E-119/C-92-318 ORDER DIRECTING CONTINUED TESTING AND INVESTIGATION

BEFORE THE MINNESOTA PUBLIC UTILITIES COMMISSION

Don Storm	Chair
Tom Burton	Commissioner
Cynthia A. Kitlinski	Commissioner
Dee Knaak	Commissioner
Norma McKanna	Commissioner

In the Matter of the Complaint Against Lake Region Cooperative Electric Association

ISSUE DATE: March 10, 1993

DOCKET NO. E-119/C-92-318

ORDER DIRECTING CONTINUED TESTING AND INVESTIGATION

PROCEDURAL HISTORY

I. Proceedings to Date

On April 16, 1992, the Commission received a formal complaint signed by 57 members of Lake Region Cooperative Electric Association (Lake Region or the Cooperative). The filing expressed dissatisfaction with Lake Region's response to complaints about stray voltage on dairy farms served by the Cooperative. The Complaint was verified on May 15, 1992, by one of the signatories to the complaint, Lonnie Nelson.

On May 27, 1992, the Commission met to consider requiring an answer to the Complaint. The Commission issued an Order on June 4, 1992, requiring the Cooperative to file an answer. Lake Region filed its answer on June 25, 1992. The Cooperative also filed a petition to dismiss the complaint or, in the alternative, to make the Complaint more definite and certain as to the allegations contained therein.

On August 18, 1992, the Department of Public Service (the Department) submitted comments on the Complaint. Two days later, on August 20, 1992, the Environmental Quality Board (EQB) filed a resolution recommending the Commission initiate an investigation of utility grounding practices. On August 21, 1992, the Department filed a petition to intervene. Otter Tail Power Cooperative (Otter Tail) filed comments on September 13, 1992.

On October 1, 1992, a pre-hearing conference was held to clarify issues in the Complaint and discuss procedural issues related to the Commission's consideration of the Complaint. Lake Region, the Complainants, the Department, Commission staff and Commission counsel participated in the conference. The conference served to clarify aspects of the Complaint. It also identified the two Complainants, Lonnie Nelson and Darrel Franze. Commission staff provided minutes of this conference to the participants on

October 5. Lake Region filed a letter clarifying the minutes on October 13, 1992. Commission staff sent revised conference minutes to the parties on October 14, 1992. These minutes incorporated Lake Region's clarifications.

On October 22, 1992, Lake Region filed an amended answer to the Complaint based on the pre-hearing conference. The amended answer included the Cooperative's proposed agreements offered to the Complainants. On October 29, 1992, the Complainants submitted comments addressing the Cooperative's amended answer.

On November 4, 1992, Otter Tail filed a petition to intervene in this docket. Otter Tail's petition states that it may be affected by decisions in this case, and that the resolution of stray voltage issues should be left to the Commission's rulemaking docket, E-999/R-92-245. The Commission found that Otter Tail's petition was untimely filed and denied it.

On November 17, 1992, the Commission issued its ORDER INITIATING INVESTIGATION. In this Order, the Commission found that it has jurisdiction over this Complaint, denied the Cooperative's motion to dismiss the Complaint, and initiated an investigation of the electrical environments on both Complainants' farms. The Commission directed that the investigators provide the Commission with the results of their assessments no later than December 31, 1992.

On December 31, 1992, petitions to intervene in this matter were received from the Minnesota Rural Electric Association (MREA), Cooperative Power Association (CPA), and The Electromagnetic Research Foundation (TERF).

On January 8, 1993, the investigators' reports and a separate filing from the Cooperative containing substation data generated as part of the investigation were mailed to parties and potential parties for comment.

On January 28, 1993, comments were filed by the Cooperative, the Department, the Complainants, and the potential intervenors (MREA, CPA, and TERF).

On January 29, 1993, Complainant Franze filed a Motion to Deny Intervention and on February 1, 1993, Complainant Nelson filed a similar motion.

