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Department of Commerce
Division of Public Utilities

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ACTION REQUEST RESPONSE

To: Public Service Commission

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

Date: October 30, 2012

Re: Docket No. 12-035-98 – Major Event 30 – September 1, 2012

RECOMMENDATION (APPROVE)

The Division recommends that the Commission approve the Company's application for Major Event exclusion for the event that took place on September 1, 2012 (Event 30). The System Average Interruption Duration Index (SAIDI) value for the event 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 in Docket No. 98-2035-04.

ISSUE

On October 1, 2012, Rocky Mountain Power (Company) filed Major Event Report for the weather-related events that took place on September 1, 2012. The Commission issued an Action Request, to the Division on October 1, 2012 with a due date of October 31, 2012. The Division issued a formal data request to Rocky Mountain Power (Company) on October 15,

2012. The Division received responses to its data requests on October 24, 2012. This memorandum represents the Division's response to the Commission's Action Request.

EVENT DESCRIPTION

On September 1, 2012, a thunderstorm with lighting, rain, and high speed winds passed through Utah causing extensive damage to Rocky Mountain Power facilities. In response to a Division data request the Company stated while the storm affected customers within the entire state, the most concentrated customer interruptions occurred primarily in the Company's Ogden operating area. High winds blew lines together and blew branches into distribution lines. The National Weather Service issued flash flood warnings from Provo to Green River. Sustained interruptions occurred on 90 substations serving 110 circuits. The longest interruption of the event occured on Rose Park #11 circuit, affecting 1 customer for 25.2 hours due to a leaning pole close to a barn containing livestock, requiring a pole replacement. The second longest interruption of the event occurred on the Porter Rockwell #17 circuit and also affected one customer. The total outage duration for this second customer was 23.5 hours. Overall, the event resulted in 29,243 customers experiencing a sustained outage and 9,010,256 customer minutes being lost. The Company's preliminary cost estimate is $180,000 as set forth in the table below.

Cost	Labor	Contractors	Materials	**Grand Totals**
Capital	105,000	5,000	16,000	**126,000**
Expense	45,000	5,000	4,000	**54,000**
Totals	**150,000**	**10,000**	**20,000**	**180,000**

DISCUSSION

To determine whether the event of September 1, 2012 was a Major Event 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, TMED."* A Major Event Day is simply a day 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 days per year.

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 September 1, 2012 was 10.76 minutes. Therefore, the event of September 1, 2012 was a Major Event and should be excluded from the network performance reporting.

Restoration Efforts

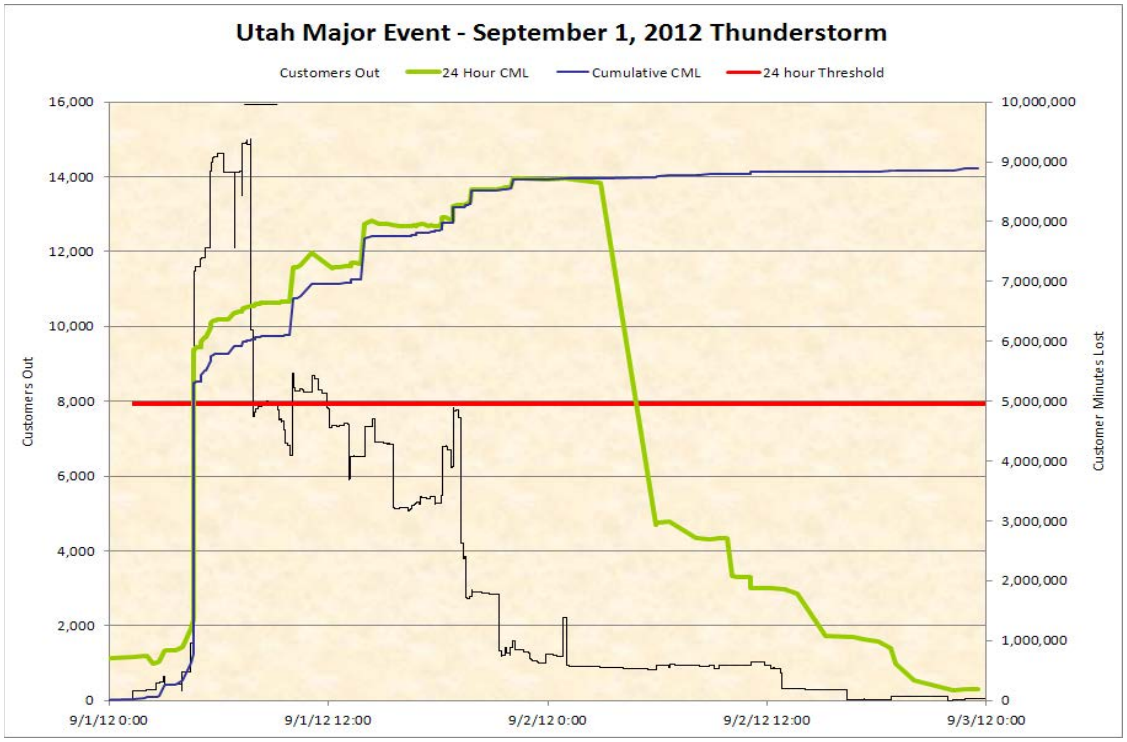
The graphical hourly analysis of Event 30 below shows that the impact of the storm had been building up for a number of hours with the Company restoring customers as soon as practicable. The outage began at 1:15 a.m. on September 1, 2012. The cumulative customer minutes lost was relatively flat for the 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 took place at about 4:30 a.m. The Company utilized its own crews from Utah, crews borrowed from Idaho and Wyoming, and contract crews to assist during the storm. Forty-two percent of the sustained customer interruptions were restored at 9:30 a.m. Facilities damage in Utah included replacement of 7 distribution poles, 18 crossarms, 3 transformers, and approximately 3,000 line feet of conductor.

