



**Minnkota Power**  
COOPERATIVE

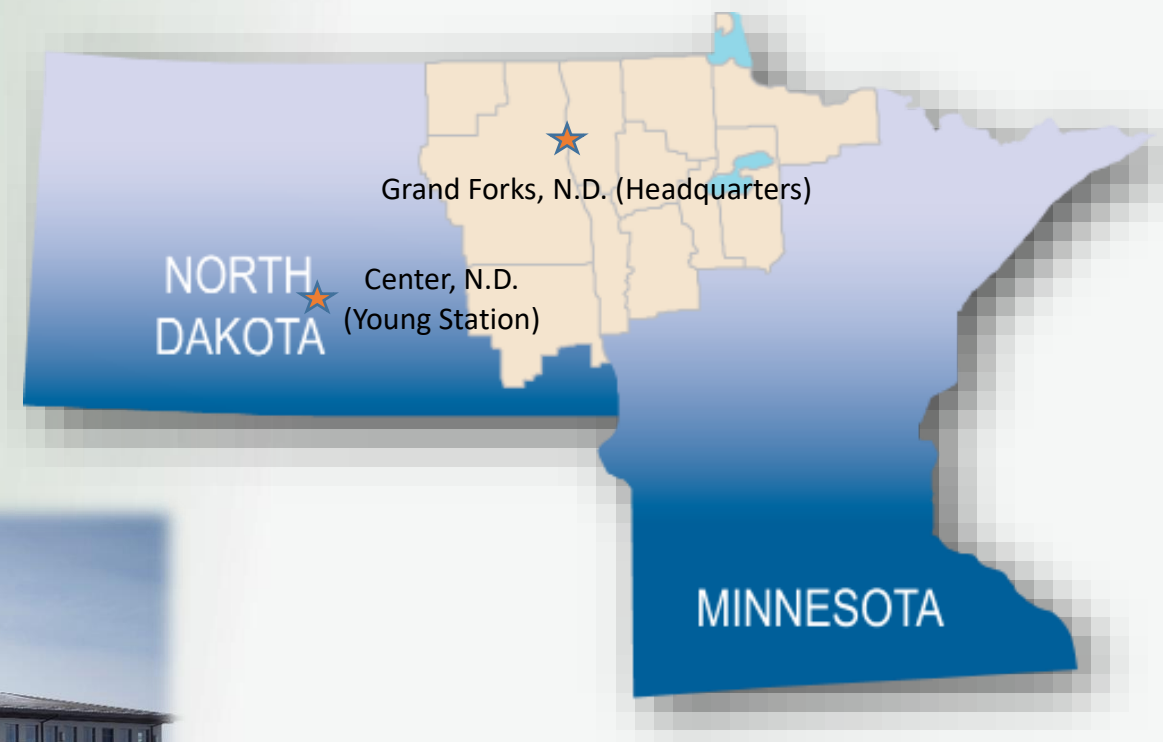
A Touchstone Energy® Cooperative 

# **Vegetation Mgmt. Lessons Learned**

**November 2018**

# About Minnkota

- Wholesale electric generation and transmission cooperative
- Transmission lines subject to FAC-003: **900 miles**
- Service area: **35,000 sq mi**
- Consumer accounts: ~ **150,000**
- Employees: ~ **400**
- **9 Area Line Workers**



# FAC-003 R2

R2. Each applicable Transmission Owner and applicable Generator Owner shall manage vegetation to prevent encroachments into the MVCD of its applicable line(s) which are not either an element of an IROL, or an element of a Major WECC Transfer Path; operating within its Rating and all Rated Electrical Operating Conditions of the types shown below<sup>9</sup> [*Violation Risk Factor: High*] [*Time Horizon: Real-time*]:

- 2.1. An encroachment into the MVCD, observed in Real-time, absent a Sustained Outage,<sup>10</sup>
- 2.2. An encroachment due to a fall-in from inside the ROW that caused a vegetation-related Sustained Outage,<sup>11</sup>
- 2.3. An encroachment due to the blowing together of applicable lines and vegetation located inside the ROW that caused a vegetation-related Sustained Outage,<sup>12</sup>
- 2.4. An encroachment due to vegetation growth into the line MVCD that caused a vegetation-related Sustained Outage.<sup>13</sup>

# 2003 Blackout



- 50 million without power due to tree contact with a line.

