

***REGULATORY APPROACHES TO
ADDRESSING THE IMPACT OF
STRAY VOLTAGE ON FARM
OPERATIONS***

*FOR THE ONTARIO ENERGY BOARD
DECEMBER 5, 2007*

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Scope of Assignment

- To survey a sample of other jurisdictions and gather data about the **regulatory** approaches used to address the impact of stray voltage on farm operations
- To examine regulatory measures implemented, costs and cost impacts
- To draw conclusions as to the suitability of the measures for use in Ontario
- Focus of the review is on the role of the regulator, and not on identification of engineering standards or engineering solutions

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Regulation of Electric Utilities

- In North America, electric distribution utilities have a service territory in which they are sole service provider
- Independent body needed to ensure fair rates, safe and adequate service to all customers
- In both Canada and United States, most issues about electricity are decided at the province/state level
 - Each province and state has its own independent regulator for electric utilities
 - There are similarities in approach to utility regulation that are seen almost everywhere, but also many differences
- Typical powers of the regulator include: approval of rates, approval of large capital projects (new stations, lines, etc.), approval of the conditions of service and quality of service to customers, hearing and resolving customer complaints

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Jurisdictions reviewed for this study

- Canada:
 - Alberta, British Columbia, Québec
- United States:
 - Idaho, Michigan, Pennsylvania, Vermont, Wisconsin
- Also looked for information as to scope of the issue in Europe and Australia
 - These systems, due to their design, are less likely to be a source of stray voltage
- North American jurisdictions are relevant to Ontario because of similarity of electricity system design, and of regulatory framework

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How We Gathered Data

1. Review of documents gathered from web sites
 - Reports, decisions and other information from the regulator's site
 - Web sites of utilities in the jurisdiction
 - Government and other web sites, as applicable
2. Telephone conversations with staff of regulators and utilities and/or emailed questions

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Basic Questions We Asked in Each Jurisdiction

- Single major utility, or many?
- Role of regulator with regard to farm stray voltage problems?
- Other agencies involved (example, department of government, eg agriculture)?
- What technical requirements are established:
 - Definition of limit to acceptable level of stray voltage
 - Specification of testing procedures and equipment
 - Specification of allowed remediation approach(es)
- Process for handling individual cases, data collection and reporting
- Costs related to the testing and remediation procedures, where available
- Level of activity, where available (number of cases addressed annually)
- Who pays costs of testing and remediation? Can the utility recover its costs through rates to customers?

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Alberta – Overview of Approach

- Two electric utilities serve the majority of rural customers in the Province (Fortis and ATCO Electric)
 - Others serve mainly urban areas
- The Regulator is the Alberta Energy and Utilities Board (AEUB)
- There is no Provincial legislation and no regulatory rules for FSV testing or remediation measures
- If FSV is suspected, the farmer will initially contact the LDC. If not satisfied with the response, a complaint may be filed with the AEUB
- The AEUB will handle FSV complaints on a “case-by-case” basis
- Utility bears costs of testing and for remediation up to the customer’s meter
- Costs are recovered through the rates

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British Columbia – Overview of Approach

- BC Hydro distributes electricity to the majority of the Province
- The Regulator is the British Columbia Utilities Commission (BCUC)
- There is no Provincial legislation and no regulatory rules for FSV testing or remediation measures
- If FSV is suspected, the farmer will initially contact the LDC (BC Hydro). If not satisfied with the response, a complaint may be filed with the BCUC
- BC Hydro voluntarily responds to FSV issues with extensive testing to identify both off-farm and on-farm sources, and will implement remediation measures for off-farm sources.
- Utility bears the cost of testing and for remediation up to the customer’s meter
- Costs are recovered through the rates

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Idaho – Overview of Approach

