The Results of Asset-Based Manual Testing of Utility-Owned Objects in New York State

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2005 NY PSC Order

- Instituted after the death of Jodie Lane in New York City
- Required manual testing of all utility owned objects and streetlights in New York State
- Six large utilities report results in consistent format annually
- More than 3.8 Million Tests per year
- Shocks have declined from about 450 in 2005 to about 250 in 2010

Contact Voltage Shock Risk Factors

- Probability of an undetected failure for a given asset
- Duration that the object was energized
- Frequency at which a human or animal comes into contact with the object

Stray and Contact Voltage

- **Contact Voltage** - A voltage resulting from abnormal power system conditions that may be present between two conductive surfaces that can be simultaneously contacted by members of the general public and/or their animals. Contact voltage is caused by power system fault current as it flows through the impedance of available fault current pathways. Contact voltage is not related to normal system operation and can exist at levels that may be hazardous.
- **Stray Voltage** - A voltage resulting from the normal delivery and/or use of electricity (usually smaller than 10 volts) that may be present between two conductive surfaces that can be simultaneously contacted by members of the general public and/or their animals. Stray voltage is caused by primary and/or secondary return current, and power system induced currents, as these currents flow through the impedance of the intended return pathway, its parallel conductive pathways, and conductive loops in close proximity to the power system. Stray voltage is not related to power system faults, and is generally not considered hazardous.

