

2004 NERC Vegetation Management Report



North American Electric Reliability Council

August 1, 2005

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Background

This report focuses on data collected from the regions regarding transmission outages caused by vegetation in 2004. In response to blackout recommendation 4 from the report *August 14, 2003 Blackout: NERC Actions to Prevent and Mitigate the Impacts of Future Cascading Blackouts* NERC collected vegetation-related transmission outage information in 2004 from the regions. Recommendation 4 is as follows:

Recommendation 4a: NERC and the regional reliability councils shall jointly initiate a program to report all bulk electric system transmission line trips resulting from vegetation contact. The program will use the successful WECC vegetation monitoring program as a model.

Recommendation 4b: Beginning with an effective date of January 1, 2004, each transmission operator will submit an annual report of all vegetation-related high voltage line trips to its respective reliability region. Each region shall assemble a detailed annual report of vegetation-related line trips in the region to NERC no later than March 31 for the preceding year, with the first reporting to be completed by March 2005 for calendar year 2004.

Recommendation 4c: Each bulk electric transmission owner shall make its vegetation management procedure, and documentation of work completed, available for review and verification upon request by the applicable regional reliability council, NERC, or applicable federal, state or provincial regulatory agency.

In the NERC 2004 Compliance Enforcement Program (CEP), a new compliance template (Appendix A) was developed and implemented to provide for the collection of vegetation-related transmission outages, to require a vegetation management plan, and to confirm compliance with an annual work plan. Additionally, a vegetation-related transmission outage reporting form (Appendix B) was crafted. As part of the 2004 CEP, the regions required transmission owners to self-certify that they have a fully documented vegetation management program that contains all three elements listed in the Reliability Standard; inspection requirements, trimming clearances, and an annual work plan. No violations to this requirement were identified in any region. Compliance with the annual vegetation management work plan will be monitored in the 2005 CEP.

Vegetation-Related Transmission Outages

During 2004, there were 34 vegetation-related outages reported for 200 kV and higher transmission lines. This is the first year for which NERC has data on this subject. With additional years of data, we should be able to identify trends and problem areas.

During 2004, there were three 345 kV and four 230 kV transmission outages caused by tree contact from within the right-of-way zone. The following is a brief description of each of these outages:

- MAIN reported two 345 kV vegetation-related transmission outages that were caused by vegetation within the right-of-way. One 345 kV line experienced an outage caused by a tree adjacent to a property with a tree plantation. The tree was incorrectly assumed to be

part of the plantation. The plantation owner and the previous transmission owner had an easement agreement that limited the amount of trimming that could be performed on plantation trees. As a result, the forestry crew was not providing the normal level of communication regarding this tree, and the tree clearance was not maintained.

Subsequent to the outage, a release from the easement agreement was obtained, the tree in question as well as adjacent trees under the line were cut, a survey was conducted of all transmission owners' critical and 345 kV lines, and other positive actions were taken.

A second 345 kV line in MAIN experienced an outage caused by brush inside the right-of-way. An aerial patrol conducted four months prior to the outage did not provide an accurate clearance estimate on the brush at the location where the outage occurred. Foliar herbicide applications were scheduled to begin during the month of the outage. As a result of this outage the line was ground patrolled in its entirety, and the entire floor of the right-of-way was mowed. The vegetation management strategy was adjusted; including the implementation of new patrol procedures.

- NPCC reported a 345 kV line tripped due to a tree within the right-of-way. The tree was subsequently removed.
- MRO reported a 230 kV line tripped due to a tree within the right-of-way. The line was patrolled and the tree was removed.
- SERC reported two separate 230 kV line outages occurred due to trees within the right-of-way. These outages were caused by property owner objections to proper tree trimming. As a result of meetings with homeowners, these trees were removed; other trees were also trimmed or removed.
- In WECC, a 230 kV line tripped due to contact with a tree within the right-of-way. The tree was trimmed earlier in the year, but new growth and conductor sag caused the contact. As a result of this outage, policies and procedures for patrolling and trimming orchards have been revised.

In addition to the outages caused by vegetation within the right-of-way described previously, there were four 345 kV and twenty-three 230-kV transmission outages caused by vegetation outside the right-of-way. Of these outages, fifteen were the result of severe weather and twelve were the result from trees falling into the lines due to loggers, contractors, and other. SPP reported five outages for critical transmission facilities that are less than 200 kV as a result of vegetation outside the right-of-way. No vegetation-related transmission outage was reported for transmission lines greater than 345 kV.

