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Division of Public Utilities

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ACTION REQUEST RESPONSE

To: Public Service Commission

From: Chris Parker, Director
Artie Powell, Energy Section Manager
Charles Peterson, Technical Consultant
Sam Liu, Utility Analyst
Douglas Wheelwright, Utility Analyst

Date: April 19, 2012

Re: Docket No. 12-035-70 – Major Events 27 & 28 – January 18-21, 2012

RECOMMENDATION (Approve)

The Division recommends that the Commission approve the Company's application for Major Event exclusion for each of the two "waves" that took place on January 18-19, 2012 (Event 27) and January 21, 2012 (Event 28). The System Average Interruption Duration Index (SAIDI) value for both exceeded the threshold that defines a Major Event under the Institute of Electrical and Electronic Engineers' (IEEE) 2.5 Beta methodology adopted by the Commission in 2005 under Docket No. 98-2035-04.

EVENT DESCRIPTION

On January 18 - 21, 2012, two "waves" of a Pacific storm system came through California into Utah that caused extensive damage to the facilities and significant customer interruptions in

Rocky Mountain Power service areas. The primary affected locations were Salt Lake City Metro, Jordan Valley, Tooele, Layton, Richfield, and American Fork operating areas. The first "wave" of the storm on January 18th – 19th resulted in outages due primarily to pole fires. On January 20th there was a temporary lull in the storm activity. The second "wave" of the storm occurred on January 21st and caused snow, wind and tree related outages with another round of pole fires. The storm damage resulted in sustained interruption that affected 171 substations and 239 circuits. The longest interruption of the event occurred on Jordan Valley's Herriman #11 circuit, affecting 5 customers for 1,628 minutes (27 hours) due to pole fires.

A pole fire is caused by contamination of insulators during long periods of dry weather followed by light rain or snow. During an extended dry period, the insulators become covered with dust or salt. The light precipitation causes a current flow (or "leak") from the energized conductor over the contaminated insulator surface to the cross arm and pole. The current flows on or through wood that is made slightly conductive by the contaminated moisture, can cause erosion, charring, and finally an open flame.

	Wave 1: 1/18-19	**Wave 2: 1/21**	**Total**
Total Customer Minutes Lost	5,116,041	5,710,413	10,826,454
Total Sustained Incidents	229	170	399
Total Sustained Customer Interruptions	34,039	40,432	74,471

DISCUSSION

To determine whether the event of January 18-19 & 21, 2012 were Major Events the Division followed the IEEE 1366-2003 definition of a Major Event. The Commission adopted this methodology, commonly referred as the 2.5 Beta Method, in Docket No. 98-2035-04. The IEEE 1366-2003 defines a Major Event as "*an event that exceeds reasonable design and or operational limits of the electric power system. A Major Event includes at least one Major Event Day.*" IEEE 1366-2003 defines a Major Event Day as "*a day in which the system SAIDI exceeded a threshold value, T_{MED}.*" The Company, in response to data request, indicated that it

typically uses calendar days to determine reliability metrics reported in service quality reviews and to calculate annual major event thresholds. Occasionally, a rolling 24-hour period is applied if the event spanned two calendar days and neither calendar day alone met the threshold, but the cumulative customer minutes lost in some 24-hour period within those two days did meet the threshold, e.g. noon day one through noon day two. A Major Event Day is simply a 24 hour period in which the reliability of the distribution system is much worse than normal. The 2.5 Beta Method allows the segmentation of reliability data into normal and abnormal categories, based on the identification of outlier events that cause Major Event Days. Assuming that the daily SAIDI measures follow a log-normal distribution, the probability of a day being defined as a Major Event day under the 2.5 Beta Method is less than 1 percent. The expected number of major event days is 2.3 per year.[1]

According to the definition of a Major Event, any daily SAIDI value that exceeds 5.91 minutes is considered a Major Event. The Company's Utah SAIDI value for the Wave 1, January 18-19, 2012 was 6.11 minutes, and for Wave 2, January 21, 2012 was 6.82 minutes. Therefore, the events of January 18-19, 2012 and January 21, 2012 were Major Events and should be excluded from the network performance reporting.