On February 18 and 19, 1993, the Cooperative and CPA, respectively, filed responses to the comments of the Department of Public Service.

On February 22, 1993, the Cooperative filed comments regarding the evaluation of Dr. Bodman, which had been submitted as part of the Department's comments.

On February 24, 1993, the Commission met to consider this matter.

FINDINGS AND CONCLUSIONS

II. Petitions to Intervene

The Electromagnetic Research Foundation (TERF), Minnesota Rural Electric Association (MREA), Cooperative Power Association (CPA), and have filed petitions asking to intervene in this proceeding.

In its Petition, The Electromagnetic Research Foundation (TERF) stated that it was an organization of farmers, doctors, and veterinarians whose purpose was to assist in the resolution of stray voltage problems. TERF asserted a commitment to thoughtful research and on-farm practice and argued that it should be allowed to intervene because the outcome of this case could set a precedent and influence the future of Minnesota dairy farmers. No party opposed TERF's petition.

In its Petition, MREA stated that it is an association of 47 Minnesota distribution cooperatives and seven generation and transmission cooperatives. MREA stated that this docket has the potential to set a precedent that will impact MREA members in regard to other farm customers with similar stray voltage complaints. MREA offered to provide a statewide perspective and expertise to assist the Commission in resolving these issues.

In support of its Petition, CPA stated that it is a Minnesota cooperative association that supplies electricity to 17 member distribution cooperative associations, including Lake Region. CPA argued that the outcome of this case will affect each of its members separately and distinctly from the interests common to the public or taxpayers. For example, CPA stated, the Commission's decision to use the Department's proposed protocol will have an effect upon the stray voltage rulemaking and resolution of this complaint is likely to have an effect on the resolution of other similar complaints against CPA members.

The Complainants opposed MREA's and CPA's petitions, arguing that these parties made no showing that their interests would be prejudiced by denying them intervenor status, that the interests of the public would be served by such interventions, or that their intervention would enhance the efforts of the Commission. Complainants predicted that these interventions would greatly increase the burden of their costs and efforts.

Intervention is governed by Minn. Rules, part 7830.2200, which provides in relevant part:

> Any person desiring to be made a party to a pending proceeding may petition for leave to intervene therein. The petition with proof of service shall be filed with the commission at least ten days prior to the date set for hearing, but not thereafter except for good cause shown.

> A petition to intervene shall allege the grounds for the proposed intervention and the specific interest of the petitioner in the proceeding..... The allegations shall be reasonably pertinent to the issues involved in the principal pleadings, and shall not unduly broaden the issues.

The Commission finds that all three petitioners qualify for intervenor status and will grant their petitions. Each party has a particular interest in this proceeding that is peculiar to that party as distinguished from an interest common to the public or other taxpayers in general, as required by Minn. Rules, Part 7830.0600. Complainants' concern that these intervenors will unduly burden them is mitigated by the condition under which such petitions are granted, i.e. that the intervenors' issues not "unduly broaden the issues." See Minn. Rules, Part 7830.2200. That petitioners' interests may partially overlap with each other or existing parties is not automatically fatal to their petitions.[1] Rather than prohibiting such overlap, the rules provide a method for mitigating any undesired effects of such overlap. Minn. Rules, Part 7830.2400 (Scope of Intervenor's Participation) recognizes the possibility that the interests of intervenors may overlap and provides in part:

> Where there are two or more petitioners having substantial like interests and petitions, the presiding officers may, in order to expedite the hearing, arrange appropriate limitations on the number of attorneys who will be permitted to cross examine and make and argue motions and objections on behalf of such intervenors.

III. Untimely-Filed Documents

In its January 8, 1993 Notice to the parties (including the Cooperative and CPA), the Commission established a comment period regarding the reports from the Commission's two investigators. No reply comments or response filings were authorized. The Commission stated that all comments were due to be filed with the Commission no later than January 28, 1993. Several parties, including the Cooperative and CPA, filed comments within that time period.

