

Instruction: Answer question 5 only if you answered "yes" to question 1.

5. Did Northern States Power Company distribute electricity to the Schachtners in a manner that created a nuisance?

ANSWER: Yes
(Yes or No)

Instruction: Answer question 6 only if you answered "yes" to question 5.

6. Was such nuisance a cause of damages to the Schachtners?

ANSWER: Yes
(Yes or No)

Instruction: Answer question 7.

7. Were the Schachtners negligent?

ANSWER: ~~Yes~~ NO (P)
(Yes or No)

Instruction: Answer question 8 only if you answered "yes" to question 7.

8. Was such negligence a cause of damages to the Schachtners?

ANSWER: _____
(Yes or No)

Instruction: Answer question 9 only if you answered "yes" to any of questions 2, 4, or 6 and also answered "yes" to question 8.

9. Taking all of the negligence which caused damage to be 100%, what percentage of negligence do you attribute to:

A. Northern States Power Company _____ %

B. John A. Schachtner, Terese M. Schachtner,
Richard H. Schachtner, and Elaine M. Schachtner
_____ %

TOTAL _____ 100%

Instruction: Whether or not you answered any of the previous questions, answer the following questions:

10. What sum of money, if any, will fairly and reasonably compensate the Schachtlers for:

- a. their economic damages due to stray voltage? \$ 850,000.00
- b. damages for the inconvenience, annoyance and loss of use and enjoyment of their property due to stray voltage? \$ 200,000.00

Dated at Hudson, Wisconsin, this 23 day of November, 1999.

Paullette Anderson
Foreperson

Dissents, if any:

Question(s)

RURAL LINE GROUNDING PROGRAM

CONSTRUCTION SPECIFICATIONS

Obtain maps with lines serving dairy customers. Determine the number of grounds per mile. Follow the procedures outlined below depending on the number of grounds per mile and the measured level of neutral-to-earth voltage (NEV).

Number of grounds is less than 9 per mile.

1. Measure the NEV with a digital voltmeter. The NEV can be measured between the pole ground and an isolated ground located 50 feet from the pole using insulated wire, or the NEV can be measured between the ground rod wire and the neutral by cutting the wire between the pole ground and the neutral. Measure the NEV approximately every 1/3 mile.
2. Install additional grounds so 9 grounds per mile exist. Install the grounds a minimum of 5 feet from the pole. Megger the new grounds. If the resistance exceeds 25 ohms, install an additional rod in series. If the second rod cannot be installed in series because of rock, install a second rod in parallel located at least 10 feet from the first rod.
3. Measure the NEV on the existing driven grounds. If the NEV exceeds 1.5 volts, megger the rods and install a second rod as explained above if the resistance exceeds 25 ohms.

Number of rods is 9 or more per mile

1. Measure the NEV every 1/3 mile. If the NEV exceeds 1.5 volts, megger the grounds. If the resistance exceeds 25 ohms, install additional rods as explained in 2 above.

Procedure for areas with neutral isolators.

1. Install 9 additional grounds at 25 ohms or less on poles adjacent to the neutral isolator. Measure the NEV before and after installing the additional grounds at neighboring farm transformer grounds. Locate the grounds at least 5 feet from the pole. Install additional rods in series if one rod is not 25 ohms or less. If rods cannot be installed in series because of rock, install the rods in parallel located at least 10 feet apart.
2. If the NEV increases at neighboring farm transformers after the isolator and additional grounds are installed, contact distribution engineering.

Prepared by T. E. Nigon 12-21-67
Revised 1/13/88

O # M W. U. 97 1514

B. Installation of an equipotential plane

Cost: Approximately \$50-\$75 per stall

Company Participation: A grant of 50% of the installed cost not to exceed \$2000. The remaining cost of the installation can be financed by a company guaranteed loan from a cooperating credit union or lending institution upon credit approval.

Advantages: The unit reduces the possibility of an electric potential difference between barn equipment and floor by establishing an equipotential plane between all conducting parts in the barn. The unit improves the on-farm and off-farm grounding system.

C. Installation of neutral isolator

Cost: Approximately \$1000

Customer Participation: The customer is responsible for 50% of the installed cost (\$500) and NSP pays the expense necessary to establish proper grounding on the primary neutral unless the cow contact voltage exceeds 0.5 volts ac rms as recorded during a 24 hour period and is due to the primary NEV as determined by an NSP employee. If the voltage exceeds this recorded level of 0.5 volts and is due to the primary neutral voltage, the isolator may be installed at no cost to the customer. NSP may install other devices than the neutral isolator to minimize the NEV at no cost to the customer if the NEV exceeds the level as discussed above. If the customer is responsible for the \$500 charge, this amount can be financed by a company guaranteed loan from a cooperating credit union or lending institution upon credit approval.

When the voltage measured at the cow contact points is below 0.5 volts and the customer elects to install the neutral isolator on a temporary basis to judge its value, a non-refundable charge of \$200 will be assessed to cover the labor charges. This temporary installation period is approximately 6 months. If the customer elects to have the neutral isolator left as a permanent installation after the six month period, the non-refundable temporary installation charge of \$200 will be considered as part payment and the remaining \$300 of the \$500 total charge will be collected. Place the \$300 contribution in a five-year refundable account and forward a copy of Exhibit #9 (Neutral Isolator Agreement) to General Accounting with the Cash Receipt stub. Whether the isolator is installed originally on a permanent basis, or originally installed on a temporary basis and then made permanent, only \$300 will remain available for refund for a five-year period should the farmer decide to have the unit removed.

If a neutral isolator is installed, install for the customer, at no charge, a Pacer model SVM1 meter. Connect the meter between cow contact points so the customer can monitor the voltage that could affect the behavior of the animals. A suggested cow contact point is the water cup to the rear hoof area. The lead to the rear hoof area should be installed with a lag bolt so the

connection does not become disconnected from the movement of the animal. Instruct the customer on the operation and testing of the SMV1 meter as shown in Exhibit 13.

Advantages: Eliminates the off-farm stray voltage source.

Disadvantages: The installation of the unit increases the primary NEV and does not eliminate on-farm sources of NEV.

The customer signature is required on the agreement explaining the neutral isolator (Exhibit 9). Refer to exhibits 10, 11, and 12 for instructions on the sizing and installation of the neutral isolator. Complete a neutral isolator Record of Installation form as shown in Exhibit 7.

Install additional grounds on the NSP primary neutral to replace the farmstead grounding. A minimum of 9 additional grounds is usually required. Measure the primary NEV before and after installing the neutral isolator and additional grounding. Contact distribution engineering if the primary NEV is higher after the neutral isolator and additional grounds are installed. Install the grounds in accordance with the construction standard shown in Exhibit 15.

D. Update Barn Wiring

Cost: Variable

Customer Participation: The customer is responsible for the entire cost. NSP guaranteed loans are available from cooperating credit unions and lending institutions upon credit approval.

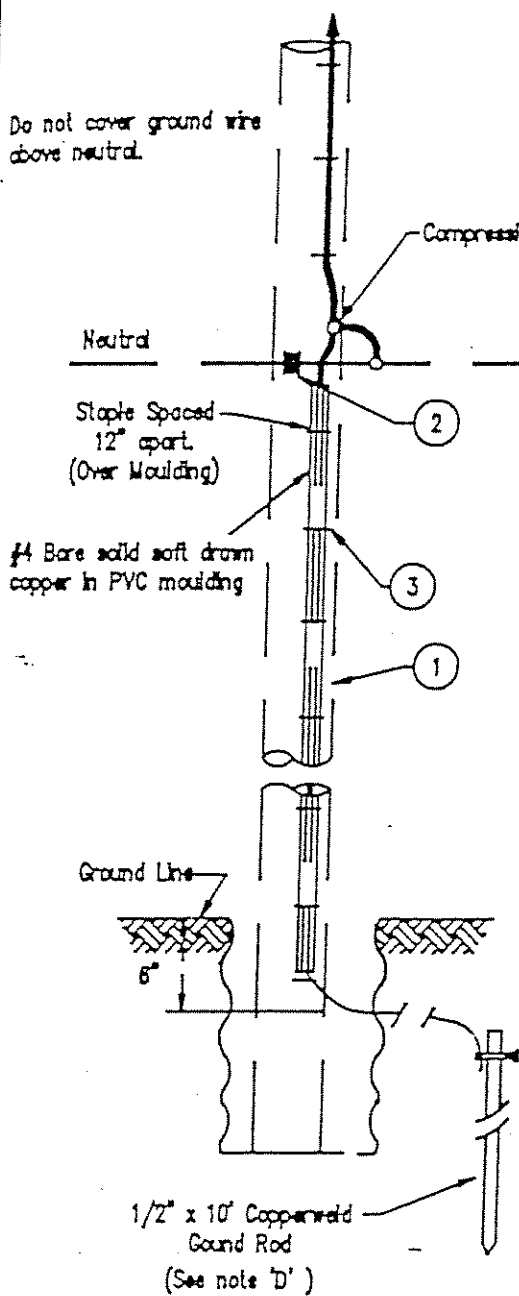
E. Combination of Mitigation Devices

Qualified customers may obtain a grant of 50 percent of the installed cost of an equipotential plane (EPP) and electronic grounding system (EGS) not to exceed \$2,500. A grant for the EGS and/or EPP will not be made if a neutral isolator is installed because the isolator prevents the devices from improving the off-farm grounding.

