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August 20, 2008

Jaclyn A. Brilling,
Secretary,
New York State Public Service Commission,
Three Empire State Plaza,
Albany, New York 12203-1350

RE: CASE 04-M-0159 – Proceeding on Motion of the Commission to Examine the Safety of Consolidated Edison Company of New York, Inc.'s Electric Transmission and Distribution Systems. NOTICE SOLICITING COMMENTS (Issued July 8, 2008)

Ms. Brilling,

Attached please find Power Survey Company's response to your request for comment on changes to the Commission's Electric Safety Standard Case#: 04-M-0159.

Sincerely,

Thomas Catanese
Chief Operating Officer

Summary

Safety standards for New York State must be modified to achieve a homogenous increase in public safety throughout the state. Lessons learned in the execution of mobile stray voltage testing program across ConEdison's underground distribution system are reliable indicators of what can and must be achieved statewide.

The Power Survey Company engineering team has been actively working in stray voltage detection since 2004. Power Survey is an active participant in the development of IEEE standards for stray and contact voltage testing and mitigation. On an annual basis Power Survey Company technicians detect more stray voltage hazards than any other group of organizations combined.

Mobile testing is the only effective methodology for reducing public shocks in underground distribution areas. Mobile testing is thorough, scalable, and cost effective. It directly targets the areas and structures responsible for the majority of shocks. Comparatively, manual testing programs have delivered very few findings, resulting in little repair activity and thereby have proven ineffective in reducing public shocks.

The HD LV-5 probe is the primary device used in manual stray voltage testing in New York State. It has never been certified to 4.5 volts in a real world scenario. The certified lab test on the HD LV-5 does not represent use of the device in the field. In light of the test data and equipment available in the marketplace, it is not possible to adopt 4.5 VAC as the sensitivity specification for handheld test equipment.

The blanket use of a 500 ohm shunt to confirm stray voltage findings masks real hazards and forces mitigation activities on some safe structures. The definition must expand to cover the typical scenarios found in the field. For many energized structures, the use of any shunt during the measurement is inappropriate. In specific definable cases where a shunt is needed, a value of 3000 ohms is appropriate.

Some of the proposed changes to definitions are quite narrow. Much has been learned about the specific manifestations of stray voltage in the public landscape. That body of information must be covered in the scope of definitions. This report contains detailed information to support each of the above statements.

Efficacy of Utilizing Mobile Stray Voltage Testing Technology on a Statewide Basis

Mobile testing is the only effective methodology for reducing public shocks in underground distribution areas. Manual testing programs have proven ineffective in reducing public shocks.

It is widely known that a large scale mobile stray voltage detection program is in operation in ConEdison's distribution territory in New York City. The testing program has expanded over the last several years. Initial requirements were to perform 1 survey per year. Currently, the program completes 12 surveys over a 12 month period.

There are two primary factors contributing to the increase in the use of mobile scanning. First, the trend data in the early stages of the program indicated that successive mobile scans were yielding similar quantities of energized structures, scan over scan. If a true reduction in the number of energized structures is to be achieved, it is desirable to scan at a rate where a downward trend can be observed in the number of energized structures detected. The most recent directives specify 12 scans per year to target that downward trend. Fortunately, mobile testing is scalable and scanning at this rate is readily achievable.

The second factor contributing to the increase in scanning is the measurable decrease in public shocks. In essence, the downward trend in public shocks validates the efficacy of the mobile testing program.

The reduction in public shocks and achievement of a downward trend in discovery of energized structures are the expected result of expanded testing, and a tribute to its success.

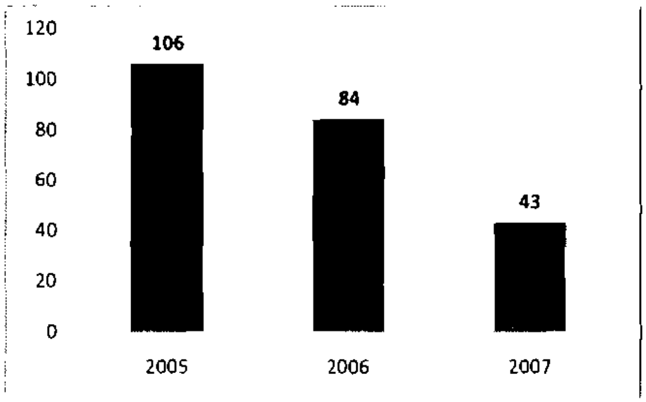
The operators and regulators of all distribution systems worldwide are ultimately responsible for the safety of the distribution systems in the public landscape. It is impossible to make a statement about compliance with this requirement where little testing is performed, or where trends in shock reports are not considered.

