only be considered where complete undergrounding of the electric facilities is recommended.

Pass enabling legislation, in the District, for the undergrounding program

- Prepare legislation to ensure appropriate governance and regulatory guidance to support the undergrounding strategy



Appendix



For the District of Columbia, there are fundamentally five different options for undertaking the process of undergrounding power lines:

Scenario 1: Underground the overhead three phase primary mainlines retaining existing overhead transformers, secondary and service poles and overhead laterals;

Scenario 2: Underground the primary laterals including secondary and services. Replace overhead pole mounted transformers with pad mount transformers;

Scenario 3: Underground primary mainline and laterals. Replace overhead pole mounted transformers with pad mount transformers. Leave existing overhead secondary and services;

Recommendation

Scenario 4: Underground all primary mainline and laterals, transformers, secondary, and services up to the service delivery point;

Scenario 5: Underground the primary laterals, retaining existing overhead mainline, secondary and services. Replace overhead pole mounted transformers with pad mount transformers.