To Grounded Equipment

Place staples at top & bottom of ground wire run and 24" intermediate locations.

Do not cover ground wire above neutral.



NOTES:

- A. Ground wire shall be run continuous from the ground rod to the upper most grounded equipment connection point on the pole. Moulding over the ground wire is required from the ground line to the system neutral position.
- B. Connections shall be made from ground wire to system neutral for multiground systems. Bond all transformers, regulators, capacitors, sectionalizers, reclosers, arresters, concentric neutrals and all equipment brackets to pole ground wire.
- C. Common neutral system shall have a minimum of 9 driven grounds per mile including transformer and other equipment grounds in accordance with PSC 114.98A3. Measure the resistance of a single driven ground. If the resistance exceeds 25 ohms, install a second ground rod. Stack the second rod if possible. If the rod cannot be stacked because of rock or other impenetrable surfaces, install the second rod in parallel located at least 10 feet from the first rod. Connect the driven grounds with No. 4 bare copper wire if installed in parallel.
- D. Install the driven grounds at least 5 feet from the pole. Do not install the ground rod in the same hole as the pole because this can increase the resistance of the driven ground by approximately 30 percent.
- E. Use only compression type connectors.

COMPATIBLE UNITS NEEDED IN THIS ASSEMBLY

Item	Qty.	Code	Description	Group
1.	1	(Specify)	Pole Assembly	2
2.	1	ICS	Secondary Rock	8
3.	1	GRM4	Ground Rod and Moulding #4	12

Measure the ohmic value of the ground rod. (See note 'C')

► WISCONSIN ONLY

RURAL LINE GROUNDING
#4 COPPER POLE GROUND INSTALLATION
34.5KV AND BELOW

WISC. NOTE

NORTHERN STATES POWER COMPANY DISTRIBUTION STANDARDS AND ENGINEERING	DESIGN RDP	APPROVED	OVERHEAD CONSTRUCTION STANDARDS NSP SHEET OF G-3
	CHECKED		
	DATE 1/12/88	REV. DATE	

STRAY VOLTAGE ANALYSIS REPORT - EXHIBIT 2

CITY Deer Park
 LAST NAME Schachtner
 TAX DISTRICT 7506
 AG REP D. Luchman

DATE 3, 2, 93
 FIRST NAME Richard
 POLE NO. 7506 BB 65G
 RE TEST Y N

TESTING PROGRAM D&I HERD SIZE 50 MILK PRODUCTION 14914 SCC (X 1,000) 567
 ISO XFMR Y N EPP Y N 4WIRE Y N PIPELINE Y
 FENCER/TRAINER INSTALLED OK 10.22 Y N EGS Y N PULSATION Y N
 STANCHIONS or TIE STALLS Y N (no means milking parlor)

Substation Lake Canby No. of miles from substation 23 Grounds in first circuit mile toward substation 10
 End of line N Transformer size 50 KV 13.8 (primary ϕ to gnd)
 Number of primary phases 1 (1, 2, or 3) Secondary service phases 1 (1 or 3)
 Primary phase conductor #6 Cu Neutral conductor #6 Cu

Was the waterline bonded previous to testing? Y N RECORDED
 INST. CONTINUOUS SPIKE
 DATE RECORDER SET 3, 1, 2, 1, 93
 N-E VOLTS AT XFMR GROUND 0.173 1.1 1.6
 N-E VOLTS AT BARN NEUTRAL 0.346 1.0 1.6
 CC W/ RESISTOR 0.805(V_{WR}) 0.45 0.7
 CC W/O RESISTOR 0.107(V_{WO}) $R_s = R(V_{WO} - V_{WR}) / V_{WR}$ $R_s = 270 \text{ ohms}$
 Size of shunt resistor used for testing $R = 470 \text{ ohms}$
 Voltage at primary xfmr ground to ref. ground during maximum CC voltage 0.9
 Voltage at service entrance ground to ref. ground during maximum CC voltage 1.0
 Maximum steady state CC voltage measured with shunt resistor during testing 0.45
 Are off farm sources causing more than 1ma in the CC area? Y N (If yes, do secondary volt drop test)
 CALCULATED SECONDARY VOLT DROP MEASURED SECONDARY VOLT DROP

TEMPORARY ISOLATOR INSTALLED	Y	N	DATE OF INSTALLATION
SERIAL NO. _____			____/____/____
ON FARM			CAT. NO. _____
GROUNDING Y N			OFF FARM
EPP Y N			GROUNDING Y N
EGS Y N			NEUTRAL CONNECTIONS Y N
ISO XFMR Y N			REBUILD LINES Y N
4 WIRE Y N			BURY CONDUCTOR Y N
BALANCE 120 Y N			BALANCE PRIMARY Y N
NEUT CONN Y N			OTHER _____
OTHER _____			

COMMENTS cc Reaches 0.45 at feeding time. Panel that supplies feeding equip. needs to be grounded and split bolts need to be changed to crimps.

STRAY VOLTAGE ANALYSIS REPORT - EXHIBIT 2

CITY Deer Park
 LAST NAME Schachter
 TAX DISTRICT 7506
 AG REP D. Buchman

DATE 3.19.96
 FIRST NAME Richard
 POLE NO. 7506 BB 65G
 RE TEST Y N

TESTING PROGRAM DITZ : HERD SIZE 50 MILK PRODUCTION 15,000 SCC (X 1,000) 600
 ISO XFMR Y N EFP Y N 4 WIRE Y N PIPELINE Y N
 FENCER/TRAINER INSTALLED OK Y N EGS Y N PULSATION Y N
 STANCHIONS or TIE STALLS : Y N (no means milking parlor)

Substation Lake Canby No. of miles from substation 23 Grounds in first circuit mile toward substation 10
 End of line N Transformer size 50 KV 13.8 (primary ϕ to grd)
 Number of primary phases 1 (1, 2, or 3) Secondary service phases 1 (1 or 3)
 Primary phase conductor #6 Cu Neutral conductor #6 Cu

Was the waterline bonded previous to testing? Y N RECORDED
 INST. CONTINUOUS SPIKE
 DATE RECORDER SET 12.27.95 0.36 1.28 1.56
 N-E VOLTS AT XFMR GROUND
 N-E VOLTS AT BARN NEUTRAL 0.41 1.16 1.57
 CC W/ RESISTOR 0.19 (v_{wc}) 0.565 0.692
 CC W/O RESISTOR 0.28 (v_{wc}) $R_s = R(V_{wc} - V_{vt}) / V_{vt}$ $R_s = \underline{231}$ ohms
 Size of shunt resistor used for testing R = 470 ohms
 Voltage at primary xfmr ground to ref. ground during maximum CC voltage 1.55
 Voltage at service entrance ground to ref. ground during maximum CC voltage 1.57
 Maximum steady state CC voltage measured with shunt resistor during testing 0.565
 Are off farm sources causing more than 1ma in the CC area? Y N (If yes, do secondary volt drop test)

CALCULATED SECONDARY VOLT DROP MEASURED SECONDARY VOLT DROP
 TEMPORARY ISOLATOR INSTALLED Y N DATE OF INSTALLATION 1 1
 SERIAL NO. CAT. NO.