The following tables summarize the results of 2004 outage information reported. Appendix C summarizes the number of transmission outages by voltage level, and whether the outage was a result of vegetation within or outside of the right-of-way. Appendix D presents outage information summarized by voltage class with a tabulation of outages per 100 miles of transmission. Appendix E represents a summary of the total circuit mileage in each region by voltage class. NERC has received follow-up information from the regions on all outages and is satisfied with the actions taken to prevent further outages of this type.

Additional Information Reported by the Regions

- Although reporting of momentary outages is not a requirement, ECAR reported on three vegetation-related momentary outages within the right-of-way that occurred on 2-345 kV lines. Two momentary outages occurred within three days on the same 345 kV line. Crews that were dispatched after the second outage discovered a tree under the line. That tree and several other tall growing trees were cleared. Complete line clearing and right-of-way maintenance was completed in 2004. Another 345 kV line experienced a momentary outage due to vegetation in the right-of-way. Maintenance was in progress but was not complete by the time of the outage. The immediate and nearby area have been cleared, and aerial spray work completed. Patrol techniques have been examined and strengthened.
- ECAR reported several momentary outages that were the result of vegetation outside the right-of-way.
- SERC reported one momentary outage outside the right-of-way.

Appendix A

Compliance Templates

Vegetation Management Program

Brief Description Vegetation management program for transmission owners

Requirements

1. Each transmission owner shall have a vegetation management program to prevent transmission line contact with vegetation. The vegetation management program shall include the following elements:
 - Inspection requirements
 - Trimming clearances
 - Annual work plan
2. Each transmission owner shall report to its Regional Reliability Council all vegetation-related outages on transmission circuits 200 kV and higher and any other lower voltage lines designated by the RRC to be critical to the reliability of the electric system.

Applicable to

Transmission Owners

Reporting Requirements

Self-certification

The transmission owner annually self-certifies that it has performed vegetation program maintenance in the annual work plan according to the requirements and procedures contained in the program.

Periodic Reporting

Transmission owners shall report vegetation-related line outages on transmission circuits 200 kV or higher and any other lower voltage lines designated by the Regional Reliability Council to be critical to the reliability of the electric system, to the Region for a calendar month by the 20th of the following month. The Region shall report quarterly results to NERC.

All outages shall be reported where the cause of the outage is the line faulting due to contact with vegetation, except:

- Multiple outages on an individual line, if caused by the same vegetation, shall be reported as one outage regardless of the actual number of outages within a 24-hour period.
- A single trip followed by a successful automatic reclose within a 24-hour period shall not be a reportable outage.

Items to be Measured

1. The vegetation management program documentation contains the following elements:
 - Inspection requirements
 - Trimming clearances
 - Annual work plan
2. The transmission owner performs vegetation program maintenance in the annual work plan according to the requirements and procedures contained in the program.
3. All vegetation-related transmission line trips on lines of 200kV or higher and any other lower voltage lines designated by the Regional Reliability Council to be critical to the reliability of the electric system are reported.

Compliance Templates**Vegetation Management Program**

Reporting Period**Three-year Audit**

The Compliance Monitor will conduct an on-site review every three years. The Vegetation Management Program will be reviewed and assessed.

Self-Certification

The Transmission Owner annually submits a self-certification that it has performed all vegetation management maintenance in the annual work plan during the past calendar year that is described in the Vegetation Management Program.

Periodic Reporting

All vegetation-related transmission line trips on lines of 200kV or higher and any other lower voltage lines designated by the Regional Reliability Council to be critical to the reliability of the electric system will be reported to the region on a monthly basis by the 20th of the following month. The Region shall report quarterly results to NERC by the last business day of January, April, July, and October.

Full Compliance Requirements**Three-year Audit**

The vegetation management program is fully documented and contains all three elements listed in Requirement 1 of items to be measured.

Self-Certification

The transmission owner performed all maintenance as described in the annual work plan.

Periodic Reporting

All vegetation-related transmission line outages of 200kV or higher and any other lower voltage lines designated by the Regional Reliability Council to be critical to the reliability of the electric system are reported during a calendar quarter.

Non-Compliance

The transmission owner is non-compliant if:

- Vegetation-related outages occurred and were not reported during a one-month period
- The Vegetation Management Plan is found to be not complete
- The transmission owner did not perform necessary maintenance described in the annual work plan as reported via self-certification.

Compliance Reset Period

One calendar quarter

Compliance Monitoring Responsibility

Regional Reliability Councils. Each Region shall report compliance and violations to NERC via the NERC Compliance Reporting process.