In February of 2007 the Company's distribution system suffered from a rash of pole fires throughout its service territory. Because there were so many fires with accompanying customer complaints, RMP increased its focus on the causes and mitigation. It appears that weather conditions in 2007 were similar to those experienced in 2012 with an extended dry period followed by light precipitation. In response to a data request, the Company provided the document "An Approach for Reducing the Number of Pole Fires at Rocky Mountain Power," which is attached to this memo. This document was initially written in 2007 in response to the February 2007 pole fires, and was revised in March 2012. The report referenced other similar studies that had been completed and recommended possible solutions. The Division notes that

[1] For 2.5 standard deviations (the meaning of the "2.5" in the 2.5 Beta Method), the right-tail probability is approximately 99.38 percent, or the probability of exceeding 2.5 standard deviations is about 0.62 percent. Multiplying 0.62 percent by 365 days is approximately 2.3 days.

since 2007 the Company has been upgrading insulators for newly constructed poles to reduce pole fires. Recently, the Company looked for advice and explored additional laboratory testing of different mitigations through the National Electric Energy Testing Research and Applications Center (NEETRAC). The Company informed the Division that it plans to run the tests detailed in its report in Tooele County when new construction allows it to install poles with the mitigating features.

In a telephone conference with the Company, the Division asked if it were feasible to retro-fit existing poles with the pole fire mitigation technology. The Company indicated that while that would be possible it would be very expensive and not cost effective given the nature of the causes of pole fires and their wide geographic distribution. The Company did indicate that some of the contaminants that can lead to pole fires come from salting highways in the winter; and that it might be worth studying the possibility of selectively retro-fitting poles that run next to certain highways.

In addition to the pole fire report, the Division is attaching the Company's answers to its first data request set.