In the case of ConEdison's territory, the trend data is clear. The number of findings from this rigorous mobile testing program outstrips the manual testing findings by a wide margin. This observation has led ConEdison to request the NYPSC eliminate requirements to perform manual testing in areas where mobile testing is employed.

Since implementing the mobile stray voltage testing program, ConEdison has seen a substantial decline in public shocks year over year. This has been widely attributed to the implementation of SVD2000 mobile stray voltage testing. Specifically, ConEdison has repaired thousands of structures as a direct result of the mobile stray voltage detection program. Those repairs translate effectively into shock reductions as illustrated below.

ConEdison Public Shocks

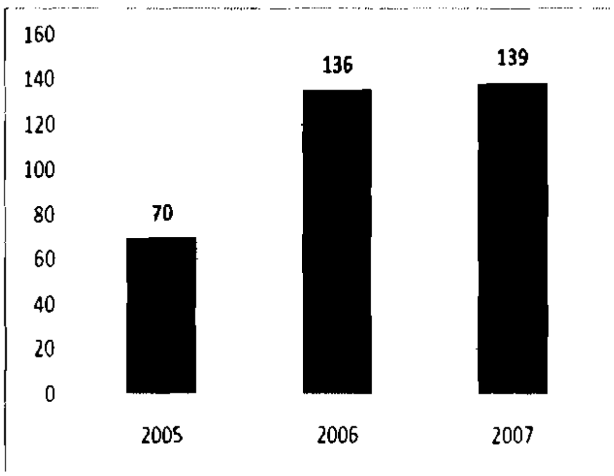
Comparison of the trend in shock reports from other New York State Utilities, where manual testing is the sole effort in stray voltage mitigation illustrates a result much different than realized in the ConEdison operating territory.



National Grid and other New York State utilities follow the NYPSC mandated safety standard that requires only manual testing of utility owned structures and assets. Annual reports have been filed and illustrate a trend in public shocks much different than that experienced in the ConEdison operating territory. Despite their manual inspection program, National Grid has actually seen an increase in company related public shocks every single year.

National Grid Public Shocks:

In 2007, National Grid's multi-million dollar manual testing program yielded approximately 60 level 1 stray voltages. Consequently, it is expected that 60 repairs of structures and assets were completed due to findings from the manual inspection program. By comparison, in 2008 a 12 hour mobile stray voltage sampling performed by Power Survey technicians yielded 60 level 1 stray voltage hazards in National Grid's distribution territory.



In 2007, National Grid reported 139 confirmed instances of public shock, but detected only 60 level 1 stray voltages during that same year. In upstate NY more stray voltage hazards are discovered by public shocks, than manual testing. Given the large number of stray voltage hazards found by mobile testing upstate, it is reasonable to assume that National Grid's distribution system contains a far greater number of stray voltage hazards than are discovered through their manual testing program.

With the small number of findings and repairs performed in the National Grid operating territory, it follows that public shocks are in an undesired upward trend. Following the path of the decision making used in the ConEdison territory, mobile testing efforts must be applied to the National Grid territory, and a reduction in public shocks will follow.

Key Differences Between Testing Methodologies:

Mobile stray voltage technology is far more effective in detecting stray voltage hazards when compared to the manual stray voltage testing method currently specified by the safety standard.

Mobile detection method

- Looks for energized structures over the entire landscape
- Not dependant upon asset lists
- Tests thousands of structures per hour
- Actively measuring over entire course of travel
- Wide coverage swath
- Efficiency allows repeated scanning
- Scalable

Manual testing method

- Only tests specific utility structures
- Ignores all points and structures in between utility structures
- Tests a few structures per man hour
- Inappropriate method for discovery
- As a stand alone method, creates false sense of security/safety
- More expensive
- Inefficient
- Not easily scalable manpower/economics

Previous Comments

It is important to consider comments already made by active parties. ConEdison has attributed much of their success in reducing public shocks to mobile detection. National Grid has suggested modifying their program to include mobile testing would be a positive enhancement. NYSEG & RGE have not spent enough time with the system to formulate any conclusive opinion. Below we have compiled previous comments from the upstate utilities to the NYPSC regarding the efficacy of mobile testing in their distribution areas.

