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XCEL ENRGY OUTAGE MANAGEMENT SYSTEM (OMS)

Xcel Energy currently uses "Power On" Outage Management System (OMS) http://www.gedigitalenergy.com/uos/oms.htm as its computer application tool to geographically locate and analyze electric service outages. It integrates or "connects" data from the Company's Geographic Information System (GIS) and address information from its Customer Information System (CIS). The GIS system, in turn, is a database that relates physical equipment in the field (circuit breakers in substations, transformers, fuses, switches, re-closers, primary opens, etc.) to geographic locations.

Future of OMS

An outage management system is software that relies on inputs such as interactive voice response (IVR) system, smart meters, the Advanced Metering Infrastructure (AMI) network and a supervisory control and data acquisition (SCADA) system to identify and diagnose a problem, then suggest a fix. Although an OMS can function with an IVR system-and even better with smart meters that push information-it performs best when combined with a robust, real-time AMI network.

AMI networks push back to the utility event-driven information it would not have received normally without an instant, automatic network. With advanced AMI, the system alerts staff immediately and automatically of outages via email and text, which allows them to gauge the full extent of the event instantly. The utility then can determine quickly whether it faces an isolated outage or widespread blackout and can dispatch and deploy crews more appropriately and more confidently.

AMI systems can interact with OMS in different ways. An AMI system with push capabilities can proactively tell the utility about outages and bring in information without the utility having to ask for it first. Alternatively, the meter can deliver information when asked, which is most useful when the utility is aware of the outage. Particularly advanced AMI networks also send thousands of meter-reading messages to the utility simultaneously, which can better represent the scope of a system event. For example, if there are 20,000 outages the system will relay up to the utility with 20,000 unique messages, which then can be grouped, analyzed and reported directly to the utility's staff.

A further, critical benefit of an AMI network is increased visibility. If an outage is visible remotely, field crews and operations can access the same data simultaneously to dispatch resources where they're needed most. The utility also has better access to information about the progress of the restoration, allowing them to keep customers up-to-date-a critical aspect of maintaining positive customer relationships. Visibility also helps utilities automatically send alerts to key accounts prior to planned outages and can help utilities recreate outages for analysis and improvement.

Managing outages is particularly critical in the event of a storm or extreme weather.
To help the utility allocate its resources more effectively, the OMS uses an automatic vehicle location tool to help the utility manage the dispatching of crews to the right locations. Overall, predictions are made quicker and more accurately with all components' working together.

The OMS of the future will also have customers' phone numbers (up to three per home) built into it. As a result, when customers call, the OMS automatically can identify their locations and provide them with outage details.

By adopting an OMS that integrates with the utility's AMI network, the utility will nearly eliminate all manual meter reads, adopted instant outage alerts and improved restoration time for its customers.

Reliability Warning Threshold (RWT)

A RWT warning is triggered if the threshold is exceeded for one year. Exceeding the RWT in two consecutive years triggers bill credits for the affected region.

The Reliability Threshold (RT) for the calendar year for Xcel's electrical system shall be the natural antilogarithm (exponential function) of the sum of (1) the arithmetic average of the natural logarithms of the annual System Average Interruption Duration Index for Ordinary Distribution Interruptions (SAIDI-ODI) for the Standard Reference Years (Alpha) plus (2) the standard deviation of the natural logarithms of the annual SAIDI-ODI for the Standard Reference Years (Beta).

$$RT = e^{(Alpha+Beta)}$$

The Standard Reference Years shall be the preceding 25 calendar years.

Electric Continuity Threshold (ECT)

Xcel shall endeavor to provide a level of electric service to each of its customers such that customers experience no more than five (5) Sustained Electric Service Interruptions (SESI) in any year, excluding Major Event Days Interruptions (MEDI) and Public Damage Interruptions (EPUBI) as defined herein.

