

STATE OF MICHIGAN
BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

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In the matter of the complaint of)	
ATTORNEY GENERAL FRANK J.)	
KELLEY against CONSUMERS ENERGY)	Case No. U-11684
COMPANY relating to stray voltage.)	
_____)	

In the matter, on the Commission's own motion,)	
to consider the implementation of standards)	Case No. U-13934
or remedial measures relating to stray voltage.)	
_____)	

At the November 25, 2003 meeting of the Michigan Public Service Commission in Lansing, Michigan.

PRESENT: Hon. J. Peter Lark, Chair
Hon. Robert B. Nelson, Commissioner
Hon. Laura Chappelle, Commissioner

OPINION AND ORDER

History of Proceedings

On April 22, 1998, Attorney General Frank J. Kelley (Attorney General)¹ filed a complaint against Consumers Energy Company (Consumers) that set forth allegations related to stray voltage in three counts: (1) that Consumers' substandard operation, maintenance, and upgrading of its electric distribution facilities are causing electricity to flow through the ground and impairing the health and productivity of dairy cattle and other livestock, in violation of Commission statutes and

¹ On January 1, 1999, Jennifer M. Granholm replaced Frank J. Kelley as the Attorney General prosecuting this complaint. On January 1, 2003, Michael A. Cox replaced Ms. Granholm as the Attorney General.

rules, including the National Electrical Safety Code (Code or NESC);² (2) that failing to institute remedial measures for stray voltage conditions in rural areas is a form of unreasonable discrimination in the service Consumers is providing to its agricultural customers, and (3) that the Commission should reduce Consumers' rates to disallow expenditures it made to address stray voltage, including costs to retain outside consultants, defend lawsuits, pay damages, and settle litigation.

The complaint requests relief in the form of a Commission order that prohibits Consumers from continuing to operate its electric distribution system so that it is a source of stray voltage. It also seeks to compel Consumers to make the improvements necessary to bring its distribution system into compliance with current Code provisions and eliminate discrimination against rural customers and communities. It further requests a rate adjustment.

After numerous preliminary proceedings that concerned discovery and other procedural matters,³ Administrative Law Judge Daniel E. Nickerson, Jr., (ALJ) conducted 16 days of evidentiary hearings beginning on September 16, 2002. To present a direct case, the Attorney General sponsored the prefiled testimony of the following witnesses: William O. English, a licensed professional engineer and stray voltage consultant, testified regarding the conditions of Consumers' grounded wye distribution system that cause stray voltage. Alexander J. Furo, a forensic and electrical engineer, testified regarding a theoretical basis for understanding stray voltage, which encompasses electrostatic and magnetic forces based on the field theory of electricity. Mr. Furo stated that field theory explains why animals experience electrical sensations

² Institute of Electrical and Electronics Engineers, Inc., National Electrical Safety Code (1997 ed.). The Commission has adopted parts of the Code as rules. 1999 AC, R 460.813.

³ The preliminary proceedings consumed more than 1,400 pages of a record that spanned 4,649 transcript pages.

in the absence of readily measurable voltage differences between two points of contact. Nancy Bellville, who, with her husband, owns a dairy farm located in Consumers' service territory, testified regarding adverse effects on her herd's health that she attributed to stray voltage. Donald Hillman, an agricultural consultant and Professor Emeritus of Dairy Science at Michigan State University, surveyed some of the scientific literature and discussed data that, in his view, demonstrated a statistical correlation between stray voltage readings and decreases in herd health and milk production.

The Attorney General also sponsored testimony by Frank Perri, a salesman with Power Quality Services, who stated that Consumers expressed disinterest in purchasing a recently updated version of instrumentation it had been using to monitor stray voltage, even though the new model produced more accurate readings. Larry Wallman, also employed by Power Quality Services, described certain of Consumers' distribution facilities that, in his view, exhibited inadequate workmanship or Code violations and were contributing to stray voltage.

Kenneth Main, a veterinarian, testified on behalf of the Attorney General regarding physical signs that livestock are being harmed by stray voltage. Andrew P. Johnson, a veterinarian employed by Total Herd Management Services, Inc., testified further regarding the adverse health effects of stray voltage on dairy cows. Martin Graham, Professor Emeritus of Electrical Engineering at the University of California, Berkeley, discussed and critiqued some of the scientific literature related to stray voltage research and measurement techniques.

Consumers presented the testimony of Jack L. Albright, Professor Emeritus of Animal Sciences and Veterinary Medicine at Purdue University, John B. Kaneene, Professor of Epidemiology at Michigan State University, and Charles G. Forster, a consulting engineer. Each witness reviewed videotapes of livestock movements filmed by a consultant affiliated with the

Attorney General and testified that there was no correlation between the animal movements shown on the tapes and the recorded electrical activity. In addition, Michael F. Stringfellow, Chief Scientist at PowerCET Corporation, criticized the Attorney General's testing methodologies.

In addition to Dr. Kaneene, V. Michael Lane, a veterinarian and faculty member at the University of California, Davis, Wayne M. Leja, a principal financial analyst employed by Consumers, and Edward D. Rothman, Professor of Statistics at the University of Michigan, testified that there were mistakes and errors in the statistical analysis used by Dr. Hillman to draw a correlation between electrical readings and milk production records. The witnesses concluded that Dr. Hillman's conclusions were not reliable and that the data did not demonstrate a statistically significant correlation.

Daniel J. Aneshansley, Associate Professor in the Department of Agricultural and Biological Engineering, Cornell University, surveyed the research that he and others had done to test the effects of stray voltage and ground current on dairy cows. He concluded that currents of less than 6 milliamperes (mA) at a frequency of 60 hertz (Hz) have no direct effect on dairy production, reproduction, or health.

Douglas J. Reinemann, Associate Professor in the Biological Systems Engineering Department of the University of Wisconsin, described his stray voltage research on dairy cattle and explained how electrical shock can affect an animal's biological functioning. He summarized the existing scientific research by observing that only a few cows exhibit a behavioral response to electrical current of 1 mA and that most begin to perceive current at 3 to 6 mA. His own research found that cows do not exhibit a behavioral response to magnetic fields. He recommended adoption of the 2 mA threshold prescribed by the Public Service Commission of Wisconsin

(Wisconsin PSC) for animal contact current as a reasonable precautionary level for preventing harm to livestock.

Charles M. DeNardo, a Principal Engineer with Wisconsin Electric Power Company, and LaVerne E. Stetson, a consulting engineer, described the regulatory proceedings and developments relating to stray voltage in Wisconsin and Minnesota, respectively. Wayne A. Knoblauch, Professor of Farm Business Management at Cornell University, testified that average milk production in Michigan and in Consumers' service territory was outpacing production in other states. Linda S. Erdreich, an epidemiologist, testified that stray voltage does not present a potential risk to human health.

Frank A. Denbrock, a consulting engineer, inspected the Consumers facilities identified in Mr. Wallman's testimony and determined that they complied with Code requirements. Johnny B. Dagenhart, a consulting engineer, described the historical evolution of grounded systems within the electric utility industry and the changes in the Code that have facilitated their use. He further explained that the ground connections in a utility's multi-grounded distribution system regulate voltage surges by facilitating the clearing of ground faults (for example, when a phase wire breaks and falls to the ground) and providing protection against lightning strikes.

James A. Schrandt, an electrical engineer who recently retired from his position as Consumers' Agricultural Services Director, described Consumers' program for addressing the stray voltage concerns of its agricultural customers. Richard B. Thompson, a Senior Technical Analyst in Consumers' Agricultural Services unit, explained the methodologies that Consumers uses when called upon to investigate a stray voltage complaint.

The Commission Staff (Staff) presented the testimony of Richard D. Whale, who has since retired as the Supervisor of the Engineering Section of the Commission's Electric Division.

Mr. Whale stated that it would be impracticable to eliminate all earth currents, which are an inevitable outcome of grounding electrical systems. He recommended that the Commission promulgate minimum standards for acceptable levels of stray voltage.