ON FARM	OFF FARM
GROUNDING <input checked="" type="radio"/> Y <input type="radio"/> N	GROUNDING Y <input checked="" type="radio"/> N
EFP Y <input checked="" type="radio"/> N	NEUTRAL CONNECTIONS Y <input checked="" type="radio"/> N
EGS Y <input checked="" type="radio"/> N	REBUILD LINES Y <input checked="" type="radio"/> N
ISO XFMR Y <input checked="" type="radio"/> N	BURY CONDUCTOR Y <input checked="" type="radio"/> N
4 WIRE Y <input checked="" type="radio"/> N	BALANCE PRIMARY Y <input checked="" type="radio"/> N
BALANCE 120 Y <input checked="" type="radio"/> N	OTHER _____
NEUT CONN Y N	
OTHER _____	

COMMENTS Ref. Rod lead was chewed off by Rabbit

000583

STRAY VOLTAGE ANALYSIS REPORT - EXHIBIT 2

CITY Deer Park
 LAST NAME Schaachner
 TAX DISTRICT 7506
 AG REP D. Luchman

DATE 3.19.96
 FIRST NAME Richard
 POLE NO. 7506 BB65G
 RE TEST N

TESTING PROGRAM DHI HERD SIZE 50 MILK PRODUCTION 15,000 SCC (x1,000) 600
 ISO XFMR Y EPP Y 4 WIRE Y PIPELINE N
 FENCER/TRAINER INSTALLED OK Y EGS Y PULSATION Y
 STANCHIONS or TIE STALLS Y (no means milking parlor)

Substation Lake Camanche No. of miles from substation 2.3 Grounds in first circuit mile toward substation 1.6
 End of line N Transformer size 50 KV 13.8 (primary ϕ to grid)
 Number of primary phases 1 (1, 2, or 3) Secondary service phases 1 (1 or 3)
 Primary phase conductor #6 Cu Neutral conductor #6 Cu

	Y <input checked="" type="checkbox"/>	N <input type="checkbox"/>	CONTINUOUS	RECORDED SPIKE
Was the waterline bonded previous to testing?				
DATE RECORDER SET <u>12/29/95</u>				
N-E VOLTS AT XFMR GROUND	<u>0.36</u>		<u>2.04</u>	<u>2.18</u>
N-E VOLTS AT BARN NEUTRAL	<u>0.41</u>		<u>1.99</u>	<u>2.23</u>
CC W/ RESISTOR	<u>0.19 (V_{wr})</u>		<u>0.696</u>	<u>0.857</u>
CC W/O RESISTOR	<u>0.28 (V_{wro})</u>		$R_s = R(V_{wro} - V_{wr}) / V_{wr}$	$R_s = \underline{231}$ ohms
Size of shunt resistor used for testing			$R = \underline{470}$ ohms	<u>1.96</u>
Voltage at primary xfmr ground to ref. ground during maximum CC voltage				<u>1.69</u>
Voltage at service entrance ground to ref. ground during maximum CC voltage				<u>0.696</u>
Maximum steady state CC voltage measured with shunt resistor during testing				<u>0.696</u>
Are off farm sources causing more than 1ma in the CC area? Y <input checked="" type="checkbox"/> (If yes, do secondary volt drop test)				
CALCULATED SECONDARY VOLT DROP			MEASURED SECONDARY VOLT DROP	

TEMPORARY ISOLATOR INSTALLED Y N DATE OF INSTALLATION 1 1
 SERIAL NO. _____ CAT. NO. _____

ON FARM				OFF FARM	
GROUNDING	<input checked="" type="checkbox"/>	N		GROUNDING	Y <input checked="" type="checkbox"/>
EPP	Y	<input checked="" type="checkbox"/>		NEUTRAL CONNECTIONS	Y <input checked="" type="checkbox"/>
EGS	Y	<input checked="" type="checkbox"/>		REBUILD LINES	Y <input checked="" type="checkbox"/>
ISO XFMR	Y	<input checked="" type="checkbox"/>		BURY CONDUCTOR	Y <input checked="" type="checkbox"/>
4 WIRE	Y	<input checked="" type="checkbox"/>		BALANCE PRIMARY	Y <input checked="" type="checkbox"/>
BALANCE 120	Y	<input checked="" type="checkbox"/>		OTHER _____	
NEUT CONN	Y	N			
OTHER _____					

COMMENTS _____

1 Q And what does that mean, based on your experience, if
2 the primary goes up the secondary goes up?

3 A Well, number one, it tells us they are interconnected,
4 bonded, if you will. But also, it gives us reason to
5 believe that we have to be careful as we get a --
6 higher levels of voltage on the primary, that it is
7 going to affect the secondary and potentially the cow
8 environment.

9 Q By the way, Mr. Bodman, is it uncommon at all to go on
10 a farm and get low measurements one day and higher
11 measurements other set of days?

12 A Oh, no, we're looking at a very dynamic system, just
13 like talking about maintenance on milking system on a
14 farm. There's maintenance being done at the time on
15 the utility systems, depending on what loads are
16 running on a neighbor farm, may have higher reading
17 today, very low tomorrow, might be better balanced
18 under a different scenario, varies minute to minute.

19 Q But my question is: You weren't aware of any other
20 tests being done on the Schachtner farm. I want to
21 know whether or not you were surprised at all the day
22 you went out there that had lower measurements?

23 A Actually, I wasn't aware of those tests until after I
24 was done with my testing.

25 Q Okay. So in your report, then, that you made on this

1 first visit having done half of the tests -- I think
2 you have a copy of this here?

3 A I don't have a copy. I'm sorry.

4 Q You have don't have a copy. May I ask the witness?

5 First of all, taking into account data that was
6 collected in 1993, 1995 and 1996, and by undated graphs
7 which you have now seen -- I think they were from Mr.
8 Woychik?

9 A Yes.

10 Q Okay. Did you come to an opinion to a reasonable
11 degree of whether or not problematic levels of voltage
12 and its related current were present in the animal
13 environment during those tests?

14 A Yes.

15 Q What is that opinion?

16 A On an intermittent basis, there were problematic levels
17 of voltage present.

18 Q The second opinion or conclusion that you come to is
19 the calibration of the recorder used during the August
20 '93 test would result in detection of voltages which
21 were actually lower than that was present in the animal
22 environment. What are you talking about there, Mr.
23 Bodman?

24 A On page seven of my report I note that the calibration
25 of the system is far from ideal specifically one

1 channel consistently read below zero on the graphs.
2 This will result in a depression of apparent voltage
3 readings of approximately 0.05 to 0.10 volts or
4 five-hundred tenths to a tenth of volt low because of
5 the way the system is calibrated. That's what I was
6 referring to.

7 Q Okay. Okay. '93 those were tests from Northern States
8 Power Company, '93 test?

9 A Yes.

10 Q Based on the testing that you did, Mr. Bodman, did you
11 come to an opinion to a reasonable degree of certainty
12 as to whether or not before certain improvements had
13 been made on a distribution line, that is the increase
14 in voltage and the addition of grounding, as to whether
15 or not the problematic levels of voltage -- let me
16 start again, your Honor.

17 Taking into account your experience and training
18 in the field of stray voltage, Mr. Bodman, and taking
19 into account your review of the documents and
20 particularly NSP's testing, and taking into account the
21 fact that there was additional grounding added,
22 basically 15 ground rods added to the west of the
23 Schachtner farm in 1988 and, in part, 1990 and then in
24 approximately 1990 there was voltage upgrade on the
25 line from 7,200 volts to 13,800 volts, do you have an

1 opinion to a reasonable degree of certainty as to
2 whether or not before these changes problematic levels
3 of voltage, that is voltages causing currents in excess
4 of one milliamp, would have been present in the
5 Schachtner farm?

6 A Yes.

7 Q And what is that opinion?

8 A Based on the data that I had seen, it is more probable
9 than not that the voltages that existed prior to these
10 upgrades would have been even higher.

11 Q Based on the investigation that you did in September of
12 1996, Mr. Bodman, were you able to come to a
13 determination to a reasonable degree of certainty as to
14 the source of those voltages and problematic currents?

15 A Yes.

16 Q What was the source in your opinion?

17 A The predominant source was the primary system, or the
18 utility system.

19 Q Did you find any ground currents on the farm at the
20 time that you were there?

21 A Nothing of any significance.

22 Q Now, after this initial testing, then, in 1996, Mr.
23 Bodman, we ended up being involved in the case and you
24 then came back in September of 1997?

25 A Correct.

1 Q What was the purpose of coming back in 1997?

2 A I had learned -- or you had learned and advised me that
3 an isolation transformer had been installed so that,
4 effectively, the primary and secondary neutrals had
5 been separated; and the purpose of the test or the
6 purpose of the visit was to be able to conduct the set
7 of four tests for more comparisons and a more complete
8 diagnosis.

9 Q And were you able to do that at this time?

10 A Yes.

11 Q Did you conduct all four separate tests here that
12 you've got on Exhibit 736?

13 A Yes.

14 Q And based on those four tests, Mr. Bodman, did you come
15 to any opinions or conclusions about the source of the
16 problematic voltages on the Schachtner farm?

17 A Yes.

18 Q Okay. First of all, let me clarify. In 1997 when you
19 were there, did you find any actual voltages on the
20 farm at that time that were a problem?

21 A No. In fact, in general, the voltages in an animal
22 environment were lower in '97 than they were in '96.

23 Q Okay. So something was getting better?

24 A Things were improving, changes in loads or system;
25 that's correct.

1 Q And the primary system was lower also then?

2 A Yes.

3 Q Showing you what we marked for identification as
4 Exhibit 389A, first of all, what's that?

5 A This is four pages of handwritten notes of what I call
6 -- are labeled as field report forms. This would be to
7 simply identify the test setup and then identifying the
8 different tests. I use a number on the tapes and write
9 a description of what was happening during each one of
10 those testing conditions so I could go back and
11 correlate changes in data with what was actually going
12 on or what I was doing on the farm.