# Elevated risk



# MRO Regional Risk Assessment



## Vegetation Management

Conductor contact with trees has been an initiating trigger and a contributing factor in several major system disturbances since 1965, including the blackout of August 14, 2003. Tree contact caused the loss of multiple transmission circuits in several of the outages, causing multiple contingencies and further weakening of the system. By carefully tracking and enforcing standards related to inadequate vegetation management, the ERO is able to identify and eliminate the causes, with the goal of preventing line outages from vegetation located on transmission rights-of-way (ROW) and minimizing outages from vegetation located adjacent to ROW. In 2017, MRO experienced exceptionally warm and wet conditions in parts of the region, which may have prompted accelerated vegetation growth rates, and resulted in two instances of vegetation-related transmission outages. Vegetation programs per FAC-003-4 need to be robust enough to account for varying conditions, and ensure that prompt action is taken to mitigate issues when discovered. MRO has modified its *Maintenance of BFS facilities* performance area to include all FAC-003 requirements related to the design and implementation of entity, vegetation management plans. A self-certification, originally planned for 2018, was expedited to Q4 of 2017, to react to this identified risk.

# NERC CMEP



## Gaps in Program Execution

The ERO Enterprise has observed an increase in FAC-003-3 R2 violations resulting in vegetation contacts. These violations result from vegetation management programs that have less than adequate procedures to address identified problems or that fail to adapt to changing conditions, e.g., increased precipitation that accelerates vegetation growth.<sup>34</sup>

Change management weaknesses have also led to significant violations related to Facility Ratings and maintenance of Protection System devices. Some registered entities have Facility Ratings based on inaccurate equipment inventories, or ratings are not being updated during projects or following severe weather. Where records are not kept up to date, inaccurate models and damaged equipment can result. Failing to keep accurate inventories of equipment, following asset transfers, addition of new equipment, or mergers and acquisitions, is also causing incomplete Protection System Maintenance and Testing Programs that jeopardize the functionality of the equipment to respond to faults or disruptions on the electric system.

# What didn't happen on July 17, 2017





# What Happened on July 17, 2017



- Emphasis on efficiency
- Annual Helicopter Patrols
- Supplemental Fixed-Wing Patrols
- Looked for trees within 15' of conductor

# What Happened on July 17, 2017



Before

- Fault on line
- Three line trips
- Scorch Marks on Tree
- No apparent contact

# Cause of violation

- Poor observation criteria
- Communication breakdown
- Ideal growing conditions
- Hot day



# Mitigation Plan Highlights

- Improving criteria related to measuring vegetation.
- Enhanced training for vegetation personnel.
- Recordkeeping and reporting improvements.

# Lesson: “Distance from conductor” isn’t ideal

- Old approach to trimming
  - Less than 15’ from conductor
  - Too subjective
  - Impossible to measure
- New approach to trimming
  - Height of tree



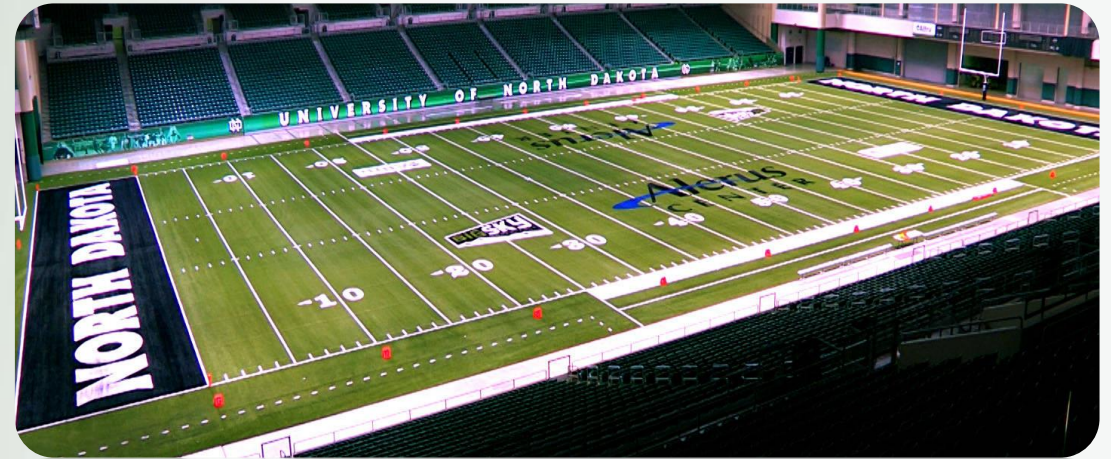
# Lesson: Communication is important

- Clear, direct and urgent
- Written memos lack nonverbals
- Develop style for desired information