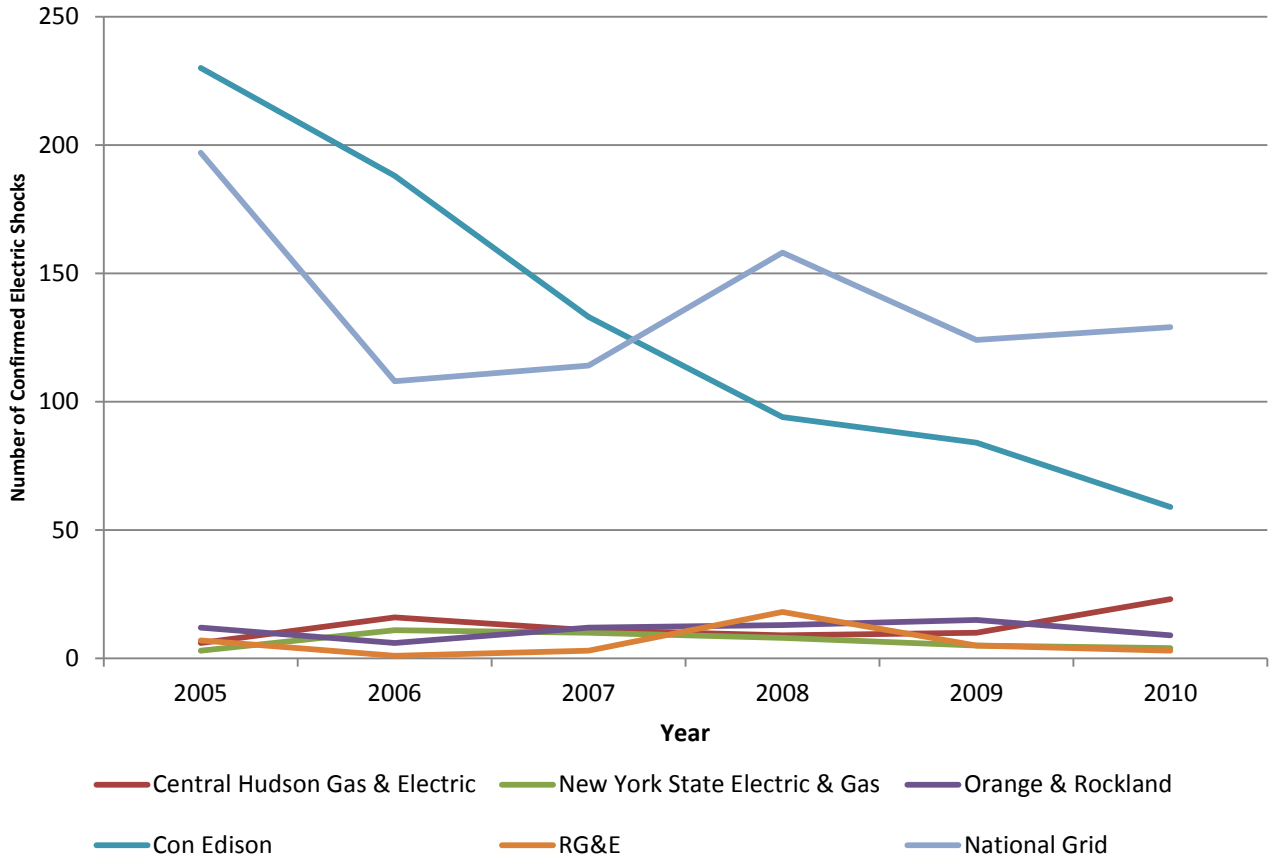
Objectives of Study

- Determine if mandated manual testing was driving reduction in shocks
- Identify average failure rates of various types of equipment
- Identify methods to optimize testing efforts

Testing Methods

- **Manual Testing** – Utility owned objects are tested from an asset list using a contact type test instrument
- **Mobile Testing** – Entire landscape is tested for elevated voltages by sensing electric fields using a sensor mounted to a vehicle. Mobile testing is only performed in underground areas.