The Division requested that the Company explain why two customers were without power for more than 24 hours in Salt Lake Metro area. The first customer called in reporting a leaning pole close to a barn containing livestock. Due to the significant outage activity throughout the Wasatch Front impacting crew availability, the Company prioritized this work toward the tail end of the restoration activity. The Company indicated that this outage only

affected a line to the customer's horse stables. When a crew was available, it expended several hours to replace the pole. The total outage lasted 25.2 hours. The second customer outage was actually two separate outages. Originally, the Company reported that the total duration of second outage lasted 28 hours. A Company crew discovered 2 spans of line down, which were repaired. Later, it was discovered that a second outage had occurred when a transformer had lost one phase. Subsequent to the filing, it was determined that this second customer was out of power 4 hours and 29 minutes less than originally reported. The two outages together totaled 23.5 hours.

Based upon the information available to it, the Division concludes that the Company's restoration efforts were reasonable.

Figure 1. Hourly Analysis of Event 30



Restoration Resources:

Troubleman/assessors	7
Internal local crewmembers	78
Internal borrowed crewmembers	2
Substation crewmembers	2
External (contract) crewmembers	2
Vegetation crewmembers	8

CONCLUSION

As summarized above, the Division verified the Company's calculation of the five-year T_{MED} threshold value of 5.91 minutes. The September 1, 2012 (Event 30) has a SAIDI value of 10.76 minutes. Therefore, this was a major event by the criteria adopted by the Commission. The Division recommends that the Commission approve this event as a major event.

Attached to this memorandum is the Company's response to the Division's data request.

Attachment

CC Marialie Martinez, DPU
Doug Bennion, RMP
Dave Taylor, RMP
Michele Beck, CCS

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. Using the daily SAIDI provided by the Company (from January 1, 2007 to December 31, 2011), the Division performed a normality test to determine if, under normal operating conditions, the natural log of PacifiCorp's daily SAIDI values approximate a normal distribution (testing if the daily SAIDI values follow a log-normal distribution will lead to the same conclusion).