In National Grid's 2006 safety compliance report to the NYPSC, National Grid offered the following comments regarding the SVD2000 mobile stray voltage detection system:

> *The underground system did not identify any elevated voltage conditions during the cycle 2 testing. The testing of these assets could be more efficient and better focused if the requirement was limited to the urban areas and specifically to the secondary hand holes (street lights and building services). This change coupled with a mobile testing program, would enhance the elevated voltage program. Based upon the large population of voltage tests completed, conclusions drawn include modifications to the program should be considered to allow for mobile testing of assets*
>
> *National Grid - 2006 Annual Report*
> *Elevated Voltage Testing and Facilities Inspection*

Since that recommendation was made, National Grid has seen an increase in public shocks every year, despite performing a full manual stray voltage testing cycle every year.

NYSEG & RGE also offered comments on mobile testing is their 2006 reports. Their critique was inaccurate and not based on any direct knowledge of the SVD2000. NYSEG and RGE personnel have spent less than two hours following the SVD2000 in close proximity in separate vehicles. No NYSEG or RGE personnel have ever been inside the SVD2000 system while it was in operation. Additionally, a disproportionately high number of stray voltages were discovered in their area. In less than two hours, the SVD2000 discovered 15% of NYSEG's 2006 cumulative total of level 1 stray voltages. As NYSEG & RGE have very little familiarity with the SVD2000 system, it is also no surprise that many of their conclusions are incorrect:

> *Use is limited to underground residential areas where all structures are within 15 ft. of the street.*

The detection zone has been certified by an independent laboratory to over 60 feet in diameter.

> *Roadside overhead conductors make a "stray voltage" signal indistinguishable from the background noise.*

Stray voltages are easily distinguished by trained operators from background noise, this has also been certified by an independent laboratory.

HD Probe & 4.5 VAC Threshold

The HD LV-5 probe is the primary device used in manual stray voltage testing in New York State. It has never been certified to 4.5 volts in a real world scenario. The certified lab test on the HD LV-5 does not represent use of the device in the field. In light of the test data and equipment available in the marketplace, it is not possible to adopt 4.5 VAC as the sensitivity specification for handheld test equipment.

Several references are made to specification of use of handheld test equipment certified to reliably detect voltages of 4.5 to 600 VAC. At this time, there is insufficient submitted test data to support adoption of 4.5 VAC as a minimum sensitivity requirement for handheld test equipment used in stray voltage testing.

The probe is a useful tool in determining the existence of voltages on metal objects, where direct metal to metal contact can be achieved between the probe tip and the object under test. In addition to the requirement for metal to metal contact at the tip, the device relies on coupling capacitance between the operators hand and the probe handle. In field use, operators grip, and the potential presence of a glove, will impact measurement results.

Ultimately, the probe senses the voltage potential between the tip of the probe and the operator's feet. It is often the case where the ground the operator is standing on is energized, typically from the same fault energizing the object under test. When the ground is energized, the HD probe is not exposed to the full voltage on the object under test and unable to respond accordingly.

The following example illustrates use of the probe in the field and the variability of the indications experienced. An energized street lamp was detected using the SVD2000 mobile e-field detector. A manual investigation using the HD LV-5 probe was performed. A negative indication from the probe is shown in Figure 1 below.

