IEEE WORKING GROUP ON VOLTAGES AT PUBLICLY AND PRIVATELY ACCESSIBLE LOCATIONS

Web Cast May 17, 2007

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Working Group Web Site: (http://grouper.ieee.org/groups/td/dist/stray/)

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IEEE-SA Standards Board Bylaws on Patents in Standards

6. Patents

IEEE standards may include the known use of essential patents and patent applications provided the IEEE receives assurance from the patent holder or applicant with respect to patents whose infringement is, or in the case of patent applications, potential future infringement the applicant asserts will be, unavoidable in a compliant implementation of either mandatory or optional portions of the standard [essential patents]. This assurance shall be provided without coercion. The patent holder or applicant should provide this assurance as soon as reasonably feasible in the standards development process. This assurance shall be provided no later than the approval of the standard (or reaffirmation when a patent or patent application becomes known after initial approval of the standard). This assurance shall be either:

a) A general disclaimer to the effect that the patentee will not enforce any of its present or future patent(s) whose use would be required to implement either mandatory or optional portions of the proposed IEEE standard against any person or entity complying with the standard; or

b) A statement that a license for such implementation will be made available without compensation or under reasonable rates, with reasonable terms and conditions that are demonstrably free of any unfair discrimination.

This assurance is irrevocable once submitted and accepted and shall apply, at a minimum, from the date of the standard's approval to the date of the standard's withdrawal.

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Inappropriate Topics for IEEE WG Meetings

- Don't discuss the validity/essentiality of patents/patent claims
- Don't discuss the cost of specific patent use
- Don't discuss licensing terms or conditions
- Don't discuss product pricing, territorial restrictions, or market share
- Don't discuss ongoing litigation or threatened litigation
- Don't be silent if inappropriate topics are discussed… do formally object.

If you have questions, contact the IEEE-SA Standards Board Patent Committee Administrator at patcom@ieee.org or visit http://standards.ieee.org/board/pat/index.html

This slide set is available at http://standards.ieee.org/board/pat/pat-slideset.ppt

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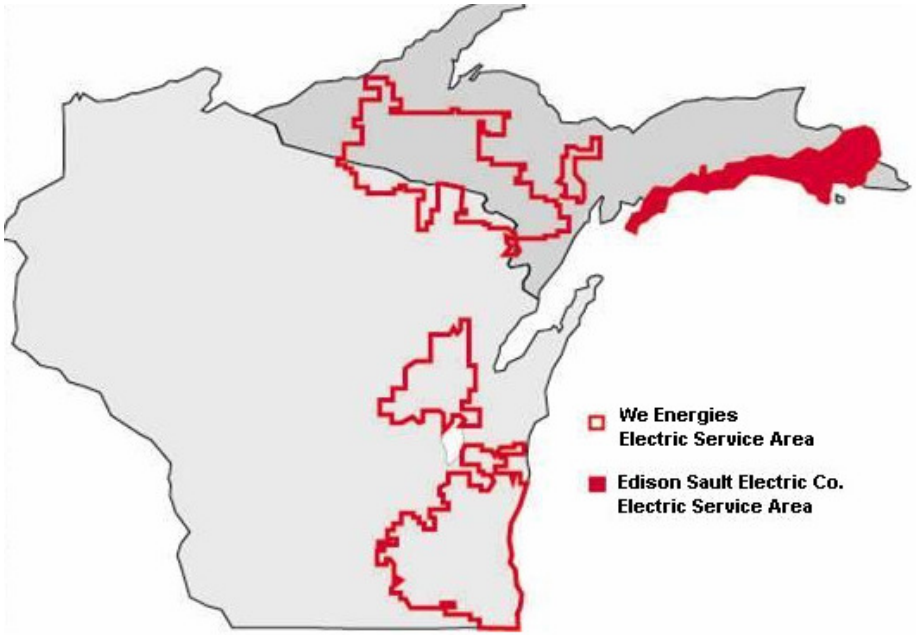
WE ENERGIES - Host of Today's Web Meeting



Serves about 2.3 million people in a service area of 12,600 sq. miles in Wisconsin and Michigan's Upper Peninsula

- Electric and gas utility
- 1,026,000 electric service customers
- Service area of 12,600 square miles
- Generating capability of 5900 MW
- Peak demand of 6,400 MW
- Urban & rural service areas
- Voltages from 4kV through 34.5kV
- 28,000 miles of primary power lines
- 30,000 miles of secondary/service power lines
- Number of employees: 5,800

we energies

This Web cast will have two parts:

- Shashi Patel (NEETRAC): Swimming Pool Equipotential Bonding - Proposed Changes to NEC 680.26

- Chuck DeNardo: Trial Use Guide - Outline Draft

Please mute your phones when not speaking.

