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National Association of Regulatory Utility Commissioners

Introduction to Reliability Audits

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Missouri Public Service Commission

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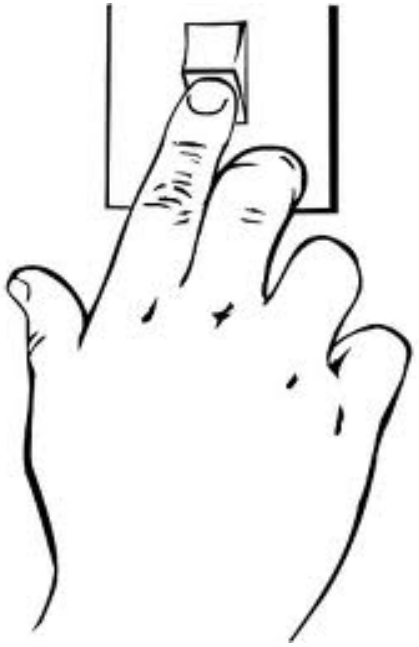
What is Reliability?

System Reliability =



System Reliability

- Who is responsible for Reliability?

Procedure, People and Process

- **Procedure (rules), People and Process (action)**

- A process is not the same thing as a procedure
- A process defines “what” needs to be done and which roles are involved
- A procedure defines “how” to do the task and usually only applies to a single role

What is a process?

- A process consists of the following:
  - Roles and responsibilities of the people (roles) assigned to do the work
  - Appropriate tools and equipment to support individuals in doing their jobs
  - Procedures and methods defining “how” to do the tasks and relationships between the task

Who makes the procedures?

- **FERC – Federal Energy Regulatory Commission**
  - NERC – North American Reliability Corporation
    - Bulk Power Systems (Transmission)
- **State Utility Commissions**
  - Missouri Public Service Commission
    - Generation and Distribution
    - Chapter 23

What is NERC?

- The North American Electric Reliability Corporation (NERC) is a not-for-profit international regulatory authority whose mission is to assure the reliability of the bulk power system in North America. NERC develops and enforces Reliability Standards; annually assesses seasonal and long-term reliability; monitors the **bulk** power system through system awareness; and educates, trains, and certifies industry personnel. NERC's area of responsibility spans the continental United States, Canada, and the northern portion of Baja California, Mexico. NERC is the electric reliability organization for North America, subject to oversight by the Federal Energy Regulatory Commission and governmental authorities in Canada. NERC's jurisdiction includes users, owners, and operators of the bulk power system, which serves more than 334 million people.

Key Roles of NERC

- Standards
- Critical Infrastructure
- Reliability Assessment and Performance Analysis
- Reliability and Risk Management
- **Compliance and Enforcement**
- System Operation Training and Certification

Focus on Compliance

- All Registered Entities are subject to audit for compliance with all reliability standards applicable to the functions for which the Registered Entity is registered.
- **The audit objectives are:**

Independently review the Company's compliance with the requirements of the NERC and regional reliability standards that are applicable to the Company based on the Company's registered functions.

Focus on Compliance

- Validate compliance with applicable reliability standards from the NERC 2009 Implementation Plan list of actively monitored standards.
- Review self-reported violations and previous self-certifications, confirm compliance with other requirements of the reliability standard, and review the status of associated mitigation plans.
- Validate coordination with neighboring BAs, TOPs, and the Reliability Coordinator.
- Document the Company's compliance culture.

Steps for NERC Compliance Audit

- Audit Plan is Developed
- Audit Team is Chosen
- On-site Audit is Conducted
- Exit and Findings by Audit team
- Company Response to Findings
- Corrective Action and/or Fines
- Audit Report is Approved and Made Available in Public Format

Missouri Public Service Commission's Role

- Chapter 23 Rules
  - **4 CSR 240-23.010** Electric Utility System Reliability Monitoring, Reporting and Submission Requirements
  - **4 CSR 240-23.020** Electrical Corporation Infrastructure Standards
  - **4 CSR 240-23.030** Electrical Corporation Vegetation Management Standards and Reporting Requirements

Commission Rules Work Together

- Chapter 23 Rules have been referred to as a three legged stool.
- Each part of the rule works to support the other legs. If one leg is taken away the stool will fall.