Less than a week before the February 24, 1993 hearing on this matter, CPA filed a response to the Department's comments and the Cooperative made two filings responding to the Department's comments. The Commission's January 8, 1993 Notice establishing a comment period had not authorized the filing of reply comments by any party. In addition, at the hearing the Cooperative provided a position paper and Complainants furnished documents reporting milk production and water consumption on their farms.

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[1] In this case, all CPA members are also members of MREA and CPA itself is a member of MREA.

Because Cooperative's and CPA's reply comments and Complainants' milk production records were untimely filed, the Commission did not view them as part of the record under consideration at the February 24, 1993 hearing, but allowed parties to refer to the substance contained in the filings in the course of their oral arguments. The untimely filed documents need not be refiled. They are viewed as part of the record for subsequent proceedings. To equalize the comment opportunities between the parties, the Commission will, in this Order, authorize the other parties to file reply comments to the parties' January 28, 1993 comments within 15 days of this Order. Regarding the milk production records, the Complainants' untimely filed records will be augmented by additional records required to be filed in this Order. Together, all these milk production records will be subject to comment by the parties in subsequent filings as detailed in Ordering Paragraph 9.

IV. Scope of This Order

The Commission's investigation into this matter is on-going. The primary purpose of this Order is to review the data gathered during the fieldwork portion of the Commission's investigation to date (the investigation reports ordered by the Commission's November 17, 1992 Order) and determine what, if any, further action is warranted under the circumstances.

V. Evaluation of the Testing Mandated by the Commission's November 17, 1992 Order

A. Protocol Development and Execution

The test protocol was drafted by Commission Staff in consultation with the two principal investigators, Mr. Hendrickson and Mr. Gagnon. The draft protocol was circulated to the parties for comments and finalized by Commission Staff. Mr. Gagnon was assigned to measure the utility and farm electrical service parameters; Mr. Hendrickson was assigned to measure the parameters around the individual cow's environment; the Cooperative was requested to provide certain information regarding the individual feeder loadings and any maintenance of its substations and feeders prior to the testing.

The investigators' reports provide a data base, a record of certain electrical conditions on the two farms during the testing period. Gagnon, Electrical Characteristics of Primary and Secondary Power Delivery Systems (December 29, 1992); Hendrickson, Electrical Characteristics of the Cow Environment (December 30, 1992). The investigators did not attempt to identify and comment upon specific correlations in the data and event logs or to distill conclusions from that data base. As investigator Hendrickson stated:

> Logically, the ultimate reduction of information and subsequent conclusions can only be made with access to the second half of the data base, the electrical service data. Hendrickson Report, page 98.

B. Parties' Comments on Test Results

The reports of both investigators, together with substation voltage and current data from the Cooperative's Stalker Lake and Battle Lake substations recorded during the period December 7-14, 1992 and other data requested of the Cooperative in Sections B and D of the protocol, were issued to the parties on January 8, 1993 for their analysis and comment.

The parties' principal comments, proposed conclusions, and recommendations regarding the Complaints[2] were as follows:

1. The Cooperative

The Cooperative drew four primary conclusions from the reports:

1. there is no traditional stray voltage exceeding industry standards and limits at the cow-contact points;

2. the grounding electrodes of the primary system in the immediate vicinity of the farm building did not contribute to the level of stray voltage or ground currents at the cow-contact locations in the barn on either the Franze or the Nelson farm;

3. stray voltage and ground currents occurred in the barns on both farms as a result of secondary neutral current flowing in the barn; and

4. in the case of the Nelson farm, the cow-contact voltages were not found to be significantly different when the farm was operated from a generator as compared to operation from the power supply transformer.