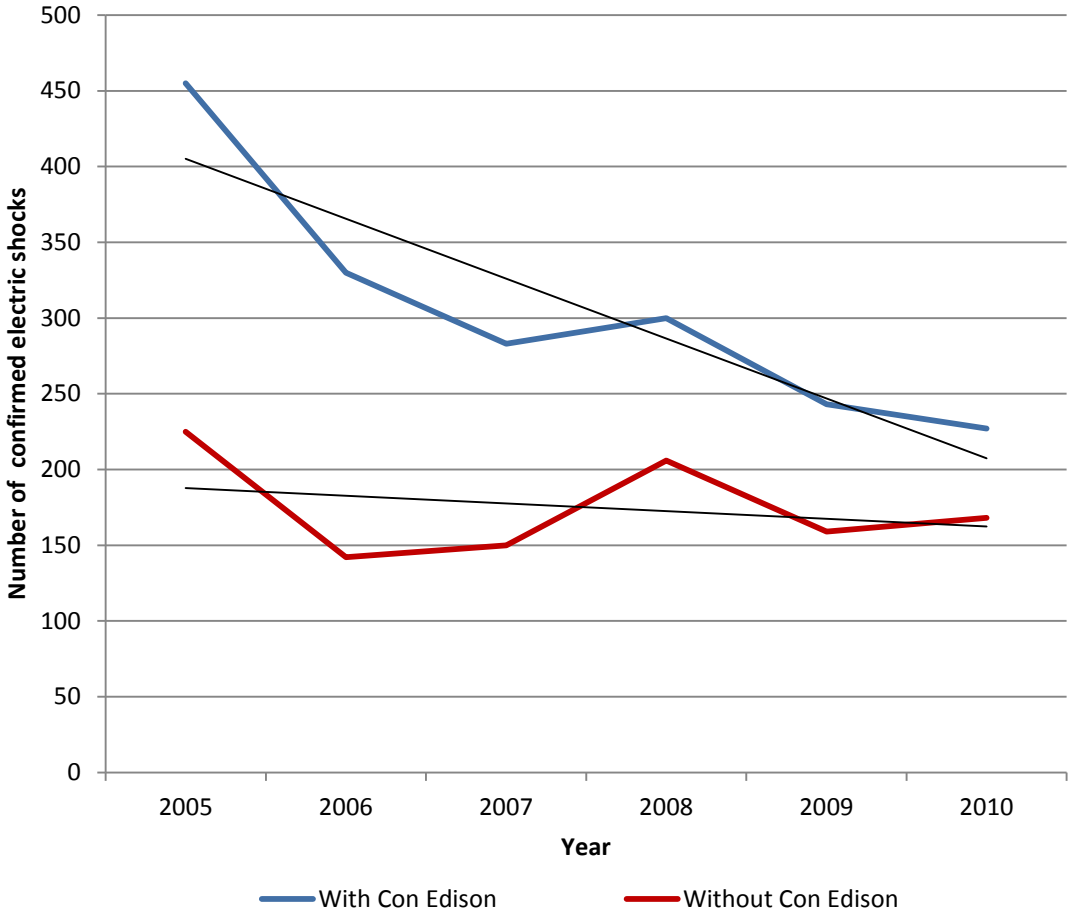
Shock Trends in New York State



Shock Trends in New York State

Customer and Utility Responsibility

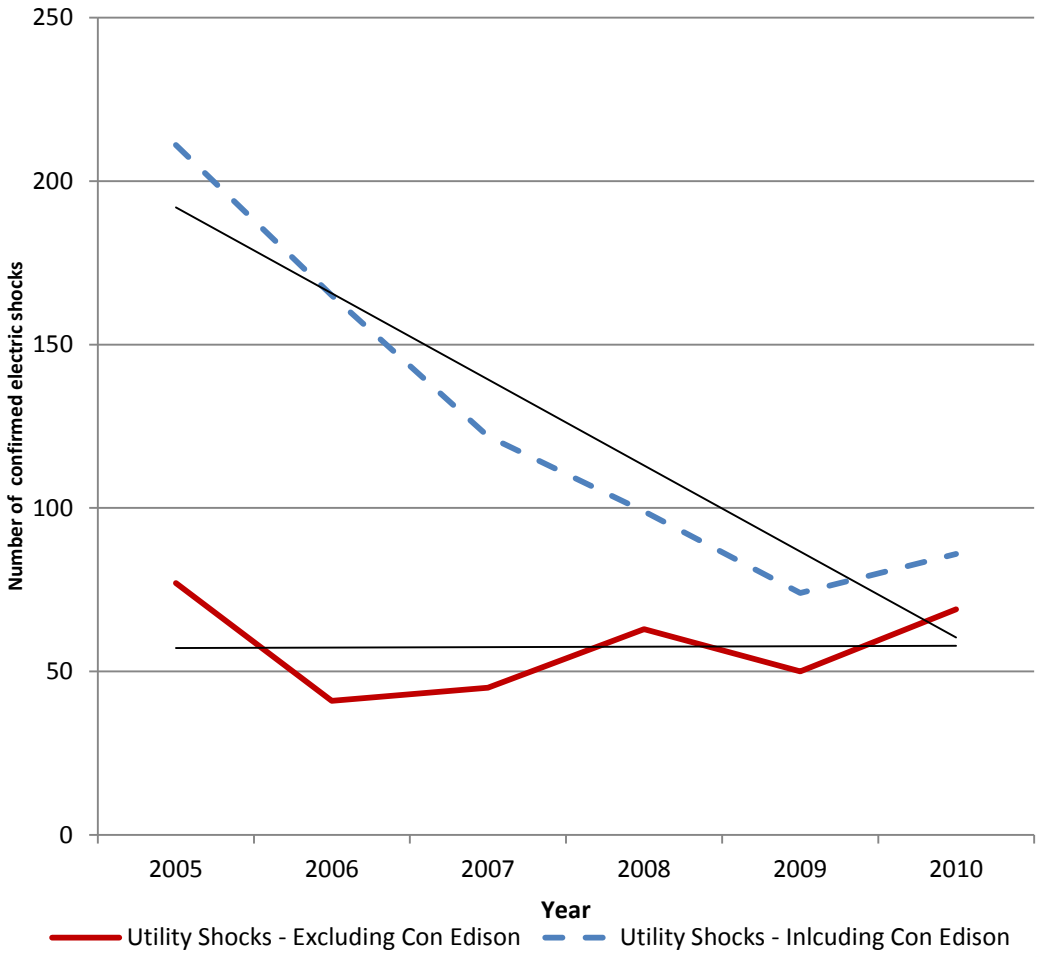
- More than 20 million manual tests performed since 2005
- Over $100 Million spent on manual testing



