

Stray Voltage

By: Lee Hansen, Chief Legislative Analyst

April 20, 2023 | 2023-R-0103

Issue

This report describes (1) how stray voltage is regulated in Connecticut and (2) stray voltage statutes in other states.

Summary

In general, “[stray voltage](#)” is a small amount of voltage that can be measured between two possible contact points. When these two points are connected together by an object, such as a person or an animal, a current will flow. It has often been related to [issues with dairy farms](#) and cows, but has also been tied to [accidents](#) involving people and their pets in urban areas.

Connecticut’s statutes do not address “stray voltage” explicitly, but they more broadly cover issues related to regulating voltage. The Public Utilities Regulatory Authority (PURA), which regulates the state’s electric distribution companies (EDCs, i.e., Eversource and United Illuminating), has enacted regulations that require the EDCs to maintain their voltage within certain limits. PURA is also currently developing a process to track EDC power quality metrics. In addition, the law generally requires an EDC to report an accident involving their facilities and personal injuries or public safety to PURA. According to PURA, EDC customers who experience stray voltage issues should first contact the EDC to try to resolve the issue, but they may also contact PURA’s call center (1-800-382-4586) or file a complaint [online](#). If they suffered damages, they could also contact the EDC’s claims department or bring a civil action against the EDC.

We identified at least four states (Idaho, South Dakota, Utah, and Wisconsin) with laws that explicitly address stray voltage. These laws generally require the state’s utility regulatory agency to create a stray voltage program with certain criteria (e.g., a uniform system for measuring stray

voltage, inspection and remediation requirements). The laws in Idaho and South Dakota also establish a procedure for a dairy producer to sue an electric utility company for damage caused by stray voltage. In some other states, which are not discussed in this report, utility regulators have created a stray voltage program through their own decisions and orders, without an explicit statutory requirement. For example, see the orders issued by New York's Department of Public Service in [Case No. 04-M-0159](#).

Regulating Stray Voltage in Connecticut

Regulating Voltage

The law requires the EDCs to maintain the integrity of their distribution systems in conformity with the National Electric Safety Code, and other electric distribution industry standards that PURA finds applicable, in a way sufficient to provide safe and reliable service ([CGS § 16-244i](#)).

PURA has interpreted this law a number of ways that may relate to regulating voltage. For example, PURA's regulations require an EDC to maintain voltage on its system within certain prescribed variation limits ([Conn. Agencies Regs., § 16-11-115](#)). Under this regulation, standard operating limits are -5% and +3% of nominal voltage (e.g., for 120 volts (V), the voltage can range from 114V to 123.6V). According to PURA, this standard is stricter than the corresponding national standard, which sets a +5% upper limit. Voltage excursions above the upper limit cannot last for more than one minute, and providing voltage below the lower limit must be limited in extent, frequency, and duration. In addition, an EDC must promptly take corrective action whenever deviations result from situations other than temporary conditions. Temporary conditions, such as automatic switching to supply interrupted feeders, should not exceed 24 hours where practical.

In 2019, however, PURA issued a [decision](#) that increases the upper voltage variation limit from +3% to +5% for all residential and commercial customers. As under the current regulation, voltage excursions cannot exceed the upper limit for more than one minute. The decision, which primarily stems from issues related to interconnecting certain distributed energy resources (e.g., solar facilities), keeps the increase in place until the regulation is formally changed or legislation is enacted superseding it.

Tracking

In 2022, a separate [PURA decision](#) began a process to track EDC power quality metrics (e.g., whether: (1) voltage stays within a prescribed range, (2) frequency remains close to the rated value, and (3) there are both smooth voltage and current waveforms). PURA and the EDCs are still in the process of determining what power quality data can be collected and, according to PURA, it will continue doing so in Docket no. [23-08-09](#) later this summer.