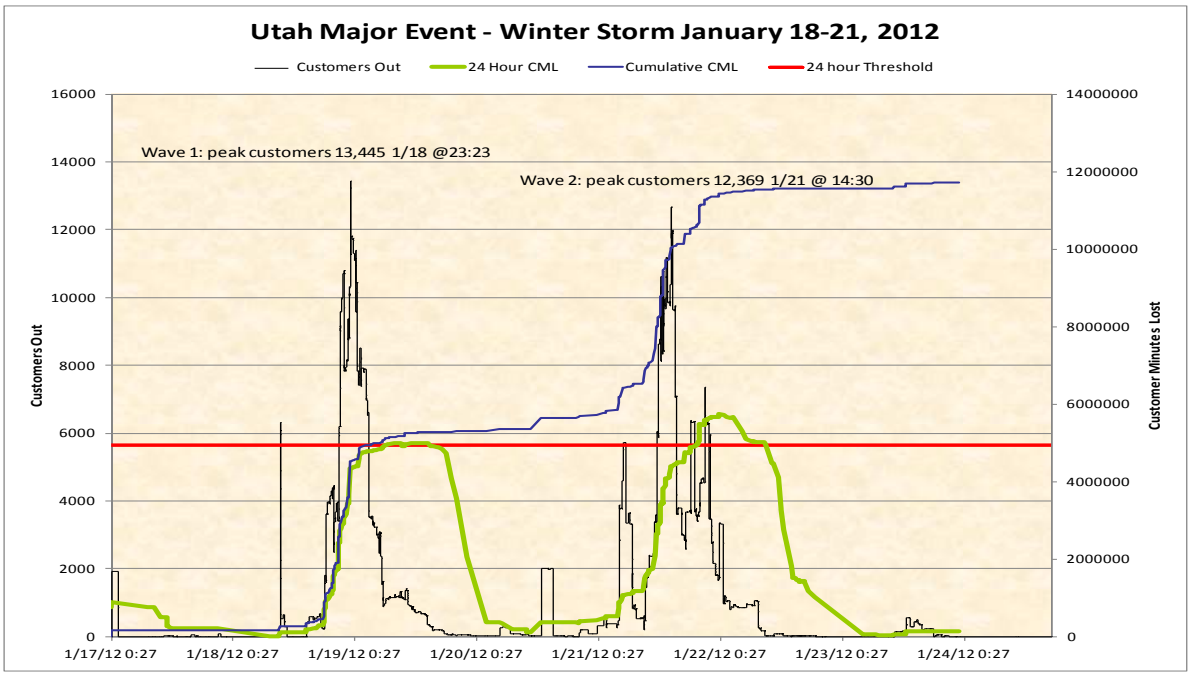
RESTORATION EFFORTS

Facilities damage in Utah included replacement of 33 distribution poles, 2 transmission poles, 53 crossarms, 11 transformers, and approximately 7,000 line feet of conductor. The Company, using its own crews (both local and from other Company service areas) and contract crews and materials were borrowed from less-affected operating areas within Utah and Wyoming. In some cases, crews had the assistance of local fire departments to help extinguish pole fires. Overall for the event period, the Company restored 69% of total affected customers within 3 hours of the initial outage; and 14 customers were without service for more than 24 hours.

The hourly analysis of Events 27 & 28 below shows that the impact of the storm had been building up for a number of hours with the Company restoring customers as soon as practicable. This is evidenced by the fact that the graph of the "customers out" was relatively flat for the first few hours of the storm. That means that as some customers were restored, other customers were losing power. The peak number of customers without service during the first wave took place around 11:20 p.m. on January 18, 2012. The second peak for the number of customers without service from Wave 2 of the storm took place around 2:30 p.m. on January 21, 2012.

Customer Guarantee 1 (Restoring Supply After an Outage) requires that in the event of an outage, the Company will restore a customer's electric supply within 24 hours of being notified, except where, among other things, there is an inability to access the Company's or the Customer's facility for reasons beyond the Company's control and where there is a major event. Despite the access problems and the designation of a Major Event, the Company restored the electric supply to 99% of the customers within 24 hours. Therefore, the Division concludes that the Company's restoration efforts were reasonable.

Figure 1. Hourly Analysis of Events 27 (Wave 1) & 28 (Wave 2)



Estimated Major Event Costs:

Cost Estimates by storm wave:			
	#1	#2	Event Total
Labor	195,000	250,000	445,000
Material	20,000	10,000	30,000
Expense	**215,000**	**260,000**	**475,000**
Labor	100,000	165,000	265,000
Material	40,000	45,000	85,000
Capital	**140,000**	**210,000**	**350,000**
Grand Total	**355,000**	**470,000**	**825,000**

Restoration Resources in Primary Affected Areas:

Resource	**Wave 1**	**Wave 2**
Troubleman/assessors	17	17
Internal local crewmembers	152	112
Internal borrowed crewmembers	6	8
External (contract) crewmembers	30	20
Vegetation crewmembers	21	11
Support staff	7	6
Total	**233**	**174**

CONCLUSION

As summarized above, the Division verified the Company's calculation of the five-year T_{MED} threshold value of 5.91 minutes. The January 18-19, 2012 Wave 1 has a SAIDI value of 6.11 minutes and the January 21, 2012 Wave 2 has a SAIDI value of 6.82 minutes. Therefore, by the criteria adopted by the Commission, this was a major event.

APPENDIX—DISCUSSION OF THE 2.5 BETA METHOD

For the 2.5 Beta Method to be valid, the daily SAIDI data must follow a log-normal distribution. That is, the log of the daily SAIDI data must follow a normal distribution. For the current major event, the Company provided the daily SAIDI provided over the January 1, 2007 to December 31, 2011 period.

