

Working Group On Distribution Reliability

WTM 2007 – January 2007
Orlando, FL

Monday, January 08, 2007
Task Force on Interruption Report Practices– Chair Rodney Robinson
(Rodney.L.Robinson@westarenergy.com)

Rodney Robinson called meeting to order at 1:00 pm

Passed out copies of the draft guide and agenda.

Discussed the Scope, Purpose and Reason for the Guide. There was a discussion on the wording in one sentence of the purpose. Based on if the comparison was inter or intra company (wording). With modified change, the consensus of the attendees was that the PAR is ready for submittal to IEEE. Rodney will submit the PAR prior to the June meeting.

Went over outline for section 3 of guide. Remarkd on TF web meetings. Went thru section 3, part by part.

Section 3.2 on Performance Assessment and Trending was turned over to Heide Caswell. Heide reviewed the charts comparing multiple years of daily SAIDI and the resulting trends with large medium and small events included. If the curve is shifting right and down, performance is improving; if the curves shift left and up, they are getting worse. Horizontal curve was from worst day to best day (highest daily SAIDI to lowest SAIDI). The charts were shown in descending Log of Daily SAIDI for several years.

Next Heide shared charts showing number of outages and customer interruptions by cause for her utility. Charts only included customer hours of interruptions and number of sustained interruptions. After much discussion on what was the leading cause of interruptions for the utilities present, most companies noted that they were seeing Failed Equipment as a leading cause of interruptions.

Lee Taylor and others brought out that not always is equipment just failing, rather there is really another more accurate root cause, such as lightning, high winds, etc. This issue is handled differently by each utilities based on their own viewpoint. Charlie Williams stated that utilities seeing an increase in failed equipment caused outages when weather is not a factor. Keith Frost stated that this should be captured as an issue. Bob Saint, RES survey, equipment failure was smaller percentage due to loss of supply being a large value for RES'. Most of these failures are due to reduction on maintenance. Also, newer equipment will not have the life span as the old stuff being removed.

Action Item: Discussion on Failed Equipment causes increasing and the need to identify the root cause for the equipment failures, i.e. end-of-life, lightning, high winds, etc.

Whatever categorization used in section 1, should be the same throughout the guide!

Action Item: Clean up the inconsistent use of categories.

Be very specific on the graphs when they are included in the guide or the addendums, to clearly describe what conclusions form the graphs. It was agreed to provide the basic information for the charts included so that everyone can correctly compare their statistics.

Heide presented state level map of CEMI maps including major event days. Shown in blocks of 5 (0-5, 6-10....). It was suggested to redefine the blocks for the color-coding. They have different action plans based on the number of outages, mostly dealing with inspections. This information is provided to the regulators to show them what is going on. When zooming in on the state map, you can see more details on the pockets of CEMI customers.

The group discussed how utilities are dealing with CEMI on individual transformer versus circuit level. It was Heide's position that you get more bangs for buck when dealing with a poor circuit versus an individual transformer station. Heide could also retrieve a list each outage record for each of the transformers shown on the map.

Rodney presented Westar's CEMI 9 & 11 map. The user can zoom into laterals and individual transformers to determine the extent of the problems in the area.

Mapped CEMI versus customer and transformer summary.

Some utilities break out major event days when determining the CEMI premises and others look at all outages. Cherri Warren showed a portion of pockets of poor performance maps. Heidi noted that they do not have a hard guideline for CEMI, only for SAIFI/SAIDI. New systems can save events for each customer, or up to transformer and so on. Being forced to look at these pocket areas as the customers with the greater # of outages are the ones that complain to the regulators. Heidi's also overlaid complaints on the CEMI maps. Postcards are sent out after reliability improvement work is completed to let those customers know they should see an improvement. This effort can help with customer satisfaction by letting them know the utility is working on the problem, public relation is always an issue.

For CEMI work, the utilities present indicated they keep track of each customer interruptions at transformer level. With this information recorded, you can also overlay inspection results with CEMI map. If there are items with high CEMI, then can go out and do maintenance to improve performance.