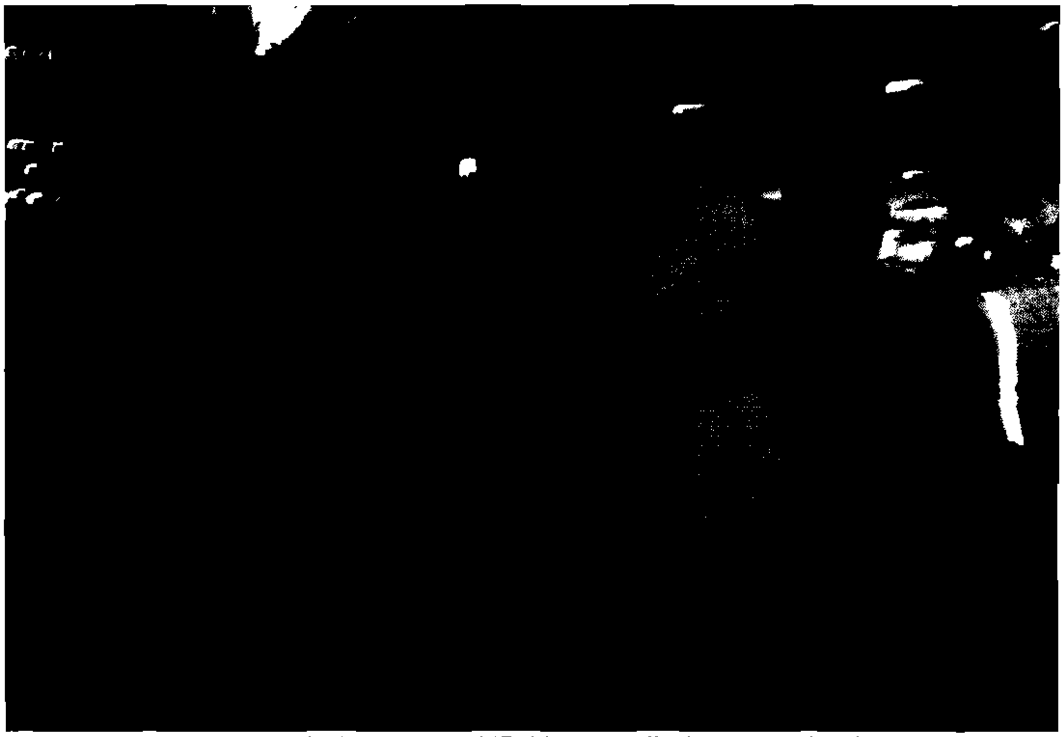


Figure 1. Negative indication on HD LV-5 applied to energized streetlamp.

The investigation continued with the application of a voltmeter. The voltmeter was grounded to a standpipe a few feet from the streetlamp. The voltmeter indicated 11.46 volts, as shown in Figure 2 below.

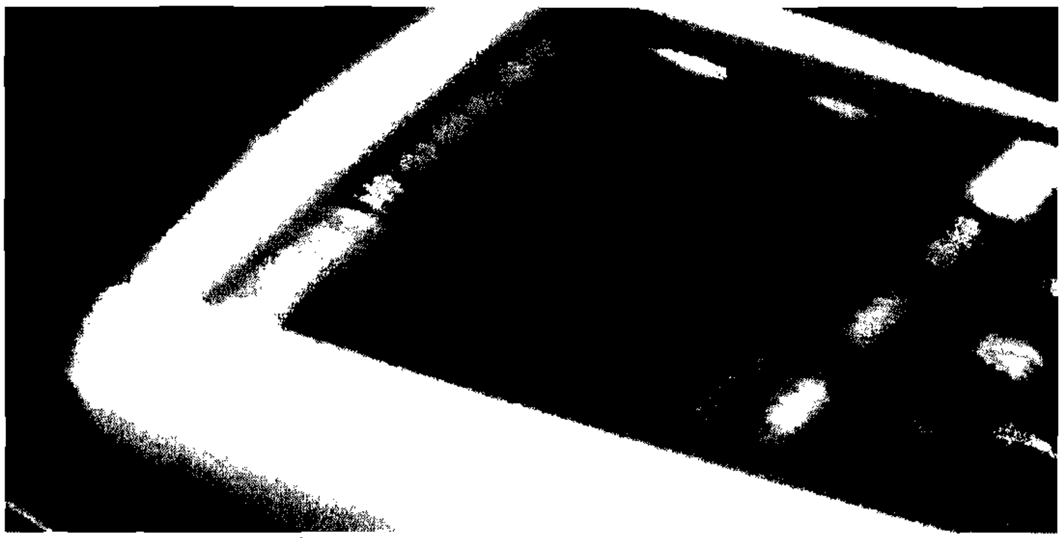


Figure 2. Voltage measured on streetlamp = 11.46 VAC.