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[2] The parties also commented on the appropriateness of the test protocol and offered suggestions on how the protocol could be improved. The focus of this proceeding, however, is to resolve the complaints before it rather than to develop a protocol for use in all similar situations. Therefore, the analysis and discussion here will focus on what has been learned about relevant conditions at the Complainants' farm from the testing that was done rather than to fine tune the protocol itself. To the extent that Commission Staff deems the parties' suggestions necessary to a reasonably expeditious and fair resolution of this Complaint, of course, the parties' suggestions regarding the test protocol will be adapted and incorporated in any future testing in this docket.

The Cooperative concluded that the test results confirm that the Cooperative was and is delivering safe, adequate and reliable electric services to the Complainants and that any alleged problems experienced by Complainants are from sources other than utility electrical service and are not within the control of the service provided by the Cooperative. According to the Cooperative, the tests showed that there was no reason for the Commission to require the Cooperative to modify its primary neutral grounding practices or modify its policies regarding installation of isolation devices on either of the Complainants' farms.

2. CPA

Similar to the Cooperative, CPA stated that the test results showed that

1. the levels of stray voltage at cow contact points were acceptable even under Mr. Bodman's conservative corrective action thresholds;

2. there were no significant levels of electricity at the primary and secondary neutrals; and

3. changes in the primary neutral grounding wire did not affect the farms' electrical environments. CPA concluded that since there was no factual basis on which to order mitigation by the Cooperative, the Commission should dismiss the Complaint.

3. MREA

The MREA stated that the tests demonstrated three main things:

1. any stray voltage at cow contact points was below acceptable levels;

2. that the voltage levels of electricity passing through the primary and secondary neutrals were not significant; and

3. the disconnection of the primary neutral ground had no measurable effect on the electrical environment of the Complainants' farms.

In addition, the MREA stated that it subscribed fully to the comments submitted by the Cooperative and CPA addressing the technical aspects and significance of the test results.

In sum, the MREA concluded that the tests confirm that the Cooperative is discharging its utility responsibility to furnish safe, adequate, efficient, and reasonable service to the Complainants. The MREA urged the Commission to dismiss the Complaint.

4. The Complainants

Complainants stated that the test data gathered by the Cooperative on its own substations was meaningless because the Cooperative was not an independent investigator and there was no data gathered during a different time period to allow comparison. Complainants discounted the data contained in Mr. Gagnon's report because, they alleged, a Cooperative employee had been allowed to tamper with and run Gagnon's testing equipment. Complainants also noted that the investigators' data were at significant variance from the Cooperative's previous test recordings and that their data were incomplete regarding the Franze farm because the generator provided for the test was inadequate. Complainants stated that the testing left many questions unanswered, such as:

1. Since electricity takes the path of least resistance and the resistance of Complainants' barns (between 9-10 ohms) is low compared with the surrounding ground resistance (40 to 500 ohms), is the resistance of the substation grid adequate to assure that electricity will flow to the substation rather than to the Complainants' barns?

2. Where did the 3.5 plus volts between Reference 1 and Reference 2 at the Nelson farm come from?

3. Why isn't the Cooperative's electrical system balanced?

At oral argument, Complainants further questioned the validity of the data contained in Mr. Gagnon's report and alleged that without adequate safeguards, it was likely that the Cooperative's system had been manipulated to affect the electrical environment on the farms on the days when the tests were conducted.

Nevertheless, Complainants drew several conclusions from the test data:

1. even when the on-farm power is turned off, electricity remains in the cows' environment;

2. the electricity found on the waterline does not correlate with any loads on the farm;

3. cow contact recordings in the millivolt range and waterline to reference in the 2 to 5 volt range indicate that Complainants cows are standing on 2 to 5 volts of electricity.

Complainants alleged continuing serious impact on all life forms due to electricity being injected into the earth by the Cooperative and urged prompt and immediate action to prevent the earth on their farms from carrying electricity.

