NERC Lessons Learned:

“Networking Packet Broadcast Storms”

“Incorrect Field Modification and RAS Operation Lead to Partial System Collapse”

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• Title
  – Networking Packet Broadcast Storms

• Source of Lesson Learned
  – Midwest Reliability Organization

• Date Published
  – October 2, 2018
• Conference room was set up for a training class
  – Bridge protocol data unit (BPDU) packet propagation prevention
    setting was disabled on a switch port
• After training, the network switch was removed but BPDU packet
  propagation setting was inadvertently not restored
• An additional network cable was connected to the output port of
  a VOIP phone into a secondary network jack
  – A switching loop resulted because of incorrect switch settings
  – A broadcast packet storm from the switching loop prevented
    network communications and SCADA was lost for several hours
  – Effects are like a self-inflicted denial of service (DoS) attack
• Use BPDU packet propagation prevention where applicable
• Complete physical separation between SCADA Operations networks and business networks, VoIP, and external facing networks is preferred over VLAN
• Where physical separation is not feasible, Layer 2 Quality of Service (QoS) can be used
• Investigate proprietary settings for CPU loading
• Use checklist/peer reviews when configuring/installing equipment
• Establish standardized settings for network devices
• Title
  – Incorrect Field Modification and RAS Operation Lead to Partial System Collapse

• Source of Lesson Learned
  – Northeast Power Coordinating Council

• Date Published
  – October 17, 2018
Problem Statement

• 500 kV line disconnect temporarily bypassed for replacement
• Auxiliary contact multiplier relay was incorrectly set OPEN
• When line was placed in service, it tripped when it loaded up
  – Looked like major fault to relays
• RAS to trip other lines and some generation did not operate for
  the loss of the 500 kV circuit
• Resulted in separation of a large portion of the entity’s system,
  load losses, generator trips, and islanding of a small pocket
  sustained by local generation
Lesson Learned

- Multiplier set correctly, relay settings adjusted, documentation reviewed/updated
- Ensure field staff verify status of equipment prior to making changes on auxiliary contact multiplier and include in procedures
- Reinforce proper communications between control room and field staff so both understand purpose of auxiliary switching
- Consider adding an alarm or status change when a RAS Contingency is inadvertently blocked by any means other than the “Master Block” control point