“Stray Voltage”
Legislative and Regulatory Activity

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Wisconsin

Legislative Involvement

1987 Wisconsin Act 399

- Authorized PSCW to Create Stray Voltage Rules
- Provided Utility Funding for a Stray Voltage Analysis Team (SVAT)
- Provided Utility Funded Research $$

Wisconsin

Public Service Commission of Wisconsin (PSCW)

Stray voltage is a special case of voltage in which the neutral to earth voltage is present across points (generally grounded metal objects) in which a current flow is produced when an animal comes into contact with them.

Stray voltages are low-level voltages and should be distinguished from painful shocks felt by humans.

Wisconsin

August 1987 Docket 05-EI-106 Commenced

Findings:

- Stray voltage is from both on and off farm sources.
- Stray voltage can be detected and mitigated.
- Mitigative action should be taken when levels of stray voltage (animal contact voltage) exceed 0.5 volts (1 mA).
- Repair and maintenance of the utility and farm wiring systems is a more effective solution to stray voltage than utility isolation.
- The equipotential plane is an effective mitigation strategy.
- Open delta services may increase primary neutral current.

Wisconsin

Docket 05-EI-106 Order Points

- Discontinue the use of isolators (Temporary Use Only).
- Improve rural load balance.
- Increase system grounding where appropriate.
- Locate customer yard poles to minimize neutral voltage drop.
- Discontinue use of split bolt connectors.
- Create a statewide uniform stray voltage tariff.
- Ensure that test protocol is consistent with PSCW guidelines.
- Continue to provide educational opportunities.
- Implement farm wiring financial assistance programs.

Wisconsin

January 1996 Docket 05-EI-115 Commenced

Findings:

- A scientific consensus exists about the effects of stray voltage.
- The 1987 0.5 volt "Level of Concern" is extremely conservative.
- 1.0 volt is below a level where behavior or production would be harmed.
- Based on a concept of equal responsibility, the "LOC" is raised to 1.0 v.
- Mitigative action is required when the utility contribution exceeds 0.5 v.
- Stray voltage does not directly cause health problems.
- A transient "LOC" is not necessary.
- A primary NEV standard is not necessary.
- Neutral isolation can hide stray voltage from on farm sources.
- Utilities will isolate on demand, but customers are required to pay.
- A 500 ohm resistor used to represent the cow in the measurement circuit is part of a conservative measurement process.

Wisconsin

2003 Legislative Action - Assembly Bill 529

Hearings held by the Assembly Committee on Energy and Utilities.

•This bill prohibits electric utilities and cooperatives from causing objectionable flows of current on the property of others.

•*"Objectionable flow of current" is defined as a steady state of load electrical current for five seconds or more on a grounding conductor or any other conductor that normally does not carry electric current.*

•The bill provides that an objectionable flow of current that an electric utility or provider causes on the property of another person is a trespass on that property.

The proposed bill did not make it out of committee.

Minnesota

Minnesota Public Utilities Commission (MPUC)

May 1994 - The Minnesota Legislature authorized the MPUC to establish a committee of science advisors in response to claims by some dairy farmers that electric currents in the earth from electric utility distribution systems are somehow responsible for problems with animal behavior, health and production problems of dairy cows.

Minnesota

November 1994 - The MPUC authorized the science advisors to carry out the following tasks:

Review any evidence that might support the proposal that earth currents adversely affect dairy herd health and production.

Determine whether further research in this area is warranted.

Oversee any research related to possible earth current effects.

Provide recommendations to the MPUC.

Minnesota

July 1998 – The Science Advisors Submit Their Final Report

Stray Voltage is the difference in voltage measured between two surfaces that may be contacted simultaneously by a person or animal (typically less than 10 volts). Sources of stray voltage are neutral to earth voltages resulting from normal current flow on a resistive neutral system. ……. Stray voltage on a farm can exist between two metal objects, between a metal object and the ground, or between two points on the ground. When an animal contacts these two points, it provides a conducting path for current to flow.

