



Investment Analysis and Monitoring, Ex-ante

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Association of Regulatory Commissioners

General Outline of Presentation

Assessing Levels of Investment Service Reliability

- **Reliability Measures**
- **Reliability Standards** \bullet
- Worst-Performing Circuits **Field Inspection Process** Maintenance Programs Management and Field Audits **Prudency Analysis**





What is the Right Level of Investment?

- Statutory obligations to provide safe, adequate and reliable service at just and reasonable rates
- Commission must balance these two competing interests looking for the investment level that is just right.
- Absent a pre-approval request, that decision is made by utility management in the first instance





Judging Projections of Future Investments

- Is there a large rate increase that is being driven by capital investments?
- How do projections of future capital spending compare with past levels of spending?
- How do past levels of spending compare with past projections?
- Are there new requirements which would drive increased investments(e.g. environmental mandates)?





Judging Projections of Future Spending

- Have the expectations of what constitutes reliable and adequate service changed?
- This question will likely arise more frequently given the pace (and cost) of new technologies.
- This question may drive more frequent requests for pre-approval.
- Is the current increase in spending a result of prior underspending?





Assessing Whether Past Spending Was Reasonable

- Use of Service Quality Index (SQI) metrics
- Customer Complaints
- Age of Plant
- Use of Utility Budget and Plans
- Management or Field Audits





Use of Service Quality Indicators (SQI)

- SQI can be used with both performance based regulation as well as with traditional cost of service regulation
- Provide assurance of a reasonable level of reliability or service is being met
- Allow for analysis on performance over a period of time.
- SQI can be set based on historical performance or anticipated performance based on future program investment (vegetation management, smart grid, modernization)





Use of Standardized Metrics

- Standard metrics have been adopted to normalize results to facilitate comparisons over time or across utilities.
 - System-wide
 - Customer based
- Definitions further clarify how specific events are characterized within the metric:
 - Outages that are measured: momentary, sustained
 - Events that are excluded: storm exclusions, planned outages
 - When outage hours are measured: calendar day, 24-hour period
- Technology has increased reporting capabilities
 - Outage management systems
 - Advanced metering





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Reliability Measures

The PUCO measures reliability using SAIFI and CAIDI

- SAIFI represents the average number of interruptions per customer.
- CAIDI represents the average time to restore service to \bullet interrupted customers.
- SAIFI and CAIDI calculations are based on sustained \bullet interruptions, which involve a complete loss of power for over five minutes.
- SAIFI and CAIDI calculations exclude data for major events and \bullet transmission outages, which are reported separately.
- Here is a link to the applicable rule: ${}^{\bullet}$ http://codes.ohio.gov/oac/4901:1-10-10





Reliability Measures (Continued)

Excluding Major Events

- Previously, utilities were required to exclude "major storms" from performance data, and each utility was allowed to develop its own "major storm" definition.
- As a result, there were variations among utilities on how their major storm exclusions affected their performance.
- To address this problem, the Institute of Electrical and Electronics Engineers (IEEE) developed the "2.5 Beta" methodology for establishing a standardized "major event" threshold.
- The 2.5 Beta method is a statistical methodology which excludes any day when the average duration of interruptions across a utility's system is more than 2-1/2 standard deviations above the mean for the past five years.
- The current PUCO rules adopt the IEEE methodology





Reliability Standards

- The PUCO has established reliability standards for each electric utility.
- These standards apply to performance across the utility's entire Ohio distribution system.
- The standards were initially established in 2010 and remain in effect until the utility applies for new standards.
- Previously, PUCO rules provided for reliability "targets", but missing a target was not considered a violation.
- Under the current rules, however, missing a reliability standard in two consecutive years constitutes a rule violation.





Reliability Standards (Continued)

The standards are based on the following factors:

- Historical system performance (primary factor);
- System design;
- Technological advancements;
- Service area geography; and
- Customer perception surveys.