13 Q Those were done in your handwriting?

14 A Yes.

15 Q And are they fairly and reasonably accurate?

16 A Yes, sir.

17 MR. HAMMARBACK: We'd offer Exhibit 389A.

18 MR. THOM: No objection.

19 THE COURT: Received.

20 Q (By Mr. Hammarback, continuing) Then you also made a
21 summary of a test, I believe, from 1997?

22 A Yes.

23 Q And showing you what we marked as 389B, is that one of
24 the -- a copy of that summary?

25 A Yes. This is a summary of the test that I conducted in

1 1997.

2 MR. HAMMARBACK: 1997. Offer 389B.

3 MR. THOM: No objection.

4 THE COURT: Received.

5 Q (By Mr. Hammarback, continuing) Mr. Bodman, what did
6 the test show you, first, in terms of the utility power
7 neutral primary, neutral secondary connected? What did
8 the test in 1997 reveal to you?

9 A I had approximately three-tenths of a volt on both the
10 primary and secondary system, secondary neutrals during
11 most of those tests.

12 Q Did they when they were -- how did you go about -- now
13 in 1997, the isolation transformer was in place?

14 A Right.

15 Q And how do you go about going across the isolation
16 transformer, in other words, reconnecting the primary
17 neutral and the secondary neutral for these tests?

18 A Using a piece of conductor wire, if you will, with an
19 alligator clip on each end and simply going across from
20 the secondary neutral to the transformer to the primary
21 neutral to the transformer, so basically effectively
22 connected again.

23 Q Connected back together?

24 A Right.

25 Q And so basically, they were the same?

1 A Yes. Essentially, they are almost identical.

2 Q Okay. And when you disconnected the two, what
3 happened?

4 A The primary increased by anywhere from about two-tenths
5 to four-tenths of a volt and the -- which was up to 50
6 percent, up to a hundred percent, little more than a
7 hundred percent increase. The secondary system
8 decreased to roughly one-fourth what it was before.

9 Q Which was approximately what?

10 A It is less than a tenth of a volt.

11 Q Okay. Less than .1 volts?

12 A Yes, with -- under the separated condition.

13 Q On either of these tests, Mr. Bodman, did you find
14 anything on the farm that was causing any problematic
15 levels of voltage?

16 A By -- you mean '96, '97.

17 Q Either set?

18 A No, I did not.

19 Q And I take it that -- we'll talk about it in a minute
20 -- but I take it, you did look and found some wiring
21 that may not have met code?

22 A That's right.

23 Q And could have been a cause of stray voltage?

24 A Under some conditions, yes.

25 Q But the fact of the matter is in the Schachtner case --

1 do you have an opinion as to whether or not anything
2 you have seen in terms of the recordings or wiring on
3 the farm was, in fact, a cause of stray voltage, that's
4 problematic levels of voltage, on the Schachtner farm?

5 A Yes.

6 Q And what's that?

7 A Well, although the potential is increased because of
8 the -- some of the wiring conditions, I have seen no
9 documentation by my own or anyone else's that, in fact,
10 those conditions were causing excessive levels of
11 voltage into to the animal environment.

12 Q And under normal operations in the isolated condition,
13 what was the level of voltages in cow contact on the
14 Schachtner farm when you were there?

15 A Say it again, please.

16 Q In isolated condition, the farm equipment operating,
17 what was the level of voltages that you measured in cow
18 contact?

19 A With utility power?

20 Q With utility power.

21 A The highest I had was 55 millivolts or 0.05 volts.

22 Q So five-thousandths of a volt was caused from on the
23 farm?

24 A No, I don't agree with that.

25 Q Okay.

1 A I have to go to the generator power neutral separated;
2 and in that case the voltages were 0.03 volts or
3 roughly 30 millivolts.

4 Q Three-hundredths of a volt?

5 A Three-hundredths or thirty-thousandths of a volt,
6 right.

7 Q Okay. And so whatever the wiring was on the farm and
8 in the isolated condition it was with normal farm loads
9 of three-hundredths of one volt in cow contact?

10 A Under my comparison test, yes.

11 Q Were you able on the second test to check for current
12 flow on the secondary neutral with the farm power
13 utility power off?

14 A Yes.

15 Q And what did you find?

16 A On the neutral conductor itself, given the precision of
17 the recorder, I recorded it zero; but between the
18 jumper, the primary and secondary, I had two-tenths of
19 an amp still flowing from the primary on to the
20 secondary.

21 Q That's .2 amps?

22 A 0.2 amps, yes, technically 0.21 amps.

23 Q If you would now, using the summary that you have got
24 to explain, would you explain to the jury how NSP's
25 distribution line caused the voltages in the Schachtner

1 farm to rise when they were connected? Do you have
2 those tests in front of you there?

3 A What the tests show is that we have voltage on the
4 Schachtner farm due to off-farm sources from off-farm
5 loads, in other words, by the neighbors. We also have
6 voltage, an increased level of voltage, present on the
7 farm due to increased voltage on the primary system due
8 to on-farm loads. In other words, the Schachtner farm
9 demands more electricity, requires more current flow,
10 through the system, the voltage goes up, that in turn
11 is reflected back on the grounded system on the
12 Schachtner farm.

13 Q Based on your experience and training, Mr. Bodman, I'm
14 going to ask you to assume that in 19 -- let me check
15 with Mr. Murray. I've got to check the date and see if
16 it is right. My memory is good but not long. It is my
17 birthday today anyway.

18 THE COURT: Are you saying age has something
19 to do with memory loss?

20 MR. HAMMARBACK: I don't remember.

21 (Whereupon, a brief discussion was held off
22 the record.)

23 Q (By Mr. Hammarback, continuing) Mr. Bodman, I want you
24 to assume that Mr. Reininger made a measurement on the
25 secondary neutral at the service entrance panel in the

1 milk house in 1995 and that he measured one and
2 one-half amps with a clamp-on hand meter with the farm
3 power disconnected at the disconnect. Assuming that to
4 be true, that he testified to that, and taking into
5 account the measurements you made, can you come to an
6 opinion to a reasonable degree of certainty as to what
7 level of voltage or current in the cow contact -- let's
8 do voltage first -- voltage in the cow contact that
9 level of current would have caused given the
10 measurements that you made?

11 A Yes.

12 Q And what is that opinion?

13 A Given the increased current level that was measured in
14 earlier time, it is more probable than not that the
15 voltage levels that were present would also have been
16 higher conceivably by a factor of seven or seven and a
17 half times. That would be probably an upper maximum.

18 Q And so based on the measurements that you made if we
19 are just talking about a voltage, what level of voltage
20 would that be in cow contact?

21 A Given the voltage that I have measured in 1996 which
22 were a little higher, conceivably up to seven-tenths or
23 eight-tenths of a volt range.

24 Q And the sole source of that voltage would have been
25 what?

1 A I can't answer that.

2 Q With the power off at the farm?

3 A Oh, with the power off?

4 Q Yes.

5 A Yes, that would have been from the primary system.

6 Q NSP's system?

7 A Correct.

8 Q And based on your knowledge of the resistance of dairy
9 animals and taking in account your knowledge of the
10 electrical system on the farm and the measurements that
11 you have made, do you have an opinion to a reasonable
12 degree of certainty as to whether or not NSP would have
13 been causing more than one milliamp of current flow on
14 the farm at that time, that is 1995?

15 A Yes.

16 Q What is that opinion?

17 A They would have, in fact, be causing more than one
18 milliamp of current flow, given all the data I have
19 seen to date.

20 Q Now, if we go back to -- Mr. Bodman, you have also been
21 made aware of certain testing that Northern States
22 Power Company did on the Schachtner farm?

23 A Yes.

24 Q I don't know if you can see this from there. Let's use
25 this one here. First directing your attention to

1 Exhibit 653, date 12/29/95. You can go ahead and stand
2 right up. If we take a look at the measurements made
3 here, first of all, based on the measurements here and
4 based on the information that you have on the farm
5 wiring, looking at Exhibit 653, do you have an opinion
6 to a reasonable degree of certainty as to whether or
7 not Northern States Power Company was causing more than
8 one milliamp of current flow in cow contact as of 12/29
9 of 1995?

10 A Yes.

11 Q What is that opinion?

12 A They were in fact causing a current flow of more than
13 one milliamp in the cow contact as evidenced by the
14 data.

15 Q And explain how you come to that decision?

16 A Here we have cow contact, with a resistor on a
17 continuous basis we have 696 millivolts or 0.696 volts.
18 And they say the size of the shunt resistor is 470
19 ohms. Then if we divide those out that's a current
20 flow of 1.48 milliamps.