Minnesota

July 1998 – Final Report of the Science Advisors

We have not found credible scientific evidence to verify the specific claim that currents in the earth or associated electrical parameters such as voltages, magnetic fields and electric fields, are causes of poor health and milk production in dairy herds.

At the present time, there is no basis for altering the PUC-approved standards by which electric utilities distribute power onto or in the vicinity of individual dairy farms.

There are many well-documented non-electrical factors that are known and accepted by the scientific community, and by most farmers as well, to cause dairy cow health and production problems.

Connecticut

Department of Public Utility Control (DPUC)

Stray Voltage is used to describe the voltage between two animal contact surfaces, where an animal can come into simultaneous contact with both conductive points, thus completing the circuit. These surfaces include metal parts of the milking parlor or freestall area, feeders, waterers, and concrete floors.

Connecticut

Department of Public Utility Control (DPUC)

- May 1994 – DPUC receives stray voltage complaint from a Connecticut dairy farmer.
- August 1994 – DPUC conducts an investigation of the complainant's dairy farm.
- October 1994 to March 1995 – A series of hearings are held.
- June 1995 – DPUC Order.

Connecticut

Department of Public Utility Control (DPUC) 1995

Findings of Fact:

Currents from stray voltages can cause:

- physiological and behavioral changes in livestock
- production losses
- physical and manageability problems
- financial loss and psychological stress for the farmer

Mitigative action should be taken when there is 0.5 volts/1.0 milliampere in the cow contact areas and voltages in excess of 1.0 volts between primary neutral and earth (at the farm under investigation).

Connecticut

Department of Public Utility Control (DPUC) 1995

Conclusion

The Department concludes that a voluntary Stray Voltage Task Force should be formulated to foster cooperation among the various interest groups on stray voltage issues, take on the role of dispute resolution, and assist in mediating problems of farmers or utilities.

Order

The attached *Protocol for the Study and the Implementation of Procedures Regarding Stray Voltage/Current and Its Possible Effects on Farm Animals* (Appendix B), as amended from time to time, shall be used as a guide to correcting the stray voltage/current conditions.

Vermont

Vermont Legislature

1994 – Dairy farmer concerns result in legislative hearings concerning stray voltage.

Statement from the Vermont Public Service Board:

In response to proposed legislation in 1994, the Department of Agriculture, Food and Markets, the Department of Public Service, and electric utilities cooperated to write a proposal describing stray voltage problems on farms, and identifying the steps necessary to mitigate those problems.

Vermont

Statement from the Vermont Public Service Board:

Adhere to the terms of A Voluntary Program for the Control of Stray Voltage on Farms, and adopt a proactive program that ……tests for stray voltage at all …… dairy farm customers and installs, at utility expense, a neutral isolation device if neutral-to-earth voltages in excess of 0.5 Volts are encountered.[1]

Majority of dairy farms now isolated.

Different types of isolation devices used.

Utilities check isolation effectiveness once a year.

[1] Statement slightly modified for clarity.

Michigan

Michigan Public Service Commission (MPSC)

Stray voltage means the measured difference in an AC electrical potential when measured with a shunt resistor between 2 points that an animal can simultaneously contact in locations normally accessible by the animal through step or touch both inside and outside of farm buildings.

Michigan

Michigan Public Service Commission (MPSC)

•April 1997 – Michigan Utilities asks the MPSC to promulgate stray voltage rules (U-11368).

•October 1997 – Hearings are held and testimony is provided.

•April 1998 – The Michigan Attorney General files a complaint against Consumers Energy (U-11684) alleging:

- •Consumers grounded system is creating harmful earth current
- •Failure to stop the flow of earth current is agricultural discrimination
- •Stray voltage litigation expenses should not be recovered in rates
- •The MPSC lacks authority to allow **any** stray voltage

•March 2000 – Previous Docket (U-11368) intended to promulgate stray voltage rules is closed pending outcome of (U-11684).

Michigan

Michigan Public Service Commission (MPSC)

November 2003 – The Attorney General's complaint (U-11684) is dismissed.

November 2003 – A new docket again intended to promulgate stray voltage rules is opened (U-13934), and the MPSC submits a proposed protocol for comments.

