Reliability Working Group Meeting Notes - Jan. 9, 2012
Draft dated January 15, 2013

Attendees:

City Staff:	**Consultants:**	**Participants-**
Bob Harberg	Bob Lachenmayer	Burrell Eveland
Heather Bailey	Warren Wendling	Puneet Pasrich
Kathy Haddock	Tom Ghidossi	Jim Look
Heather Bailey	David Hughes	Pete Bastion

Meeting Overview:

- INTRODUCTIONS
- Shared Kelly Crandall's sensitivity/uncertainties analysis list (handout)
    - Pete described process for further refinement and categorization of uncertainties
    - Kathy helped clarify the process
    - Burrell – Cost and availability of water is not correctly reflected
        - Puneet – Resource group is reviewing this issue
- Previous Meeting notes review
    - Send changes to Basecamp and Andrew will update the master version and repost
- Spreadsheet on Benchmarks from sister cities and other public power utilities (handout)
    - New info provided by Ft. Collins that has been added to spreadsheet
    - Puneet – Do we have some of these for Xcel in the metro area? SAIDI and/or SAIFI?
        - Bob – There is some information available, but not all. Elaborated on the info we have. It was a better metric than what they had published.
    - Pete – WAPA production. Looking at their maintenance figures that he'll pull out and send via basecamp
- Existing Xcel Energy Reliability Considerations presentation by Tom Ghidossi (PowerPoint)
    - Slide #1 – Distribution Infrastructure Strengths
        - Cross-connection between substations
        - Feeders sized for efficient distribution
        - Steel poles in several areas
        - Switching and sectionalizing equipment
        - Protection coordination
        - Underground/Overhead lines
            - 50% underground/50% overhead
            - Talked about the differences in types of underground wires, conduits, evolving regulations, city mandates, older wires fail more quickly, new wires last longer and are generally buried better

        - Reliability neutral because you can't assess it until something happens and you have to dig
    - ATO's – Automatic throw-overs
        - Indicated on the map
- Slide #2 – Infrastructure weaknesses
    - Overhead construction in back lots
    - ROW clearing has fallen behind
    - Age of equipment –
        - General concern in review. Small percentage of equipment that is older than it should be.
    - Overhead construction crowded with joint use pole attachments
        - Cable, Telecom, other – many poles with use beyond electricity.
        - Could cause problems with weather, maintenance, payments from other users
        - Poses reliability risk and safety issues
        - ROW issues with multiple parties using one pole for various services
    - Overhead clearances
        - Due to numerous factors, may not meet codes in various areas
    - Pad-mount equipment access restricted
        - Don't have safe access to much of the equipment
        - Covered by vegetation and other items
- Slide #3 - Reliability through on-going procedures – items city should consider. Items we know Xcel has been doing, but don't have full data on their maintenance. All contribute to reliability
    - Assessment of system performance from grid data
        - Ticking timebomb = transformers in residential areas originally installed to supply 12 to 24 homes and those home have expanded equipment (AC, EVs, etc.) which has led to blown transformers. Stressed transformers.
    - SCADA at substations
        - Supervisory control at substations
        - Xcel has done this for a long time
        - Not sure what type of SCADA Xcel is using
            - Mostly built in-house
    - Local crews – Xcel has local maintenance crews that can be readily mobilized
    - Pole testing
        - Have evidence of pole testing. Stamped tags typically with dates. Some poles are old.
        - Look at "reject rate." If it is climbing, then we need to step up testing.
        - Pole testing and replacement is necessary
    - Line patrol
        - Can't tell you exactly how much there is.

        - Maintenance
            - We've seen a lack of evidence of maintenance
            - See pole with tag that said it was hit by a bus last year and it hasn't been replaced/repaired.
            - Have a feeling that the level of maintenance isn't what you'd like to see.
            - Transformers appear to have been installed between 70s and 90s.
            - Switch gear is hidden. But you can tell by weathering on exterior.
            - Actual maintenance and preventative maintenance aren't where they need to be for Xcel
            - Air-magnetic circuit breakers – 5-year replacement program established some time ago but not sure of current status – Warren
            - Need to determine transformer exposure to overheating - Burrell
    - Slide #4 - Generation and Transmission system reliability – mostly hidden and not observable by simply looking
        - Reserves
        - Scheduling and balancing
        - 115kV and 230kV looped transmission system – most desirable
            - Multiple feeders coming in
                - 2 – 230 in the north
                - 1 – 115
                - We can be a part of the transmission planning sessions at any time
        - ROW maintenance – appears to be up-to-date
        - Substation upgrades – have data on these and appear to be maintained
    - Slide #5 – Existing Reliability Indices
        - SAIDI: 85 – total duration of interruption for an average customer in minutes per year
        - SAIFI = 85
    - Slide #6 - Other aspects to consider
        - Adaptability of the infrastructure to distributed generation at significant penetration levels
        - Fiber optic network – groundwork for SmartGrid
    - Slide #7 – Concepts
        - Redundancy
        - Capability – how much of the redundancy can you really make use of. One has to handle the load of two.
        - Power Quality Controls
            - Capacitors
            - Lightning protection
            - Voltage regulators
        - Reserve margins