1. Major Event Day Interruptions (MEDI) shall include Distribution System Interruptions that commence on a Major Event Day (MED) as defined herein.
2. Public Damage Interruptions (EPUBI) shall include Common Distribution Interruptions that are precipitated by a person, or persons not within the control of Xcel.

Electric Restoration Threshold (ERT)

Xcel shall endeavor to restore power within 24 hours following a SESI, excluding Bulk Supply Interruptions (BULKI), MEDI, and EPUBI as defined.

1. BULKI shall include SESI that originate at an electric power generation facility, or on the electric power transmission system (including transmission substations and including the transmission portions of substations providing distribution service), or on the electric power facilities of other electric power utilities. BULKI shall also include those SESI in which more than half of the total time of electric service unavailability is due to a controlled load curtailment initiated by the utility to protect the bulk power supply system.

Determination of Major Event Day (MED)

The Major Event Day Threshold (TMED) shall be determined annually for Xcel using historical Distribution System Interruption (DSI) data. Major Event Days shall be determined in accord with IEEE Standard 1366-2003 with the following clarifications and exceptions:

Xcel may revise any historical data determined to be inaccurate. The Major Event Day Threshold shall be calculated from the Distribution System Interruptions for the preceding five calendar years.

Sustained Electric Service Interruptions

Sustained Electric Service Interruptions (SESI) shall include any interruption to a customer that exceeds five (5) minutes duration, of any cause or origin, except a temporary de-energization of electric service by the utility at the request of the Customer, or an agent of the Customer. Further, if a Customer's electric service entrance is not safe for re-energization, the electric service interruption for that customer shall effectively terminate when the utility notifies the customer that the electric service entrance must be repaired or replaced before electric service can be restored.

For each SESI, the number of Customers experiencing a sustained Customer Interruption (CI) shall be recorded, as shall the total of the Customer Minutes Interrupted (CMI). CMI values shall include the effects of stepped service restoration. SESI are divided into three (3) classes of interruptions based on event origin:

1. BULKI shall include SESI that originate at an electric power generation facility, or on the electric power transmission system (including transmission substations and including the transmission portions of substations providing distribution service), or on the electric power facilities of other electric power utilities. BULKI shall also include those SESI in which more than half of the total time of electric service unavailability is due to a controlled load curtailment initiated by the utility to protect the bulk power supply system.

2. Substation Interruptions (SUBI) shall include SESI that originate in the non-transmission portions within an electric distribution substation or the distribution-serving portions of a combined transmission and distribution-serving substation of Xcel. SUBI specifically include interruptions that originate in a substation distribution power transformer (including its associated non-transmission system high-side protective equipment) or on the primary distribution voltage equipment (including bus work, insulators, and other conductor system; surge arresters and surge gaps; breakers, re-closers, fuses, circuit switchers, and other interrupters; switches and other isolators; instrument transformers; protective relaying, controls, reactive power equipment; voltage regulation equipment; and other ancillary equipment integral to the distribution service operation of the facility). SUBI shall not include conductor systems comprising the distribution feeder exit from the substation. Distribution Substation Interruptions shall also include all SESI (or restoration steps thereof) in which more than half of the total time of electric service unavailability is due to a controlled load curtailment initiated by the utility to protect electric distribution substation equipment.

3. DSI are SESI that originate on Xcel's primary or secondary voltage electric distribution system. The distribution system is Xcel's electric facilities between the distribution substation fence and the active Customer meter. Generation, Transmission, and Substation facilities are not part of Xcel's electric distribution system. DSI are subdivided into two (2) categories by a Major Event criterion:

    a. MEDI shall include DSI that commence on a MED as defined herein.

    b. Common Distribution Interruptions (CDI) shall include DSI that commence on a date that is not a MED. CDI are further subdivided into two (2) categories by event circumstances:

        i. Extraordinary Distribution Interruptions (EDI) shall include CDI that meet any one of the specified criteria.

        ii. ODI shall include all CDI that are not Extraordinary Distribution Interruptions