Several of the Attorney General's witnesses presented rebuttal testimony.⁴ In addition to Mr. English, Mr. Furo, Ms. Bellville, Dr. Hillman, Mr. Wallman, Dr. Main, and Dr. Graham, the Attorney General presented the rebuttal testimony of Duane A. Dahlberg, a physics professor retired from Concordia College (in Moorhead, Minnesota), Michael Behr, a forensic economist, and William A. Peloquin, an employee of the Attorney General. Dr. Dahlberg addressed a wide range of scientific, technical, and theoretical issues relating to electrical distribution systems that serve dairy farms. In his rebuttal, Dr. Behr claimed to identify misapplications of scientific methodology and flaws in research protocols exhibited by various Consumers witnesses.

Mr. Peloquin discussed the ratemaking implications of stray voltage.

The record closed on October 10, 2002. On December 5, 2002, the Attorney General, Consumers, and the Staff filed briefs. On January 30, 2003, the Attorney General and Consumers filed reply briefs.

On April 22, 2003, the ALJ issued a Proposal for Decision (PFD) recommending that the Commission dismiss the Attorney General's complaint on its merits. On May 30, 2003, the Attorney General filed exceptions. On June 30, 2003, Consumers filed replies to exceptions.

PFD

In the PFD, the ALJ rejected the Attorney General's claims that deploying a multi-grounded wye distribution system so that it permits some flow of current through the earth violate Code

⁴ Rebuttal and surrebuttal testimony were prefiled and cross-examined simultaneously with each party's direct case.

requirements. The ALJ stated that the Code endorses the multi-grounded wye distribution system used by Consumers. He further stated that, as a matter of physics, grounding an electrical system means that some of the current will inevitably use the earth as its return path to complete an electrical circuit, even if there is a neutral wire in place to conduct most of the return current. He determined that this type of configuration is permissible under Code provisions that prohibit the utility from designing a supply circuit to “use the earth normally as the sole conductor,” NESC Rule 215B5a, and require the utility to arrange ground connection points so that there is “no objectionable flow of current over the grounding conductor” under “normal circumstances,” NESC Rule 92D. Given Consumers’ compliance with these Code provisions, the ALJ determined that the Attorney General’s attempts to argue that its distribution system is inherently defective amount to a collateral attack on the Code, which Commission rules incorporate by reference.

The ALJ found that the record failed to demonstrate that stray voltage or other manifestations of electrical energy were flowing through the earth in quantities sufficient to impair dairy health or productivity. The ALJ discredited much of the expert testimony presented by the Attorney General, finding instead that Consumers’ expert witnesses were generally more persuasive, that their application of scientific methodology and testing procedures was more rigorous, and that their explanations of stray voltage had a better basis in scientific principles. The ALJ stated that the Attorney General’s theories lacked the support of measurable scientific observations, as the Attorney General had not submitted any credible evidence of electrical current readings made with proper instrumentation at locations accessible by livestock. According to the ALJ, the Attorney General did not prove a single violation of standards relating to stray voltage within Consumers’ service territory.

The ALJ further characterized the complaint as alleging that stray voltage is inflicting pervasive harm on numerous customers throughout Consumers' service territory. He stated that even if he were to construe the evidence as sufficient to demonstrate one or a few isolated instances of stray voltage, it would not be sufficient to make the type of systematic or pervasive showing required to sustain the complaint. Although he said there were possible instances of minor violations of the Code or other rules, he stated that there was a failure of proof of widespread negligence on the part of Consumers in operating or maintaining its distribution system.

The ALJ stated that the Attorney General's complaint, which contends that any electrical current moving through the earth as a result of Consumers' activities is improper, makes it unnecessary to address other parties' proposals to establish a minimum threshold or level of concern that would define unacceptable quantities of stray voltage. However, the ALJ observed that there was a body of scientific research that would support an effort to regulate a threshold level of concern or action.

With respect to the second count of the complaint, the ALJ found no merit in the claim that Consumers is discriminating against agricultural customers. He stated that Consumers' deployment of persons without electrical engineering degrees in the Agricultural Services unit that responds to stray voltage complaints did not demonstrate that the utility was failing to provide reasonable care. He also stated that disparities in the engineering credentials or equipment in its Agricultural Services unit, compared to another unit that serves large industrial customers, does not demonstrate that Consumers is providing substandard or discriminatory service. He found that the personnel deployed by Consumers were appropriately trained and equipped to respond to stray voltage.

The ALJ recommended rejection of the Attorney General's third count based on a claim for rate relief. He did not find evidence that any of the costs incurred by Consumers to respond to stray voltage complaints or defend litigation were unreasonable.

Evaluation of the Evidentiary Basis for Stray Voltage

The Attorney General excepts, arguing that the ALJ erred by requiring measurements of stray voltage in animal contact areas as an essential element of the burden of proof. The Attorney General says that it is undisputed that Consumers is continuously injecting some electrical current into the earth as an inevitable consequence of operating a grounded distribution system. According to the Attorney General, Consumers further concedes that some of the stray voltage produced by its system affects conditions in dairy barns, and the parties only disagree over how much electrical energy is straying outside of the circuit paths formed by the utility's electrical wires and distribution facilities.

According to the Attorney General, the ALJ's statements regarding the evidence necessary to sustain the complaint are an implicit endorsement of Consumers' narrow definition of stray voltage, even though the ALJ purported to accept the Attorney General's broader definition for purposes of evaluating the complaint. PFD at 13-14. Consumers had defined stray voltage in terms of electricity that delivers a shock, i.e., electrical current that passes through an animal that simultaneously touches two or more points with a difference in potential voltage that is sufficient in magnitude to conduct the current. See Ex. R-148, p. 2-1. Using this definition, Consumers typically measures the voltage and current in dairy barns and makes stray voltage determinations based on whether the measurements meet or exceed the benchmarks that serve as its threshold of concern. In contrast, the Attorney General's broad definition refers to any quantity of electrical current, field, or energy that occurs outside of the wires and utility facilities that are (or should be)

designed to contain the circuit path. Because a grounded distribution system causes some return current to flow through the earth instead of the utility's neutral wires, the Attorney General says, measurements in animal contact locations are not essential to prove that stray voltage exists. The Attorney General adds that although the visible signs of stray voltage may be more apparent when cows experience it in dairy barns, stray voltage is a hazard without regard to where it is detected.

The Attorney General argues that the ALJ was wrong to discredit the expert witnesses who explained why Consumers' narrow definition of stray voltage fails to account for all of the adverse effects on livestock. On behalf of the Attorney General, Mr. Furo testified that the shock mechanism is not the only means of conveying electrical energy to a farm animal, even if it is the only one that utilities typically account for when they conduct their investigations. Mr. Furo stated that the electric utility industry ignores the effects of electric and magnetic fields and their role in propagating transients⁵ over distances. Mr. Furo asserted that, unlike the circuit theory used by electrical engineers to explain the two points of contact required to complete a circuit, well established principles of physics known as field theory explain how electrical energy can affect an animal making a single point of contact with a conducting object. He added that electrical engineers use circuit theory as a simplified approximation of field theory for working purposes, but that circuit theory does not accurately capture the more complicated dynamics of electricity in the stray voltage context.

In response, Consumers argues that, regardless of how expansively the Attorney General defines stray voltage, the proof required to sustain the complaint must establish two points:

(1) that farm animals are being exposed to stray voltage caused by the utility, and (2) that some

⁵ A transient is a distortion of the electrical sine wave form of a very brief duration. According to Consumers witness Dr. Aneshansley, a transient lasts less than one cycle, or one-sixtieth of a second at a steady-state frequency of 60 Hz. 33 Tr. 3118. See also 26 Tr. 1492-93.

combination of the quantity, frequency, duration, and electrical characteristics of the exposure is causing them harm. Consumers does not dispute that any grounded electrical system, including its own as well as similar ones used throughout the electric utility industry, causes earth currents. It does claim that the mere existence of earth currents does not establish either that there is a resulting electrical exposure in a dairy barn or that the exposure is sufficient to affect cows. It says that the Attorney General's evidence fails altogether on both points.