21 Q Now, there's a statement down here that we're looking
22 at and it says are off-farm sources causing more than
23 one milliamp of cow contact here? Do you see that
24 statement?

25 A Yes.

1 Q And it is circled no.

2 A Yes.

3 Q And is that right?

4 A Not based on their data it is not.

5 Q Okay. And just looking at this sheet alone without the
6 other information that you have on the isolation and
7 the generator test, can a person come to that
8 conclusion one way or the other?

9 A Not that it is all off farm they can't, no because it
10 is more than one milliamp. But by itself it doesn't
11 tell us it is all off farm.

12 Q What additional testing should have been done at that
13 point in your opinion?

14 A You need to look at the on-farm contribution. The
15 tests that were done there's no way of knowing what
16 portion is off-farm what portion is on-farm.

17 Q Can you tell us whether or not they would have been
18 able to tell if they had just tested an isolated farm
19 to see if that's what happened?

20 A That's important first step, yes.

21 Q And in all of the information you saw from Northern
22 States Power Company up until 1998, did they ever
23 isolate the farm to find out what was coming in from
24 off the farm?

25 A Not to my knowledge, no.

1 Q Okay. Then, in addition, to this particular test
2 there's another one similar, 12/27/95, and I'm showing
3 the jury here Exhibit 652. And looking at NSP's own
4 testing. At all, again -- first of all, do you have an
5 opinion as to whether or not there was more than one
6 milliamp of current flow at the Schachtners' farm as of
7 12/27/95?

8 A Yes.

9 Q And then there was one, in fact, one milliamp current
10 flow in the cow contact. How do you come to that
11 conclusion?

12 A Once, again, look at the voltage with the resistor
13 which was 0.56 -- 565 volts or 565 millivolts. We have
14 a resistor of 470 ohms. Divide those out that's 1.20
15 milliamps.

16 Q Okay. Based on your knowledge and training and based
17 on the further tests that you took and all the
18 information that you reviewed, do you have an opinion
19 as to whether or not NSP itself was contributing more
20 than one milliamp to the cow contact area?

21 A Yes.

22 Q What's that opinion?

23 A Indeed it was, based on the tests that I have
24 conducted.

25 Q Once again he's got are off-farm sources causing more

1 than one milliamp in the cow contact area and that's
2 no.

3 A Correct.

4 Q And is that right based on what you know now?

5 A Well, number one, these calculations themselves don't
6 tell us that; and number two, the test reading is
7 incomplete to draw that conclusion.

8 Q Let's back up to 1993. Exhibit 651, again, from
9 Northern States Power Company testing 8/2/93. Okay.
10 At this time, first of all, is this a recording graph
11 that you looked at that was miscalibrated by a tenth of
12 a volt?

13 A Yes. It was 1993 data.

14 Q Okay. And if we look, then, at the cow contact with a
15 resistor here, what reading do we have?

16 A 0.45 volts, or 450 millivolts.

17 Q And with spikes to what?

18 A Seven-tenths of a volt, or 700 millivolts.

19 Q And then with that resistor in place, 470 ohms, first
20 of all, based on what you know, Mr. Bodman, and looking
21 at these tests results, do you have an opinion to a
22 reasonable degree of certainty as to whether or not one
23 milliamp of the current was existing in the cow contact
24 area of the Schachtner farm as of August 2nd, 1993?

25 A Yes.

1 Q What is that opinion?

2 A Given the miscalculation of it and the instance that we
3 use, in this case, if I increase this voltage by either
4 five-hundredths or one-tenth of a volt and divide by
5 470 ohms, it was more than one milliamp.

6 Q And based on your testing and taking this into account,
7 is it more probable than not -- can you tell us whether
8 it was more probable than not that the majority of that
9 current was coming from Northern States Power Company?

10 A Yes.

11 Q What is that opinion?

12 A Based on my test, now, with everything I've looked at,
13 yes, the majority of that was coming from the NSP
14 lines.

15 MR. HAMMARBACK: Okay. This would be a good
16 time to break if the Court wants to.

17 THE COURT: All right. Recess for lunch.

18 (Whereupon, a lunch recess was taken.)

19 (In the courtroom, in the presence of the
20 jury.)

21 THE COURT: All right. You are still under
22 oath. Let's proceed.

23 Q (By Mr. Hammarback, continuing) Mr. Bodman, early on
24 in the study of stray voltage, particularly in the 70's
25 and 80's, did people become aware of some problems on

1 distribution lines where farms were isolated from stray
2 voltage and its problems?

3 MR. THOM: I'm going object to foundation,
4 your Honor.

5 THE COURT: Sustained.

6 Q (By Mr. Hammarback, continuing) Isolation is one of the
7 things that's used to alleviate extraneous or stray
8 voltage from a dairy farm if coming from the power
9 line?

10 A That is correct. That is one methodology.

11 Q And after a while, after some farms had been isolated,
12 what, if any, effects were noted from the isolation of
13 isolators as relates to the primary distribution line?

14 A What was found -- and again, yeah, what was found was
15 as we continually increase the number of farms that are
16 isolated, we tend to increase the voltage on the
17 primary neutral.

18 Q Now, we've received records in this case and there's
19 been some testimony from a Mr. Tom Dalton and you've
20 seen some of that information?

21 A Yes.

22 Q And showing you and the jury Exhibit 649, have you had
23 a chance to take a look at that?

24 A Yes.

25 Q Now, if we look at Exhibit 601 here, Mr. Bodman, a line

1 map, can you locate Mr. Dalton's farm on the top left
2 corner of that?

3 A Yes.

4 Q And then the Schachtner farm?

5 A Is here in the center.

6 Q Yes. And I'm going to ask you so assume that those two
7 farms are about eight-tenths of a mile apart?

8 A Okay.

9 Q And taking that into account and assuming in 1988 the
10 grounding was as we see it here on Exhibit 601, and
11 then assuming that the Tom Dalton farm was isolated on
12 March 15th of 1988, do you have an opinion to a
13 reasonable degree of probability as to whether or not
14 such isolation would effect the primary
15 neutral-to-earth voltages as they arrived at the
16 Schachtner dairy?

17 A Yes.

18 Q What is that opinion?

19 A We would expect the isolation of the Dalton farm to
20 increase the voltage on the primary neutral that was
21 present or serving providing electricity to the
22 Schachtner farm.

23 Q Why would it do that?

24 A Well, we've lost some of the grounding; and usually the
25 grounding, as I said earlier, the grounding on a farm

1 is usually fairly good. It is a low resistance
2 compared to individual ground rods.

3 Q Now, on the test that NSP did, which is Exhibit 649,
4 does it show what happened to the voltage on the
5 neutral when that farm was isolated?

6 A Yes.

7 Q And could you point that out to the jury, please, as to
8 what happened when it was isolated?

9 A Well, the neutral-to-earth voltage of the primary
10 neutral before installation -- isolation was 0.55
11 volts. When they isolated the primary neutral, voltage
12 went up to three and a half volts.

13 Q Okay. And in addition, on cow contact on the Tom
14 Dalton farm, it was showing what before isolation?

15 A The 0.55 volts.

16 Q And after isolation?

17 A 0.02 volts.

18 Q Two-hundredths of a volt?

19 A Yes.

20 Q So in that particular case, based on your experience,
21 what -- what was coming from NSP in that situation?

22 A Approximately 0.53 volts.

23 Q Now, with that isolator installed on March 15th of 1988
24 and with the primary neutral voltage rising to three
25 and a half volts afterwards, based on your experience,

1 what should NSP have done, if anything, to check with
2 neighboring farms about the effects of that rise in
3 primary neutral-to-earth voltage?

4 A With a substantial increase it would be prudent to
5 advise other areas farmers within a mile of the farm
6 for increased potential of problems.

7 Q By the way, if we look at voltage and related current
8 flow on those two charts, the factor that the voltage
9 increased 6.4, in other words, three and a half is 6.4
10 times greater than .55, okay. If we go down the line,
11 then, I want you to assume that there was in force at
12 that time a policy from NSP which is marked Exhibit
13 704A. And you've seen this before?

14 A I have.

15 Q Okay. If we go down this, first of all, based on your
16 experience and training, Mr. Bodman, and taking into
17 account the knowledge of the measurements that were
18 made on the Schachtner farm and also on the Dalton
19 farm, do you have an opinion to a reasonable degree of
20 certainty as to whether NSP complied with its own
21 policy as it relates to the isolation of the Tom Dalton
22 farm?

23 A Yes.

24 Q What is that opinion?

25 A They did not comply with their own policies.

1 Q Why not?

2 A Well, they didn't -- first off, they didn't advise any
3 of the neighboring farmers and they did not install
4 additional grounding at that time as their policy
5 provided for.

6 Q Okay. If we look down to the very bottom thing, number
7 two is if the NEV increases at a neighboring farm
8 transformer after the isolator and additional grounds
9 are installed, contact distribution engineering. As
10 far as you know is there any record that after the Tom
11 Dalton isolation anyone contacted Schachtner farm at
12 all?