Action Item: after discussing the need to survey the utilities to identify the practices being followed by the utilities across the US, it was agreed that the Working Group would complete this survey and include the results in the 1366 Guide.

Customers generally do not know that utilities have plans for events. Only the negative things make the news (Queens outage).

Jim Bouford then showed his belly curve with the National Grid SAIDI per day for 5 years. All graphs were very similar. More detail can be seen when the very bad days were taken out. Dropped the first 15 days and the very small SAIDI days, detail in the knee can be seen. In the .05 to .3 SAIDI per day graph, it was shown that performance was degrading. Also seen from .1 out to end. What is happening to the system? Each company's curves have somewhat similar characteristics, which is one way to see if reporting is consistent.

Action Item: Based on comments received during the discussion, it was agreed to incorporate these graphs in the Guide with a discussion of what can be understood from the graphs.

Heidi then showed breaker trips by circuit (those with SCADA) including both momentary and sustained counts. The utilities can do something similar for stations without SCADA based on breaker counters.

Keith Frost presented Exelon's chart of number of devices with various multiple of operations for each region. The user can click on the link and get more detail on the devices and outage information by cause. Keith also demonstrated another chart showing number of outages, CI and CAIDI for each day for the calendar showing the maximum number for each outage.

Keith noted that Exelon has determined based on surveys that there is a big drop in customer satisfaction after 4 interruptions of over 4 hours.

The group discussed the percentage of total number of outages that were circuit lockouts. NStar noted that 10% of 13 kV and 25 kV circuit outages are lockouts. Further at 4 kV, it is up to 25-33%.

Additionally, it was noted that for NStar to keep their average circuit breaker age to 40 years, they would need to replace 1% of CB. The group further discussed the fact that the new equipment that is available to the utilities does not seem to have the anticipated life the older units being replace have.

Heidi's presented additional charts of showing the correlation between % State SAIFI vs % State SAIDI. These charts point out the circuits with high opportunities for improvement (those circuits to the upper right of the charts outside of the main pack of circuits). The information on these charts excluded MED's.

From the above chart and graph discussions, the following are items discussed with the noted action items:

Action Item: Greg Audrey, Wisconsin Power and Light, agreed to write up on information on how they use this type of information to identify 'pockets of bad performing areas' (I would send her a reminder then)

Additional comparisons were discussed including SAIFI vs. CEMI, for a SAIFI at a certain level, is there a way to determine if a certain % are of a CEMI X? There seemed to be an agreement that the utilities go after improving SAIFI first before attacking CEMI. Go after the big hitters that will affect the CEMI. It was suggested that each utility will need to have multi-faceted, multi-year programs to reduce outages.

Rodney showed Westar's CEMI 9 identification and resolution tracking website. The information is provided by office and circuit, plus devices that operated 4 or more times leading to that CEMI 9 customer. The information also breaks down the outages by cause, too. The website also shows the historical remediation activities by device with the current evaluation in response to recent outages. Site is used to evaluate the CEMI 9's and provides a summary by office of progress. Westar's goal has been to resolve, at least 80%, of the device problems within 60 days. Another report provides those devices that operated multiple times within the prior tolling 12 months that could lead to a CEMI 9 customer. The website did not include interruptions during a MED.

In discussing Rodney's charts with the outage cause, Charlie F. asked what is considered extreme wind? Charlie brought out that they have seen damage increase exponentially when winds are greater than 35 MPH over a certain time frame. National Grid saw a better correlation with wind gust then sustained winds.

In discussion the rough draft handed out at the meeting, the group discussed section 3 of the Guide as written:

It was suggested that the utility should correlate the dollars spent for each reliability improvement program/initiative to results. This will be used in the later prioritization of available funding. In determining the circuits for trimming, it was suggested to have a program to evaluate vegetation outages since last trimmed to help identify the next circuits for trimming and also look for mid-cycle problems and adjustments to cycles.