According to Consumers, stray voltage readings made at the utility's ground rods are not evidence of animal exposure, as farmers do not tether cows or other livestock to ground rods. It says that there is no record evidence of stray voltage actually occurring at locations accessible by livestock. Consumers also argues that the stray voltage measurements on the record do not distinguish between the contribution of its distribution facilities, if any, to stray voltage and that contributed by a customer's facilities, even though the electrical wiring and motors used on farms are often a major contributor to stray voltage. In the 1990s, Consumers adds, it instituted a program of separating the primary and secondary neutral ground rods at all dairy farms as a precaution.⁶ Consumers argues that the evidence required to sustain the complaint must demonstrate that its neutral separation program was ineffective.

Consumers contends that the efforts of the Attorney General's witnesses to invoke scientific principles are entirely devoid of credibility. It says that their claims contradict a well established body of peer-reviewed scientific research, as presented by its own expert witnesses who have impressive credentials in both electrical engineering and physics. Consumers adds that Mr. Furo

⁶ The procedure used to effect neutral separation or isolation starts with the removal of the bonded connection between the primary grounded neutral (on the utility's facilities) and the secondary neutral at the customer's service transformer. There are separate ground rods for each of the neutrals, which are at least ten feet apart. The objective is to isolate electrically the secondary neutral system serving the farm premises from all off-farm sources of earth current. 40 Tr. 4279-80.

stands alone in his unusual views, which cannot compensate for the lack of hard evidence that stray voltage is actually harming dairy cattle. Consumers characterizes the Attorney General's science as a series of speculative hypotheses without supporting data.

Much of the evidentiary record in this case consists of opinions expressed by expert witnesses holding impressive credentials in scientific and technical disciplines. In general, the views of the experts sponsored by each side conflict sharply with the other. Moreover, the testimony of some of the Attorney General's witnesses calls into question the conventional thinking of much of the scientific community, which appears to be more aligned with Consumers' position. However, as explained further in this order, the record makes it unnecessary for the Commission to make definitive judgments at this time as to which viewpoints are consistent with good science and which are not.⁷ Therefore, this order will not attempt to make findings that any of the theories advocated by the parties have attained the status of scientific certainty. There is reason to reserve such sweeping judgments as the research on stray voltage and its effects on farm animals continues to develop.

Putting aside the disputes over scientific validity, there must be evidentiary support for the Attorney General's claims in the form of empirical observations or data that accurately and reliably records the occurrence of stray voltage. It is not enough to assert that grounded wye

⁷ The Commission is not disclaiming the statutory authority or competence to make scientific determinations when necessary. Regulatory agencies are often called upon to make scientific judgments. For example, the January 28, 1993 order in Cases Nos. U-10059 and U-10061, at 13-15, addressed the health and safety implications of electromagnetic fields associated with a proposed high-voltage transmission line. Civil litigation of stray voltage often reaches scientific issues. See, e.g., Hoffman v Wisconsin Electric Power Co, 255 Wis 2d 831; 646 NW2d 854 (2003). It is possible that the Commission will be required to address some of these issues in any rulemaking that results from the comment proceedings discussed later in this order. Because stray voltage has potentially serious implications for the public's health, safety, and economic productivity, the Commission would expect to have before it a substantial body of credible scientific research in order to make definitive findings regarding scientific controversies.

distribution systems inevitably produce some stray voltage and that Consumers operates such systems. There must be evidence that stray voltage is actually occurring in detectable quantities and that a contributing factor is some electrical facility owned or operated by Consumers or some activity conducted or controlled by Consumers. Without such evidence, the Attorney General cannot sustain the complaint, regardless of the validity of the scientific theory used to explain stray voltage.

A reading of the complaint indicates that it is not being brought on behalf of only a few persons experiencing isolated problems. The complaint instead indicates that stray voltage is a system-wide problem within rural parts of Consumers' service territory, and the Attorney General, acting on behalf of the public, is proposing system-wide remedies to resolve the problem. The Commission thus agrees with the ALJ that the "complaint requires a showing of stray voltage problems widespread throughout the service area served by Consumers." PFD at 34. In other words, more than a few verifiable instances of stray voltage are necessary to establish a basis for granting the forms of relief that the Attorney General is requesting. As explained in this order, the Commission further agrees with the ALJ that the record does not provide sufficient evidentiary support of stray voltage to substantiate the key proposition stated in the complaint—that "Michigan's farming businesses and livelihoods are being systematically destroyed by the stray voltages and currents emanating from Consumers' electric system." Complaint, ¶ 31.

The Commission also agrees with Consumers that a showing of an impairment to the health or productivity of dairy cows is material. To some extent, the relevance of adverse effects depends upon the legal theory being pursued by the complainant. For example, if the claim is that stray voltage is an "unjust" or "improper" practice "to the prejudice of the complainant," MCL 460.58, a showing that stray voltage is causing harm to farm animals would be important. If, on the other

hand, the claim is that any amount of earth current per se violates the utility's duties under applicable law, or that some quantity of earth current violates a certain rule or standard, harm may not be necessary to establish the fact that the claimed violation occurred. The Attorney General's complaint appears to invoke both types of theory.

Notwithstanding the claim that stray voltage measurements are not strictly necessary, the Attorney General alternatively argues that the record does contain the measurements necessary to prove the complaint. The Attorney General says that Mr. Wallman recorded his test readings in Exhibits C-115 through C-118, which are the reports of four farm investigations he conducted. The Attorney General adds that the graph shown as Figure 27 of Exhibit C-118 indicates that the farm's electricity was shut off when Mr. Wallman measured current, so that the readings show stray voltage caused solely by Consumers.

In addition to the results provided by Mr. Wallman, the Attorney General says, Consumers itself provided numerous voltage and current measurements in animal contact areas. In this regard, the Attorney General observes that Mr. Schrandt, Consumers' former Agricultural Services Director, testified that readings at cow contact points were 0.3 volts or less. The Attorney General further observes that Consumers' own documentation shows a range of test results measuring voltage from 0.2 to 0.4 volts and current from 0.002 mA to 0.092 mA.

The Attorney General argues that these measurements exceed the minimums that should be thresholds for taking corrective action. The Attorney General states that one of Consumers' witnesses, Mr. Stetson, coauthored a paper that suggested an action level of 1 millivolt (mV). 35 Tr. 3507-09. The Attorney General further contends that Consumers itself had proposed an

action level of 1 mA for the utility's contribution to stray voltage.⁸ The Attorney General cites published articles to the effect that cow contact voltages as low as 9 mV can be harmful, Ex. C-38, and that cows can perceive current as low as 0.02 mA, Ex. C-125. Citing Mr. Furo's testimony, the Attorney General contends that 0.3 volts at animal contact points harm cows and that some animals become less productive at exposures as low as 0.1 volts. 27 Tr. 1716-17; Ex. C-58.

Because Ohm's law equates current to voltage divided by resistance, utilities typically measure current (in amperes or amps) with reference to an assumed value for the resistance of the animal (in ohms). The Attorney General disputes the validity of the utility testing protocol that uses a 500 ohm shunt resistor, arguing that a cow's electrical resistance in real conditions can be much lower than 500 ohms (so that the current produced for a constant voltage becomes higher).⁹ The Attorney General says that the United States Department of Agriculture's stray voltage handbook (USDA Handbook)¹⁰ cites an article stating that cow resistance can be as low as 200 ohms.¹¹ Ex. C-153, at p. 43. According to the Attorney General, Mr. Schrandt testified that parallel resistance circuits could exist in dairy barns when a cow simultaneously touches the floor

⁸ The 1 mA threshold is based on rules proposed by Michigan electric utilities in Case No. U-11368. Ex. R-264, at 9. The rulemaking proceeding concluded without the adoption of stray voltage rules in an order issued on March 14, 2000.

⁹ The Attorney General also disputed the propriety of relying solely on measurements that use a shunt resistor. Mr. Furo stated that the utility's testing protocol erroneously assumes that the effects of stray voltage are limited to the shock received when an animal makes simultaneous contact with two points. He said that the protocol ignores or obscures low voltages that may indicate the propagation of harmful transients and high frequencies. 27 Tr. 1758-59.