13 A Not to my knowledge.

14 Q Now, in addition to the isolator being installed, do
15 you know of anybody measuring the grounds, measuring
16 the NEV every one-third mile to find out if it exceeded
17 one and a half volts?

18 A No. The only data I have seen is this particular
19 installation.

20 Q And, in fact, at the transformer on the Dalton farm, it
21 was three and a half volts?

22 A That's correct.

23 Q Which would have exceeded their guideline?

24 A That's correct.

25 Q Okay. Mr. Bodman, do you have an opinion to a

1 the sources?

2 A Yes. There had been such a policy in place.

3 Q And, in fact, have any records ever been provided that
4 that policy was followed?

5 A Not that I have seen; no, sir.

6 Q So if we look at the Tom Dalton farm, which is up here
7 on Exhibit 749, I'll direct your attention to Exhibit
8 675, which is a policy, here, of the Northern States
9 Power, a policy, which identified by Mr. Gunther, and
10 note the characteristics of the form, here, compared to
11 Exhibit 649. Does that appear to be the same?

12 A It appears to be identical, yes.

13 Q If we follow on to the next page, second page after
14 that, to Exhibit 4 from 675, what do we see in terms of
15 the testing that should have been done in 1988 on the
16 Tom Dalton farm?

17 A Well, all of the voltages are supposed to be measured
18 with or without a resistor and then with the highest
19 value recorded. There were normal farm loads on power
20 to farm turned off. They went 240-volt loads on, so we
21 had on the primary neutral, not farm neutral, 120 volt
22 loads too. So we maximize current on the secondary
23 neutral then we isolate the farm with normal on-farm
24 loads, separate the primary and secondary neutral.

25 Q And then the results of those tests would have been

1 different locations of cow contact in 1996?

2 A No.

3 Q Okay. Anything about this load box test that NSP did
4 that would make you want to rethink in any way your
5 opinions concerning the sources of voltage and
6 problematic currents on the line affecting Schachtner
7 farm?

8 A Not what I looked at, of everything I have seen in this
9 case so far, no.

10 Q What's your understanding of the number of grounds that
11 existed or should have existed in each mile of line as
12 of January 1st of 1988 on a rural system in Wisconsin?

13 A Should have been nine.

14 Q Okay. And if we look at Exhibit 601, and going to the
15 west, there, do you have an opinion to a reasonable
16 degree of certainty as to whether or not Northern
17 States Power Company had adequate grounding to meet the
18 minimum code requirements in Wisconsin as of January
19 1st of '88?

20 A Yes.

21 Q What's that opinion?

22 A They did not meet code.

23 Q And show why not.

24 A Well, we have marked, here, on the Exhibit one mile of
25 the farm; but I don't know if that includes these spurs

1 or not.

2 Q It does.

3 A That includes this distance and this distance as well.

4 That is from the main line to the individual grounds.

5 And therefore, we would have one, two, three, four,

6 five -- it looks like five, possibly six -- five or

7 six. Depends on how it is counted.

8 Q Based on voltage readings you saw, Mr. Bodman, was the
9 grounding adequate for the service that was provided to

10 the Dalton and the Schachtner farm?

11 A No.

12 Q Why do you say that?

13 A Well, we have elevated voltages, over three volts with

14 Dalton isolated, plus the voltages in the cow

15 environment on Schachtner farm were higher than

16 considered acceptable.

17 Q Professor Bodman, is it your opinion to a reasonable

18 degree of certainty that the failure to provide

19 adequate grounding was a part of their failure to

20 provide adequate service to the Schachtner farm?

21 A Yes, indeed.

22 Q And how did that come into play?

23 A Because with a reduced grounding, the -- in a short

24 section of line, the resistance of that line is going

25 to be marginally higher so we're going to have greater

1 proportion of the current from the neutral returning to
2 other pathways including the Schachtner farm.

3 Q Do you have an opinion, Mr. Bodman, to a reasonable
4 degree of certainty as to whether or not NSP's conduct
5 in failing to check the Schachtner farm when it
6 isolated the Dalton farm was a reckless disregard of
7 its obligations under its policies?

8 A Yes.

9 Q What's that opinion?

10 A Indeed, it was. It was contrary and reckless in my
11 judgment.

12 Q And was that a cause of damages that the Schachtner
13 farm sustained?

14 A Yes, sir.

15 Q Mr. Bodman, I've had you look at Exhibit 602. I'm
16 going to put it up back here and sit it here so
17 everybody can see?

18 MR. HAMMARBACK: Sorry.

19 MR. THOM: Your Honor, may we approach?

20 THE COURT: Yes.

21 (Whereupon, a side-bar discussion was held
22 off the record.)

23 Q (By Mr. Hammarback, continuing) Mr. Bodman, I would
24 like to you step up here for a moment. And first of
25 all, I'd ask you to assume that this is an exhibit that

1 thousand dollars, charges that the Schachtners will
2 look at?

3 A If it goes to \$15,000, I would be very, very surprised.
4 I don't think it is that much.

5 Q All right. And that's without having done the
6 individual work-up on each of these things yourself?

7 A Right.

8 Q Okay. On the USDA -- well, strike that. Before we get
9 that on the inadequate service issue, under the
10 definition of Exhibit 703 here, and I ask you to listen
11 to this as it is in evidence: The commission does not
12 view the dairy farm customers in need of neutral
13 isolation service because of off-farm utility
14 conditions as special needs customers. If the utility
15 system is causing stray voltage in the cow contact area
16 greater than 1.0 milliamperes and the utility fails to
17 mitigate the stray voltage problem in a manner required
18 by this order and the commission's order of August 10th,
19 1989, the utility is not providing adequate service to
20 that customer. Providing a system that does not cause
21 stray voltage problems to the customer is to be
22 considered basic service, not special needs.

23 Taking into account adequate service in your mind,
24 Mr. Bodman, and going from 1989 and 1990, after these
25 voltage upgrades were made, to the time that the

1 isolator was installed at the Schachtner farm, do you
2 have an opinion, assuming this definition to be the
3 accurate working one of 703, as to whether or not
4 Northern States Power Company failed to provide
5 adequate service?

6 A Yes.

7 Q And what is that opinion?

8 A They failed to provide adequate service based on the
9 tests we have seen.

10 Q Based on their testing at the Tom Dalton farm and their
11 reactions to that, do you have an opinion as to whether
12 or not their failure to provide this adequate service
13 was reckless?

14 A Yes.

15 Q What is that opinion?

16 A It was a failure to follow the recommendations and the
17 requirement of the agency, as Mr. Thom said, governs
18 what they were allowed do -- they are allowed to do.

19 Q You said that if you don't do the generator test,
20 there's a portion in the system that may not get tested
21 that can cause a problem?

22 A Right.

23 Q And having looked back over at your data, is there a
24 potential explanation for the difference in the
25 currents that you saw?

1 MR. HAMMARBACK: Yes, it would be a page in
2 717.

3 THE COURT: 717. So part of Exhibit 717, and
4 this is marked 703?

5 MR. HAMMARBACK: Right.

6 THE COURT: Okay. Any objection?

7 MR. THOM: No.

8 THE COURT: Received.

9 Q (By Mr. Hammarback, continuing) Mr. Woychik, from an
10 electrical point of view, I'd like to publish to the
11 jury the Commission's order here which says as follows
12 -- so would you read it to them please and read it loud
13 so they can hear it?

14 A The Commission does not view the dairy farm customers
15 in need of neutral isolation service because of
16 off-farm utility conditions as "special needs"
17 customers. If the utility system is causing stray
18 voltage in the cow contact area greater than 1.0
19 milliamp and the utility fails to mitigate the stray
20 voltage problem in a manner required by this order and
21 the Commission's order of August 10th, 1989, the
22 utility is not providing adequate service to that
23 customer. Providing a system that does not cause stray
24 voltage problems to the customer is to be considered
25 basic service, not special needs.

1 Q And then on the bottom of that there's an amendatory
2 paragraph. And why don't you just read that to the
3 jury, too?

4 A And was intended to be grounded upon and is grounded
5 upon utilities first being notified, or discovering,
6 that a potential stray voltage problem exists and
7 having a reasonable opportunity to investigate the
8 matter and to correct any stray voltage problem caused
9 by the utility system in a manner required by the
10 orders.

11 Q Okay. Now, if we take that and apply it to this case,
12 we need to do a couple of things because we have been
13 talking about voltage, right?

