

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

- 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

- 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

- https://www.nerc.com/pa/rrm/ea/Lessons%20Learned%20Document%20Library/LL20181001_Networking_Packet_Broadcast_Storms.pdf
- https://www.nerc.com/pa/rrm/ea/Lessons%20Learned%20Document%20Library/LL20181002_Incorrect_Field_Modification_and_RAS_Operation_Lead_to_Partial_System_Collapse.pdf