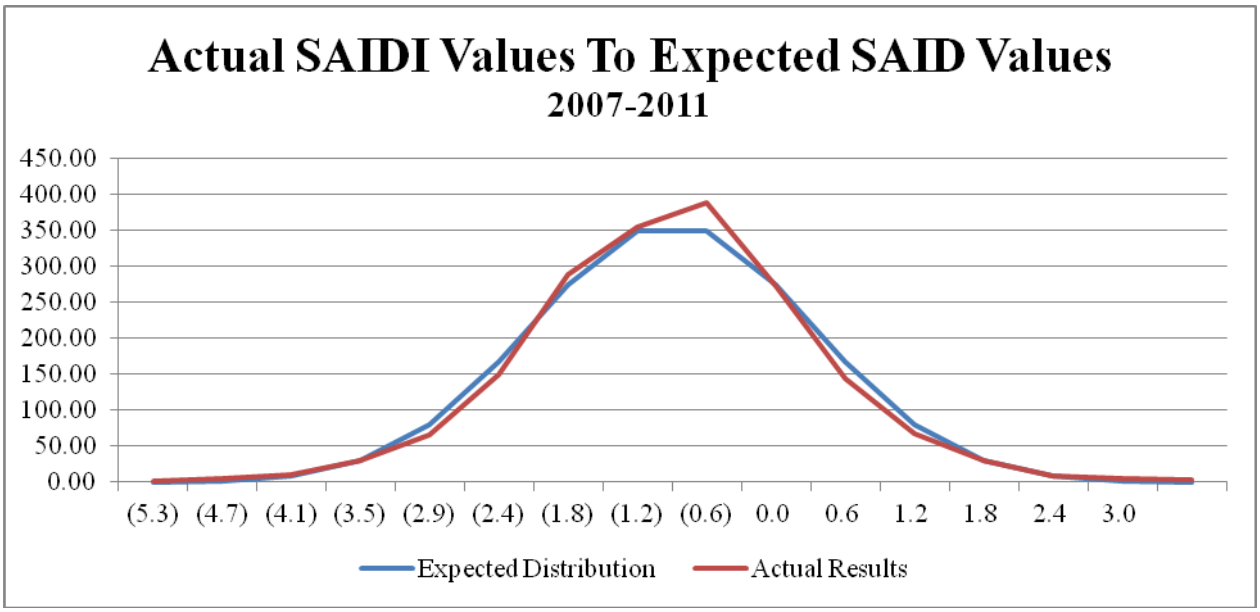
The Division has previously performed a normality test on the 2006 – 2010 data to determine if, under normal operating conditions, the natural log of PacifiCorp's daily SAIDI values approximates a normal distribution (testing if the daily SAIDI values follow a log-normal distribution will lead to the same conclusion). The Company SAIDI data have consistently passed the test for a log-normal distribution. To implement the test, the Division used a Box-and-Whisker plot to identify any outliers in the data set. SAIDI values determined to be outliers were removed from the data set. Removing the outliers was essential to ensure that the remaining data represented "normal" operating conditions. To test for normality, the Division used the Kolmogorov-Smirnov normality test. The null hypothesis tested was that the natural log of PacifiCorp's daily SAIDI values is normally distributed. The Kolmogorov-Smirnov failed to reject the null hypothesis (at $p<0.01$). Hence, based on the result of the Kolmogrov-Smirnov normality test, the Division concludes that, under normal conditions, the natural log of PacifiCorp's daily SAIDI values are normally distributed and the use of the 2.5 Beta Method is justified. As noted earlier, the Company provided statistical evidence showing that the 2007 – 2011 data are approximately distributed log-normal.

The Company calculated the Major Event threshold (T_{MED}) as 5.91. The $T_{MED,}$ is calculated using the following procedure:

1. Assemble the preceding five years of daily SAIDI values,
2. Remove from the data set any day, in which the daily SAIDI value was zero,
3. Take the natural log of each of the daily SAIDI values,
4. Calculate the mean, α, and the standard deviation, β, of the natural logs of the daily SAIDI values, and

5. Calculate the threshold, $T_{MED} = e^{(\alpha+2.5\beta)}$.

The Company provided a statistical analysis that indicated the 2007 – 2011 SAIDI are approximately distributed log-normal. The figure below graphically depicts the goodness-of-fit of the log of the 2007-2011 SAIDI data to the normal curve, i.e. a visual demonstration of the log-normal nature of the SAIDI data.



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Attachments