Shock Trends in New York State

Utility Responsibility

- In the New York Program only utility owned objects and streetlights are tested
- There has been no reduction in electric shocks in areas tested exclusively with manual testing
- Lack of shock reduction in utility responsible shocks highlights ineffectiveness of manual testing



Shock Trends in New York State

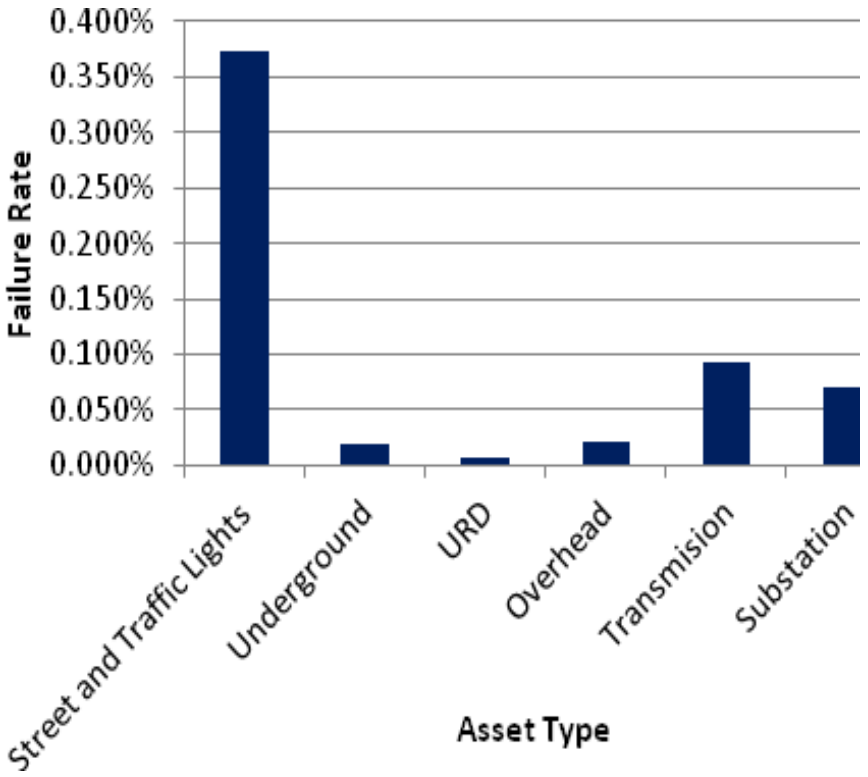
- Con Edison has experienced more than a 75% reduction in electric shocks
- The remainder of the New York utilities have validated the same number of customer reported shocks since the inception of the program despite performing more than 20 Million manual tests

Shock Trends in New York State

- Manual testing does not appear to have had a significant impact on shocks
- The primary difference between Con Edison and the rest of the utilities is the widespread frequent use of mobile testing which appears to be the main driver is shock reduction

Asset Specific Performance (Manual Testing)

- Comparing all detections from manual testing on utility assets over a 4 year period
  - Street and Traffic lights had the highest rate of detection
  - Overhead and Underground assets had similar detection rates
  - All of the Substation and Transmission Findings were “stray voltage” events



Testing Criteria in Other States

- In 2013 Maryland and Rhode Island instituted standards which require mobile testing in dense areas, referred to as Contact Voltage Risk Zones, on more frequent basis
- In 2013 New York relaxed manual testing requirements for Overhead, Transmission and Substation assets, requiring testing every 5 years.

Conclusion

- Manual testing appears to have had little impact on reducing contact voltage shocks in New York
- Mobile testing appears to be more effective in reducing contact voltage shocks, in part because it tests the entire landscape (sidewalks, fences, etc.)
- Targeting assets based on failure rate may be effective in areas when mobile testing cannot be performed