Further investigation ensued and efforts were made to determine conditions necessary for the HD probe to illuminate on this energized streetlamp. When the operator made special effort to move his feet to a much greater distance from the base of the streetlamp, the probe was shown to illuminate as shown below in Figure 3. These photos were taken in Columbus, OH in the presence and direct observation of George Zajac of the Ohio PUC.

Figure 3. HD probe illuminates when operator moves feet far away from pole base.

While the HD probe is a useful tool in field testing operations, there are no submitted independent laboratory reports to support certification of the device to indicate reliably down to 4.5 VAC in actual field use.

The submitted lab report (TR300106-05E National Technical Systems. Acton, MA) details test of the HD test probe in a specially designed test chamber shown below in Figure 4.

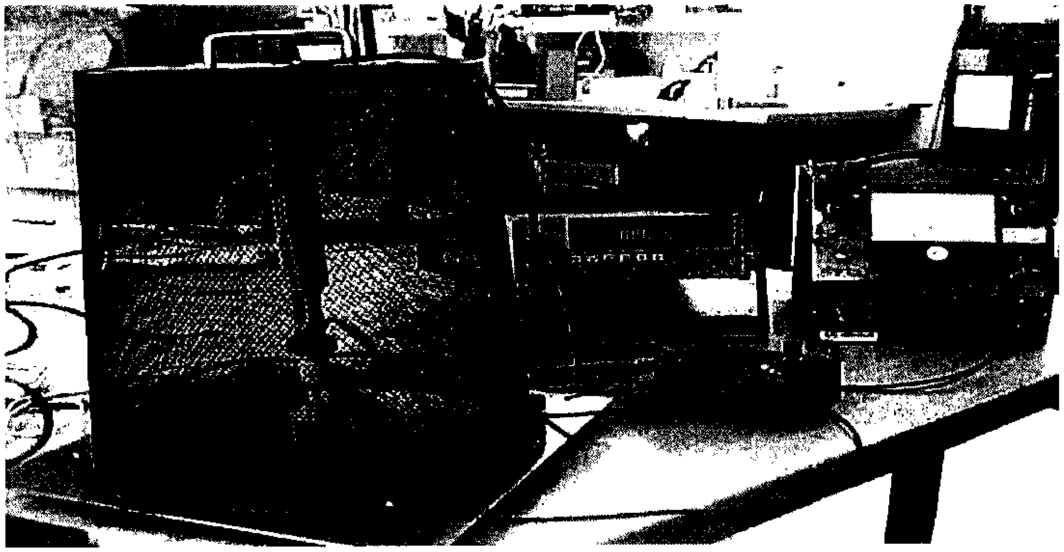


Figure 4. HD LV-5 probe in test chamber.

In the test scenario depicted in Figure 4, the operator and capacitive coupling through the operator are removed from the measurement circuit. A metal tube and screened cage replace the operators hand and body present in field use. Measurements made under these conditions do not represent actual field use and are insufficient basis to support adoption of measurement equipment voltage sensitivity standards.

Definition of Findings

The blanket use of a 500 ohm shunt to confirm stray voltage findings masks real hazards and forces mitigation activities on some safe structures. The definition must expand to cover the typical scenarios found in the field. For many energized structures, the use of any shunt during the measurement is inappropriate. In specific definable cases where a shunt is needed, a value of 3000 ohms is appropriate.

Proposed change in the Electric Safety Standards, Appendix A, Section 1:Definitions, item (f) defines findings as "Any confirmed voltage reading on an electric facility greater than or equal to 1V measured using a volt meter and a 500 ohm shunt resistor."

This definition fails to define publicly accessible energized surfaces which are not specifically an electric facility as a finding. It is common to find energized sidewalks, grates, railings, fences and gates in the performance of stray voltage detection and investigation efforts. These items are typically energized by electric distribution faults buried beneath publicly accessibly areas. These items are not electric facilities and therefore are not included in the proposed definition of findings. The definition also implies that the confirmed measurement of 1 volt or greater across a 500 ohm shunt resistor constitutes a finding. The unilateral specification of the 500 ohm shunt resistance can lead to erroneous test results and potentially cause hazardous energized objects left "unconfirmed" in light of the 1 volt across 500 ohms specification.

The goal of stray voltage testing and mitigation programs mandated by the NYPSC is to find and repair conditions where a publicly accessible surface or structure is energized due to a fault in the electrical distribution system. The measurement standards and protocols must be designed to locate faults and perform repairs as needed.