¹⁰ United States Department of Agriculture, Effects of Electrical Voltage/Current on Farm Animals, Agricultural Handbook No. 696 (Alan M. Lefcourt, ed., 1991). The USDA Handbook was admitted into the record as Exhibit R-148.

¹¹ M.W. Woolford, Small Voltages on Milking Plants, In Proceedings of the 2d Seminar on Farm Machinery and Equipment, Pub. 645, at 43 (New Zealand Department of Agriculture, Hamilton, N.A., 1972) (cited in Exhibit R-148, at p. 8-13).

and more than one other contact point. 41 Tr. 4561-62. Under such circumstances, the Attorney General claims, the cow's resistance could be less than 166 ohms.

The Attorney General says that the ALJ either ignored the stray voltage readings or discounted them as too low to be significant. By finding that the record contained only one reading that indicated a possible instance of stray voltage (2 mA at the Bellville farm), PFD at 33, the Attorney General says, the ALJ in effect adopted Consumers' proposed action levels of 0.05 volts and 1 mA based on its standard testing protocol using a 500 ohm shunt resistor (that is, $0.05 \text{ volts} \div 500 \text{ ohms} = 0.001 \text{ amps}$, or 1 mA.). According to the Attorney General, this implicit finding is at odds with the ALJ's explicitly stated determination that it is neither necessary nor appropriate to set an action or concern level in this proceeding. PFD at 48. The Attorney General maintains that the action levels observed by Consumers are excessive and rely upon a flawed body of utility-sponsored scientific research.

Consumers states that the ALJ correctly found that Mr. Wallman's testing was not credible. PFD at 30-31. Consumers says that the instrumentation and techniques used by Mr. Wallman are of dubious value and that his direct testimony contains no discussion of his testing. On cross-examination by its counsel, Consumers says, Mr. Wallman admitted that some of his simultaneous readings of current and voltage are not consistent with Ohm's law, but he attempted to attribute the discrepancy to something he called stray capacitance, a concept that he did not explain.

According to Consumers, the Attorney General's exceptions attempt to assert, for the first time in these proceedings, that Consumers' own readings prove stray voltage, after having spent most of these proceedings in an attempt to discredit them. Consumers says that most of its readings measure stray voltage without delineating between the contribution from the utility's facilities, if any, and that from the customer's own premises and wiring. It adds that

Mr. Wallman's readings also make no attempt to identify the utility's and the customer's respective contributions. For the most part, Consumers explains, the readings produced during its farm investigations fell below its threshold of concern, so that it was not necessary for it to isolate any contribution on its part. In the absence of a showing that utility distribution facilities were causing or contributing to the stray voltage readings, Consumer says, it is not necessary for the Commission to determine whether the readings exceed a scientifically valid threshold of concern.

Consumers further contends that the concern or action levels it observes in its investigations are well supported by the consensus of scientific research. It says that none of the Attorney General's experts who expressed contrary opinions performed controlled experiments or had their findings published in scientific journals that require peer review. It notes that the Wisconsin PSC has established an action level of 2 mA, with 1 mA attributable to the utility's contribution, on the basis of the existing scientific evidence. It claims that its action levels are also consistent with the USDA Handbook, which is based on peer-reviewed research.

Consumers argues that the Attorney General's references to statements of Consumers witnesses that purport to support lower thresholds are being taken out of context. Consumers claims that Mr. Stetson never supported 1 mV as an action level, but that the paper made reference to 1 mV in attempting to define stray voltage. It says that Mr. Schrandt pointedly denied that a cow's resistance could be as low as 166 ohms. 41 Tr. 4560-63.

The Attorney General's exceptions do not purport to abandon Mr. Wallman's test results, but they do rely more on the testing done by Consumers' personnel to prove that stray voltage exists in cow contact areas. Even though the readings taken by Consumers were below the thresholds it deemed to be a cause for concern, the Attorney General claims that those readings demonstrate harmful levels of exposure. One basis for this claim is the Attorney General's expert testimony

that very small amounts of stray voltage can have significant adverse effects and that their electric and magnetic fields propagate transients and high frequencies. The Commission does not find the Attorney General's claims regarding low readings to be persuasive when evaluated in light of the evidentiary record as a whole.

In the first place, the stray voltage measurements generally do not delineate between the utility's and a customer's contributions. As Consumers emphasizes, its own readings were too low by its standards to prompt followup investigations to determine whether, or to what extent, the utility's distribution facilities or operations were causing the readings. Given the real possibility that wiring and electrical equipment on farm premises are a source of stray voltage, this flaw is, by itself, fatal to the Attorney General's efforts to establish that Consumers is causing harmful quantities of stray voltage in cow contact areas. The Attorney General's exceptions contain a single citation to the record to rebut this point—a graph generated by Mr. Wallman. There is little in the way of explanation, and the one citation is not adequate to demonstrate that Consumers was responsible for stray voltage throughout its service territory. The record as a whole provides no basis for the Commission to infer that Consumers is responsible for some or all of the voltage and current levels shown in the readings.

More fundamentally, the scientific testimony offered to explain why the low readings are of concern is itself debatable. It is highly theoretical. There is relatively little supporting scientific research. Judging by the record as a whole, the Attorney General's theories run counter to the mainstream scientific community. As noted earlier, the Commission is not prepared to dismiss those theories as definitively wrong as a matter of science, but it is also unable to reach the conclusion that they present an adequate basis at this time to reject the substantial body of scientific research and evidence provided by Consumers. As some of the Attorney General's own

witnesses seem to acknowledge, not all of their ideas rise to the level of scientific certainty, but at best they provide a basis to conduct more, and better, research. 27 Tr. 1718-20; 29 Tr. 2240, 2359-60. More research may shed more light on a situation that electric utilities and agricultural customers have struggled both to define and to redress in recent years, and the Commission would welcome such efforts. However, the Commission cannot find on this record that utility-caused stray voltage is a pervasive source of substantial harm to dairy cattle throughout Consumers' service territory or conclude that it should order sweeping revisions to Consumers' distribution systems in rural areas.

The Commission also finds that the results from Mr. Wallman's testing on four farms do not establish that stray voltage is present in harmful quantities within cow contact areas. Mr. Wallman did not thoroughly explain his methodology. Consumers claims that it is very different from the standard testing protocols it uses based on the USDA Handbook. The Commission is not persuaded that Mr. Wallman's methodology is as reliable or credible as Consumers' testing protocol.

The Attorney General argues that expert testimony and supporting studies have shown that stray voltage does impair milk production. The Attorney General further claims that, even without an epidemiological study, it is clear that stray voltage is harmful to human health.

Consumers claims that milk production in Michigan and in Consumers' service territory is increasing at a faster rate than the national average or averages from other milk-producing states. It offered the testimony of Dr. Erdreich, who stated that there is no credible scientific evidence that stray voltage is adversely affecting human health.

Consumers' recitation of average rates of milk production is not helpful as a basis for evaluating whether stray voltage is affecting some or all dairy farms in its service territory.

However, there is little persuasive evidence to show an actual impairment to milk production or dairy health. Some of the studies are based on areas outside of Michigan. The Commission is thus unable to infer a causative link between any electrical activity and a decline in milk production or animal health. This reflects in part the weakness of the evidence regarding stray voltage measurements.

There is little basis for making any findings regarding human health. As the Attorney General concedes, there are no scientific studies of human health on the record. The reports of medical issues are anecdotal and do not demonstrate a causative link with stray voltage.

Separation of Neutral Grounds

The Attorney General takes exception to the ALJ's finding that Consumers' program of separating neutrals is an effective means of eliminating off-farm sources of stray voltage. PFD at 53. As noted, Consumers had argued that the program should absolve it from any responsibility for stray voltage in the absence of evidence demonstrating that neutral separation had been ineffective.¹²

The Attorney General argues that the ten feet used to separate the utility's primary ground rod from the secondary grounding for customer-specific wiring is not enough to prevent current from passing from one ground rod to the other. The Attorney General claims that Consumers has admitted that neutral separation does not stop all ground current from reaching animal contact points. The Attorney General cites to Mr. Forster, whose testimony Consumers sponsored, as stating that cow contact current of up to 2 mA could occur even with neutral separation. 37 Tr. 3695-96. The Attorney General cites statements attributable to another Consumers witness,

¹² See supra note 6.