Appendix B

NERC QUARTERLY VEGETATION OUTAGE REPORT

Year: _____

Quarter: _____

Requirements

All vegetation-related transmission line trips on lines of 200kV or higher and any other lower voltage lines designated by the Regional Reliability Council (RRC) to be critical to the reliability of the electric system will be reported to NERC on a quarterly basis by the last business day of January, April, July, and October.

Reporting Instructions

All outages shall be reported where the cause of the outage is the line faulting due to contact with vegetation, except:

- Multiple outages on an individual line, if caused by the same vegetation, shall be reported as one outage regardless of the actual number of outages within a 24-hour period.
- A single trip followed by a successful automatic reclose within a 24-hour period shall not be a reportable outage.

Outage Reporting Disclaimer: Vegetation contacts that result from natural disasters, or are storm related, are not considered vegetation outages. [Examples: earthquake, fire, tornados, hurricanes and wind shear (micro-bursts) ice storms, hail storms, and floods]

Reporting Region:	_____
Reported by:	_____
Title:	_____
Phone: _____	E-mail: _____ Date of Reporting: _____

Number of Vegetation Related Transmission Line Outages

Category	RRC Designated Critical Lines <200 kV	Transmission Lines		
		230kV class miles: _____	345kV class miles: _____	500/765kV class miles: _____
Category 1 – Vegetation located within transmission right-of-way	_____	_____	_____	_____
Category 2 – Vegetation located within the buffer zone of the transmission line right-of-way or outside of transmission right-of-way (Example: Danger Tree)	_____	_____	_____	_____

Comments/explanations: _____

Please complete this form and email it to mike.delaura@nerc.com

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Appendix C

2004 NERC Vegetation-Related Transmission Outage Statistics

Region	First Quarter		Second Quarter		Third Quarter		Fourth Quarter	
	Category 1 (within row)	Category 2 (outside row)	Category 1 (within row)	Category 2 (outside row)	Category 1 (within row)	Category 2 (outside row)	Category 1 (within row)	Category 2 (outside row)
ECAR	0	0	0	2-345 kV	0	1-230 kV; 1-345 kV	0	0
ERCOT	0	0	0	0	0	0	0	0
FRCC	0	1-230 kV	0	0	0	0	0	1-230 kV
MAAC	0	0	0	0	0	0	0	1-230 kV
MAIN	0	0	0	0	2-345 kV	0	0	0
MRO	0	0	0	0	1-230 kV	0	0	0
NPCC	0	0	0	0	1-345 kV	0	0	0
SERC	0	0	1-230 kV	0	1-230 kV	0	0	0
SPP	0	0	0	0	0	3<200 kV	0	2<200 kV
WECC	0	8-230 kV	0	2-230 kV	1-230 kV	1-230 kV; 1-345 kV	0	8-230 kV
Subtotal	0	9-230 kV	1-230 kV	2-230 kV; 2-345 kV	3-230 kV; 3-345 kV	2-230 kV; 2-345 kV; 3<200 kV	0	10-230 kV; 2<200 kV
TOTAL	Within ROW: 4-230 kV; 3-345 kV				Outside ROW: 23-230 kV; 4-345 kV; 5< 200 kV			

Appendix D
Summary of 2004 NERC Vegetation-Related Transmission Outages

Voltage Level	Category 1 (within row)	Category 2 (outside row)	Total Outages	Outages/100miles
230 kV	4	23	27	.027
345 kV	3	4	7	.012
500/765 kV	0	0	0	0
TOTAL (230 kV and up)	7	27	34	.017
Critical Facilities Less Than 200 kV¹	0	5	5	---

¹ NERC requires reporting of facilities deemed critical, by the region, to the bulk electric system below 200 kV.

Appendix E

Summary of Total Circuit Mileage by Voltage Class

REGION	230kV Class	345kV Class	500/765kV Class
ECAR	1,227	12,046	2,881
ERCOT	0	8,081	0
FRCC	5,545	0	1,349
MAAC	5,190	165	1,676
MAIN	226	5,879	90
MRO	12,027	5,742	473
NPCC	13,562	10,302	11,322 ²
SERC	19,338	758	8,464
SPP	2,851	4,694	114
WECC	41,441	9,627	15,961
NERC SUB TOTAL	101,407	57,294	42,330
NERC TOTAL	201,031		

² Mileage includes 1,730 miles of 450kV DC circuits.