Historically, the term stray voltage was used to define voltages appearing as the result of proximity to distribution systems. These voltages are usually not related to faults and are often difficult to isolate. Studies such as those detailed in the following link:

http://www.mikeholt.com/documents/strayvoltage/pdf/StrayVoltageHandbook.pdf

illustrate the goals and requirements for this type of stray voltage testing. It should be noted that dairy farms and the physiological effects of stray voltage on cows were the primary concern for developing some of the outlined test procedures. In the case of dairy farms, a 500 ohm shunt is used as it represents the equivalent impedance path through the body of a cow. First, measurements are made with a voltmeter, contact resistances are considered and grounds are considered before a shunt is introduced. The goal of using the shunt in this case is to determine if enough current flow will pass through the cow's body to affect the behavior of the cow. The shunt's utility and its selected value of 500 ohms are detailed in the above reference.

In the case of testing structures in the public landscape, such as the testing of interest to the NYPSC, conditions and goals are very different than those seen in the dairy farm environment. Primarily, the protocols must support locating energized structures, followed by locating the fault and performing a repair. The notion of using an equivalent impedance to gauge a physiological effect is of no value in this arena.

Fundamentally, the measurement method to determine if mitigation is required on a particular structure depends upon the type of structure. Adopting a single "1 volt across 500 ohms" standard fails on two counts. It dictates repair efforts on some objects that are fundamentally safe and it forces no action on some objects that are hazards in need of repair. Two categories of findings illustrate this clearly.

Take the case of a streetlight that is part of a lighting string supplied by long cables. There are cases where resistance in the neutral conductor will result in a voltage drop. This will result in a measurable neutral to earth voltage. Since this is a low impedance circuit, it can source current into the 500 ohm shunt. If 1V or greater is measured in this fashion, the streetlamp will be flagged for repair. Fundamentally, it is not a hazard. The voltage source is a solid connection (low impedance) to a low voltage. The voltage will only vary with load on the circuit and will never increase to a hazardous level. In this case, using the "1 volt across 500 ohms" standard forces mitigation activities on safe structures.

There is another common failure of the "1 volt across 500 ohms" standard. Take the case of an energized sidewalk. Often considerable voltages are found on sidewalks. A distribution fault or open neutral are the most common causes of energized sidewalks.

When energized sidewalks are discovered, first a measurement is performed with a voltmeter without shunt. Often, when a 500 ohm shunt is engaged, the voltage drops significantly. Concrete is a conductor, but not a good conductor. How can good contact be made to this type of surface? It is easy for a human or animal to make good contact, because the surface area of a foot or paw is sufficient to make a low impedance connection. The standard test method is to use the tip of a test probe on the concrete or to probe the dirt in the cracks of the sidewalk. The resistance at this tiny contact point is high and subsequently a low voltage is measured. Here again the measurement methods fail and a hazard is not mitigated.

There are conditions where a shunt resistor may have utility in the measurement of distribution fault related stray voltages. Some specific structures can be energized with phantom voltages. Phantom voltages are the result of capacitive or inductive coupling between distribution conductors and other conductive surfaces. It is typical to find window frames near neon signs energized with phantom voltages. Introducing a shunt resistance to this circuit will collapse the phantom voltage and prevent erroneous measurement results. Typically a value of 3000 ohms is used for this purpose.

Using a shunt resistor to collapse phantom voltages is only a viable consideration on structures that are subject to supporting phantom voltages. These structures are definable. They are electrically isolated in some fashion. Metal frames around fluorescent lighting and metal objects near neon lighting are subject to phantom voltages.

Objects such as manholes covers, service box covers, storm grates, streetlamps and other structures are not subject to phantom voltages. The blanket application of a low value shunt resistance such as 500 ohms leads to erroneous conclusions in measuring these objects.

The definitions section of the standards should cover these cases and conditions. It is typical to have findings of this type in performance of stray voltage test programs. The existing standard and proposed changes establish conditions where energized objects are missed due to inadequately specified test procedures and practices. At minimum, a voltage measurement using a high impedance voltmeter without a shunt should be performed on any structure suspected to be energized. The result of this voltage measurement must be recorded as part of the test results. When and if a shunt is applied, the change in voltage observed is crucial to understanding the hazard potential along with the potential for measurement error.