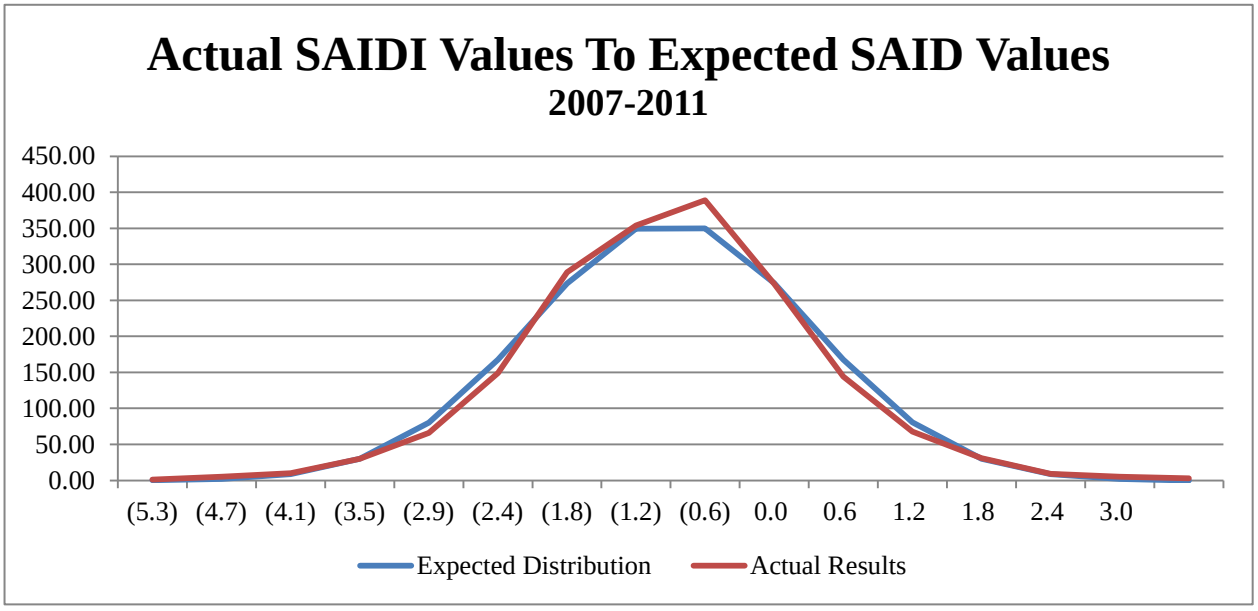
To implement the test, the Division used a Box-and-Whisker plot to identify any outliers in the data set. SAIDI values determined to be outliers were removed from the data set. Removing the outliers was essential to ensure that the remaining data represented "normal" operating conditions. To test for 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.

The Division calculated the Major Event threshold (TMED) as 5.91. The TMED, 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.



DPU Data Request 1.1

Two customers were without power for more than 24 hours in the Salt Lake Metro area. Please explain what caused that outage and why it took more than 24 hours to restore power to those customers.

Response to DPU Data Request 1.1

Outage #1177534
Circuit: Rose Park #11
Start Time: 9/1/2012 18:05:10
Outage Cause: Needed to replace pole
Customers Affected: 1
Duration: 25.2 hours

Explanation for duration:
At 6:05PM 9/1/2012 a customer call came in reporting a leaning pole close to a barn containing livestock. A troubleshooter was sent to investigate and he lifted the jumpers at facility point 150504 at 11:45PM 9/1/2012 to de-energize the line and make safe until the situation could be permanently resolved; this would require replacing the pole. There was significant outage activity throughout the Wasatch Front at this time impacting crew availability. Since the impact of the de-energized line was limited to horse stables and only affected the single location, in keeping with the priority of restoring power to as many customers as promptly as possible, the Company prioritized this work toward the tail end of the major event activity, when a crew would be available to expend several hours to replace the pole. The work was completed at 7:15PM 9/2/2012. (The outage lasted 25 hours and 10 minutes)

Outage #1176568 and 1177469
Circuit: Porter Rockwell #17
Total Duration: 28 hours (subsequent to the filing it was determined that this customer was restored 4 hours and 29 minutes earlier, so the total duration was actually 23.5 hours)

Explanation for duration:

The duration of the outage was overstated, first due to it being comprised of two separate outages, secondly due to the outage restoration time being misstated. The corrected durations and reason for their length is explained below.

Outage#1176568 began at 1:15 AM 9/1/2012. A troubleshooter arrived at the site at 1:50 am and discovered 2 spans of line down between facility points 143202 and 144301. At 4:00AM 9/1/2012 a Jordan Valley line crew was assigned to repair the line down and restored power at 9:17 AM on 9/1/2012 and completed clean up at 1:00 PM 9/1/2012. This outage lasted eight hours and two minutes.