Dr. Aneshansley, 33 Tr. 3145-46,¹³ and Exhibit R-171, an order issued by the Wisconsin PSC,¹⁴ as indicating that neutral separation may worsen ground currents on farms.

Consumers claims that it has conducted numerous tests on farm premises after it implemented the neutral separation program and has consistently found that measurements at animal contact points were below its action level (of 1 mA), unless on-farm sources of stray voltage were present.

The Attorney General's characterization of Mr. Forster's testimony in the exceptions is not consistent with a reading of the transcript. On cross-examination, Mr. Forster acknowledged that separation of the neutrals would not completely eliminate all ground current flowing between them, but he stated that it would reduce the current to an insignificant level. He denied that a 2 mA cutoff had any relationship to the amount of ground current that could be expected to flow between two separated ground rods, but he instead identified the USDA Handbook's reference to 2 mA as an action level applicable to cow contact points. 37 Tr. 3693-99. In addition, he testified that separating the neutrals could worsen stray voltage on farm premises if the customer's electrical facilities were a source of stray voltage and those facilities became electrically isolated from the utility's grounding system. 37 Tr. 3705-06. His testimony is consistent with Consumers' position that neutral separation has the effect of isolating the utility's distribution system from the customer's electrical wiring and facilities and thereby curtails off-farm sources of stray voltage.

¹³ Strictly speaking, the cited testimony does not state that neutral separation can exacerbate stray voltage. Dr. Aneshansley simply agreed during his cross-examination that the USDA Handbook contained certain statements read to him by counsel.

¹⁴ Investigation on the Commission's Own Motion Into the Practices, Policies and Procedures Concerning Stray Voltage for Electric Distribution Utilities in Wisconsin, Docket No. 05-EI-115 (Wis. PSC, July 11, 1996) (requiring electric utilities to file tariffs providing for neutral isolation upon the demand of a customer). The cited reference appears at page 15 of the Wisconsin PSC's order.

Consumers implemented its neutral separation program to mitigate any adverse effects caused by its distribution system. The Attorney General concedes that neutral separation has some value as a measure of mitigation. 26 Tr. 1476. Because Consumers is not responsible for the customer's own electrical facilities or wiring, it is not clear how the argument that neutral separation may, in some circumstances, exacerbate on-farm sources of stray voltage implicates any duty on the utility's part. Because the record does not ultimately support a finding that utility-caused stray voltage is systematically harming dairy cows and farm businesses throughout Consumers' service territory, it is not necessary to make findings regarding how effective the neutral separation program has been in containing stray voltage.

National Electrical Safety Code

The Attorney General contends that stray voltage is attributable to Consumers' distribution facilities that violate various provisions of the Code.

a. NESC Rule 96C

The Attorney General contends that Consumers deploys undersized wire as neutral conductors in violation of NESC Rule 96C, which states that the neutral in a multi-grounded system "shall be of sufficient size and ampacity for the duty involved."¹⁵ The Attorney General refers to Consumers' "Electric Distribution Engineering Manual," which specifies a smaller size of wire to use as the neutral for five out of the six identified sizes of primary conductor. Ex. C-45, at p. 24-102. The Attorney General contends that using a smaller size for the neutral conductor means that some of the return current must use the earth to complete the circuit.

¹⁵ The 2002 edition of the NESC (not the 1997 edition adopted by Commission rule) defines a neutral conductor as a "system conductor other than a phase conductor that provides a return path for current to the source." NESC Section 2.

Consumers argues that the Attorney General did not brief this issue before the ALJ, but that the exceptions are raising it for the first time in this case. Consumers further argues that there is no evidence that its neutral conductors lack the size and ampacity necessary to provide safe, reliable service. It says that the Code standard does not specify that the size for the neutral conductor shall be equal to the phase conductor.

The Commission agrees with Consumers' contention that there is no evidentiary basis to find that the sizes of neutral conductors it uses are inadequate to comply with NESC Rule 96C.

b. NESC Rules 92D and 215B5a

The Attorney General takes the position that the earth currents caused by Consumers' distribution system violate NESC Rule 92D, which provides in part: "Ground connection points shall be so arranged that under normal circumstances there will be no objectionable flow of current over the grounding conductor." Rule 92D further states: "The temporary currents set up under abnormal conditions while the grounding conductors are performing their intended protective functions are not considered objectionable."

The Attorney General argues that, by stating that temporary situations are not deemed "objectionable," the rule is indicating that an "objectionable" current occurs whenever the utility configures its system to use the earth as a normal, continuous return path for some portion of the circuit. The Attorney General contends that no provision in the Code recognizes a right to use the earth as a return path on a continuous basis. The Attorney General says that Consumers uses the earth for up to 75% of its return current, which could equate to 39 amps, or 39,000 mA. According to the Attorney General, this level of earth current easily exceeds the human health threshold of 8 to 15 mA. Because Consumers' reliance on the earth as a ground conductor is

unsafe and causes stray voltage in animal contact areas, the Attorney General maintains, it is objectionable under Rule 92D.

Consumers states that, under Ohm's law, electrical current takes all available pathways to complete a circuit, and the flow of current is inversely proportional to the resistance of the circuit path. In other words, it says, any grounded system will produce some regular flow of current through the earth as well as the neutral wires, even though the facilities are built in compliance with Code specifications. Consumers argues that an "objectionable" current within the meaning of NESC Rule 92D must cause specific harm in a specific manner. As such, it says, regular flows of ground current are not per se objectionable, and there is no evidence that its distribution system is causing actual harm.

Consumers also claims that the Attorney General's attempt to assert Rule 92D as a basis for prohibiting all earth currents is inconsistent with NESC Rule 215B5a, which provides: "Supply circuits shall not be designed to use the earth normally as the sole conductor for any part of the circuit." Consumers construes the term "sole" to mean that as long as the earth is not the only conductor, it may permissibly serve as a conductor of return current along with the neutral wire. To prove a violation, Consumers continues, would require evidence of distribution facilities that did not have any neutral conductor, but there was no such showing in this case.

In response, the Attorney General contends that Consumers is attempting to argue that 99% of the return current can flow through the earth without violating Rule 215B5a. The Attorney General maintains that Consumers does not routinely evaluate ground currents, so that it is in no position to make representations regarding the extent to which currents are in fact using the earth as their return path.

Consumers says that the claim based on 99% of return current is speculative and theoretical. In any event, Consumers says, 99% would not violate the Rule 215B5A prohibition on using the earth as the sole conductor.

The Commission finds that Consumers' normal configurations of its distribution facilities, as described in the record, do not violate NECS Rule 215B5a. Because Consumers has installed neutral wires and designed its facilities to provide a path for conducting return current, it meets the requirements of the rule. There is no evidence to indicate that Consumers is using the earth as the sole conductor, or for 99% of the return current, as the Attorney General hypothesizes.

This is not to say that compliance with NESC Rule 215B5a necessarily ensures that the utility is also meeting its responsibility to avoid "objectionable" currents over grounding conductors under Rule 92D. However, the Code does not explain in detail what it prohibits as "objectionable." It does not quantify thresholds or describe the circumstances in which ground current becomes objectionable. The Commission reads this provision as creating some room for discretion to determine when, or under what quantities or circumstances, ground current becomes impermissible.

The Commission does not agree with the contention that any amount of earth current violates the rule. As the parties seem to agree, some amount of continuous earth current is a byproduct of the multi-grounded wye distribution systems deployed by Consumers and most other electric utilities throughout the United States. The Code makes provisions specifically applicable to multi-grounded systems. Thus, to claim that any ground current is per se "objectionable" is a distorted reading of the Code, which recognizes that grounded systems are a legitimate configuration. Moreover, the provision in Rule 92D clarifying that temporary currents under abnormal circumstances are not "objectionable" does not purport to describe the only instances in which

some quantity of ground current is permissible, and it would not be reasonable to infer that the rule meant to prohibit all other ground currents.