14 A Yes.

15 Q And what is a milliamp here?

16 A A milliamp is one-thousandth of an amp.

17 Q So .001 amps?

18 A Yes.

19 Q And milliamp is abbreviated mA?

20 A Yes.

21 Q Equals 0.001 amps, right, or one one-thousandth of an
22 amp?

23 A Yes.

24 Q And to put this in some kind of perspective, if we have
25 like a ground fault circuit interrupter in the bathroom

1 A Yes, they are exceeding their recommendations of this
2 article.

3 Q (By Mr. Hammarback, continuing) Okay. Do you know if
4 NSP -- or have you been made aware of any changes that
5 NSP did or monitoring of the Schachtner farm between
6 1993 in August when those tests were made and when you
7 were out there in January of 1996?

8 A I am not aware of changes.

9 MR. HAMMARBACK: Exhibit 653 we would offer,
10 your Honor, test summary from 12/29/95.

11 THE COURT: Any objection?

12 MR. THOM: No objection.

13 THE COURT: Received.

14 Q (By Mr. Hammarback, continuing) Mr. Woychik, looking at
15 Exhibit 653, cow contact area on the Woychik farm,
16 470-ohm resistor in place, voltage level of .696, at
17 that time can you tell us whether or not they were over
18 the level of concern as previously described?

19 A Yes. Schachtner farm?

20 Q I'm sorry.

21 A Not Woychik.

22 Q I apologize. They were over the level of concern?

23 A Sure.

24 Q Based on the definition I gave, were they providing
25 adequate service?

1 A No.

2 Q Day earlier --

3 MR. HAMMARBACK: Exhibit 652 offered.

4 MR. THOM: No objection.

5 THE COURT: Received.

6 Q (By Mr. Hammarback, continuing) Cow contact with the
7 resistor, .565 volts, 470-ohm resistor, is that over a
8 milliamp?

9 A Yes.

10 Q Were they providing adequate service?

11 A No.

12 Q Okay. Now, if you look at the higher voltages, the
13 spikes, some of those go up to a volt and a half?

14 A That's correct.

15 Q And in terms of the milliamps, then, that are provided
16 by a 470-ohm resistor, that would be --

17 A Three mill --

18 Q Be about three milliamps?

19 A Yes.

20 Q Your test that you took in January of 1996, about a
21 month after this, also showed voltages in cow contact,
22 referring back to Exhibit 667 here, in excess of half a
23 volt?

24 A Yes.

25 Q And did that have a 470-ohm resistor in place?

1 A Yes.

2 Q Did that also exceed the level of concern we've talked
3 about?

4 A Yes, it did.

5 Q Was NSP providing adequate service at the --

6 A Not at this level, no.

7 Q You did your load box testing, Mr. Woychik, in
8 February, we believe, of 1996. And your load box test
9 with just NSP's contribution on there based on your
10 testing, did that exceed one milliamp of cow contact?

11 A Yes, it did.

12 Q And did NSP provide adequate service to the Schachtner
13 farm at that time?

14 A No. That day, no.

15 Q Now, when you were there and did your load box test,
16 Mr. Luehman had seen those results that you had. You
17 showed them to him, didn't you?

18 A Yes. Yes.

19 Q And your conclusion, after showing him those tests and
20 the voltages that you got, was that he was going to do
21 what about it?

22 A Mr. Luehman -- I understand now we're getting the names
23 correctly, but I believe it was Dennis Luehman, Loomis,
24 Luehman, we didn't go through the tape itself, but he
25 was there, and the digital readings were available to

1 him, and he did monitor that.

2 Q Now, the earlier Public Service Commission orders that
3 we had I think were in effect until -- where's our
4 latest -- the newest version 115?

5 A That's not it.

6 Q That's it on July. On July 17th, 1996, if you assume
7 that NSP at that point can't contribute more than a
8 milliamp to cow contact, taking that into consideration
9 and saying that's the limitation, did the testing that
10 you did in February exceed the new Commission order
11 even as of July of 1996?

12 A Yes, it would have.

13 Q Okay. And under the new Commission order, would NSP
14 have been providing adequate service to the Schachtner
15 farm?

16 A No.

17 Q You're familiar with Professor Gerald Bodman?

18 A Yes.

19 Q Do you find him authoritative in the field of stray
20 voltage?

21 A Yes.

22 MR. HAMMARBACK: Your Honor, we have 715
23 previously noticed as a learned treatise to the
24 defendant's comments of the Minnesota Department of
25 Public Service on stray voltage rule making.

1 MR. HAMMARBACK: Objection. Foundation.

2 THE COURT: Overruled. Can you answer that?

3 THE WITNESS: I don't understand the
4 question.

5 Q (By Mr. Thom, continuing) Unless we determine and do a
6 load box and determine what is coming from the utility
7 system, there's no basis to determine whether or not
8 there's inadequate service as defined by the PSC
9 orders, correct?

10 A You're asking me to answer something I wasn't involved
11 in, and I don't know the circumstances of this test. I
12 only see the results.

13 Q What test are we talking about now?

14 A The test in, I believe, 1995.

15 Q Well, there were three of them there. All I'm trying
16 to -- I'm trying to find out, Mr. Woychik, was what was
17 the basis for your saying NSP provided inadequate
18 service with respect to 651, 652 and 653 where there
19 was no determination as to what amount of the cow
20 contact recorded there was NSP contribution?

21 A Okay. Now I follow the questions because in 1996 when
22 I ran the load bank test, I found there was no
23 contribution by farm; therefore, my answer was based on
24 my findings of 1996 when I answered the question
25 pertaining to this. The circumstances on the farm

1 previous to that were somewhat identical.

2 Q So you're not saying that 651, 652 and 653 show any --
3 anything that was -- that can be argued as being
4 inadequate service?

5 A Oh, it is over one volt, yes. And you have to find out
6 where it's coming from.

7 Q What's over one volt?

8 A I mean, it is over the half volt.

9 Q That's correct. And until we find out what's coming
10 from the utility, we can make no determination,
11 correct, as to inadequate or adequate service?

12 A Well, you definitely want to find out what the
13 contribution is.

14 Q I understand that, and you can't tell that from those
15 documents, can you?

16 A No, I'm assuming, as I stated earlier, the situation
17 was the same as when I was there in '96. Based on
18 that, my answer is yes.

19 Q Okay. And other people checked -- tested both before
20 and after you and didn't find what you found in
21 February, correct, with your load box?

22 A I'm not aware of that.

23 Q And that happens to be the load box where we don't have
24 a single piece of information from, correct, that test?

25 A Oh, that test, yes.

1 Q Back when the Dalton farm was isolated, Mr. Luehman,
2 looking back on that in retrospect, do you think NSP
3 should have checked the Schachtner farm at the same
4 time that the Dalton farm was isolated?

5 A Considering the grounding that went in before
6 isolation and the distance between the farms, and I
7 don't know what was known then, but what I know now, I
8 don't think it was necessary.

9 Q Don't think they had to do that?

10 A No.

11 Q At the Dalton farm, the only thing we really know is
12 number one, the NSP crew that did it didn't follow the
13 NSP procedure to do a line profile, did they?

14 A I don't think it called for a line profile.

15 Q If we look at Exhibit 704-A under procedure for areas
16 with neutral isolators, what it says is install nine
17 additional grounds at 25 ohms or less on poles
18 adjacent to the neutral isolator. Measure the NEV
19 before and after installing the additional grounds at
20 neighboring farm transformer grounds. Locate the
21 grounds at least five feet from the pole, right?

22 A Yes.

23 Q And so if they were measuring the NEV, were they
24 measuring it on the poles or not?

25 A Only at neighboring farms. A profile in my

1 definition, Mr. Hammarback, is you measure every pole.
2 Q We go back up to the first thing. Now, first of all,
3 the number of grounds back when they got there was
4 less than nine per mile, right?

5 A Yes.

6 Q So this first paragraph would apply?

7 A Well, I -- these two --

8 Q First paragraph apply?

9 A Maybe not in this situation. I believe you're
10 bringing in a redundancy. Either this is followed,
11 but if an isolator is involved, this is followed.

12 Q The procedure, as I understand it and according to the
13 Dalton notes, is back in '88 on the first visit they
14 went in, took some measurements, found that the
15 voltage was over half a volt in cow contact?

16 MR. THOM: Object to the form of the
17 question, Your Honor.

18 THE COURT: Overruled.

19 BY MR. HAMMARBACK:

20 Q And at that time, then, what they tried to do is
21 actually, they tried to add some grounding?

22 A Yes.

23 Q And the note is that the grounding didn't seem to
24 help?

25 A Yes.

1 MR. HAMMARBACK: Yes, sir. Call Mr. Bob
2 Reininger.

3 THE COURT: Okay.

4 ROBERT REININGER

5 being first duly sworn upon oath to testify to
6 the truth, the whole truth and nothing but the
7 truth, testified as follows:

8 DIRECT EXAMINATION

9 BY MR. HAMMARBACK:

10 Q Would you state your name for the record, please, sir?

11 A Robert Reininger.

12 Q And where are you from?

13 A Rice Lake, Wisconsin.

14 Q And your occupation?

15 A HPI rep for Associated Milkiers -- Milk Producers
16 Incorporated.

17 Q You were here during Mr. Bonte's testimony?

18 A Yes, I was.

19 Q And, basically, what does an HPI specialist do?

20 A Basically, what he does, he goes out, and he checks all
21 of the equipment. He does an air flow reading on the
22 vacuum pump to make sure that the proper air flow is
23 there to accommodate the units and the milking
24 equipment pulsation. And he wants to make sure that
25 the cows are comfortable through the milking process.