Outage #1177469 began at 9:06 PM 9/1/2012 (11 hours and 49 minutes later) when a jumper came off eleven spans away from the first outage. A troubleshooter was dispatched at 10:13PM on 9/1/2012 and determined that the pad-mounted transformer had lost one phase and believed that the equipment had failed; replacing a pad-mount transformer requires a crew to safely perform the work, so requested that a crew be sent to change out the suspected failed pad-mount transformer at 8:19AM 9/2/2012. Upon arrival the crew determined that the jumper had come off; after reattaching the jumper, they tested the transformer and determined that it was operable. They restored power according to their log at 12:30PM 9/2/2012 (Fifteen hours and 24 minutes later).

DPU Data Request 1.2

The following areas experienced outages to a significant portion of Rocky Mountain customers in those areas: Moab, Ogden, Richfield (Delta), Smithfield, Tremonton, and Vernal. For each of these six areas please provided the following information:

a. the start time and duration of the outages in those areas;
b. the principal cause of outages in those areas;
c. the maximum wind speed in those areas;
d. the design limits of the facilities of the facilities that were damaged (for example, state the maximum wind speed that the poles and wires were expected to withstand).
e. the most recent time that the Company's vegetation management program "cleared" the damaged facilities in those areas.
f. were these areas affected by the same storm system, or by multiple storm systems? Please explain.

Response to DPU Data Request 1.2

a. the start time and duration of the outages in those areas;

Please refer to Attachment DPU 1.2a for spreadsheet information of outages in the areas; while it was most damaging in Ogden, the event was experienced across the state.

b. the principal cause of outages in those areas;

A day of thunderstorms and late summer storms caused extensive damage to Rocky Mountain Power facilities due to lightning, wind and rain. While the storm affected customers within the entire state, the most concentrated customer interruptions occurred primarily in the company's Ogden operating area. High winds slapped lines together, toppled trees and blew branches into distribution lines.

c. the maximum wind speed in those areas;

See below for maximum gust speeds recorded by National Climatic Data Center (NCDC) data across the state

Ogden: 36 MPH
Salt Lake City: 39 MPH
Provo: 52 MPH
Price: 40 MPH
Vernal: 40 MPH
Logan: 22 MPH
Dugway Proving Ground: 31 MPH
Moab: 38 MPH
Bryce Canyon: 24 MPH

Cedar City: 30 MPH
St George: 30 MPH

d. the design limits of the facilities that were damaged;

Depending upon the installation dates of equipment the design limits vary but were installed consistent with either the NESC medium and heavy loading standards. Specific details for any damaged component cannot be individually identified, but generally damage was the result of broken and windborne branches that were the result of the heavy winds. Generally speaking, the industry experience suggests that interruption events increase non-linearly as wind-speeds reach and exceed 30 mph.

The IEEE 2.5 Beta Method for major event criteria does not include a factor for exceeding design limits. The major event exclusion criterion is met if customer minutes lost exceed the threshold within a 24 hour period.

e. the most recent time that the Company's vegetation management program "cleared" the damaged facilities in those areas.

The damage rendered by the late summer storm affected customers across the state, in spite of most of the customer interruptions being experienced in Ogden, Utah. The Company conducts its vegetation management on a three year cycle, and is mid-way through its third cycle. All distribution circuits are currently within the three year vegetation cycle.

f. were these areas affected by the same storm system, or by multiple storm systems? Please explain.

This was a single event caused by single storm system.

DPU Data Request 1.3

Can the Company provide additional detail on the costs, such as putting it into a table such as what has been done previously; that is, please split the costs between whether they are capitalized or expensed, and then subdivide them between contract labor, employee labor and materials. Please provide the detail on the Little Mountain event costs separately.

Response to DPU Data Request 1.3

Below are the materials that were provided in the filing with cost details as requested.

There was no outage for Little Mountain nor costs for that outage.

Cost	Labor	Contractors	Materials	**Grand Totals**
Capital	105,000	5,000	16,000	**126,000**
Expense	45,000	5,000	4,000	**54,000**
Totals	**150,000**	**10,000**	**20,000**	**180,000**