

Contact Voltage

New York State Joint Utility Perspective

Agenda

- Overview
- NYS PSC Safety Order
- Results of Harmonics Analysis in Underground Areas
- Results of Harmonics Analysis in Overhead Areas
- Troubleshooting Flowchart
- Questions

Utilities Overview

- Six large regulated utilities in New York
 - Central Hudson Gas and Electric
 - Con Edison
 - National Grid
 - New York State Electric and Gas
 - Orange and Rockland
 - Rochester Gas and Electric
- Serving over 6 million customers
- Statewide peak of approximately 33,000 MW
- Approximately 4.8 million utility owned assets and municipally owned street lights
- Collectively the New York State Utilities have performed more than 23 million manual tests since 2005
- New York State utilities have conducted nearly 33,000 investigations since 2005

Current New York State Regulations

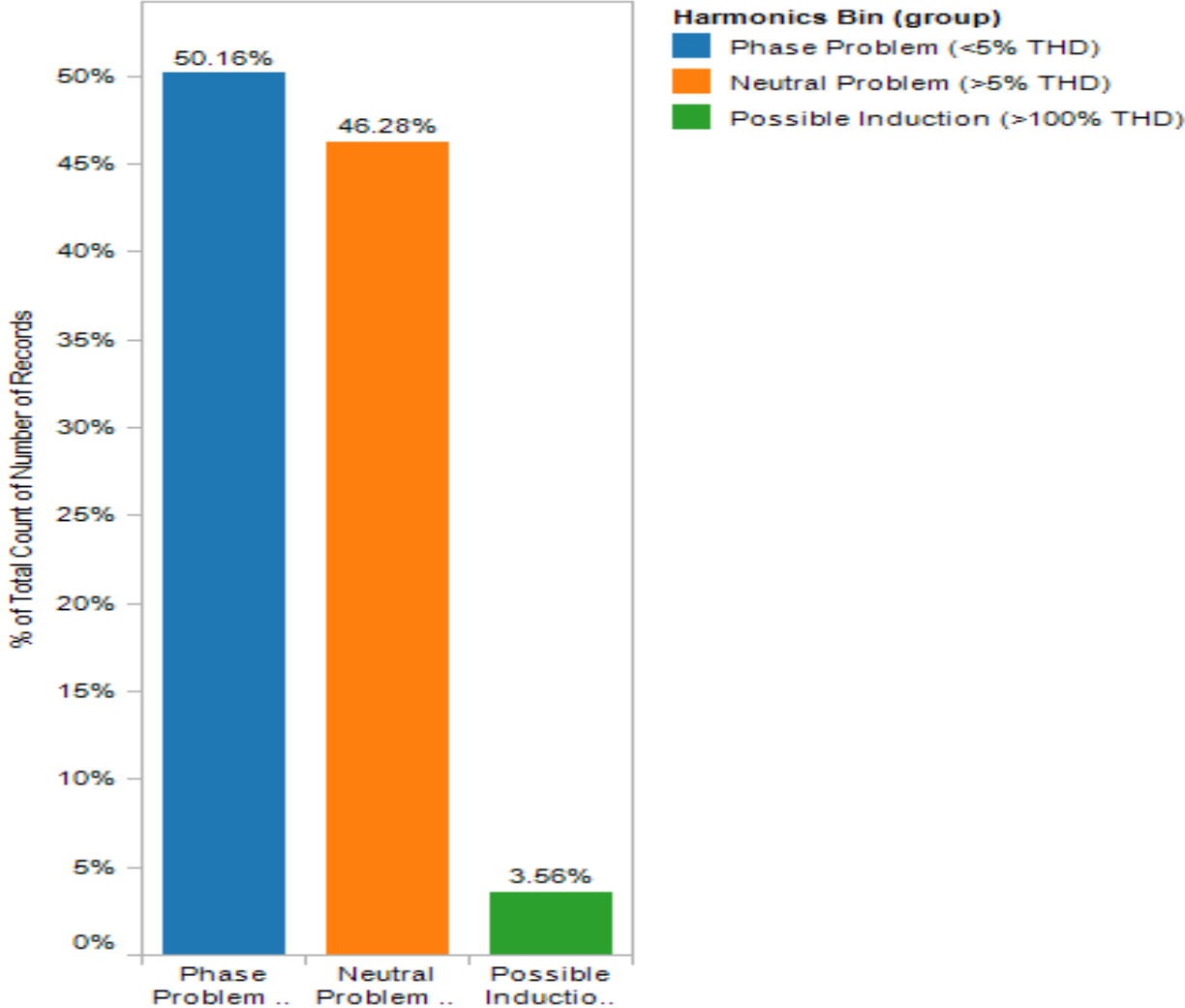
- In 2008 the New York Public Service Commission issued a revised order (04-M-0159) requiring:
 - Annual testing of all utility owned electrical facilities and street lights which are publicly accessible
 - Detection equipment must detect to a minimum of 6 volts
 - Mitigation of findings to 1 volt or less
 - Mobile testing of incorporated cities of >50,000
 - Twelve mobile scans annually in New York City
 - Upstate cities scanned once per year
 - Annual reporting requirements
 - Mandated compliance with NESC
 - Penalties in excess of \$200 million for failure to comply with testing requirements

