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Division of Public Utilities

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Action Request Response

To: Public Service Commission of Utah

From: Utah Division of Public Utilities

Chris Parker, Director
Brenda Salter, Assistant Director
Doug Wheelwright, Utility Technical Consultant Supervisor
Bob Davis, Utility Technical Consultant

Date: March 18, 2024

Re: **Docket No. 24-035-06**, Rocky Mountain Power's Power Quality Report for the Period of January through December 2023

Recommendation (Acknowledge)

The Division of Public Utilities (Division) recommends the Public Service Commission (Commission) acknowledge Rocky Mountain Power's (RMP) 2023 Power Quality Report (Report). The Commission does not need to take any further action at this time. This report and future reports will be used to establish a baseline.

Issue

On February 15, 2024, RMP filed its Power Quality Report for 2023. On the same day, the Commission asked the Division to review RMP's Report for compliance and make recommendations. The Commission asked the Division to report back by March 15, 2024. On February 16, 2024, the Commission issued its Notice of Filing and Comment Period asking any interested person to submit comments by March 18, 2024, and reply comments by April 2, 2024.

Division of Public Utilities

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Background

On May 1, 2020, RMP filed its January 1 through December 31, 2019, Service Quality Review Report (2019 Report)¹ pursuant to the Commission's orders in Docket Nos. 08-035-55, 13-035-01, and 15-035-72 as well as the requirements of Utah Administrative Code R746-313, Electrical Service Reliability (Reporting Requirements). On June 1, 2020, the Division filed its comments and recommended the Commission establish a work group to review RMP's reliability baseline standards and make recommendations.² On June 16, 2020, RMP filed reply comments in which it supported the Division's recommendation.³ On June 23, 2020, the Commission issued an Order directing the Division and RMP to establish a work group led by the Division with the purpose of examining RMP's reliability baseline standards and make recommendations.⁴

In compliance with the Commission's Order, the Division and RMP convened the work group (Work Group) on August 4, 2020. In addition to the Division and RMP, the Office of Consumer Services, Utah Association of Energy Users, Utah Petroleum Association, Utah Mining Association, and Clean Harbors Aragonite Inc. participated in the Work Group. On December 21, 2020, the Division filed a memorandum containing the Work Group's recommended changes to the control limits and the baseline notification levels.⁵

The Work Group met several times through June 2022, and addressed baselines for the reliability indices and power quality issues raised by representatives of the large industrial customers. On June 28, 2022, RMP filed its proposed Power Quality Reporting template.⁶

¹ *Rocky Mountain Power's Service Quality Review Report*, Docket No. 20-035-22, Report filed May 1, 2020, <https://pscdocs.utah.gov/electric/20docs/2003522/313499RMPServQuaRevRepPeriodJanDec20195-1-2020.pdf>.

² Docket No. 20-035-22, Comments from the Division of Public Utilities filed June 1, 2020, <https://pscdocs.utah.gov/electric/20docs/2003522/314067DPUComnts6-1-2020.pdf>.

³ See Docket No. 20-035-22, Rocky Mountain Power's Reply Comments filed June 16, 2020, <https://pscdocs.utah.gov/electric/20docs/2003522/314292RMPRplyCmnts6-16-2020.pdf>.

⁴ Docket No. 20-035-22, Order issued June 23, 2020, at 2, <https://pscdocs.utah.gov/electric/20docs/2003522/3143552003522o6-23-2020.pdf>.

⁵ See Docket No. 20-035-22, Division of Public Utilities Memorandum filed December 21, 2020, <https://pscdocs.utah.gov/electric/20docs/2003522/316802DPUMemWrkGrp12-21-2020.pdf>.

⁶ See *Rocky Mountain Power's Proposed Reporting for Power Quality*, Docket No. 22-035-34, Rocky Mountain Power's Proposed Reporting for Power Quality filed June 28, 2022, <https://pscdocs.utah.gov/electric/22docs/2203534/324661PrpsdRprtngPwrQlty6-28-2022.pdf>.

The parties each filed comments and reply comments containing suggestions for RMP's proposed reporting template. On November 1, 2022, the Commission approved RMP's proposed reporting template and February filing deadline.⁷ The Commission noted in its correspondence that the report template is a work in progress and subject to change as more data becomes available. Parties are encouraged to re-evaluate the reporting template and recommend further action if necessary.⁸

Discussion

RMP's service quality, measured by System Average Interruption Duration Index (SAIDI), System Average Interruption Frequency Index (SAIFI), Customer Average Interruption Duration Index (CAIDI), and Momentary Average Interruption Event Frequency Index (MAIFI_E), are evaluated annually.⁹ While the service quality report generally refers to system related outages measured by SAIDI and SAIFI, the Power Quality Report refers to system faults that result in system voltage sags¹⁰ from various causes.

Voltage sags or spikes and the duration of the events can create problems for all customers but primarily industrial customers due to the ride-through¹¹ capabilities of their equipment. Many equipment manufacturers follow standards established by the Underwriters Laboratories (UL), International Electrotechnical Commission (IEC), Institute of Electrical and Electronics Engineers (IEEE), and Conformité Européene (CE).¹² Most manufacturers follow the SEMI-F47 Curve developed by the semiconductor industry to ensure that control and manufacturing equipment would not require operator intervention in the event of a

⁷ Docket No. 22-035-34, Correspondence from Gary L. Widerburg filed November 1, 2022, <https://pscdocs.utah.gov/electric/22docs/2203534/326013CorresWiderburg11-1-2022.pdf>.