Accident Reporting

While not specific to stray voltage, the law more broadly requires an EDC to report an accident involving personal injuries or public safety to PURA if it was due to the EDC's operation of its property, or caused by contact with its wires. It must do this as soon as reasonably possible after the accident unless it is a minor accident. The EDCs must report minor accidents to PURA on a monthly basis in writing, in a summary form ([CGS § 16-16](#)).

Under PURA's regulations, a "major accident" includes, among other things, incidents that involve a fatality, or an injury requiring in-patient hospitalization that was or may have been connected with or due to electrical contacts with an EDC's property or facility. "Minor accidents" include, among other things (1) structure fires or other damage to an EDC's facility or customer equipment, which were or may have been connected with or due to the EDC's operation or equipment, where the public was not exposed to primary voltage and (2) accidents to members of the public that are not considered a major accident but resulted in personal injury or at least \$50,000 of property damage, whether or not hospitalization was required ([Conn. Agencies Regs., § 16-16-2](#)).

Customer Recourse

According to PURA, EDC customers who experience stray voltage issues may contact PURA's call center (1-800-382-4586) or file a complaint [online](#); however, PURA asks that customers contact the EDC first to attempt to resolve the problem. Although the law allows PURA to order restitution and levy penalties for certain statutory violations ([CGS § 16-41](#)), PURA also notes that it is not designed or staffed to adjudicate individual property or damage claims. Instead, it focuses on ensuring that the companies comply with applicable laws, regulations, and orders.

If a customer believes that he or she incurred damage from stray voltage, PURA's process and remedies would largely focus on assessing whether the EDC complied with the applicable laws, regulations, and orders. In such a case, PURA may look at whether the EDC acted in accordance with its approved terms and conditions of service. (For example, Eversource's current [Terms & Conditions for Delivery Service](#) (p. 14) specifies that the company "does not undertake to regulate the voltage or frequency of its service more closely than is standard commercial practice. If the customer requires regulation of voltage or frequency that is more refined, he shall furnish, install, maintain, and operate the necessary apparatus at his own expense.")

There may also be other remedies available to a customer, such as by contacting the EDC's claims department or bringing a civil action against the EDC. PURA does not believe that a customer would need to pursue an administrative remedy through PURA before filing a civil action.

Stray Voltage Laws in Other States

At least four states, Idaho, South Dakota, Utah, and Wisconsin, have statutes explicitly related to regulating stray voltage.

Idaho

Idaho's [law](#) requires the Idaho Public Utilities Commission (IPUC) to promulgate rules that establish uniform procedures and protocols for measuring stray current or voltage. The commission must review and update the rules from time to time to ensure that the procedures and protocols are the most scientifically and technologically accurate and reliable way to detect stray currents. Under the law, any stray current measurements that were not in compliance with IPUC's rules are inadmissible before the commission or in any civil action ([Idaho Code § 61-803](#)). The rules, which are available [here](#), cover topics such as the qualifications of people performing stray voltage tests, calibrating testing equipment, testing procedures, data analysis and reporting, and remedial actions.

Under the law, a dairy producer who claims that its dairy cows are being affected by a utility company's stray current (or other electrical energy) must give the company written notice specifying why the producer believes its dairy cows are being affected by the company's stray current. Within 14 days after receiving the notice, the company must take measurements at cow contact points at the producer's dairy to identify the existence and magnitude of any stray voltage. If the portion of the stray voltage attributable to the company's distribution system exceeds 50% of a preventive action level, then the company must begin remedial procedures within five days to bring that stray voltage down to no more than 50% of the preventive action level ([Idaho Code § 61-804](#)).

A "preventive action level" is (1) a steady-state, root mean square (rms), alternating current (AC) of 2.0 milliamp (mA) or more through a 500 ohm resistor connected between cow contact points, as measured by a true rms meter or (2) a steady-state, rms, AC voltage of 1.0V or more, across (in parallel with) a 500 ohm resistor connected between cow contact points, as measured by a true rms meter ([Idaho Code § 61-802](#)).