Cost of Compliance with Order

- Mobile testing for three utilities in excess of \$11 million Dollars annually
- Manual Testing in excess of \$20 million annually
- Investigation and repairs estimated at more than \$7 million annually
- Because of tight regulation and significant penalties utilities cannot right size programs
 - NYS Utilities have spent in excess of \$5 million testing transmission structures with zero contact voltage detections
 - Limited access
 - Other protective systems in place to prevent contact voltage
 - NYS Utilities have spent in excess of \$2 million testing URD structures with less than 5 contact voltage detections - Failure rate of less than .001%.

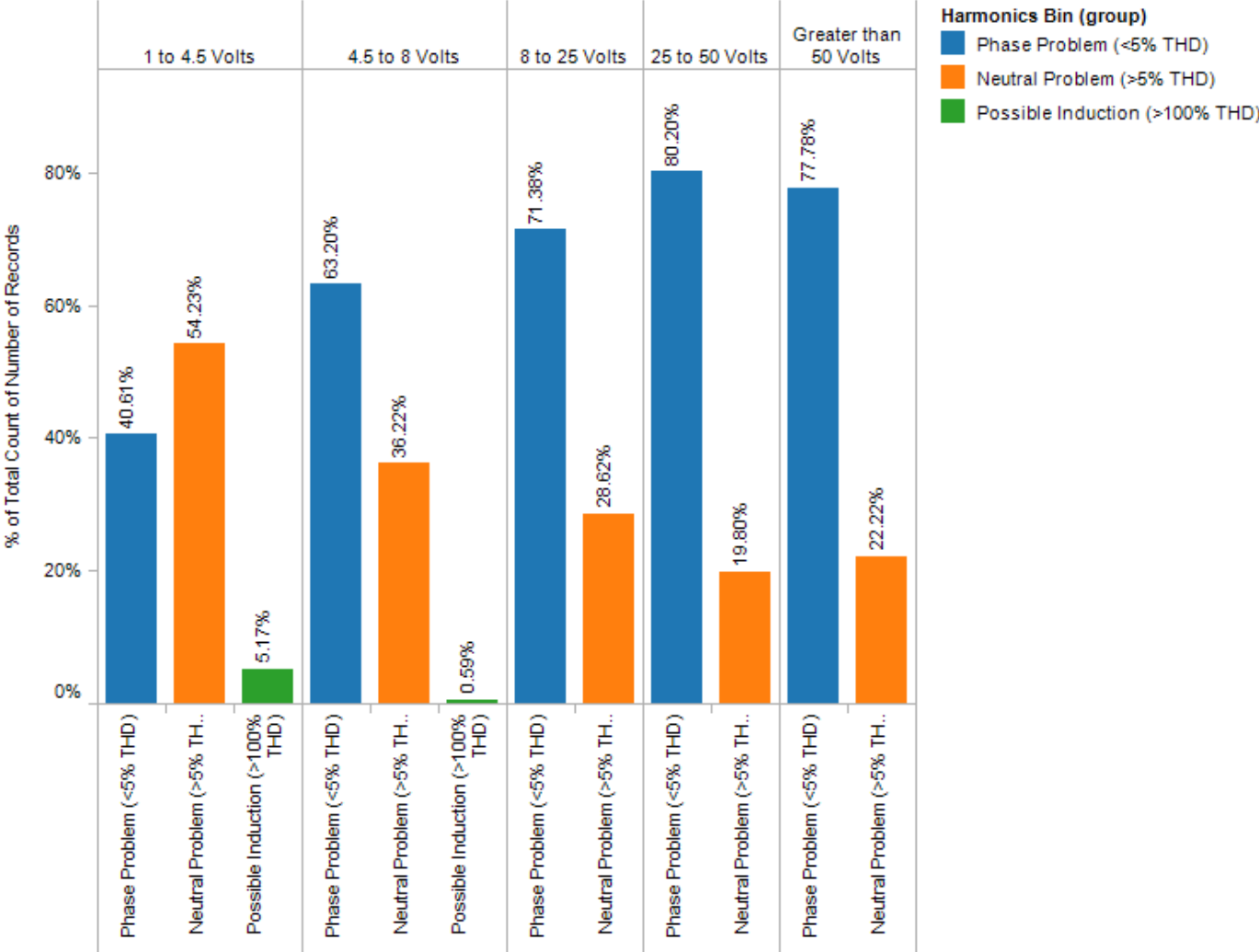
Results of Harmonics Analysis in Underground Areas