The record does not support a finding that ground current attributable to Consumers' distribution system violates NESC Rule 92D. Although the Attorney General claims that 75% of the return current may be using the earth, there is no evidence to show how systematically or frequently it occurs at that level.¹⁶ Although the Attorney General compares a computed amperage with human tolerances for current exposure, there is no evidentiary basis to find that Consumers' system is actually creating hazardous conditions with respect to either livestock or public safety. The claims to the contrary are speculative. If such hazards exist, it should not have been difficult to present direct evidence.

c. NESC Rule 012C

The Attorney General argues that Consumers' failure to construct and operate facilities that are free of stray voltage violates NESC Rule 012C, which states that "construction and maintenance should be done in accordance with accepted good practice for the given local conditions known at the time." The rule is a general standard that embraces most, if not all, of the contentions raised by the complaint. The Attorney General has not proven that Consumers has fallen short of this standard.

¹⁶ The apparent source for the reference to 75% of return current is an internal Consumers document entitled "Farm Service Maintenance Program." Ex. C-46. A page of the document prepared in an outline format under the heading "Pilot Project Conclusions" states that "[u]p to 75% of the neutral return current flows through the earth." (Emphasis added.) Mr. Schrandt identified the document as a reference manual used to train Consumers employees. 41Tr. 4523-24, 4547. He stated that Consumers conducted the pilot project in 1994 to test the effect of implementing a neutral separation program. 41 Tr. 4523. He claimed that the reference to 75% of return current relates to a single location subject to a complex set of conditions. 41Tr. 4524-27.

d. NESC Rule 013B

The Attorney General argues that the ALJ's reference to NESC Rule 013B was improper. The rule is a grandfathering provision that addresses which edition of the Code applies to facilities constructed prior to the 1997 edition. Consumers says that the testimony regarding Rule 013B is responsive to the request in the complaint for the Commission to issue an order requiring Consumers to bring its existing facilities into compliance with the latest edition of the Code. The Commission finds that this case, in its present posture, does not require an adjudication of issues that might turn on which edition of the Code is controlling.

Rules Governing Services Supplied by Electric Utilities

The Attorney General's exceptions raise issues regarding alleged violations of various provisions of the Commission's rules governing services supplied by electric utilities, 1999 AC, R 460.3101 et seq.

a. Rule 801

Rule 801 states: "Each utility shall exercise reasonable care to reduce the hazards to which its employees, its customers, and the general public may be subjected." 1999 AC, R 460.3801. The factual basis for the claim that Consumers is violating Rule 801 is similar to the allegations supporting the complaint generally; i.e., the Attorney General reiterates that Consumers does not have a system in place to monitor earth currents, it has not implemented adequate measures to detect or prevent stray voltage, it does not inspect its facilities often enough, and its testing protocol is deficient. This order has already addressed the factual basis for these claims and has determined that the record in this case relating to stray voltage and Consumers' response to it fails to demonstrate unreasonableness at this time. It has also found wanting the evidence to support

the claim that stray voltage is causing hazards that would justify immediate remedial action. The record provides no basis to find Consumers in violation of Rule 801.

b. Rule 702

The Attorney General argues that the record contains test readings of voltage fluctuations in violation of Rule 702, 1999 AC, R 460.3702, which requires the utility to limit variations in the voltage of retail electric service to within $\pm 5\%$ of the standard nominal service voltage. However, voltage sags are a power quality issue that is distinct from the stray voltage claims. The exceptions do not tie the voltage fluctuations to effects on cows, but instead the Attorney General is alleging that the fluctuations may have damaged customer appliances and equipment that connect to electrical systems; i.e., the sags occur within the confines of the electrical facilities that constitute the circuit's design path. These allegations are beyond the scope of the complaint.

c. Rule 701

Rule 701, 1999 AC, R 460.3701, specifies that the standard frequency for alternating current shall be 60 Hz. The Attorney General claims that the presence of harmonics¹⁷ on Consumers' system violates this standard. There is no showing that the type of electrical activity alleged by the Attorney General has altered the standard frequency on Consumers' system so that it does not comply with Rule 701.

d. Rules 501 and 502

The Attorney General argues that the allegations of stray voltage on Consumers' system demonstrate that Consumers is violating Rule 501, which requires it to construct, install, maintain, and operate its electric plant "pursuant to accepted good engineering practice in the electric

¹⁷ A harmonic distortion alters the electrical sine wave form, usually as a result of interaction with non-linear loads, and occurs in integral multiples of the fundamental frequency. In other words, a harmonic distortion of electricity with a frequency of 60 Hz could produce frequencies of 120 Hz, 180 Hz, 240 Hz, and so forth. 31 Tr. 2805-06; 35 Tr. 3398, 3401.

industry,” 1999 AC, R 460.3501, and Rule 502, which requires it to “apply the standards of accepted good practice” in the NESC, 1999 AC, R 460.3502. This argument is a restatement of the Attorney General’s contentions that Consumers is violating various Code provisions, including NESC Rule 012C, which requires the utility’s “construction and maintenance [to] be done in accordance with accepted good practice for the given local conditions known at the time.” The Commission rejects this argument for the same reasons.

Discrimination

In addition to the stray voltage allegations in count 1 of the complaint, the Attorney General pleaded a discrimination theory in count 2. This count alleges that Consumers’ responses to stray voltage issues demonstrate that it is discriminating against its agricultural customers by providing them with service that is inferior to the service it provides to other, primarily commercial and industrial customers.

The Attorney General argues that the employees that Consumers assigns to its Agricultural Services unit to respond to farmers’ stray voltage complaints have less training and fewer qualifications than the employees it assigns to respond to the power quality issues of its commercial and industrial customers. The Attorney General further claims that Consumers’ responses to stray voltage have been unreasonable and that agricultural customers suffer disproportionately from its neglect. The Attorney General contends that Consumers’ use of obsolete, degraded, or poorly maintained equipment to provide service in rural areas is a contributing factor to stray voltage. The Attorney General suggests that farmers do not have the resources or leverage to seek the redress that a large industrial customer could obtain if it were to receive similar treatment.

Consumers responds that it devotes considerable resources to addressing farmers' stray voltage complaints and that it staffs its Agricultural Services unit with qualified employees who have received training in stray voltage matters. It says that the services it provides to its rural customers are appropriate and not prejudicial.

The Attorney General's assertions regarding stray voltage do not demonstrate that Consumers is discriminating against its agricultural customers. The Attorney General has not supported the claim that Consumers' overall course of conduct has been unreasonable or deficient, let alone that stray voltage exists as a problem of a magnitude that requires some additional response on Consumers' part. Stray voltage is an issue of concern primarily for agricultural customers. Even if stray voltage were to impose disproportionate effects, costs, or burdens upon them, vis-à-vis other customers or classes of customers, that would not mean that the utility has singled out agricultural customers for unfavorable or discriminatory treatment.

Discrimination requires a showing that similarly situated customers are being treated differently. The record says little about the commercial and industrial classes and their needs, so there is no basis for comparing the service that Consumers provides to those customers with the service it provides to dairy farmers. Given the differences in service characteristics, energy consumption, and power quality requirements, it is not likely that the service Consumers provides to either group could be subject to a meaningful comparison with the other. There is almost no indication as to what power quality issues commercial and industrial customers typically bring to Consumers' attention, or how Consumers responds to those issues. Thus, it would be speculative to find that the employees and resources that Consumers now assigns to the commercial and industrial unit would be more effective in resolving stray voltage complaints than those that Consumers currently commits to its Agricultural Services unit. Differences between the two units'

qualifications, training, and equipment do not equate to discrimination, if the different needs of the customers each unit serves explain those differences.

Ratemaking Effects

In count 3 of the complaint, the Attorney General takes the position that the Commission should disallow the costs that Consumers incurs to retain expert witnesses and defend stray voltage lawsuits. The Attorney General also argues that the funding Consumers allocated to its neutral separation program was imprudent because Consumers should have used those funds to upgrade its distribution system.