- 4 investor-owned LDC's serve electricity to the majority of customers in the State (plus cooperatives).
- The Regulator is the Idaho Public Utilities Commission (IPUC)
- IPUC responsible for electrical safety
- Legislation in 2005 required IPUC to set uniform procedures and protocols for the measurement of FSV
- Rules developed through stakeholder negotiations, in force Dec 2005
- Rules define standardized testing procedures, establish the qualifications for persons completing the tests and analysis, and standards for the testing equipment
- Inspectors are required to complete a IPUC approved FSV training program (follows approach established in Wisconsin)
- The Rules apply to dairy farms only

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Idaho – Detailed Requirements

- Preventative Action Level (PAL) - maximum total animal contact voltage 2 mA or 1.0 volt; maximum utility contribution set at 50% of that (1 mA or 0.5 volts)—this is the level at which the utility must mitigate
- Standardized set of tests (up to 6) plus standard forms to record the results. The tests attribute the FSV to on-farm and off-farm sources.
- utility is required to take corrective action within 5 business days of notice from the dairy farmer.
- Complaints are first brought to the utility, but may be referred to the IPUC for resolution if the customer is not satisfied
- Costs of off-farm mitigation recovered through rates; on-farm remediation is at the expense of the dairy farmer
- The Rules specify the results to be achieved and the specific remediation measures are left to the discretion of the utility

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Michigan – Overview of Approach

- Multiple electric utilities serve customers in the State
- Regulator is the Michigan Public Service Commission MPSC
- Detailed rules were defined, applicable to all electric utilities in Michigan, MPSC order in 2006, rules became final early 2007.
- Customer complaints can be directed to the utility or to the MPSC
- MPSC staff believe that the number of customers with stray voltage issues is small, because of consolidation in the dairy farm industry

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Michigan – Detailed Requirements

- "Preventive action level" -- steady state animal contact current ≥ 2 milliamperes RMS using a nominal 500 ohms resistor at 60 Hz from all sources, including the farm itself and the utility.
- Specific procedure for measurement of total stray voltage and utility contribution is defined, based on measure over a 72 hour period
- Specific requirements for the measurement equipment
- If remediation by the utility is required, isolation of the neutral is allowed (and has widely been done); MPSC has not established specific requirements as to how the utility must mitigate
- Cost recovery is allowed through the rates
- Complaints initially handled by the utility as they arise; referrals to the MPSC are expected to be very few

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Pennsylvania – Overview of Approach

- Pennsylvania customers are served by a number of investor-owned utilities and rural cooperatives
- The utility regulator in Pennsylvania is the Public Utility Commission (“PUC”)
- the PUC has not established any testing or remediation requirements unique to stray voltage issues,
 - view is that issue of stray voltage is too complex for specific regulations
- PUC deals with issues if they arise in the form of customer complaints
- Utility bears costs of remediation up to the customer’s meter
- Costs are recovered through the rates

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Québec – Overview of Approach

- Hydro-Québec distributes electricity throughout the territory of Québec, excluding the territories served by municipal, cooperative or private electric power system (of which there are a very small number)
- The Régie de l’énergie is the Québec regulator
- There is no legislation regarding farm stray voltage in Québec
- the Régie has taken no role in administering an approach to mitigation of farm stray voltage.
- however, there has been considerable work on the issue through combined efforts of Hydro-Québec, the Québec department of agriculture, fisheries and food (“MAPAQ”), and a farm interest group the Union des producteurs agricoles (“UPA”)
- Standards and test procedures established as internal Hydro-Québec documents, along with a detailed procedure to handle inquiries and requests for help from farmers

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Vermont – Overview of Approach

- Electricity is distributed by 4 private utilities, 15 municipally owned utilities and 2 cooperatives
- The Vermont Public Service Board is responsible for electricity regulation
- A voluntary program is in effect; no requirements set by the regulator
- On-farm measures include education, training, and technical assistance
- Each utility adopts a pro-active policy to test all farms
- Each utility installs neutral isolators on every dairy farm in their service area
- According to PSB, 99% of Vermont's 1,100 dairy farms now have neutral isolators installed
- The "Vermont" perspective is that it is less expensive to install the neutral isolator than to complete extensive testing. FSV is no longer perceived to be an issue in the State.