Cheri Warren suggested that the utility should analyze animal caused outages for time of day and period in the year.

Section 3.3 - Identification and Prioritization of System Reliability Improvement Activities

As the group began discussing the various information already presented, Rodney noted that the task force will probably incorporate most of the graphical information as discussed above into addendums to the actual Guide and as a part of the Guide itself. This should facilitate the balloting of the Guide in the future.

The primary question everyone had on this subject was what are you targeting your reliability improvement activities, SAIFI reduction, SAIDI reduction, CEMI reduction or simply resolution, devices experiencing multiple outages, programs to target specific outage cause(s), targeting problem overhead or underground areas, or simply resolution of the PUC worst performing feeder requirements. Further it was asked as to what combination of indices are the utilities using for their prioritization of improvement activities?

Charlie Williams suggested targeting the problems at the device level and do a costs optimization of the work required to fix the problems.

Action Item: Vince Forte agreed to describe the process that National Grid utilizes to prioritize their improvement projects and programs.

Section 3.4 Standard design, construction and Operating Practices

A couple individuals provided Rodney their hand written comments, mostly editorial. Rodney asked everyone to review this section and provide comments, suggestions and additional information to round out this section to him.

Section 5 – Benchmarking

Cheri Warren has assigned drafting up this section to Vince Forte.

Section 3.6 Stakeholder Usages.

Can be used for legislative districts, municipalities, or town. Keith Frost provided examples showing the 12-month rolling average for SAIFI for a House District area. Most of these entities do not know what their reliability statistics where at this time. This information can be used a teaching tool for these customer groups. It is up to each utility to determine how to use their data.

Keith showed another graph with the number of customers out on an hourly basis throughout a prior storm. This type of information can be used to show regulators that the restoration is better than the customer's perception. Further, Keith showed a real time display that Exelon let their municipalities see on their company web site. This display shows where the outages are, plus details of that outage, such as # customers, estimated restoration time...

3.7 – Real-time and near-real time usages

It was agreed that the group would include information in this section from the real-time panel session being held at the June meeting.

Lastly, Rodney asked everyone to provide him any suggestion on draft Section 3 along with any additional information that you think is missing.

Meeting adjourned at 4:30 PM

Tuesday, January 09, 2007

1. Welcome and Introductions

Cheri Warren, Subcommittee Chair, called the meeting to order and introductions were made for all 37 attendees. Minutes taken by John McDaniel in the absence of the group's secretary.

The group reviewed the minutes from the Montreal meeting. A motion to approve the minutes was made by Jim Bouford with a second by Mark Thatcher. There was a brief discussion on the Worst Performing Feeder portion. It was decided that a short survey will be sent out.

Task Force on Reliability Indices – Chair Cheri Warren (Cheryl.warren@us.ngrid.com)

This task force started with a round table with the following comments:

Keith Frost. On Worst Performing Feeders – How are they defined and what remediation is taken.

Jim Bouford. On cut-outs and other equipment, do other utilities ground and bond the metal brackets. Jim wanted to know what the general practices are. One of co-ops that Bob Saint worked for in the past went to switches to a cross-arm. PNM grounds them. Duke uses fiberglass standoffs. Alliant Energy grounds them. Keith Frost will get Exelon's answer to Jim (AI for Keith). Cheri asked who makes sure that grounds are placed properly. Some utilities have an audit program to check this. One of the consultants did surveys for a client and found a 25% difference if the ground is placed in the pole hole versus a driven ground. Chuck DeNardo stated that a better ground helped lower the Neutral to Earth Voltage.