NEETRAC Presentation

OUTLINE DRAFT

Trial Use Guide for Assessing Voltages at Publicly and Privately Accessible Locations

From the Standards Board Operations Manual:

- *Guides*: documents in which alternative approaches to good practice are suggested but no clear-cut recommendations are made.

- *Trial-Use documents*: publications that are effective for not more than two years.

Voltages at Publicly and Privately Accessible Locations

(a.k.a. Stray Voltage, Contact Voltage, Neutral-to-Earth Voltage, Urban Stray Voltage, Metallic Object to Earth Voltage, Animal Contact Voltage, Tingle Voltage, etc.)

Technically Complicated

Publicly Misunderstood

Controversial & Emotional

Litigious

P1695 PURPOSE

There is presently no industry wide guide or standard that describes the variety of publicly and privately accessible voltages resulting from the delivery and use of electrical energy. This guide will help dispel misinformation surrounding this topic and enhance public safety.

P1695 SCOPE

This guide addresses the normal and abnormal voltages that exist at publicly and privately accessible locations as a result of the delivery and use of electrical energy (often referred to as stray voltage). It focuses primarily on the presence of power frequency related voltages, and discusses definitions, causes, impacts, testing techniques, mitigation strategies, and hazard levels.

A Few Important Points

(Based On Working Group Discussions To Date)

There are publicly accessible voltages related to normal system operation that must be present, and there are publicly accessible voltages related to abnormal system operation that should not be present. These are two very different things that should be defined and discussed separately.

Human and animal exposure to conducted current is well understood. We want the reader to learn something about the science behind existing exposure standards; where to find, and how to apply these standards. This is necessary so that informed decisions can be made regarding the degree of hazard that exists and what, if anything, should be done about it.

We want to provide the reader with the knowledge and tools necessary to make meaningful measurements. This will enable identification of sources and, if necessary, aid in selection of appropriate mitigation alternatives.

Outline Draft (05/17/2007)

IEEE Trial Use Guide for Assessing Voltages at Publicly and Privately Accessible Locations

1. Overview (Required)

2. Normative References (Required)

3. Definitions/Acronyms/Abbreviations (Required)

4. General Discussion

5. Human and Animal Sensitivity to Conducted Current
   - 5.1 Sensitivity in terms of voltage exposure

6. Publicly and Privately Accessible Voltages Related to Abnormal System Operation ("Contact Voltage")
   - 6.1 General
   - 6.2 Contact Voltage Sources
   - 6.3 Contact Voltage Investigation
     - 6.3.1 Test and Measurement Equipment
     - 6.3.2 Investigation Protocol
   - 6.4 Contact Voltage Mitigation
   - 6.5 Case Studies

7. Publicly and Privately Accessible Voltages Related to Normal System Operation ("Stray Voltage")
    - 7.1 General
    - 7.2 Stray Voltage Sources
        - 7.2.1 Return Current
        - 7.2.2 Induced Current
    - 7.3 Stray Voltage Investigation
        - 7.3.1 Test and Measurement Equipment
        - 7.3.2 Investigation Protocol
            - 7.3.2.1 Confined Livestock
            - 7.3.2.2 Swimming Pools
            - 7.3.3.3 Outdoor and Basement Showers
    - 7.4 Stray Voltage Mitigation
    - 7.5 Case Studies

8. Previously Established Voltage Exposure Standards

9. Existing Regulation

Annex A: Flow Charts

Annex B: Sample Data Collection Forms

Annex C: ???