1 really malfunction in order to cause a problem.

2 Q So you tested the pulsators, right?

3 A Yes.

4 Q Were they working okay?

5 A I believe they were, yes.

6 Q So this was kind of a precautionary measure you made?

7 A It was kind of a -- it was kind of a recommendation to

8 look for -- for a lower cell count, too, we felt that

9 could maybe be an irritation problem on the count.

10 Q All right. What else did you do when you were there?

11 A Nothing, really. Pulsators, that was about the only

12 suggestion I made here on that day.

13 Q Now, on Exhibit 220B, what date does that relate to?

14 A 220B?

15 Q Yes.

16 A That was an evaluation of the milking system.

17 Q When was that?

18 A That was on July 13th, 1995.

19 Q Now, is -- did you do any other measurements or tests

20 on the farm on Exhibit 220B?

21 A Yes, I believe I did. I did do a check on the neutral.

22 Q What neutral might that be?

23 A That was on the main entrance panel.

24 Q Now, we got a couple of photographs of that here

25 somewhere. Let's see, exhibit -- you have a black and

1 white copy here of that picture. There you go. So
2 you've got Exhibit 227, here, in evidence, and that's a
3 black and white, small kind of version of this one,
4 which is Exhibit 714, right?

5 A Yes.

6 Q So let's use 714. Did you make a measurement, then, of
7 the neutral in this service entrance panel that's
8 Exhibit 714?

9 A Right, I clamped right on that neutral.

10 Q When you say you clamped on it, how do you that?

11 A With a Fluke meter.

12 Q Now, we've heard that Fluke meter name a couple times,
13 what is that?

14 A That's a digital readout meter that measures voltage,
15 ohms, milliamps, it is --

16 Q It is a brand name, right?

17 A It is a brand, right, yes.

18 Q So a type of electrical digital meter?

19 A That's correct. And I use it on checking pulsation on
20 pulsation stall clocks, electric pulsators. I check it
21 and read the ohms on electric pulsation for the -- I
22 use that meter for a lot of things.

23 Q Okay. And one of them is checking the neutral current?

24 A Well, Schachtner asked me to check it, and did I check
25 it.

1 Q Now, how did you go about checking it?

2 A Well, first of all, we clamped on there. We wanted to
3 check it, see how many amps we had on the neutral. I
4 talked to Wisconsin Public Service Commission, Dan
5 Dasho, at the time at a meeting we had over by --

6 MR. THOM: Object. Hearsay, your Honor.

7 MR. HAMMARBACK: It does go for the truth of
8 the matter certified, your Honor, for the reason he did
9 it.

10 THE COURT: Wait a minute. He talked to him,
11 but what this fellow says is hearsay.

12 MR. HAMMARBACK: Let me ask it to you this
13 way.

14 Q (By Mr. Hammarback, continuing) As a result of your
15 conversation with Mr. Dasho, did you make specific
16 measurements?

17 A He told me --

18 Q No, not what he told you. What did you do in response
19 to what he said?

20 A I checked the amperage on the neutral to see if it was
21 within the parameters that he had stated.

22 MR. THOM: I'm going to object, your Honor,
23 hearsay.

24 THE COURT: I'll allow that, but be careful
25 not to say what this fellow said.

1 MR. HAMMARBACK: Only six more minutes.

2 We'll make it, okay?

3 Q (By Mr. Hammarback, continuing) It is a legal rule we
4 have you have to testify from what you say yourself,
5 not from what someone else said.

6 A Oh, okay.

7 Q Okay. So, anyway, there's a range that you use?

8 A Right.

9 Q Let me ask it to you that way. What's the range?

10 A The range -- I checked to see how well the 110 circuits
11 are balanced on the neutral.

12 Q Okay.

13 A And then I had one of the Schachtner guys go out and
14 pull the whole top down, and we shut the farm
15 completely off.

16 Q First let me ask you this. There's two things. So the
17 balance on 100's that's what you're checking for,
18 on-farm imbalance, right?

19 A Well, anything over five amps of the neutral is
20 excessive.

21 Q Okay. And did you find any on-farm imbalance?

22 A Not that much.

23 Q Okay. And so, then, the next test that you made was
24 you had one of the Schachtners go out and pull down the
25 pole disconnect at the main pole?

1 A Yes, and I had one and a half amps on that neutral.

2 Q With the whole farm shut off?

3 A With the whole farm shut off, and that was too much.

4 Q And why do you say that was too much?

5 A Well, I like to see the meter at zero.

6 Q Now, when the farm is shut off like that right at the
7 meter pole, based on your knowledge of electricity and
8 working with milking equipment, where's the only place
9 that current can be coming from?

10 A It would have to be coming from feeding if from the
11 utility side.

12 Q You've been on the Schachtner farm about how many times
13 over the years, would you say?

14 A Well, several.

15 Q Okay. And you were there, you're familiar with the
16 fact that there's an isolation transformer out there
17 now?

18 A Yes.

19 Q And asking you to assume that that went in on April
20 17th of 1997, can you tell me whether you noticed any
21 substantial changes in the overall housing when you
22 were out there?

23 A Not that much, no.

24 Q Okay. Nothing significant. Did you notice -- do you
25 know anything about dairy nutrition?

1 A I don't get into nutrition, no.

2 Q Okay. We'll skip that with you. Milking equipment,
3 let's talk about that. At the times that you've gone
4 up there, and in the exhibits you talked about milking
5 equipment; in your view, how would you rate it on a
6 scale of one to ten?

7 A From one to ten?

8 Q Yeah, ten being the best?

9 A I'd rate it a nine.

10 Q Okay. And why do you give it that rating?

11 A Well, there's always chances of updating equipment and
12 making it -- you know, going with the state of the art,
13 but do you really need state of the art? No. You can
14 milk with adequate milking equipment.

15 Q And was there ever a time when you felt that the
16 milking equipment was inadequate on the Schachtner
17 farm?

18 A No, I didn't.

19 Q Did you ever see a time where you thought the milking
20 equipment was causing a problem with the production?

21 A Well, like I stated on here, there was a few things we
22 tried to change, but it didn't seem to help that much.

23 Q Okay. The overall farm management, at least in terms
24 of the operation and the milking parlor and the cows,
25 were you able to make observations of that on the farm?

1 A Yes.

2 Q And -- and how would you characterize their overall
3 management out there?

4 A I would say it was, on a scale from one to ten, I would
5 say probably an eight, nine.

6 Q Okay. And if we go down and talk about -- you didn't
7 get into any disease problems out there?

8 A I don't get into that. I feel they have their
9 veterinarian for that.

10 Q Okay. And genetics, you didn't deal with any of that?

11 A I don't deal with that either.

12 Q And the only thing you observed as related to stray
13 voltage, then, was you noticed the current on the
14 neutral with the farm shut of?

15 A That is correct.

16 Q And have you made that test on other locations, Mr.
17 Reininger?

18 A Yes, I have.

19 Q Can you tell me whether or not that measurement you
20 made was normal or abnormal?

21 A That was abnormal.

22 Q Okay. Have you ever seen, actually, current on the
23 neutral, with all of the farm shut, off that high
24 before?

25 A No.

1 Q And one and a half amps would be 1500 milliamps, right?

2 A That's correct, yes.

3 MR. HAMMARBACK: That's all I have.

4 THE COURT: Cross. I should maybe ask you.
5 I don't know how long you are going to go. Relatively
6 short? Anybody have a problem staying over a few
7 minutes?

8 MR. THOM: It will be more than few minutes,
9 unfortunately, Judge. Not long, long; more than few
10 minutes.

11 THE COURT: I guess -- so the range is five
12 minutes to two hours, or what?

13 MR. THOM: No, no, no. Half hour, maybe.

14 THE COURT: Well, approach the bench.

15 (Whereupon, a brief discussion was held off
16 the record.)

17 THE COURT: Probably better wait until
18 tomorrow. Can we shoot for, like, 8:45?

19 MR. HAMMARBACK: Sure.

20 THE COURT: Is that okay?

21 (Whereupon, a brief discussion was held off
22 the record.)

23 THE COURT: 8:45, 8:45. Maybe we can limit
24 noon hour or something. Okay.

25 MR. HAMMARBACK: Your Honor, I would like to