Cheri stated that a PAR has been submitted and approved for the revision of 1366. The group has until 2008 to revise the Guide. The group needs to look at the Catastrophic day. Cheri stated that she has obtained additional data sets. Some utilities saw their Tmed at least double with some of the recent Hurricanes. One of the Southern Companies stated that theirs increased four fold. This can lead to no events being excluded. Need to rekindle a group to look at extreme or catastrophic days. There is a group that will be looking at this. SEE utilities will be providing data sets to help analyze this. Greg Obenchain will provide additional data sets. When you segment data out, how are you sure it was done properly and did the utility do everything within their power to restore service? There is not an absolute answer. Some states want to define what should be done. It was asked what did previous EEI surveys look at, such as how many poles, how much wire, how many crews.... It would be impossible to put this in a formula. (AI for Cheri: put on a future agenda)

** Regulatory Update:*

- Rhode Island has agreed to go fully with the 2.5 Beta method. This is both in reporting and penalties.
- Massachusetts – has stuck with 15% of the total customers, but will be reporting 1366 in parallel.
- New York – there is no movement at this time
- New Hampshire – will be opening case with the proposed merger of National Grid and Keyspan and National Grid will be pushing for 1366 inclusion.
- Pennsylvania – period recently closed on Preventive Maintenance case. Utilities stated that cost would go up, but reliability would not change. Expect some ruling on Inspection and Maintenance. Seems to be pushed by unions.
- Starting to see more and more states look at Maintenance and Inspections. FPL being pushed into doing certain things due to the recent hurricanes. Iowa is proposing rules on pole inspection. Partly because utility board inspectors were seeing the same "old" poles time after time (no formal inspection). It was asked what the qualifications of the inspectors were.

- Manny Gonzalez stated that Texas was inquiring about the hardening of the grid from its utilities.
- Missouri has asked about the cost to harden the grid. Amren IL has also been asked this.
- Oregon – alternate form of regulation. Service quality programs have been adopted, one of which is a 10 year inspection cycle along with correction timeline. There was a question of pole safety.
- All of Heidi’s states (parts of California, Oregon, Washington, Idaho, Utah and Wyoming) have adopted 1366, except Oregon. They even have an understanding of the methodology.
- Cheri asked if EEI tracks of which states use 1366. Or should we have a task force to keep track of this. EEI is tracking it somewhat, but not in the manner we would want. Greg Obenchain will look into this. Keith Frost suggested using a template (AI: Cheri to create form)
- Ohio had a proposal to prescribe exactly how poles are to be inspected. Was thinking of prescribing one companies method of inspection.
- North Carolina had a big audit a few years back after ice storm. Nothing came out of that audit except that the cost to bury everything were extremely high.
- Dave Gilmer has seen both sides. RUS where there were prescribed methods and investor owned where the big thing was the bottom line.

What is meaningful prescription and what will lead to customer satisfaction. Is it indices, practices or other things?

One utility requested the utility by utility data (without ID) for a five year period. They just the summarized numbers for each year. This is what has been provided to the members in the past. This will be provided to everyone. There were some concerns about the changes within the utilities over the years. This could be internal to the utility or through other means. **AI: Cheri to poll each participant to get their permission.** Another concern is that regulators or others might be able to determine who the utilities are in the database.

Second request: Have you ever had conversations about reliability metrics as they relate to high tech customers? Is there some communal wisdom I can tap for comparison with how we serve those sets of customers?

Tom Short stated that you may need to delve into the PQ world. Others to share their ideas with Heidi.

Presentation by John Goodfellow on: “Understanding How Trees Cause Interruptions”. Work was funded through a research grant. Looked at many aspects on how trees could cause faults. Testing conducted in a controlled High Voltage Lab. Showed several pictures from the lab experiments he conducted. Once a carbon path is formed, it remains. This is the smoking gun for evidence of a tree fault. There are several layers, bark which is dry and corky, then the phylum, which transports the “food” for the tree, then the xylem which contains the ions, which is the most conductive. Keith Frost asked which species show the carbon path better than others. Some species show a decrease in current due to drying in the wood due to resistance heating. There is also the case where the carbon track grows, but then there is drying and no fault will occur. Fault impedance is either very high or very low. Showed chart on Common Fault Impedance Levels. Showed formula on: Risk to Reliability due to trees. Trees do not cause faults by growing into lines. Number of phases and spacing play a role into if a tree will cause a fault. Voltage level and configuration plays a key role if a tree causes a fault (voltage gradient). The greater the gradient, the quicker a fault will incur. Anything under 2kV/foot will not cause a fault. About the only time there will be a fault with in growth is with Weeping Willows due to the thatch. The larger the branch, the more likely a fault will occur. “Burners” are due to desiccation, wilt and mortality caused by resistance heating. In the process, they become less conductive. In total 21 tree species were tested. Some specimens so difference between long trees and old trees. Surface moisture changed the time to fault, but not the likelihood to fault. Two types of water in plants; free water (sap) and bound water (exchange sites). Dead species are less conductive than similar live ones. For seasonal variations, more conductive in early and late growing seasons. Trees are least conductive in winter dormant season. This variability does