                - We're shooting for 15% when we look at our resource mix, but it depends on how you calculate it.
                - Think about – as we're developing resource plan, look at potential for distributed generation.
            - Common-mode failure scenarios
    - Slide #8 – Other Reliability Elements?
    - Slide #9 - NERC –
        - Registration as an entity such as "Distribution Provider" or "Load Serving Entity," etc.
        - Compliance
            - Coordination and cooperation on assessments performed by Transmission Operators
            - Under-frequency or under-voltage load-sharing programs as applicable
- Regulatory Reliability Considerations presentation by Warren Wendling
    - Mr. Wendling provided handout on terms and standards, and function names/functional entity
    - Generation – Transmission
    - SAIDI and SAIFI looks at whole system, but greatest impact is created by distribution system, transmission system is a small part of overall outages
    - Balancing and Balancing Authority that must do that
    - See handout provided by Warren on Federal and Regional Reliability Standards – final page – NERC Reliability Functional Model
        - Provides the framework for the development and applicability of NERC's Reliability Standards
            - See page four of handout
    - City would become subject to NERC and WECC standards if electric utility is formed
    - Loss of load probability
        - Xcel Energy – 16.3% operating reserve
        - Need to consider planning, spinning and contingency reserves
        - Spinning reserve would typically be 1% per balancing authority – Burrell
        - Xcel is the balancing authority in this area
    - Questions
        - We don't have to deal with load balancing unless we generate and sell it on the grid?
            - You will have to meet obligations through contractual obligations
            - We could contract with Xcel to do that
- Future Reliability Goals and Factors to Be Considered presentation by Bob Lachenmyer
    - Need to get slides from Mr. Lachenmeyer to post on Basecamp
    - Reasons to Pursue Reliability
        - US lags behind standards when compared to developed countries
        - Power interruptions costs US economy app. $150 billion a year or 4 cents/kWh

        - Not just related to repair costs but costs to businesses and consumers
        - SAIDI and SAIFI don't fully measure costs of service outages
    - Slide with comparison to other local munis and Xcel
    - Slide with outage causes – Major events are highest percentage, trees are next, followed by distribution equipment failure
    - Day to Day reliability
        - Undergrounding – cost estimates from $50K to $5 mil a mile
        - Vegetation management
        - Smart Grid implementation
        - Audit pole joint use
        - Implementation of GIS
        - Customer requested reliability improvements – create tariffs that allow customers with higher needs to request and contribute financially to improvements
        - Regularly collect and analyze reliability performance of overhead and underground systems to better prepare for response to outages.
    - Responding to Major events
        - Agreements with other utilities
        - Contingency plans – five stage plans are typical
        - Disaster and recovery planning
        - Asset inventory reserve
        - Public outreach efforts
    - Grid Evolution and how it may impact reliability
        - Current one-way grid
        - New two way (Smart Grid) grid evolving
        - Need to get past meter as barrier to two sides of utility (utility and user)
        - New interconnected grid
            - Smart Distribution
            - Smart Generation
            - Intelligent resource interaction
            - Efficient homes
            - Efficient enterprises
        - Change is stressing the utility distribution system because of 2-way power flows, intermittent sources
    - In a Smarter grid –
        - An integrated provider/user model will need to be developed to optimize the overall system performance
        - Consumers understand their total energy consumption as well as the flexibility that they have in instantaneous demand, and are empowered to optimize to their desired outcomes around cost, reliability and sustainability
        - All generation, including intermittent renewable, and storage mechanisms can seamlessly contribute to supplying the grid requirements

        - A conserved kWh is valued at (or above) the market rate of generated kWh
        - The system self-heals – responding quickly and surgically to power distribution events, physical and cyber attacks
        - New products, services and markets power our 21st century economy while helping energy providers and consumers meet their business objectives
        - Load density may be an issue for securing substantial distributed generation - Jim
    - Smart Grid Characteristics
        - It is "transactive" – group think. Like the Internet
            - Active participation by consumers
            - Accommodate all generation and storage options
            - Enable new products, services and markets
            - Provide power quality for digital economy
            - Optimize asset utilization and operate efficiently
            - Anticipate & respond to system disturbances – self-heal
            - Operate resiliently against attach and natural disaster
    - Managing reliability in the new paradigm
        - Leveraging automation
        - Users are no longer passive attachments
        - Users are not homogeneous when it comes to outages
        - Incorporate the financial impact on users
        - Compare investments in User improvements to improvements in the grid and to compare their associate impacts on reliability
        - More closely tie to overall Utility priorities to community goals
    - Distribution Automation
    - Cost of power outages is calculated by analyzing value of service
        - Loss of production
        - Electric shock
        - Health issues
        - Flood damage
        - Spoiled food
        - Lost sales
        - Lost experiments
        - Housing relocation
        - Reduced productivity
    - Average cost of an outage by customer type (1 hour)
        - $3 for res
        - $1,200 small to medium commercial and industrial
        - $82,000 for large commercial and industrial
    - Potential impact of grid measured reliability on economic development (see slide)
        - Schools, hospitals and data centers on same circuit but all have different needs
        - Several additional points I couldn't get – can't type fast enough!

    - Denmark Changed in Two Decades
        - Centralized system moved to decentralized system
        - Much lower SAIFI and SAIDI than US
    - Industry model will not change, the business model will
        - That will drive the change in the industry
    - End
- Wrap up/Next Steps
    - Study Session on Feb. 26 will incorporate tonight's discussions
    - One more meeting in Feb and may have another in March
    - Will need to identify system replacement needs (Tom G.)
    - System migration
    - Need to determine what we're aiming to do, what we want our system to look like now and down the road
        - That will help determine what we need to do with existing and will help lay out our plan for the future.