Distribution of findings based on Harmonic Data in Urban Areas



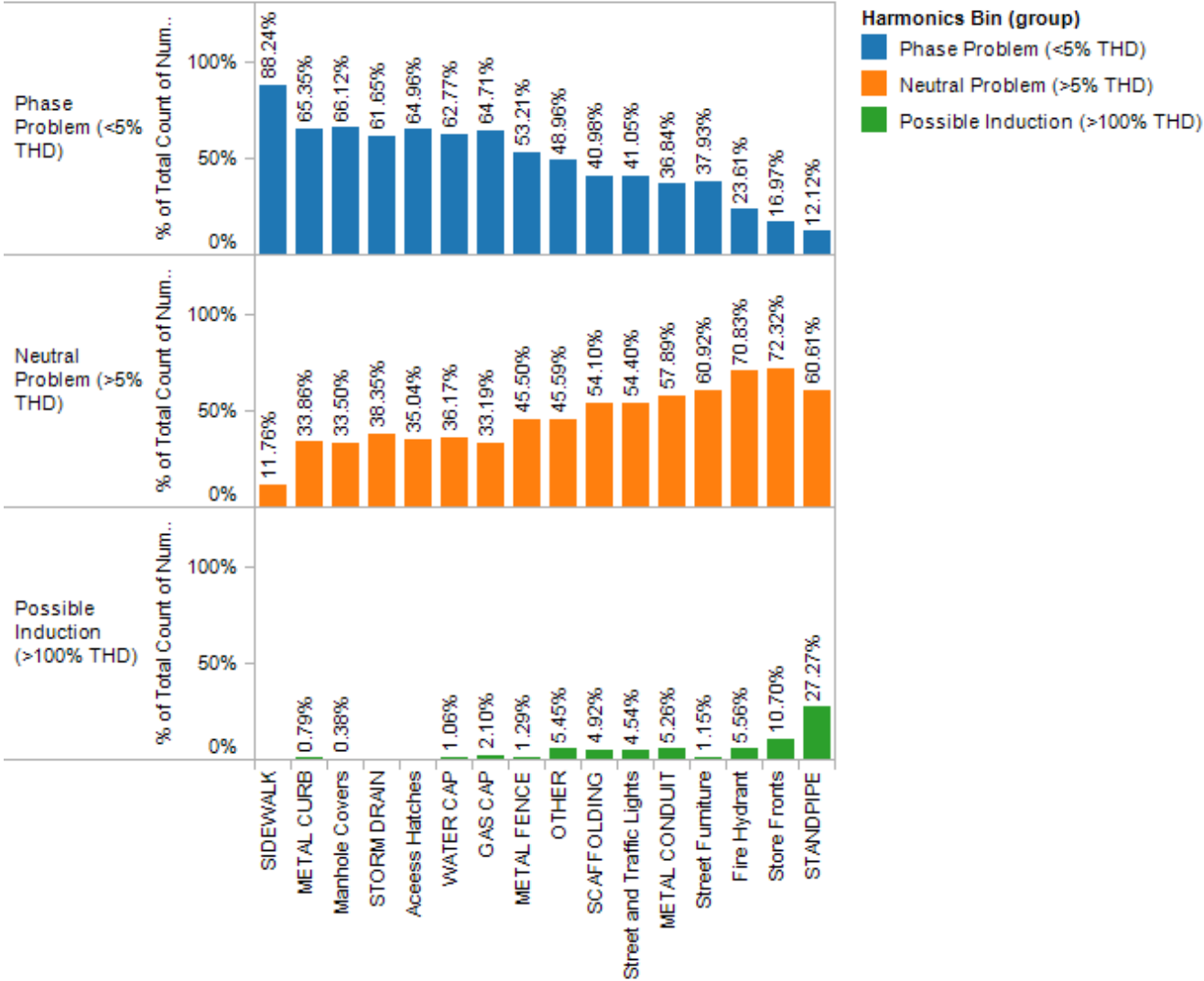