not change fault/no fault threshold. Did a field test where line (7.6 kV) was tied to a tree, did not draw a enough current to blow a 5k fuse. For equation, all variables can be determined. All tree contacts lead to a fault (high impedance or low impedance), it requires certain conditions to lead to an interruption. Once a fault (interruption) event occurs, it stays. Multiphase circuits are at more risk than single phase. Framing and spacing also play a role. Risk assessment criteria can be developed. Proper pruning it is unlikely that future problems will occur. Assess crowns as part of a hazard tree program. No need to trim burners. Need more work on the species aspect. In California, tree trimming programs increased 3x due to new rules. Decay and failure of a tree are more of a concern (mechanical failure). Need to consider safety aspects along with line losses. Showed the Top Ten Myths from '05 T&D magazine. Smooth bark species show the carbon path better than platy bark species. The following questions were asked of John:

What is proper pruning – minimize wounding, cut at junction or branch points (how and where cuts are made) (ANSI 3300 is the bench mark). Cause as little disturbance as possible.

Cheri asked if everyone wants to perform the benchmark again. She stated that 137 utilities have participated in the past, usually 100 utilities in any given year. **AI for entire working group: Please send their 2006 data to Cheri by April 1.**

Bob Saint gave an update on RUS. No action on IEEE 1366 Beta method. This was due to changes in personnel. It will probably will go into effect until 2008. Been going around to RUS members and has generally received favorable responses.

Task Force on Weather Normalization – Chair Tom Short (t.short@ieee.com)

The two main topics were the scope for the TF and panel session for '07 GM.

The mission of the task force: A panel session at the 2007 GM and a IEEE task-force paper.

Scope: Ways to normalize or account for weather changes on SAIFI and SAIDI.

Some utilities incorporate weather data from nearby weather station and incorporates it into their OMS system.

An overview of the 2007 General Meeting panel session was given by Vince Forte. Final presentations will be archived on the PES web site. Vince showed his work at NG with lightning.

Mark Thatcher – KCPL Weather Normalization of Yearly Goals. Use to use different classes of storms, based on number of customers out. Switched to 1366 with storm start and end dates to define storms. Then went back and worked with historical data. KCPL used 3 tiers for SAIDI goals. They used Threshold, Target and Maximum. Goal was to normalize weather out of the target.

Charlie Williams – Weather Normalization of Interruptions. For Progress Energy, Florida, there was a very good correlation of weather with outages or indices. There are three monthly patterns: base load (car hit pole), Summer Peaking (lightning, tree) and spring/fall (animals). After removing the animal interruption, you then can correlate outages with weather (lightning).

Task Force on Duration Indices – Chair Joe Viglietta (joseph.viglietta@peco-energy.com)

Joe Viglietta gave an update on this TF activities. SAIDET method by Tom Bialek was the driver behind this group. Goal is to get something into 1366. There is a small group looking into this. They will be making a panel presentation at a future meeting. They will also possibly be performing a survey. Will be debating this further, most likely in Tampa. Showed SAIDET and

two other possible candidates. Cheri asked if there was a need to delve into this and the group affirmed. (AI for John/Cheri: put one hour into Tampa schedule for this).

Motion to adjourn the meeting was made by Bob Saint, with a second by Charlie Williams.