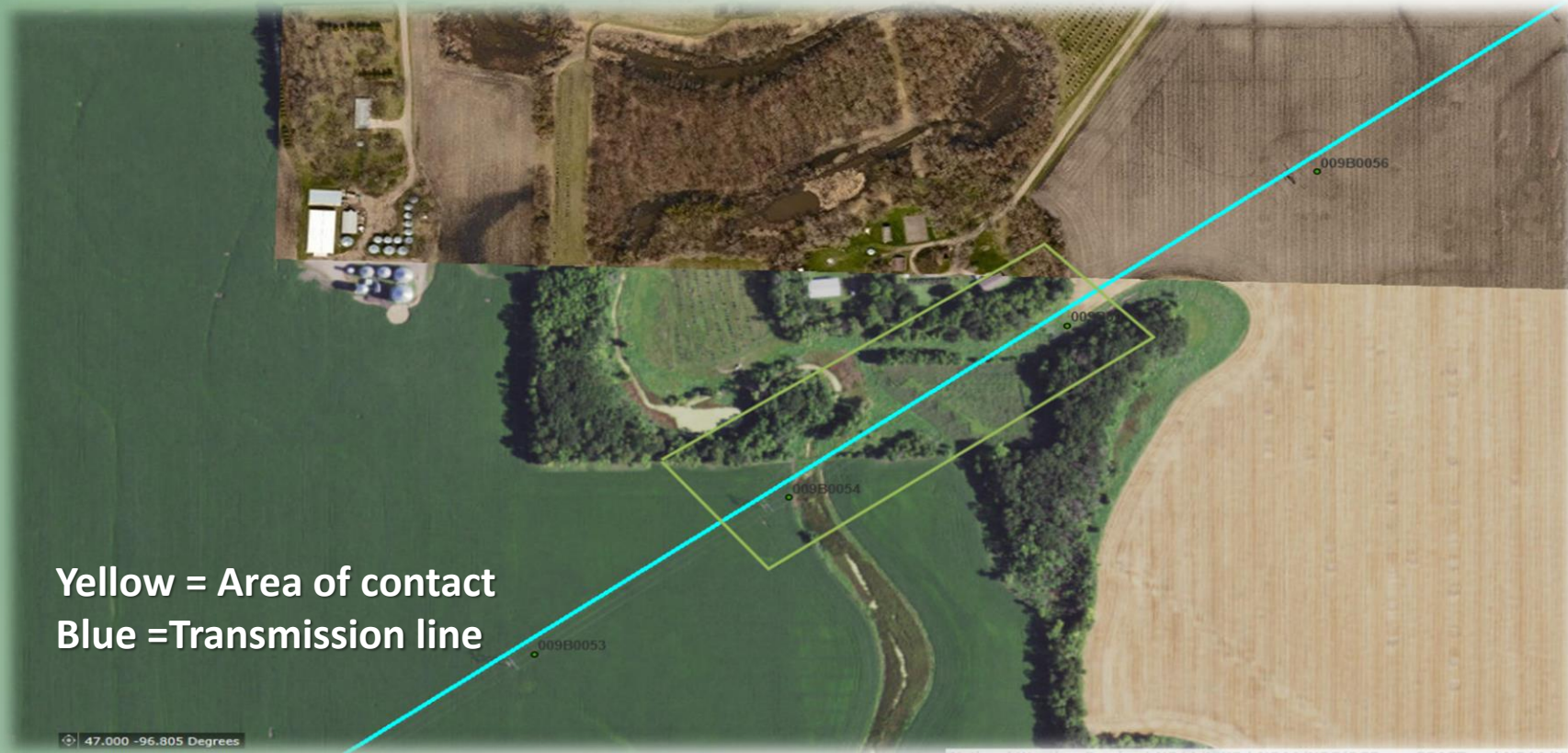


# Lesson: Perspective changes what you see

- Questionable calls!
- Fixed-Wing Pilot Lack of Urgency
- Don't rely only on aerial patrols.



# Lesson: Complacency is bad



Yellow = Area of contact  
Blue = Transmission line

47.000 -96.805 Degrees



# Lesson: Lines move. A lot.



Line Blowout



Line Loading

# Lesson: Address trees early

- Newly planted trees
- Volunteer trees
- Unusually wet conditions
- Err on the side of caution



# Lesson: Technology is useful

- LIDAR
- GIS technology
- Electronic forms with data validation/conditional logic
- iPhone apps



# Lesson: Internal Controls are good



- Humans make mistakes
- Layered Controls help catch issues
- Controls help with Compliance oversight

# Lesson: Be creative!

- More eyes = fewer failures
- Leverage desire to keep the lights on
- Invokes cooperative spirit



# Lesson: Be proactive, not reactive

- Look for ways to improve processes.
- Baby Boomers tend to be accepting.



# Lesson: People learn differently

- Training is of utmost importance
- Different learning styles
- Make roles and responsibilities clear
- Recurring vs. one and done
- Continuous improvement
- Don't settle for "It's always been done this way."



# Lesson: Patience





# Questions?



## Minnkota Contacts

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