5. The Department

The Department also found that there was reason to question the validity of some of the methods and the equipment used to gather data. The Department indicated, however, that the data were adequate to show five things:

1. both farms have very high voltages between the water line and reference grounds;

2. both farms have very high voltages between the primary neutral and the reference ground;

3. both farms have high levels of current flow through the water line;

4. the feeders servicing both farms showed a significant level of load imbalance; and

5. the resistance for several of the grounds on Complainant Franze's farm is high and may be similarly high on Complainant Nelson's farm, though this cannot be known because the resistance for the grounds on the poles leading to the Nelson farm was not reported.

Based on these observations, the Department drew four conclusions:

1. none of the tests confirm any problems with any of the on-farm equipment of either farm;

2. the high voltages between the primary neutral and reference ground and the high voltages between the water line and reference ground are most likely the result of the significant level of phase conductor load imbalance on the Cooperative's distribution system;

3. there is a high probability that under some conditions the high level of current on the water line could follow other paths and become problematic for the animals; the data strongly suggest that the current is the result of the primary neutral using the on-farm grounding as a major portion of the grounding capability of the system;

4. the high voltages on the primary neutral are accessing the animal environment.

Based on those observations and conclusions, the Department recommended that the Commission direct the Cooperative to 1) conduct a voltage profile examination of the system serving Complainants and correct any bad connections and undersized

conductors identified, thereby producing a better balanced load and lower voltages between the primary neutral and the reference ground, 2) improve its grounding for both of the farms, reducing the resistance of each ground to a maximum 25 ohms, or down to 10 ohms as needed, and 3) install an isolator on each farm that blocks higher voltages than the isolators currently used by the Cooperative. The Department further recommended that Complainants be allowed to file a request with the Commission for re-testing if, 30 days after the three recommended changes have been made, the Complainants believed that their cows continued to suffer from stray voltage. Under the Department's recommendation, the Cooperative would be required to conduct stray voltage testing using the protocol used in the original test (incorporating the changes suggested by Mr. Bodman in his evaluation), and report the test results to the Commission within 20 days of Complainants' request.

6. TERF

TERF questioned the validity of the data in the Gagnon investigation report but largely accepted the data in the Hendrickson report. TERF observed that Mr. Hendrickson's data for both farms showed high voltages between the water line and the reference compared to the low values measured from the waterline to the rear hooves. According to TERF, this showed that the floor of each barn had as much electricity flowing through it as the waterline. TERF also noted that at both farms the AC values of voltage and current do not go to zero when farm power is turned off and that these AC values are highest when 240 volt loads are operating. TERF concluded that these phenomena are due to the Cooperative's faulty distribution system which does not provide for the return of these loads to the substation on the distribution neutral but instead allows large quantities of transient and steady current to escape to earth and enter the cows' environment.

TERF urged the Commission to take immediate action to require the Cooperative to redesign its distribution lines to prevent the earth from being used as a current carrying conductor.

B. Commission Action

1. Scope of Complaint and Investigation

The tests measured two different kinds of electric presence in the cows' environment. First, the testing measured the voltage between two points in the cow environment that can be simultaneously touched by a cow. Voltages measured between those points was below the commonly accepted threshold for concern. Second, the testing revealed levels of utility-generated electric current and voltage in the cows' environment, including, for example, the waterline passing by the cows, that would have been well above the commonly accepted threshold for concern if they had been measured between two contact points.

The Cooperative asserted that only the first variety of electric presence (voltage between two contact points) was relevant. First, the Cooperative argued that by using the term "traditional stray voltage" in their Complaint the Complainants limited the scope of this proceeding to consideration of whether the Cooperative has failed to properly respond to instances of "traditional stray voltage" as that term is understood within the industry. According to the Cooperative, when the Complainants used the term "traditional stray voltage" they were referring to two contact point exposure, i.e. exposure to voltage in cow-contact areas that can pass through a cow, for example, through a watering cup to another contact point in the cow's environment. The Commission does not interpret the Complaint so narrowly. In their Complaint, Complainants made it clear that they were requesting the Cooperative to be required to investigate "the entire electrical parameter," to do "whatever was necessary" to "remove all influence from the primary neutral." In its November 17, 1992 ORDER INITIATING INVESTIGATION, the Commission found that the Complaint conveyed Complainants' concept of stray voltage in requesting specific electrical test parameters that encompass amperage, DC currents and "high frequency spikes."[3] In short, the Complainants seek to eliminate the detrimental flow of electricity through the earth on their farms. The Commission noted that the Complainants' view of stray voltage was clarified further at the pre-hearing conference. Neither the Commission nor the Cooperative have been misled regarding what the Complainants' view as "stray voltage."