Reliability Standards (Continued)

Reliability Surveys

- Each electric utility is required to conduct a periodic survey to measure customers' reliability perceptions and expectations.
- The survey is paid for by the utility, and is developed and conducted under Staff supervision.
- The survey results are considered in the establishment of performance standards.





Reliability Standards (Continued)

Establishing Reliability Standards

Each electric utility must file a reliability standards application that includes:

- A methodology for establishing reliability standards;
- The proposed standards resulting from that methodology; and
- A justification for the proposed standard.





Reliability Standards (Continued)

The legal process to establish the standards includes the following steps:

- 1. A technical conference is convened to explain the utility's application
- 2. Twenty days after the conference, interested parties file comments on the application
- 3. Thirty days after the conference, the PUCO Staff files comments on the application
- 4. Fifty days after the conference, the utility and interested parties file reply comments
- 5. After comments are filed, the commission may order a hearing, where interested parties may participate once they are granted permission.
- 6. The new standards are adopted when the Commission issues₁₅ an order approving them.





Reliability Standards (Continued)

Compliance Requirements

- Each electric utility is required to file an annual report of its reliability performance compared to reliability standards.
- If the utility misses one of its reliability standards, it must submit an action plan to improve performance.
- If the utility misses the same performance standard two years in a row, it is considered out of compliance with the rule.





Reliability Standards (Continued)

- The annual reliability report must contain the following information:
 - The utility's performance compared to standards;
 - Additional data that supports reliability performance data;
 - A listing of outages that were excluded from the calculation; and
 - An analysis of outages by cause;
- The utility submits its report using an electronic form prescribed by the PUCO Staff





Reliability Standards (Continued)

Staff monitors each utility's performance against its reliability standards

- If the utility meets its standards, Staff would still look for any adverse performance trends.
- If performance misses the standard, Staff would assess the sufficiency of the utility's action plan for improving performance.
- If the utility misses a standard two years in a row, Staff would investigate the circumstances and recommend any needed enforcement action, which could include:
 - Corrective action to return to compliance
 - Restitution to customers
 - Fines up to \$10,000 per day





Reliability Standards (Continued)

To ensure the Validity and Authenticity of the reported reliability performance:

- The annual reliability report must also include the components used in the formula to calculate that performance;
- The report must also include an analysis of outages by cause and a listing of excluded outages, which must be consistent with the data used to calculate reliability performance
- Finally, Staff has audited the utilities' exclusion of major events to verify accuracy





Reliability Standards (Continued)

Sample Report

DPL Inc Dayton Power and Light Co Rule #10 2013 Distribution System Reliability Report

1. 4901:1-10-(C)(1)

CAIDI - Customer Average Interruption Duration Index (In Minutes)

a.	b.	с.
CAIDI Performance Standard	CAIDI After Exclusions	CAIDI Before Exclusions
125.04	110.51	148.11

2. 4901:1-10-(C)(1)

SAIFI - System Average Interruption Frequency Index

a.	b.	с.
SAIFI Performance Standard	SAIFI After Exclusions	SAIFI Before Exclusions
0.88	0.70	0.86





Reliability Standards (Continued)

Sample Report (Continued)

3. 4901:1-10-(C)(1) Supporting Data Report

a.	b.	с.	d.	e.
Number Of Customers Served	Number Of Customer Interruptions After Exclusions	Number Of Customer Interruptions Before Exclusions	Number Of Customer Minutes Interrupted After Exclusions	Number Of Customer Minutes Interrupted Before Exclusions
572,677	399,705	492,487	44,169,445	72,941,491

4. 4901:1-10-10(C)(2) Major Event Outage (MEO)

a.	b.	c.	d.	e.	f.
Major Event Date	Major Event Description	Customers Interrupted During MEO	Customer Minutes Interrupted During MEO	CAIDI During MEO (in minutes)	SAIFI During MEO
07/10/2013	Thunderstorm and high winds	53,396	19,924,265	373.14	1.00
10/31/2013	Wind Storm	15,115	6,773,458	448.13	1.00 21





Reliability Standards (Continued)

Sample Report (Continued)

