Fox Valley Tornadoes
Damage & Restoration
October 5, 2014

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Overview

• Weather Event Summary
• Substation Damage Narrative
• T-Line Damage
• Recovery
System Damage

• Four(4) - 345kV lines out of service
  – 2 lattice, 3 H-Frame structures down, wires across HWY 32/57 and on top of 2 crossing 138kV lines

• One(1) - 345kV line with significant, urgent damage (in-service)
  – 2 structures with broken poles, one with broken brace

• Four(4) - 138kV lines out of service
  – 1 H-frames down, shield wire broken and down on 3 adjacent homes

• One(1) - 69kV line out of service
  – 2 H-frames down, 1 broken cross-arm, 1 leaning, 3 spans with trees on line
System Damage (cont.)

• **Major** Damage to North Appleton Substation
  
  – 345kV Bus Section 1 and 2 on the ground
  
  – Control House roof damaged
  
  – Fence down
  
  – Multiple insulators damages; disconnect switch damage

• **Point Beach Concerns:**
  
  – Generation stability
  
  – Loss of adequate off-site power
Damaged Equipment at North Appleton Substation
Damaged Equipment at North Appleton Substation
Damaged Equipment at North Appleton Substation
Debris from Substation Control House Roof and Damaged Fence
Debris from Substation Control House Roof
Second 345kV Lattice Tower Down Near Highway 32/57 Crossing
Plan View -- Damaged Equipment at North Appleton Substation
Damaged Equipment at North Appleton Substation

Breaker B512-1B phase was rebuilt from an undamaged pole of B512-2. B512-2 was retired.
Damaged Bus Section at North Appleton Substation
Damaged Bus Section at North Appleton Substation
Repaired Bus Section at North Appleton Substation
Damaged Equipment at North Appleton Substation
Damaged Equipment at North Appleton Substation

- Terminal on C-phase bushing on T2 was damaged.
- Bus and switch were damaged.
Damaged Equipment at North Appleton Substation
Damaged Equipment at North Appleton Substation
Damaged Equipment at North Appleton Substation

Switch and polymer insulators damaged

Terminal on the C-phase bushing was damaged
Project Materials at North Appleton Substation
Construction at North Appleton Substation
Construction at North Appleton Substation
Damaged Equipment at North Appleton Substation
Damaged Equipment at North Appleton Substation
Temporary Structure Erected to Raise 345kV Line Off Highway
Temporary Structure Erected to Raise 345kV Line Off Highway
Universal Pole (TERP Pole)
Restoration efforts

• ATC’s Transmission Emergency Response Plan (TERP) Activated

• Focused on Critical Items:
  – Restore customers
  – Clear wires down across HWY 32/57
  – Communicate with stakeholders; e.g. (DOT, PSCW, Point Beach)

• No Undue Delay
  – Employees knew their role
  – Crews available in footprint
  – Materials are available – universal spare poles used successfully
  – No mutual assistance needed
  – Effective use of iPhone to capture video for damage assessment
High-Level Lessons Learned

• Annual Transmission Emergency Response Plan (TERP) Training
  - Staff well prepared / knew their roles

• Material Management
  – TERP poles proved effective
  – Opportunity to adjust ER inventory for substations

• Downed Wire (on road)
  – Consider pre-engineered method to secure conductor over a highway/road

• Damage Assessment Tool
  – Use of iPhone to video damage

• Weekly Emergency Response Crew Assessment Calls
  – ATC crew availability awareness