Present – A collaborative effort of the Michigan utilities and several farm organizations resulted in submittal of an agreed upon proposed stray voltage protocol. This document is currently being reviewed by the MPSC.

New Jersey

New Jersey Board of Public Utilities (NJBPU)

Stray voltage is the non-technical term for a phenomenon known as "neutral-to-earth voltage", which is an extraneous voltage that appears on grounded surfaces (such as wires, pipes and soil) in buildings and other structures. In addition, the normal load current flowing in a distribution system's neutral and ground wires creates stray voltage.

In most instances, stray voltage is not a problem because the levels are generally below the perception level of humans and usually there is no sensitive electronic equipment that can be affected by it.

New Jersey

New Jersey Board of Public Utilities (NJBPU)

July 2002 – Twelve customers of Jersey Central Power & Light (JCP&L) residing in Brick and Dover Townships complain to the NJBPU about experiencing tingling sensations in their pools, hot tubs, outdoor showers and other conductive objects.

September 2002 – The NJBPU asks the National Regulatory Research Institute (NRRI) for assistance. The NRRI hires VitaTech Engineering to investigate and provide recommendations.

New Jersey

New Jersey Board of Public Utilities (NJBPU)

December 2002 – NJBPU accepts the report of its consultant, VitaTech, and directs JCP&L to implement the report's recommendations.

- Increase primary neutral size to match phase conductors on 4 circuits
- Balance loads (4 circuits) to within 10% during (avg), 15% (peak)
- Expand the Substation ground area

New Jersey

New Jersey Board of Public Utilities (NJBPU)

July 2003 – Following continuing customer complaints, NJBPU asks VitaTech to re-visit the site and submit a second report.

November 2003 – The NJBPU orders JCP& L to implement the eight (8) recommendations contained in VitaTech's second report, and suggests that a Neutral-to-Earth voltage standard may be necessary.

2004 – EPRI Involvement

New York

New York Public Service Commission (NYPSC)

Stray Voltage –The term "stray voltage" means voltage conditions on electric facilities that should not ordinarily exist. These conditions may be due to one or more factors, including, but not limited to, damaged cables, deteriorated, frayed or missing insulation, improper maintenance, or improper installation.

New York

New York Public Service Commission (NYPSC)

January 2004 – Jodie Lane Incident

February 2004 – Order commencing proceeding specific to Consolidated Edison. Directed to test all manholes, vaults, service boxes, and street lights, to report its findings, and submit necessary revisions to its maintenance plan.

July 2004 – Order Soliciting Comments from all regulated utilities regarding stray voltage rule proposal.

New York

New York Public Service Commission (NYPSC)

January 2005 – Order Instituting Safety Standards (all regulated utilities)

Directed utilities to submit within 45 days:

- the details of their voltage testing programs
- the details of their inspection programs
- the safety criteria to be applied
- an inspection schedule with a five year cycle
- the details of their quality assurance programs
- training plans (employee and contractor)
- a description of planned stray voltage research

New York

New York Public Service Commission (NYPSC)

January 2005 – Order Instituting Safety Standards (continued)

- Specified 8 – 600 volt detection device
- Adopted the NESC in New York
- Denied rate recovery
- Created rate based fines for failure to implement

June 2005 – Order requiring phone companies to comply with the NESC and perform stray voltage inspections.

Massachusetts

Department of Telecommunications & Energy (DTE)

Stray voltage has caused injuries to pets and the death of at least three dogs in Massachusetts. Other states, notably New York, have encountered similar stray voltage events, including the death of a woman in downtown Manhattan (Jodie Lane) in January 2004. (Navigant Report)

Beginning in June 2004, a number of manhole covers were dislodged on the underground electric distribution systems of electric companies regulated by the Massachusetts Department of Telecommunications & Energy (DTE). Several of these manhole events reportedly caused injuries to persons and property. (Siemens Report)

Massachusetts

Department of Telecommunications & Energy (DTE)

August 2004 – DTE requests information regarding “Maintenance and Inspection Practices of Underground Facilities”