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Vermont – Details of Voluntary Program

- The Voluntary Program for the Control of Stray Voltage specifies threshold neutral to earth voltage of 0.5 volts for the installation of a neutral isolator. The utilities have voluntarily installed devices regardless of this threshold.
- Testing procedure – test neutral to earth, install neutral isolator, test again. This procedure identifies any on-farm source of FSV
- Costs of neutral isolator paid for by the utility and are recovered through electricity rates (to all customer classes)

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Wisconsin – Overview of Approach

- Public Service Commission of Wisconsin (PSC) is the regulator
- electric utilities under regulation by the PSC include 27 non-municipal electric utilities, 15 municipal electric utilities, and 67 municipal utilities serving both electricity and water
- PSC also responsible for electrical safety in Wisconsin
- Standards and test procedures established by PSC order, subsequently updated based on further research and review
- Wisconsin Stray Voltage Analysis Team (SVAT) was formed under the joint administration of the PSC and the Wisconsin Department of Agriculture, Trade and Consumer Protection - collects data for analysis; investor-owned utilities also collect and submit data to PSC
 - now called Rural Electric Power Services (REPS)

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Wisconsin – Detailed Requirements

- Maximum total animal contact voltage 2 mA; maximum utility contribution set at 50% of that (1 mA)—this is the level at which the utility must mitigate
- 5 tests are required, and 6 forms to record the data
- Neutral isolation allowed on temporary basis while the problem is diagnosed (utility pays for this), longer term solution determined by the utility
- The utility also has the option of addressing its share of contribution to stray voltage through on-farm mitigation, if the farmer agrees
- Customer complaints are first brought to the utility, but may be referred to the PSC for resolution if the customer is not satisfied
- Costs of off-farm mitigation recovered through rates; if utility mitigates on-farm, ownership of equipment is transferred to the farmer, cost excluded from rate base

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LEARNINGS FROM THE JURISDICTIONAL REVIEW

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Roles for a Regulator with Regard to Stray Voltage

Our research demonstrated that regulators in different jurisdictions have chosen different roles with respect to farm stray voltage:

- Hands off, leave policy and practice to the utilities and others (Québec, BC)
- Deal with unsatisfied stray voltage complaints on a case by case basis, no regulatory requirements (Pennsylvania, Vermont, Alberta)
- Set detailed and specific requirements applicable to all utilities, monitor compliance (Idaho, Michigan)
- In addition to setting detailed and specific requirements and monitoring compliance, become involved in research, data collection, and education on the issue, direct programs to assist farmers (Wisconsin)

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Specific Standards and Requirements

Of the 8 jurisdictions examined, only three (Idaho, Michigan and Wisconsin) have standards and requirements established by the regulator

Common to all three jurisdictions:

- All base their standard on animal contact voltage (not neutral to earth)
- All establish 2 mA as the total level which triggers action (called the “level of concern” or “preventative action level”) and 50% or 1 mA as the level of contribution at which the utility must mitigate
- Utility contribution determined by specified tests
- Off farm mitigation costs are paid for by the utility and recovered in rates
- Costs of mitigation of the portion caused on the farm are not the responsibility of the utility

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Specific Standards and Requirements

Differences:

- Isolation of neutral not restricted in Michigan or Idaho, allowed only as temporary measure in Wisconsin*
- Only Wisconsin explicitly allows on-farm approach to mitigation of utility contribution with consent of the farmer
 - Ownership of the equipment transferred to the farmer, and is not part of utility rate base

* Isolation of the neutral is the major strategy adopted in Vermont’s voluntary program.

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Other Learnings from Across Jurisdictions

- In all jurisdictions, regulator has the obligation to decide customer complaints that are not resolved by the utility
 - In Québec, farmer will turn to MAPAQ in most instances, and recourse to the regulator is not expected
- In three jurisdictions the government department responsible for agriculture has been active in programs to reduce stray farm voltage
- In the jurisdictions with no regulator-imposed rules, we found generally that the utilities have defined an internal practice for stray farm voltage, and are allowed by the regulator to recover the related costs in rates

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