LONG TERM ANALYSIS OF LINE ARRESTER APPLICATION FIELD STUDY

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Lightning Caused Interruptions

- 10% of system SAIFI in 2007 (IEEE Def)
- 480,000 Customer Interruptions
- Historically a significant contributor to sustained outages



ComEd Summer Lightning Activity





2004





Key Points

•Intensity varies by year and by region •Over time, greater in Southern regions



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- Assess current standard for lightning arrester application
- Recommend changes for improved performance

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- Recommendations (New Standard)
 - New construction
 - Arresters every 180 m (600ft)
 - Existing circuits
 - Follow new standard as needed
 - Bring grounds up to spec

1995 Field Trial

- Objective
 - Verify predicted performance improvement

1995 Field Trial

• Objective

- Verify predicted performance improvement

- Methodology
 - Select 2 groups of circuits
 - Upgrade 1 group to new standard
 - 1 group left as a control
 - Compare performance after some time period



- 60 circuits selected
 - Based on 5 year outage data
 - 30 control, 30 experimental





1995 Field Trial

 After 3 "lightning seasons" compare performance

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 - IEEE outages (> 5 minutes)

1995 Field Trial

- After 3 "lightning seasons" compare performance
- ComEd database of outages coded as lightning
 - IEEE outages (> 5 minutes)
- Lightning data obtained using FALLS™ software from Vaisala, Inc
 - 1 kM buffer









1995 Field Trial							
	<u># INTER</u>	<u>LENGTH</u>	<u>GSD</u>	INT/100KM/GSD			
CONTROL AVG	14.43	150.7	21.27	0.457			
EXPER	11.93	183	21.88	0.305			

- Validate results of earlier study
- 9 Years: 1998 through 2006
- Same methodology



- Question: Are the 60 circuits still valid?
 - Mostly rural
 - Less change over time

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- Study update was performed

Detailed circuit by circuit comparison
 2006 vs. 1997 configuration

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- Detailed circuit by circuit comparison – 2006 vs. 1997 configuration
- Control circuits
 21 of 30 unchanged
- Experimental circuits - 20 of 30 unchanged



- Conclusion
 - Assumption was reasonable but
 - Rerun study using the 41 circuits





2007 Study Update – 41 Circuits

	<u># INTER</u>	<u>LENGTH</u>	<u>GSD</u>	INT/100KM/GSD
CONTROL AVG	60.8	148.6	104.8	0.390
EXPER AVG	56.2	185.7	105.5	0.291

• Statistical analysis: 16% improvement, 95% confidence



2007 Study Update – 41 Circuits

- Results not as great as prediction (70%)
 - Calculation actually *Flashover* rate, not *Outage* rate
 - Reclosers Not all flashovers are outages

2007 Study Update – 41 Circuits

- Results not as great as prediction (70%)
 - Calculation actually *Flashover* rate, not *Outage* rate
 - Reclosers Not all flashovers are outages
 - Model vs. Field Conditions
 - Arrester spacing in control group
 - Pole height
 - BIL

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QUESTIONS???

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