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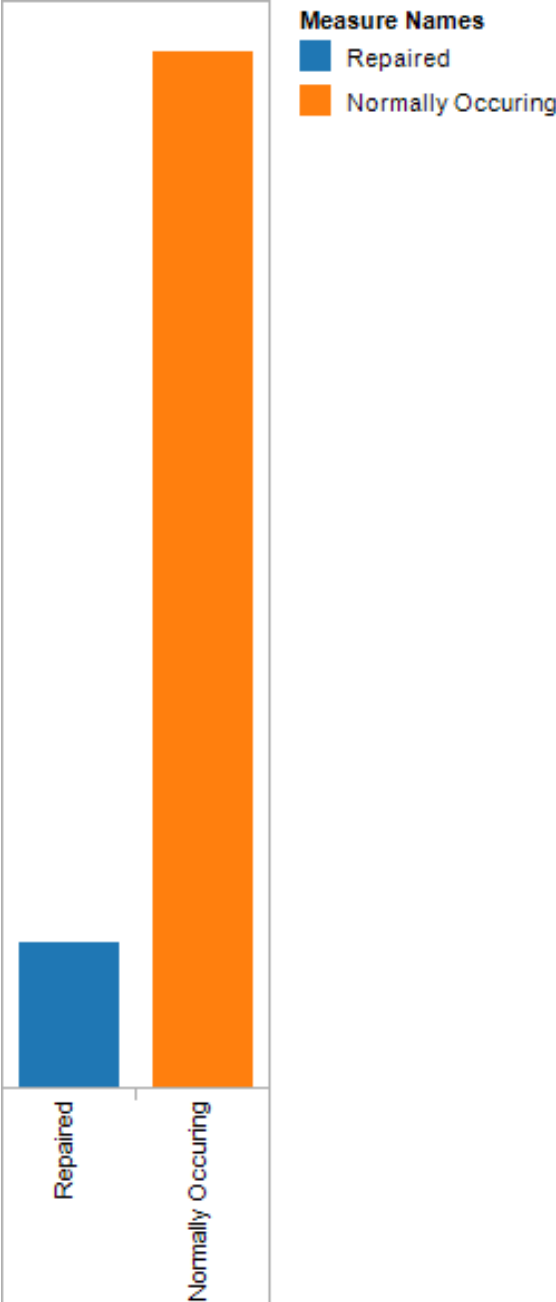