Late 2004 - DTE hires two independent consultants to provide recommendations on Stray Voltage and Manhole Safety

Navigant Consulting - Independent Assessment of Stray Voltage in Underground Distribution Systems of Massachusetts Electric Companies (Stray Voltage Safety)

Siemens Power - Independent Assessment of Dislodged Manhole Covers (Manhole Safety)

Massachusetts

Department of Telecommunications & Energy (DTE)

Navigant Consulting was asked to determine:

- Adequacy of testing methods to detect stray voltage
- Causes and remedies for stray voltage
- Communications with municipalities regarding facility abandonment
- Procedures for de-energizing facilities that have been abandoned
- Adequacy of remediation plans and implementation
- Adequacy of record keeping procedures
- Assessment of whether hazardous events have been increasing
- If stray voltage hazards are due to geographic or climatic conditions
- If state and municipal de-icing practices lead to equipment deterioration
- Further action to be taken to ensure public safety from stray voltage

Massachusetts

Department of Telecommunications & Energy (DTE)

December 2005 – DTE directs each utility to submit its plans for implementation of the recommendations contained in the final reports of Navigant and Siemens.

With respect to stray voltage these recommendations include:

•Stray voltage plans must achieve a 20 volt detection level with an expectation the detection level will be lowered over time to 8 volts

•Perform stray voltage measurements at least every five (5) years on:

- Metallic risers, sweeps and conduits
- Manhole and handhole covers
- Secondary pedestals
- Padmount transformers and transclosures
- Padmount switchgear, termination cabinets and junction boxes
- Control cabinets such as pole mounted capacitor controls

Massachusetts

Department of Telecommunications & Energy (DTE)

With respect to stray voltage these recommendations include (continued):

Immediately repair, replace or disconnect equipment with stray voltage greater than 20 volts

Repair within 24 hours all equipment with stray voltage between 8 volts and 20 volts

Utility discretion to be used when stray voltage is below 8 volts

Document all stray voltage events, and submit to DTE

Promote stray voltage safety awareness

Idaho

February 2004 – An Idaho jury awards a dairy farmer $17,500,000

Idaho Legislature

March 2005 – Idaho Legislature passes the “Stray Current and Voltage Remediation Act” requiring the Idaho Public Utilities Commission to promulgate stray voltage rules.

Idaho Public Utilities Commission (IPUC)

April 2005 - Idaho Public Utilities Commission (IPUC) provides notice that it intends to promulgate rules and to initiate informal rule making procedures.

Idaho

Idaho Public Utilities Commission (IPUC) (continued)

July 2005 – IPUC issues its decision on Temporary and Proposed Stray Voltage Rules.

Four Major Sections of “The Stray Voltage Rules’

- Qualifications of persons analyzing stray voltage data
- Calibration and standards of recording equipment
- Six stray voltage tests and data collection forms
- Analyzing data and conducting remediation actions, if required

Idaho

Idaho Public Utilities Commission (IPUC) (continued)

Stray Current or Voltage is:

a). *Any steady state, sixty (60) hertz (Hz) (including harmonics thereof) root mean square (rms) alternating current (AC) less than twenty (20) milliAmperes (mA) through a five hundred (500) ohm resistor (i.e. shunt resistor) connected between cow contact points, as measured by a true rms meter; or*

b). *Any steady state, sixty (60) Hz (including harmonics thereof), rms AC voltage of less than ten (10) volts, across (in parallel with) a five hundred (500) ohm resistor (i.e. shunt resistor) connected between cow contact points, as measured by a true rms meter.*

Idaho

Idaho Public Utilities Commission (IPUC) (continued)

c). Stray current and voltage is a normal, inherent and unavoidable result of electricity traveling through grounded electrical systems, including a dairy producer's on-farm system and a utility's distribution system. These systems are required by the National Electrical Code (NEC) and the National Electrical Safety Code (NESC) to be grounded to the earth to ensure safety and reliability.

d). Unless the context otherwise requires, the term "stray voltage" shall mean stray current or stray voltage.

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QUESTIONS, COMMENTS, CONCERNS?????