5.a.	4901:1-10-10(C)(2)	Transmission Circuit Interruption Supporting Dat

1.	2.	3.	4.	5.	6.
Date Transmission Outage Began	Reference ID Of Transmission Circuit Impacted	Time Outage Occurred	Size (in kilovolts) Of Transmission Circuit Or Equipment Involved	Cause Of Outage Including Specific Type Of Equipment And/Or Facility Causing Interruption	Total Length Of Interruption (in minutes)
01/15/2013	Garage Road {T} - Garage Road - New Westville [3302]	12:00 am	33	Equipment/Hardware Failure	257,187
02/12/2013	Greenville {T} - Greenville - West Manchester [6643]	12:00 am	69	Equipment/Hardware Failure	4,223
04/18/2013	Transmission Bus - Transmissi on bus	12:00 am	12	Transmission Trouble	31,811
04/18/2013	Transmission Bus - Transmissi on bus	12:00 am	12	Transmission Trouble	49,036
05/21/2013	Kings Creek {T} - Kings Creek - Marysvill e [6660]	12:00 am	69	Other Electric Utility	86,632

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Reliability Standards (Continued)

Example of Staff Analysis

		SAIFI		CAIDI		
	Year	Standard	<u>SAIFI</u>	Standard	<u>CAIDI</u>	
Ohio Edison	2013	1.11	0.71	114.37	100.78	
	2012	1.11	0.85	114.37	105.83	
	2011	1.11	0.86	114.37	113.76	
	2010	1.11	0.89	114.37	102.53	
	2009		0.70		97.32	

SAIFI







Worst Performing Circuits

- A distribution circuit includes the wires that extend from the distribution substation to each of the customers served by that circuit.
- Each electric utility is required to submit (for Staff's review and acceptance) a method for measuring the performance of its distribution circuits.
- That method must include SAIFI and CAIDI, but may also include other factors as well.
- Once the method is accepted, the utility must use it to rank its circuits in terms of their performance.
- The utility must include its eight-percent worst-performing circuits in an annual report to Staff.
- Here is a link to the applicable rule: <u>http://codes.ohio.gov/oac/4901:1-10-11</u>





Worst Performing Circuits (Continued)

The annual report must include the following:

- The circuit ID number, location, and number of customers;
- The circuit ranking value;
- The circuit's SAIFI, SAIDI, and CAIDI performance;
- The number of safety and reliability complaints;
- The number of critical customers on the circuit;
- A listing of circuit lock-outs with associated cause and duration;
- A listing of outages by cause with associated frequency and customer minutes interrupted;
- Identification of major factors causing the circuit to be reported; and
- An action plan to remove the circuit from the report within the ²⁵ next two reporting periods.





Worst Performing Circuits (Continued)

Staff Compliance Activities

- Staff identifies those circuits that appear on the report in consecutive years;
- For those circuits, Staff analyzes outage causes and the utility's remedial action plans to see if they are sufficient to remove the circuit;
- If a circuit remains on the report for three consecutive years, it is presumed out of compliance (unless the utility can rebut that presumption).
- For those circuits, Staff would investigate the circumstances and recommend any enforcement action





Facilities and Operations Field Division (FOFD)

- Field inspections for all four major utility functions:
 - Electric
 - Natural Gas Pipeline
 - Telephone
 - Water/Wastewater
- Outage Reporting





Electric Utilities

- Three types of field inspections/audits:
 - Rule 11 (OAC 1-10-11)
 - Rule 6 (OAC 1-10-6)
 - Rule 27 (OAC 1-10-27)





Rule 11 – Worst Performing Circuits

- Annual Report
 - Identifying the worst performing eight percent of the electric utility's distribution circuits during the pervious twelve months.
 - Action Plan to remove circuit from the list
 - Examples Include:
 - Lightening Mitigation
 - Vegetation Clearance
 - Etc.
- Inspect/Audit
 - Verify Actions Taken





Rule 6 – National Electric Safety Code (NESC)