Second, the Cooperative stated that the only electrical presence that could possibly raise a standard of service issue is "stray voltage" defined as the low-level voltages present across points in which a current flow is produced when an animal simultaneously comes in contact with them.[4] The Cooperative has urged the

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[3] In its November 17, 1992 ORDER REQUIRING INVESTIGATION, the Commission stated:

> The Complaint identifies stray voltage as its concern, and asks for very specific relief. The Complainants convey their concept of stray voltage in their request for specific electrical test parameters that encompass amperage, DC currents and "high frequency spikes." The Complainants' view of stray voltage was clarified further at the pre-hearing conference. ORDER at page 4.

[4] The Company's expert, Dr. Surbrook, explained the objection to Complainant's broad definition of stray voltage: "Electrical systems...which are grounded at more than one location...will have current flowing on the grounding electrode wires and through the earth....This is known, expected and cannot be eliminated for a multigrounded electrical system.....I object to the word stray [for such voltage] because it is not stray, it

Commission to adopt its proposed definition of stray voltage and in so doing limit inquiry in this Complaint to whether stray voltage thus defined exists in unacceptable levels on the farms in question.

The Commission finds that at this point in its investigation it is unnecessary to adopt a definitive definition of stray voltage. The dynamics and effects of utility-generated electricity in the farm environment are not so precisely known that reasonable areas of inquiry, such as those delineated in Complainants' Complaint, should be precluded. Definitions should assist in identifying problems rather than impeding inquiry into problems and the fashioning of practical responses to those problems. From a practical standpoint, if utility-generated electrical flow is having a detrimental effect upon Complainants' farms, it is not relevant whether that electrical presence meets the strict definition of "traditional stray voltage" as the Cooperative would define it.

2. Continuing Investigation

The Commission finds that further investigation in this matter is warranted. The Commission is not inclined to accept the recommendation of the Cooperative, CPA, and MREA that this matter be dismissed. At the same time, the Commission is not prepared on the basis of the record to date to find that the Cooperative has an inadequate service standard regarding stray voltage or that, for example, its practices relating to Complainants' concern are unreasonable or insufficient in violation of Minn. Stat. § 216B.17, subd. 1 (1992). The record is not adequately developed at this time to permit a decision with respect to the standard of service issue raised by the Complainants. Accordingly, the Commission will not order remedial action.

Instead, the Commission will continue its problem-solving approach and proceed with the investigatory phase of this matter. To develop useful information unavailable from other means, the Commission will introduce certain changes in the electrical environments of both farms and assess the impact of those changes upon the cows' electrical environment and upon the cows themselves. Specifically, the Commission will direct the Cooperative to install a spark gap isolator[5] on the farm of each Complainant. The Cooperative will also be required to move the

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is exactly where it is intended to be located." January 21, 1993 letter to Oscar Sorlie, Jr., Comments of Lake Region to Investigative Reports and Test Protocol, Exhibit B.

[5] In this context, the spark gap isolator is preferable to the isolators currently used by the Company on the farms where it has installed isolators. The record indicates that a spark gap isolator meets code requirements, is significantly less expensive that the Ronk or Dairyland isolators, and provides a higher degree of isolation.

transformer pole (and its attendant primary neutral grounding) a reasonable distance from the farmyard of each farm.[6] The exact transformer pole relocation points will be determined by Commission Staff after consultation with the Complainants and the Cooperative.