Outline Draft (05/17/2007)

IEEE Trial Use Guide for Assessing Voltages at Publicly and Privately Accessible Locations

1. Overview (Required)

   Scope and Purpose of the Guide

2. Normative References (Required)

   Documents necessary to understand and use the Guide (e.g. USDA Handbook 696)

3. Definitions/Acronyms/Abbreviations (Required)

4. General Discussion

   Reasons for confusion surrounding the issue, some amount of measurable voltage will always be present, contact voltage v. stray voltage, sources are both primary (utility) and secondary (customer), grounded v. ungrounded systems, etc.

Outline Draft (05/17/2007) Continued

IEEE Trial Use Guide for Assessing Voltages at Publicly and Privately Accessible Locations

5. Human and Animal Sensitivity to Conducted Current

Research summary, nerve stimulation model discussion, factors affecting sensitivity, sensitivity versus frequency and/or duration of exposure, people versus animals, etc.

5.1 Sensitivity in terms of voltage exposure

Characteristics and importance of the exposure circuit (e.g. source impedance, contact impedance, body impedance, etc.), why it's difficult to create a voltage exposure standard, etc.

Outline Draft (05/17/2007) Continued

IEEE Trial Use Guide for Assessing Voltages at Publicly and Privately Accessible Locations

6. Publicly and Privately Accessible Voltages Related to Abnormal System Operation ("Contact Voltage")

6.1 General

Potentially hazardous nature of contact voltage, degree of hazard dependent on exposure circuit not measurement circuit, number of incidents (i.e. putting the issue in perspective), existing proactive programs, etc.

6.2 Contact Voltage Sources

Fault current (i.e. shorts and opens), fault current availability, insulation degradation, wiring errors, broken conductors, voltages induced during fault conditions, etc.

Outline Draft (05/17/2007) Continued

IEEE Trial Use Guide for Assessing Voltages at Publicly and Privately Accessible Locations

6.3 Contact Voltage Investigation

6.3.1 Test and Measurement Equipment

Electric field detection (e.g. proximity detectors, mobile platforms, etc.), multi-meters, load resistors, safety gear, etc.

6.3.2 Investigation Protocol

Safety precautions, understanding remote earth, measurement location, measurement technique, data analysis, false positives, etc.

6.4 Contact Voltage Mitigation

Insulation failure, wiring errors, open conductors, etc.

6.5 Case Studies

Street light, manhole, etc.

Outline Draft (05/17/2007) Continued

IEEE Trial Use Guide for Assessing Voltages at Publicly and Privately Accessible Locations

7. Publicly and Privately Accessible Voltages Related to Normal System Operation ("Stray Voltage")

7.1 General

Historically considered a nuisance voltage. Generally associated with animal exposures, swimming pool & shower shocks. Primary (utility) and secondary (customer) sources. Harmonics, transients, etc.

7.2 Stray Voltage Sources

7.2.1 Return Current

Systems with a neutral conductor, systems without a neutral conductor, SWER, etc.

7.2.2 Induced Current

Transmission Source, Primary Source, Secondary Source, etc.

Outline Draft (05/17/2007) Continued

IEEE Trial Use Guide for Assessing Voltages at Publicly and Privately Accessible Locations

7.3 Stray Voltage Investigation

7.3.1 Test and Measurement Equipment

Recording devices, load boxes, copper plates, etc.

7.3.2 Investigation Protocol

7.3.2.1 Confined Livestock

7.3.2.2 Swimming Pools

7.3.3.3 Outdoor and Basement Showers

7.4 Stray Voltage Mitigation

Bad neutral connections, undersized conductors, poor grounding, phase balance, system voltage, etc.

7.5 Case Studies

Outline Draft (05/17/2007) Continued

IEEE Trial Use Guide for Assessing Voltages at Publicly and Privately Accessible Locations

8. Previously Established Voltage Exposure Standards

IEEE, IEC, NEC, etc.

9. Existing Regulation

Wisconsin, Idaho, Michigan, New York, etc.

Annex A: Flow Charts

Annex B: Sample Data Collection Forms

Annex C: ???

The Next Meeting of the Working Group on Voltages at Publicly and Privately Accessible Locations will be at the 2007 PES General Meeting in Tampa, Florida from 1:00 – 4:00 p.m on Monday June 25th (Marriott Room 6).

For Meeting and Room Reservations: (http://ewh.ieee.org/r3/floridawc/pesias/)

Tentative Agenda:

Electric Field Detection – Power Survey Corporation

Working Group Procedures

Outline Draft

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