

# Wisconsin PSC Stray Voltage Investigation

*The following is an excerpt from the Public Service Commission of Wisconsin's Investigation on the Commission's Own Motion Into the Practices, Policies and Procedures Concerning Stray Voltage for Electric Distribution Utilities in Wisconsin.*

Docket 05-EI-115

## ORDER

### THE COMMISSION THEREFORE ORDERS THAT:

1. Within 60 days after the date this order is mailed, the electric utilities shall develop a uniform tariff for isolation on demand. This tariff shall be based on the 2.0 mA AC RMS 60 Hz, steady state, overall level of concern and 1.0 mA AC RMS 60 Hz, steady state, utility level of concern set forth in this order, and shall comply with the conditions for isolation on request set forth in the Findings of Fact, Issues 6 and 7 (see below). Within 30 days after the Commission accepts this basic uniform tariff, each electric utility shall file revisions to its stray voltage tariff so it conforms to the uniform tariff and to the provisions of this order. Within 90 days after the date this order is mailed, each electric utility shall also file revisions to its stray voltage tariff so the tariff conforms to the provisions of this order where the utility has installed an isolator because off-farm stray voltage exceeds 1.0 mA and where the 90 day period for isolation has expired.
2. Each electric utility shall include 24-hour motor start transient tests with electronic recording equipment in their stray voltage investigations. SVAT staff may be consulted for guidance on appropriate instruments and methods for conducting these tests.
3. Each electric utility shall provide a report to the farmer after completing a stray voltage investigation. The report shall include, at a minimum, information about the level of stray voltage found, the source of any current that exceeds the level of concern, the utility's farm wiring recommendations, a description of all distribution system changes the utility made, and the results of the utility's 24-hour tests.
4. If an electric utility installs an on-farm mitigation device to control off-farm stray voltage, the utility shall transfer ownership to the farmer without charge. The utility shall continue to maintain the device and shall inspect it on request. An electric utility may only install an on-farm mitigation device to control off-farm stray voltage when it is the least costly solution and the farmer agrees to its installation.

Dated at Madison, Wisconsin: July 11, 1996

By the Commission

**Issue 6: When should isolation be available and for how long? What safety and reliability concerns need to be addressed when isolating customers?**

**Issue 7: Who pays for isolation?**

Neutral isolation is a method of separating the primary and secondary neutrals. Separation prevents any off-farm sources of stray voltage from appearing in a cow contact area. A neutral isolator can, however, hide the presence of stray voltage caused by on-farm conditions without fixing the farm wiring problems involved. Installing an isolator for one farm can also push stray voltage onto neighboring farms. A properly functioning isolator reconnects the primary neutral and secondary neutral when voltage above a specified amount is applied, so fault current can use the additional grounding available on the farm to dissipate any potentially damaging effects. The isolator reconnects the neutrals at its "breakdown voltage." Neutral isolation is discouraged, but allowed under certain conditions by section PSC 114-97 D2 of the Wisconsin State Electrical Code, Volume 1. See s. PSC 114.08, Wis. Adm. Code.

The Commission's prior orders in docket 05-EI-106 consider neutral isolation a useful short-term means of mitigating off-farm sources of stray voltage, allowing a utility time to diagnose the real cause of stray voltage and correct the problem. The Commission currently allows a utility that has identified off-farm stray voltage above the level of concern to install an isolator temporarily. The installation, though, is subject to the following conditions:

1. The utility must install the isolator at its own cost
2. Isolation is not available for stray voltage below the level of concern.
3. Isolation is not available if it creates unsafe conditions on the farm because of lack of grounding or increases the primary neutral voltage to unacceptable levels.
4. Isolation can remain in place no more than 90 days. Beyond that period, the utility must request an extension from the Commission.

(Docket 05-EI-106, Amended Order, pages 20 - 26; Supplemental Order, pages 1- 12.)

The utilities, Farmers Union, DATCP and Commission staff generally concur that, when off-farm sources of stray voltage exceed 1.0 mA, isolation subject to these conditions is still appropriate. The Commission agrees.

In this docket, a major issue concerns whether isolation should be available to farms on demand, regardless of whether stray voltage exceeds the 1.0 mA utility level of concern. Both the Farmers Union and DATCP recommend that farmers be allowed to receive isolation on demand for one-year trial periods. Commission staff originally proposed a shorter, 90-day trial period, but ultimately agreed with Farmers Union and DATCP. The Farmers Union recommended that the utility should install an isolator at its own cost, but DATCP preferred

that the farmer pay for installation. Both parties agreed that farm wiring must be adequate before an isolator is installed.