Lawsuits. Idaho's law gives IPUC exclusive, initial jurisdiction to determine whether a utility company (1) complied with its rules for measuring stray current, (2) took measurements that showed stray current at or above the preventive action level, (3) properly identified the portion of the stray current at cow contact points attributable to the company's distribution system, and (4) complied with its remediation obligation under the law. The law allows a dairy producer to bring a civil suit seeking monetary damages against a company if, after a hearing, IPUC determines that the company:

1. (a) complied with the rules for measuring stray current, (b) properly identified stray current that exceeded the preventive action level, and (c) properly identified that the portion of stray current attributable to the company's distribution system exceeded 50% or
2. failed to (a) comply with the rules for measuring stray current, (b) properly identify that that the portion of stray current attributable to the company's distribution system exceeded 50%, or (c) provide adequate remediation.

A producer must start the action within one year after a company's adequate remediation has been completed or IPUC issued its final order, whichever is later ([Idaho Code § 61-805](#)).

The law prohibits dairy producers from suing a utility company for damages or other relief allegedly due to injury caused by stray current unless the producer met the notice requirement described above and IPUC, after a hearing, issued an order making the above determinations. The order is admissible as evidence in the action ([Idaho Code § 61-807](#)). The law also limits the producer's damages in the action to those that were (1) incurred during a period that starts 12 months before the producer gave the utility company notice about the stray voltage issue and ends when the company completes its adequate remediation measures and (2) caused by the portion of the stray current attributable to the company's distribution system ([Idaho Code § 61-808](#)).

Under the law, no claim for nuisance may be asserted against a utility company for damages due to stray current. These claims are limited to claims of negligence and, if IPUC made a prior determination allowing the producer to bring a civil suit (as described above), negligence per se. In determining whether the company was negligent, the company's conduct must be judged using a standard of ordinary care under the existing circumstances ([Idaho Code § 61-809](#)).

South Dakota

Like Idaho, South Dakota's [stray voltage law](#) requires the state's Public Utilities Commission (PUC) to promulgate rules on stray voltage. However, South Dakota's law more specifically requires the rules to include the following:

1. acceptable standards for measuring stray voltage;
2. procedures and requirements for testing used to measure stray voltage;
3. responsibilities of (a) dairy producers, including notice requirements and cooperation with electric utility company measuring and testing procedures, and (b) electric utility companies, including responding to notices from dairy producers;
4. tests to detect and measure stray voltage;
5. qualifications of people performing and analyzing stray voltage tests;

6. requirements for stray voltage measuring and recording equipment;
7. protocols for people performing stray voltage tests; and
8. remediation guidelines ([SD Codified Law § 49-47-2](#)).

The provisions in South Dakota’s law requiring a dairy producer to notify an electric utility about stray voltage issues affecting cows are substantially similar to Idaho’s.

As in Idaho, South Dakota’s PUC has exclusive, initial jurisdiction to determine whether a utility (1) complied with its rules for measuring stray current, (2) took measurements that showed stray current at or above the preventive action level, (3) properly identified the portion of the stray current at cow contact points attributable to the company’s distribution system, and (4) complied with its remediation obligation under the law. But South Dakota’s PUC also has this jurisdiction to determine whether a dairy producer has (1) given the required notice to the utility and (2) cooperated with the utility to allow it to complete measuring and testing ([SD Codified Law § 49-47-4](#)).

South Dakota’s law is otherwise substantially similar to Idaho’s in all other respects. The PUC’s stray voltage rules are available [here](#), and additional information is available [here](#).

Utah

Utah’s stray voltage law requires a livestock owner or operator to file a notice with an electric entity if it believes that its livestock is affected by stray current that may be attributable to the entity and is seeking a remedy from the entity. The notice must be written and include the livestock owner or operator’s address, the location of the stray voltage, and a description of the claimed impacts. The electric entity must provide for stray voltage testing by a qualified testing professional within 30 days after receiving the notice, and the owner or operator must allow reasonable access to the property to allow for testing. Within 60 days after completing the tests, the testing professional must prepare a written report that summarizes the tests and includes their data and results. The electric entity must give the owner a copy of the report ([Utah Code § 54-22-201](#)).