Key Elements of Chapter 23

- **4 CSR 240-23.010** Electric Utility System Reliability Monitoring, Reporting and Submission Requirements

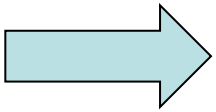
→ **Finding Weak Links**

→ **Reporting the Findings**

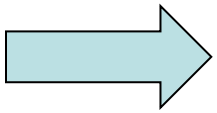
→ **Take Actions**

Key Elements of Chapter 23

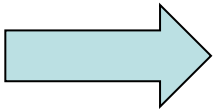
- **4 CSR 240-23.020** Electrical Corporation Infrastructure Standards



Minimum Standards



Inspections



Reporting

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Electrical Corporation System Inspection Cycles
(Maximum Intervals in Years)

	Patrol		Detailed		Intrusive		Notes
	Urban	Rural	Urban	Rural	Urban	Rural	
Poles/Overhead Structures							
Wood	4	6	---	---	12	12	Note 1
Non-wood	4	6	12	12	---	---	Note 2
Conductors, Transformers, Reclosers, Regulators, Capacitors, Switching/Protective Devices, and Streetlighting							
Overhead	4	6	8	12	---	---	
Overhead (with real-time remote monitoring)	---	---	12	12	---	---	
Underground-direct buried and conduit	4	6	8	12	---	---	Note 3
Underground-direct buried and conduit (with real-time remote monitoring)	---	---	12	12	---	---	Note 3
Underground Networks	4	---	8	---	---	---	
Underground Networks (with real-time remote monitoring)	---	---	12	---	---	---	
Manholes, vaults, tunnels, and Other underground structures	4	6	8	12	---	---	

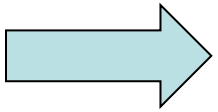
Note 1: No intrusive inspection required for first 12 years after installation, however, intrusive inspection required between years 12 and 18. For poles/structures greater than 12 years of age at inception of program, intrusive inspections must be completed within 12 years.

Note 2: No detailed inspection required for first 12 years after installation, however, detailed inspection required between years 12 and 18. For poles/structures greater than 12 years of age at inception of program, detailed inspections must be completed within 12 years.

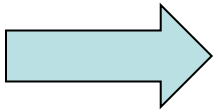
Note 3: Some components of underground-direct buried and conduit distribution systems are above ground (e.g., pad-mounted transformers, pad-mounted switches, pad-mounted reclosers, etc.) The inspection intervals also apply to these above ground devices. These inspection requirements do not apply to direct-buried cable or cable installed in underground conduit.

Key Elements of Chapter 23

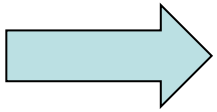
- **4 CSR 240-23.030** Electrical Corporation Vegetation Management Standards and Reporting Requirements



Minimum Standards



Inspections



Reporting

Vegetation Management

- **Maintenance Cycle**

A visual inspection at least once every two (2) years of all **urban** energized distribution conductors and at least once every three (3) years of all rural energized distribution conductors, to determine whether vegetation management is needed.

- **Technical Standards for Vegetation Management.**
- **Training, Recordkeeping and Reporting**


Plant the Right Tree in the Right Place
If you plan to plant a new tree near or under electric lines, follow these clearance guidelines. For inquiries, please call 1-800-743-5000.
Tall Zone
Trees taller than 40 feet at maturity
Medium Zone
Trees no taller than 40 feet at maturity
Small Zone
Trees no taller than 25 feet at maturity
Wire Zone
No trees
Border Zone
Only small trees or shrubs
Outer Zone
Trees or no taller than distance to the wire at maturity
Transmission Line
Distribution Line
50 ft.
15 ft.
0
Only low growing shrubs
Incompatible vegetation is subject to removal.

Vegetation Management

- Public Notice of Planned Vegetation Management.
- Outreach Programs.
  - Keeping Customers **“HAPPY”**

Reporting and Statistics

System Average Interruption Frequency Index (SAIFI);

which reflects the average frequency of service interruptions in number of occurrences per customer and is defined as the total number of customer interruptions for the period covered divided by the total number of customers served;

SAIFI = number of sustained outages per customer per year

Reporting and Statistics

Customer Average Interruption Frequency Index (CAIFI);

which reflects the average number of interruptions per customer interrupted and is defined as the total number of customer interruptions for the period covered divided by the total number of customers affected.

CAIFI = number of interruptions per customer per year

Reporting and Statistics

System Average Interruption Duration Index (SAIDI); which reflects the average interruption in hours or minutes per customer served for the period covered and is defined as the sum of all customer interruption durations divided by the total number of customers served.

SAIDI = minutes of sustained outages per customer per year

Reporting and Statistics

Customer Average Interruption Duration Index (CAIDI),

which reflects the average interruption duration and is defined as the sum of all customer interruption durations divided by the total number of customers interrupted.

Reliability Statistics

Utility A				
	SAIFI	SAIDI	CAIFI	CAIDI
2009	1.5	189.3	1.13	117.9
2010	1.4	142.4	1.12	101.5
2011	1.6	245.0	1.13	146.9
2012	1.4	145.0	1.12	103.7
2013	1.3	146.9	1.09	110.4

Utility B	SAIFI	SAIDI	CAIFI	CAIDI
2008	1.18	150.89	2	120.14
2009	0.98	121.1	2.02	127.03
2010	1.02	124.27	1.89	113.06
2011	0.91	106	1.8	109.25
2012	0.81	92	1.74	104.00
2013	0.7	88	1.69	119.58

Introduction to Reliability Audits

- Questions?

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