Results of Harmonics Analysis in Underground Areas

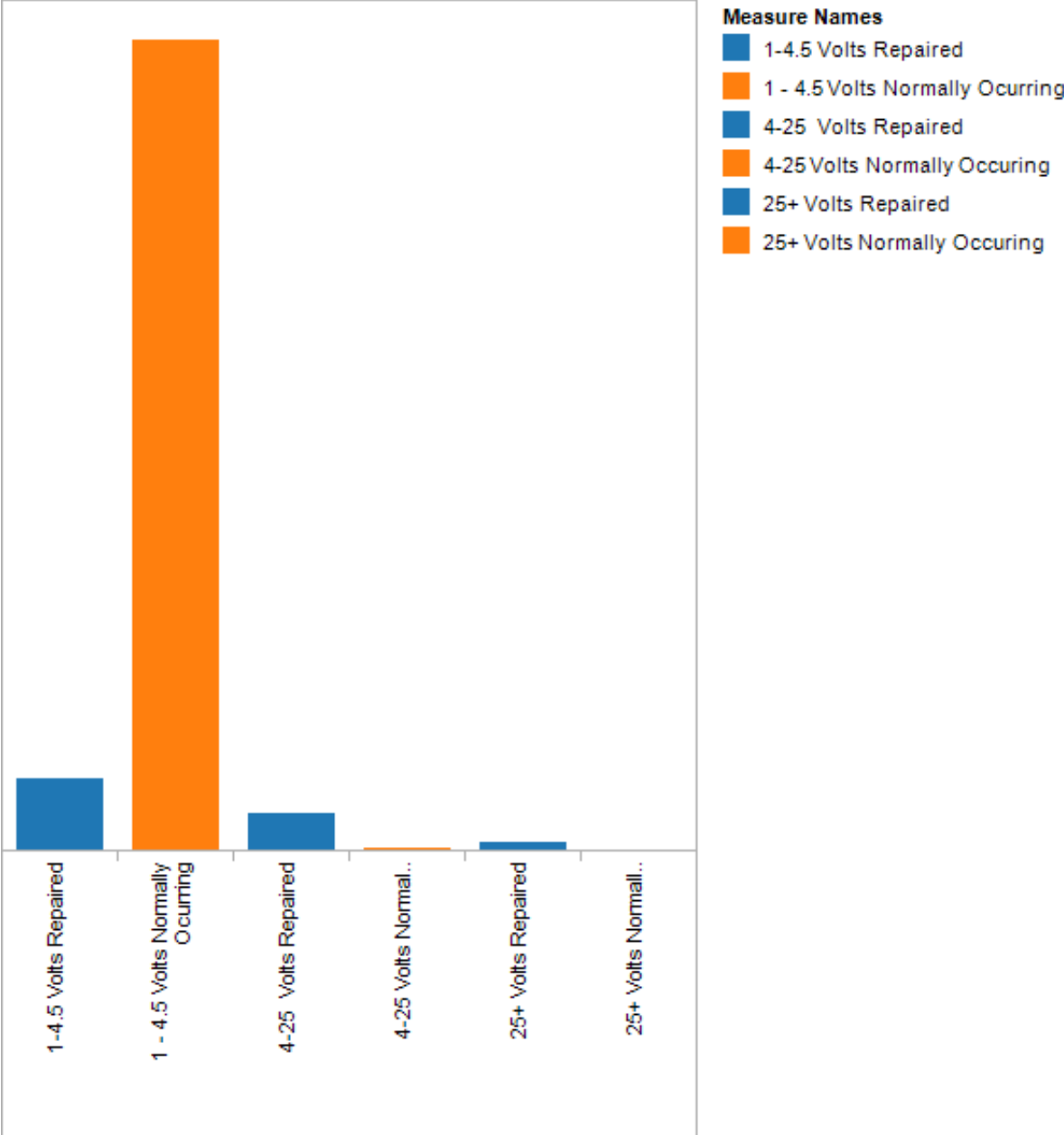
Harmonic Trends in Urban Areas



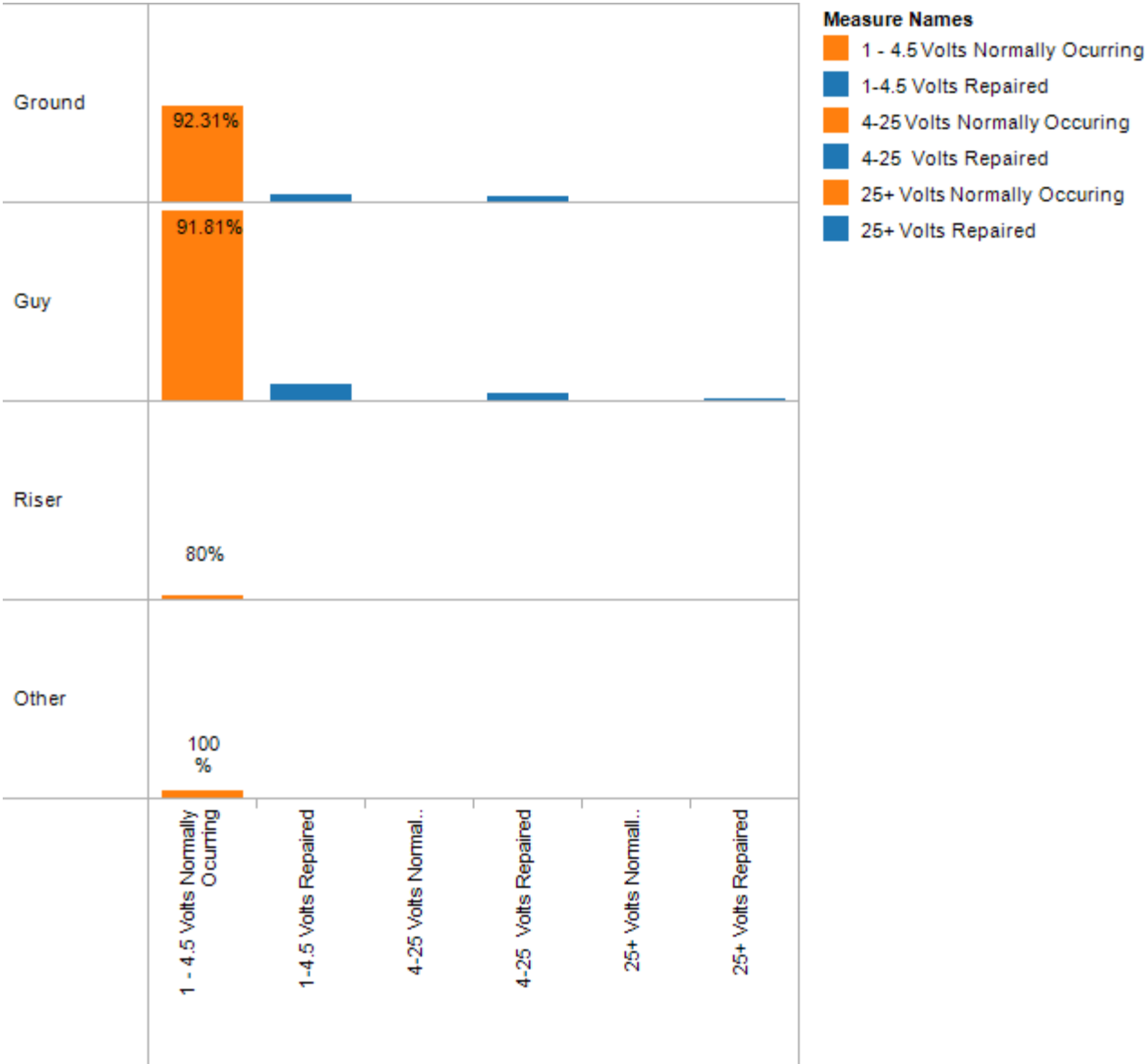
Results of Harmonics Analysis in Overhead Areas



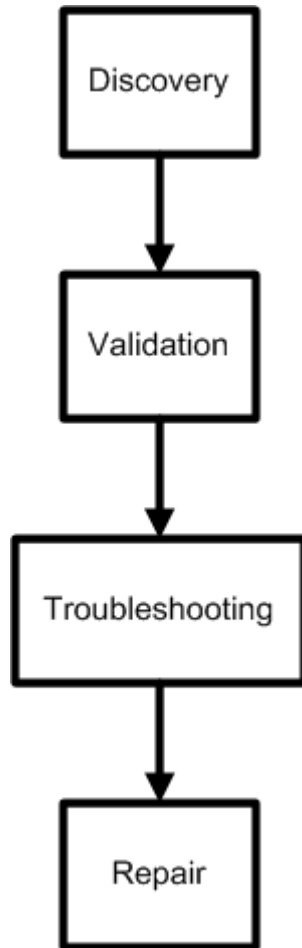
Results of Harmonics Analysis in Overhead Areas



Results of Harmonics Analysis in Overhead Areas



Troubleshooting Flowchart



- Flow chart would aid in investigation process
- Allow standardized approach to investigation
- Needs to account for wide variety of utility configurations
- May be asset specific at utility level

Troubleshooting Flowchart



Discovery

- Customer complaint of shock
- Customer power quality complaint
- Employee discovery during pre-work testing
- Discovery during asset testing program

Troubleshooting Flowchart



Validation

- Ensure that ground is not energized
 - Use handheld e-field detector
 - Validate using multiple grounds
 - Consideration of Step and Touch Potential when investigating problems associated with NEV
- Ensure that same grounds are used by all testing personnel
- Determine if Elevated Voltage is caused by defect or normally functioning equipment

Troubleshooting Flowchart

Troubleshooting

- Use harmonics data to isolate possible causes of Elevated Voltage
 - Isolate nearest to source and move out to identify cause of problem
 - Consider various return paths if THD >5%

Troubleshooting Flowchart



Repair

- Ensure that repair matches possible causes suggested by Harmonics data
- Retest after work has been completed to ensure that situation has been resolved

Questions?