The record provides no basis to evaluate the prudence of the expenditures Consumers has made in responding to stray voltage. Moreover, this is not a rate case. The Attorney General may bring claims regarding the prudence of stray voltage-related expenditures in an appropriate rate proceeding.

Stray Voltage Standards (in Case No. U-13934)

To summarize the principal determination in this order, the record is not adequate to prove that utility-caused stray voltage is occurring in measurable quantities that are impairing the health or productivity of dairy cattle throughout Consumers' service territory.¹⁸ This finding is a narrow determination based solely on the evidentiary record in this case. It is not a definitive statement of immutable scientific fact. While the findings in this order require the dismissal of the complaint, they do not ultimately absolve Consumers of any responsibility it might have if it is in fact making, or would make, a verifiable contribution to stray voltage conditions. This order also

¹⁸ As noted, this order evaluates the complaint's premise that Consumers' distribution system is pervasively inflicting harmful levels of stray voltage throughout rural parts of its service territory, as a result of system-wide misconduct or indifference on its part. This order does not adjudicate whether Consumers is responsible for specific situations at individual farms.

acknowledges the potential value of having more research performed to test the issues raised by the Attorney General. The scientific inquiries are inconclusive and invite further insights based on additional research and study before they can be resolved with reasonable certainty.

The Staff says that there is a need to provide electric utilities and their agricultural customers with guidance that better defines each party's rights and responsibilities. The Staff says that the Commission should promulgate stray voltage standards that set measurable levels of concern or action to serve as baselines for remedial responses.

In Case No. U-11368, the Commission conducted proceedings on proposed stray voltage rules. The Attorney General objected on the ground that the Commission lacked jurisdiction to promulgate the rules. In an order issued on March 14, 2000, at 2, the Commission closed the docket with the following observation:

Because Case No. U-11684 raises the jurisdictional question, as well as other issues related to stray voltage, the Commission concludes that it should close this rulemaking proceeding. Depending on the outcome of Case No. U-11684, it may be appropriate for a party to request initiation of another rulemaking on stray voltage.

The controversy over stray voltage shows no signs that it will resolve itself anytime soon, and it is beyond reasonable dispute to observe that the potential implications are serious and could have profound consequences for Michigan agribusiness as well as Michigan utilities and their ratepayers. The parties in this case do appear to agree that ground current becomes hazardous in some quantity. They disagree with respect to efforts to quantify a threshold of concern and whether electric utilities' distribution systems are in fact causing stray voltage to exceed the threshold. The Commission is well aware that stray voltage issues raise strong, perhaps unyielding, responses from some affected persons, which may stand in the way of finding a

solution, acceptable to the entire public, that does not compromise the public health, safety, and well-being or impose undue hardships.

With this contested case proceeding now concluded, it may be appropriate to undertake a generic reappraisal of whether the public interest would be best served by the promulgation of stray voltage standards based on the best scientific evidence available today. However, the Commission is not yet ready to recommence a formal rulemaking. The Commission would prefer to see as much consensus as possible form before deciding whether, or how, to set standards that would be acceptable to as many different interests as possible. Therefore, the Commission is commencing a new proceeding today in Case No. U-13934. The purpose of this proceeding is to solicit comments that would enable the Commission to decide how to proceed effectively in devising and implementing stray voltage standards or solutions.

In Case No. U-13934, the Commission is asking the Attorney General, farming interests, the electric utilities, and all other interested persons to address the following questions:

- Should the Commission promulgate stray voltage standards that would be uniformly applicable to all regulated electric distribution utilities in Michigan? Are there other mechanisms that would provide more effective means of addressing stray voltage issues than uniform standards?
- Should the Commission proceed with a formal rulemaking pursuant to the Administrative Procedures Act of 1969, MCL 24.201 et seq., in order to promulgate uniform stray voltage standards? Are there other available mechanisms that would more effectively set standards? Please comment on the Commission's statutory authority to undertake the setting of standards as rules or under any other suggested approach.
- Should the Commission set measurable levels of concern or action for stray voltage that would trigger obligations to take remedial actions? If so, what electrical characteristics or properties should be measured (e.g., potential voltage differences, animal contact current, transients, harmonics)? Should there be measures designed to evaluate potential problems related to electric or magnetic fields or other electrical phenomena that cannot be detected by measuring potential voltage and current at animal contact points? Please propose quantifiable thresholds for concern or action. Please comment on whether testing protocols and instrumentation should be addressed, and, if so, what standards should be instituted.

- Should the rules or standards prescribe the responses required when measurements are taken that exceed concern or action levels? If so, describe the responsive measures being proposed.
- How, if at all, should any regulatory actions taken by the Commission affect or complement civil litigation?

Interested persons may provide any other comments related to measures and solutions that the Commission could prospectively implement. They may suggest language for rules or standards. The Commission further requests commenting persons to give careful consideration to the relative successes and shortcomings of prior attempts by regulatory or governmental agencies to address stray voltage issues, including the proposed rules in Case No. U-11368, the record in this case, the rules adopted by the Wisconsin PSC, and experiences in Minnesota and other states. It also expects the comments to address existing scientific research and literature on stray voltage (including any recent updates).

The Commission hopes that this initiative will stimulate thoughtful deliberation before interested persons, acting either individually or in concert with others, set forth their positions in their comments. The Commission encourages persons to collaborate with each other and to present joint comments on behalf of multiple signatories. More weight may be accorded to comments that represent multiple participants or that provide the outcomes of collaborative efforts of persons with different interests.

Because efforts to devise collaborative solutions among diverse groups may take time, the Commission is setting a deadline of April 1, 2004 for filing the comments in Case No. U-13934. Provision is also being made for reply comments due on May 3, 2004. After reviewing the comments, the Commission will determine its next step. If it decides to commence a rulemaking, it will submit a request to the Office of Regulatory Reform for authorization to propose rules.

The Commission has selected this case for participation in its Electronic Filings Program. The Commission recognizes that some customers may not have the computer equipment or access to the Internet necessary to submit documents electronically. Therefore, those customers may submit documents in the traditional paper format and mail them to the: Executive Secretary, Michigan Public Service Commission, 6545 Mercantile Way, P.O. Box 30221, Lansing, Michigan 48909. Otherwise, all documents filed in this case must be submitted in both paper and electronic versions. An original and four paper copies and an electronic copy in the portable document format (PDF) should be filed with the Commission. Requirements and instructions for filing electronic documents can be found in the Electronic Filings Users Manual at: <http://efile.mpsc.cis.state.mi.us/efile/usersmanual.pdf>. The application for account and letter of assurance are located at <http://efile.mpsc.cis.state.mi.us/efile/help>. You may contact Commission staff at (517) 241-6170 or by e-mail at mpscefilecases@michigan.gov with questions and to obtain access privileges prior to filing.

Procedural Rulings

a. Application for leave to appeal

On August 19, 2002, the Attorney General made a late filing of prepared testimony and exhibits by Donald W. Zipse to replace the previously filed testimony of Dave Stetzer. The Attorney General explained that a substitution of witnesses became necessary when counsel for the Attorney General learned on August 5, 2002 that Mr. Stetzer had brought a lawsuit to collect \$2.5 million for services his firm had provided to the Attorney General. The same counsel was advised on August 7, 2002 that Mr. Stetzer would not participate unless the dispute over compensation were resolved.

On August 28, 2002, Consumers filed a motion to disallow the substitution of the Attorney General's witnesses. On September 3, 2002, the Attorney General filed a response. At a hearing conducted on September 6, 2002, the ALJ granted Consumers' motion. He stated that the Attorney General was responsible in significant part for procuring Mr. Stetzer's assistance on ambiguous terms that ended in their dispute over compensation and Mr. Stetzer's unavailability to testify. He further stated that the proposed substitution of Mr. Zipse for Mr. Stetzer would be prejudicial to Consumers, which had already deposed Mr. Stetzer and prepared itself to respond to his testimony. 23 Tr. 1190-93.