The utilities are concerned about allowing isolation on demand. They argued that other mitigation alternatives are safer and more effective than isolation. They were also concerned that isolation may create more litigation problems, so they recommended that it be allowed on demand only under certain conditions. The Commission agrees with most of the utilities' recommendations regarding how to implement isolation on demand, except their proposal that the utility would be able to deny a request for isolation. The Commission finds that farmers should be allowed to test whether using an isolator to reduce already low levels of stray voltage may be beneficial for milk production, and that it is reasonable to modify its isolation policy accordingly. The primary and secondary neutral conductors are connected for safety reasons but, if the utility and farm electrical systems are up to code, they can still operate safely when separated by an isolator. Inspections and maintenance of farm wiring and grounding are an important precondition to allowing isolation on demand, however, in order to ensure the farm's safety. Reasonable requirements for allowing isolation on demand are as follows:

1. Commission staff should create an isolation request form, in consultation with the utilities. The farm should collect appropriate information about customer service providers that must be notified, such as the gas utility, telephone utility and cable television company. When it becomes available, a farmer who wants isolation must complete the request form.
2. The farmer must supply up-to-date certification that a state-certified electrical inspector, or a state-certified master electrician, has inspected the farm and that the farm's electrical system complies with applicable codes.
3. The utility shall conduct a stray voltage investigation,

**SEE PAGE 7/STRAY VOLTAGE**

## **STRAY VOLTAGE**

**FROM PAGE 6**

using the test procedures specified in docket 05-EI-106 and in this order, before and after isolation.

4. Isolation shall be allowed only for stray voltage concerns on operating livestock farms.
5. The utility may require that the farmer hold it harmless against any utility liability related to the requested isolation. The utilities shall bring to the Commission the wording of their hold harmless clauses, for its approval within 30 days after the date this order is mailed.
6. The utility shall own and maintain the isolator. The utility may determine what type of isolator to use, although spark gap isolators and isolation transformers are not recommended for isolation on demand. Each utility shall provide the customer with specification about the isolation devices it makes available.
7. Within 60 days after the date this order is mailed, the utilities shall develop a uniform tariff for isolation service to provide farmers throughout the state equivalent access to this service. Within 30 days after the Commission approves the utilities' uniform tariff, each utility shall conform its existing stray voltage tariff to these uniform standards.

If the utility's stray voltage contribution is 1.0 mA or less, the farmer can receive an isolator on request. The farmer must pay the cost of the isolator, installation, and maintenance. If the farmer requests the utility to remove the isolator within one year after installation, though, the utility shall do so at no cost and shall reimburse the farmer the resale value of the isolator.<sup>2</sup>

Where a utility has installed an isolator because off-farm stray voltage exceeds 1.0 mA and the 90-day period for isolation has expired, isolation can continue if all the conditions set forth for isolation on demand are met. The utility, however, must provide the inspection of farm wiring by a state certified master electrician or state certified electrical inspector. If wiring code violations are not made, the utility must remove the isolator and install another mitigation technique to reduce the utility contribution to 1.0 mA AC RMS or below.

Spark gap isolators are poor devices for stray voltage isolation because the electrodes wear out as the isolator is used. As a result, the isolator's breakdown voltage increases and the time needed to close the gap between the neutrals becomes unpredictable. Isolation transformers are less safe than other isolation devices, because they are not designed to provide stray voltage isolation and do not reconnect the system safely during a fault condition. Isolation transformers are 1:1 transformers that a farmer can install in farm wiring, under an exception to the Wisconsin State Electrical Code, Volume 2 (National Electrical Code). Unlike a transformer on the utility pole, the neutrals on each side of an isolation transformer are not connected together and will not reconnect even in high-voltage fault conditions. As DATCP's witness testified, an isolation transformer is "more complex, costly, and less safe." The Commission does not recommend use of spark gap devices or isolation transformers for stray voltage mitigation.

It is reasonable to require that utilities offer isolation in a timely manner. For the first one-year period following the date this order is mailed, each utility should install an isolator within 45 days after a proper request is received. To be proper, the request must include the wiring certification and, when the forms become available, a completed isolation request form. In subsequent years, it is reasonable for utilities to install isolator within 30 days of receiving proper requests. It is also reasonable for staff to develop guidelines and specifications that define isolation for the benefit of telephone and other non-electric utility personnel, so they know how to install or modify their equipment to achieve and maintain complete isolation.

<sup>2</sup> *Applying these conditions when a farmer uses an isolator for a one-year trial period is reasonable because it allows the farmer to test the isolator during a complete lactation period and during each season of the year.*