Under the law, a “qualified testing professional” is an electrical engineer who has (1) an engineering degree from an accredited university; (2) completed at least 40 hours of relevant stray voltage training, with electric utility experience; and (3) been involved in at least one prior investigation that involved measuring or testing for stray voltage ([Utah Code § 54-22-102](#)).

If the stray voltage testing finds that an electric entity’s contribution to any stray voltage is at least 50% of an actionable level, the law requires the entity to diligently pursue remediation to lower its contribution to the stray voltage to less than 50% of the actionable level within 90 days. The

livestock owner or operator must allow reasonable access to the property for the remediation ([Utah Code § 54-22-202](#)).

Under the law an “actionable level” is stray current or voltage that is:

1. a steady-state, rms, AC of 2.0 mA or more through a 500 ohm resistor connected between livestock contact points, as measured by a digital true root mean square meter;
2. a steady-state, rms, AC voltage of 1.0V or more across, in parallel with, a 500 ohm resistor connected between livestock contact points, as measured by a true root mean square meter;
3. a steady-state direct current (DC) of 2.8 mA or more through a 500 ohm resistor connected between livestock contact points, as measured by a digital meter; or
4. a steady-state DC voltage of 1.4V or more across a 500 ohm resistor connected between livestock contact points, as measured by a digital meter ([Utah Code § 54-22-102](#)).

Under the law, (1) an electric entity may not be held liable for damages or other relief if the claim is based on livestock contact with stray voltage contributed by the electric entity below the actionable level, and (2) there is no presumption of liability if the stray current is equal to or greater than the actionable level. The law prohibits a nuisance claim from being asserted against an electric entity for damage due to stray voltage, and limits stray voltage claims to negligence. The electric entity’s conduct must be evaluated with a standard of ordinary care under the circumstances ([Utah Code § 54-22-203](#)). If the electric entity is a public utility, disputes must be resolved through the statutory process for complaints against utilities (i.e., through the state’s utility regulator) ([Utah Code § 54-7-9](#)). Disputes with other types of electric entities must be resolved by filing an action with the state’s district court ([Utah Code § 54-22-205](#)).

Wisconsin

Wisconsin’s law requires the state’s Public Service Commission (PSC) to establish and administer a stray voltage program that focuses on regulation, education, inspection, and investigations related to stray voltage ([WI Stat. § 196.857](#)). Under the program, the PSC must also:

1. identify standardized test procedures check lists and equipment that public utilities must use to investigate stray voltage;
2. conduct unannounced spot checks of on-farm stray voltage testing done by public utilities, if the farmer gives permission for the check when the farm is visited;
3. in cooperation with certain other state agencies, investigate the causes of stray voltage on individual farms, recommend solutions to farmers, and evaluate the effectiveness of on-site technical assistance; and

4. conduct classroom and on-farm stray voltage training sessions for public utilities, cooperatives, electricians, or other interested parties.

The law also allows the commission to (1) audit the results of a utility company's stray voltage investigation; (2) inspect the operation of a company's stray voltage program to ensure that proper equipment and procedures are being used that investigators are properly trained; (3) charge a fee of up to a \$300 per farm for its stray voltage services provided to farmers; and (4) charge a reasonable fee, which cannot exceed the actual costs of services, for providing stray voltage-related services, other than on-farm site-related services. Additional costs for supporting the stray voltage program are funded by service fees ([\\$500 per investigation](#)) and assessments on the state's investor-owned electric utilities and electric cooperatives.

Additional information about Wisconsin's stray voltage program, including PSC [orders](#), and [testing protocols](#), is available [here](#).

LH:kl