These two changes are selected because they may be quickly and inexpensively accomplished with high likelihood of affecting the cows' electrical environment. After the changes have been in place for a period of at least 15 days, the Cooperative will conduct on-site tests under the supervision of and pursuant to a testing protocol approved by Commission Staff.[7] This testing will produce data that will be compared with the data compiled as part of the Gagnon and Hendrickson tests to demonstrate the effect of the changes, if any, upon the cows' electrical environment. The impact of these changes upon the cows will also be assessed. To this end, the Commission will require the Complainants to supplement the December '92 and January '93 production records already on file with monthly production reports through the end of the testing period. As a result, the record will contain a complete record of the farms' milk production from December 1, 1992 until 30 days after the changes have been made.

In addition to the test data, the Cooperative will be required to file a plan for further reducing the voltage between the primary neutral and the earth on Complainants' farms.

After the post-changes experience has been reported by the Complainants and the Cooperative (and commented upon by the parties) and the Cooperative has filed its primary neutral to earth voltage reduction plan (and parties have had an opportunity to file comments upon that plan), the Commission will consider the status of its investigation and determine what its next steps in this matter will be.

ORDER

1. The petitions to intervene in this matter filed by the Minnesota Rural Electric Association (MREA), Cooperative Power Association (CPA), and The Electromagnetic Research Foundation (TERF) are granted.

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[6] No decision is made at this point regarding the final allocation of the cost of these changes.

[7] The test protocol for this round of testing will incorporate any suggested improvements that Commission Staff finds appropriate in this context, keeping in mind the goal of securing sound, comprehensible, and comparable data.

2. Within 15 days of this Order, parties (other than Lake Region and CPA who have already done so) desiring to file reply comments to the comments filed by the parties on January 28, 1993 regarding the reports filed by Mr. Gagnon and Mr. Hendrickson shall do so, serving copies of any such filings on the parties.

3. Within 15 days of this Order, Lake Region Cooperative Electric Association (Lake Region or the Cooperative) shall install a spark gap isolator on the farm of each Complainant and move the transformer pole (and its attendant primary neutral grounding) on each farm to a location designated by Commission Staff after consultation with the parties.

4. Within 45 days after the date of this Order, Lake Region shall file with the Commission and serve upon the parties a comprehensive primary neutral to earth voltage reduction plan for Complainants' farms. At a minimum, the plan shall include plans for load balancing, grounding improvements, reconductoring and regulator repairs and shall include comments regarding the feasibility and projected efficacy of each change addressed in the plan.

5. Within 15 days after Lake Region has filed its voltage reduction plan, the parties shall file comments regarding that plan and serve copies of their comments upon the other parties.

6. After the isolators have been installed and the transformer poles moved for a period of at least 15 days, Lake Region shall conduct on-site testing under the supervision of and pursuant to a protocol developed by Commission Staff.

7. On or before May 7, 1993, Lake Region shall file with the Commission and serve upon the parties a report containing the data from the testing conducted pursuant to Ordering Paragraph 6 in a form that will allow comparison with data previously gathered.

8. The Complainants shall file milk production and water consumption data for the month of February within 5 days of the date of this Order; shall file March's production data on or before April 5, 1993; and shall file April's production data on or before May 5, 1993. Complainants shall serve copies of their production reports on the parties on the same date they file them with the Commission.

9. Within 20 days after Lake Region files its report containing the data from the testing conducted pursuant to Ordering Paragraph 7, the parties shall file with the Commission and serve upon the parties their comments regarding

a. the data from the testing conducted pursuant to Ordering Paragraph 6;

b. the milk production data filed by the Complainants to date;

c. Lake Region's line upgrade plan; and

d. analysis of the record to date and recommendations.

10. Dates for the testing, reports, and comments shall be followed unless changed through notice from the Executive Secretary.

11. This Order shall become effective immediately.

BY ORDER OF THE COMMISSION

Richard R. Lancaster
Executive Secretary

(S E A L)