- Institute of Electrical and Electronic Engineers (IEEE)
- NESC
 - "...sets the ground rules for practical safeguarding of persons during the installation, operation, or maintenance of electric supply & communication lines & associated equipment. It contains the basic provisions that are considered necessary for the safety of employees & the public under the specified conditions."
 - <u>http://standards.ieee.org/about/nesc/</u>





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Rule 6 – National Electric Safety Code (NESC)



Clearances



Relations





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Rule 27 – Maintenance Plans

- Each electric utility and transmission owner shall establish, maintain and comply with written programs, policies, procedures, and schedules for the Inspection, Maintenance, Repair, and Replacement of its transmission and distribution equipment.
 - Submitted to Commission
 - 45 Day approval
 - Updated as needed
- "These programs shall establish preventative requirements for the electric utility to maintain safe and reliable service."





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Rule 27 – Maintenance Plans

- Seven (7) types of facilities:
 - Poles and Towers
 - Circuit and Line Inspections
 - Primary & Secondary Enclosures
 - Line Reclosers
 - Line Capacitors
 - Vegetation Control
 - Substations





Rule 27 – Maintenance Plans

- AUDITS
 - Desk Audits
 - Review Plan Compliance
 - Documentation
 - Interview Employees
 - Field Audits
 - Verifications
 - Post-Inspection Audit





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Outage Reporting

- Email: OutageReport@puc.state.oh.us
- Reporting Thresholds:
 - 2,500+ Customers, 4+ Hours
 - 100+ Customers, 24+ Hours
 - Other utility facility, 4+ Hours or affects public safety
 - Interruption to police/fire/hospital/9-1-1 System, 4+ Hours





Use of Management Or Field Audits

- The Commission can initiate a management audit of a public utility to determine: If a utility's construction program is adequate;
- If a utility's operations are effective, prudent and efficient; and
- Any other matter which is relevant to the Commission's obligation to ensure safe, adequate and reliable service at just and reasonable rates.





Management Audits (cont'd)

- Commission selects independent auditor
- Utility initially pays the costs
- Costs ultimately collected form ratepayers
- In initiating the audit the Commission must consider the costs of the audit on ratepayers
- Although labelled as a management audit, the audit can be a field audit of the utility plant to assess whether it is being maintained consistent with the utility's obligations





Disallowing Distribution Investment

- Can be done in three contexts: Prudence disallowance of past costs;
- Rate case request for future spending;
- Denial of request for pre-approval.





The Prudence Standard

- The essential question is: "whether the utility followed a course of conduct that a capably managed utility would have followed in light of existing and reasonably knowable circumstances?"
- If there was imprudence, the imprudence must have caused injury to ratepayers
- The standard is similar to the negligence standard in civil law suits





7 Factor Test for Imprudence

- Senior utility executives are expected to possess a high degree of financial and technical expertise
- Utility actions viewed in the context of utility industry and also against the decisions of other corporations of a comparable size and complexity
- The size and the nature of the investment must be considered
- Utility's decisions must be viewed in the context of the utility's obligation to provide safe, adequate and reliable service over time





7 Factor Test (cont'd)

- Review of prudency requires examination not only of the initial investment decision but in response to changing circumstances
- The utility's course of conduct must be reviewed in light of facts and circumstances that existed a the time of the decision
- If a utility had several reasonable options, and the (reasonable) option selected turned out badly, the utility's decision was not imprudent





Evidence in a Prudence Case

- Under Ohio law, the utility has the burden of proving the reasonableness of its costs
- •However, absent evidence to the contrary, utility's actions are presumed reasonable. So the Staff or intervening party have a burden of production
- Once the Staff or a party has raised the issue of prudence in a sufficiently specific way, the burden shifts back to the utility





Difficulties in a Prudence Case

- Investment community looks very unfavorably on imprudence determinations. So utilities will vigorously contest imprudence allegations
- •Prudent does not mean mistake free
- Evidence to meet Staff or non-utility party's burden of production not always easy to obtain
- Audits done by independent auditors not always done to quality levels expected
- •Difficulties in showing harm or damages