On September 13, 2002, the Attorney General filed an application for leave to appeal the ALJ's ruling. On September 16, 2002, the evidentiary hearings began. On September 20, 2002, Consumers filed a response to the Attorney General's application. The Commission did not issue an interlocutory order granting or denying leave to appeal. In the exceptions, the Attorney General renews the argument that the ALJ erred in granting Consumers' motion and requests that the record be reopened to admit Mr. Zipse's testimony.

The Attorney General contends that the ALJ's ruling should be evaluated in light of the standards that govern a trial court's discretion in deciding whether to allow the late addition of an expert witness, as set forth in Tisbury v Armstrong, 194 Mich App 19; 486 NW2d 51 (1991). Applying the Tisbury standard, the Attorney General argues that Mr. Stetzer was unavailable to testify at the hearings and that the arrangement that the Attorney General had made with him to secure his testimony was no different from those that Consumers used in retaining some of its expert witnesses. The Attorney General says that there was no prior notice that Mr. Stetzer might refuse to participate. The Attorney General claims that the testimony in question was crucial to establish Code violations and explain the significance of transients and harmonics, so that the

ALJ's refusal to permit a substitution of witnesses was prejudicial. Because Mr. Zipse's testimony was similar to Mr. Stetzer's, the Attorney General claims, Consumers would have incurred no more prejudice from the substitution than the Attorney General incurred when Consumers substituted Dr. Rothman as a witness for Richard W. Andrews.

Consumers argues that the Attorney General is ignoring the procedural context of the ALJ's ruling, which occurred less than one month before evidentiary hearings began and more than four years after the complaint was filed. Consumers claims that the Attorney General had previously frustrated its efforts to obtain discovery, particularly with respect to Mr. Stetzer's testing. It further claims that this type of misconduct required the ALJ to hold numerous hearings related to discovery and procedural disputes and delayed the progress of this case. Consumers says that it had already deposed Mr. Stetzer at length and conducted much discovery in an attempt to defend itself against his testimony. Consumers says that the portion of Mr. Stetzer's testimony that Mr. Zipse would have revived is little different in substance from the points made by other Attorney General witnesses. Consumers asserts that the substitution sought by the Attorney General is not comparable to Consumers' substitution of Dr. Andrews with Dr. Rothman, in that Dr. Andrews died suddenly and unexpectedly (in 2002), the Attorney General did not object to the substitution, and the Attorney General did not seek to depose either Dr. Andrews or Dr. Rothman.

The ALJ's ruling to disallow the Attorney General's substitution of witnesses was proper. Mr. Stetzer's last-minute refusal to testify appears to have been a consequence in part of previous tactical decisions made by the Attorney General when using Mr. Stetzer's services. At a motion hearing on April 20, 2000, Consumers had claimed that Mr. Stetzer's testing on behalf of the

Attorney General had violated discovery conditions imposed by the ALJ.¹⁹ The Assistant Attorney General (who is not the one that participated in the September 6, 2002 hearing or the evidentiary hearings) responded by representing that the Attorney General had not retained or paid Mr. Stetzer to perform investigations, that the Attorney General exercised no control over Mr. Stetzer's activities, and that Mr. Stetzer was acting on his own. According to this counsel, Mr. Stetzer had contacted him, he had informed Mr. Stetzer of farms suitable for stray voltage testing, and he was present when Mr. Stetzer conducted testing. 6 Tr. 202-03. This was the ambiguity in the relationship between Mr. Stetzer and the Attorney General that the ALJ cited in apportioning responsibility for Mr. Stetzer's unavailability.

The proceedings in this case dealing with procedural matters were unusually fractious, and disputes were frequent. The ALJ requires some measure of discretion in making rulings on discovery and procedural matters if he is to maintain orderly control over the proceedings and move the case toward completion. The ruling precluding a late substitution of witnesses was entirely reasonable under the circumstances. The Attorney General could have avoided responsibility for Mr. Stetzer's unavailability by securing his services pursuant to a firm contractual arrangement.

Moreover, a reading of Mr. Zipse's testimony (which does not adopt Mr. Stetzer's test results) indicates that it would not have had a material influence on the substantive findings issued in this order. For the most part, the proposed testimony reiterates points on technical matters that other witnesses covered. It does not fill in the evidentiary gaps identified in this order. The Commission does not find anything in the testimony to be outcome-determinative.

¹⁹ At a prehearing conference conducted on April 8, 1999, the ALJ required the Attorney General to give Consumers and the Staff advance notice of on-farm investigations, so that they could be present. 1 Tr. 49-50.

This situation is not comparable to Consumers' substitution of witnesses after Dr. Andrews died. Unlike Consumers, which claimed that it had devoted considerable resources in preparing to respond to Mr. Stetzer's testimony, the Attorney General has made no claim of prejudice from Consumer's late substitution of witnesses.

b. Exclusion of exhibits

The Attorney General argues that the ALJ erred by sustaining objections to Exhibits C-112 and C-113, both being papers written by Mr. Zipse. 30 Tr. 2542. The Attorney General claims that it was error for the ALJ to exclude the evidence as a means of maintaining consistency with his earlier ruling precluding the substitution of Mr. Zipse for Mr. Stetzer.

The two exhibits relate to collateral issues, and their content could not have altered the findings in this order. The Attorney General attempted to introduce them into evidence during the redirect examination of Dr. Dahlberg's rebuttal testimony. The papers discuss ground current as a potential hazard to human health in residential settings and describe occurrences relating to indoor plumbing, household appliances, and a condominium's swimming pool. There is no apparent link between the events described and Consumers' service territory. The Attorney General's complaint and evidence focus primarily on dairy cattle, and an attempt to introduce documents relating to human health would not have materially enhanced the evidentiary weight of the Attorney General's position.

The Commission FINDS that:

a. Jurisdiction is pursuant to 1909 PA 106, as amended, MCL 460.551 et seq.; 1919 PA 419, as amended, MCL 460.51 et seq.; 1939 PA 3, as amended, MCL 460.1 et seq.; 1969 PA 306, as amended, MCL 24.201 et seq.; and the Commission's Rules of Practice and Procedure, as amended, 1999 AC, R 460.17101 et seq.

b. The application for leave to appeal from the ALJ's ruling on September 6, 2002 to disallow a substitution of witnesses should be denied.

c. The complaint should be dismissed.

d. A proceeding should be commenced in Case No. U-13934 to solicit comments regarding the implementation of standards or other remedial measures relating to stray voltage.

THEREFORE, IT IS ORDERED that:

A. The application for leave to appeal from the ruling of Administrative Law Judge Daniel E. Nickerson, Jr., on September 6, 2002 to disallow a substitution of witnesses is denied.

B. The complaint is dismissed.

C. Comments shall be filed in Case No. U-13934 on or before April 1, 2004. Reply comments shall be filed on or before May 3, 2004.

The Commission reserves jurisdiction and may issue further orders as necessary.

Any party desiring to appeal this order must do so in the appropriate court within 30 days issuance and notice of this order, pursuant to MCL 462.26.

MICHIGAN PUBLIC SERVICE COMMISSION

/s/ J. Peter Lark
Chair, abstaining.

(S E A L)

/s/ Robert B. Nelson
Commissioner

/s/ Laura Chappelle
Commissioner

By its action of November 25, 2003.

/s/ Robert W. Kehres
Its Acting Executive Secretary

Any party desiring to appeal this order must do so in the appropriate court within 30 days after issuance and notice of this order, pursuant to MCL 462.26.

MICHIGAN PUBLIC SERVICE COMMISSION

Chair, abstaining.

Commissioner

Commissioner

By its action of November 25, 2003.

Its Acting Executive Secretary

In the matter of the complaint of)
ATTORNEY GENERAL FRANK J.)
KELLEY against **CONSUMERS ENERGY**)
COMPANY relating to stray voltage.)

Case No. U-11684

In the matter, on the Commission’s own motion,)
to consider the implementation of standards)
or remedial measures relating to stray voltage.)

Case No. U-13934

Suggested Minute:

“Adopt and issue order dated November 25, 2003 dismissing a complaint filed by Attorney General Frank J. Kelley against Consumers Energy Company and commencing a new proceeding to solicit comments and consider the implementation of standards or remedial measures relating to stray voltage, as set forth in the order.”