⁸ *Id.* at 2.

⁹ *Rocky Mountain Power's Service Quality Review Report*, Docket No. 22-035-14, Utah Service Quality Review Report filed April 29, 2022, <https://pscdocs.utah.gov/electric/22docs/2203514/323803RMP2021SrvCQtyRvwRprt4-29-2022.pdf>.

¹⁰ A voltage sag is defined as a decrease in voltage magnitude below 90% of nominal, but not a complete interruption. Pacific Gas and Electric Company, Voltage Sag Immunity Standards – SEMI F47 and F42, Power Quality Bulletin No. 3, https://www.pge.com/includes/docs/pdfs/about/news/outagestatus/powerquality/power_quality_bulletin-issue_no.3-volt_sagImm_std-8-10-07.pdf.

¹¹ *Id.* Ride-through is generally defined as the ability for equipment to withstand voltage or frequency disturbances for some duration of time without creating a fault.

¹² See *Rocky Mountain Power's Power Quality Report for 2022*, Docket No. 23-035-05, 2022 Utah Power Quality Report filed Feb. 14, 2023, Glossary, at 2, <https://pscdocs.utah.gov/electric/23docs/2303505/3269992022UtPwrQltyRprt2-14-2023.pdf>.

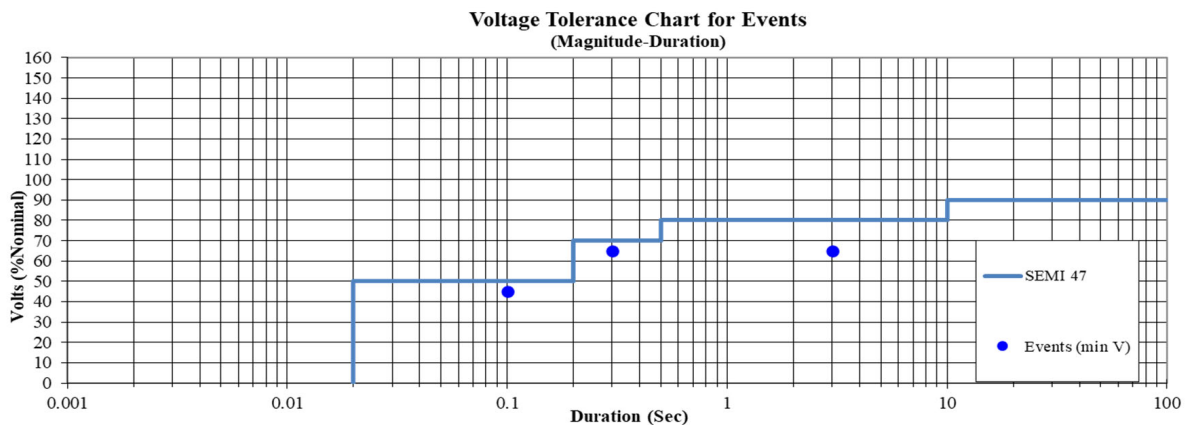
voltage sag or spike. The SEMI-F47 Curve is based on a table of metrics that establishes maximum durations in seconds of sags or spikes at percentages of the nominal voltage.¹³

Table 1¹⁴ illustrates the metrics and Illustration 1 is an **example** of the SEMI-F47 Curve showing sample voltage sags and duration.¹⁵

Table 1

VOLTAGE SAG DURATION				VOLTAGE SAG
Second (s)	Milliseconds (ms)	Cycles at 60 hz	Cycles at 50 hz	Percent (%) of Equipment Nominal Voltage
<0.05 s	<50 ms	<3 cycles	<2.5 cycles	Not specified
0.05 to 0.2 s	50 to 200 ms	3 to 12 cycles	2.5 to 10 cycles	50%
0.2 to 0.5 s	200 to 500 ms	12 to 30 cycles	10 to 25 cycles	70%
0.5 to 1.0 s	500 to 1000 ms	30 to 60 cycles	25 to 50 cycles	80%
>1.0 s	>1000 ms	>60 cycles	>50 cycles	Not specified

**Illustration I
(SEMI-F47 Curve Example)**



On November 1, 2023, RMP filed with the Commission its *Service Quality (Reliability) Report* for the 1st half of 2023.¹⁶ In its report, RMP requested two changes to its reporting

¹³ *Supra* note 10.

¹⁴ *Id.*

¹⁵ *Supra* note 12, at 2.

¹⁶ Docket No. 23-035-21, *Rocky Mountain Power's Service Quality Review Report*, November 1, 2023, <https://pscdocs.utah.gov/electric/23docs/2303521/330553RMPsSvcQltRvwRprtJan1Jun30202311-1-2023.pdf>.

template: first, subdividing the state into five reliability reporting areas, and second, reporting activities associated with RMP's Wildfire Mitigation Plan.¹⁷ The Commission approved RMP's modifications on December 12, 2023.¹⁸ RMP has modified its 2023 *Power Quality Report* to include four reporting areas: North, West, Central, and South to better match the service reliability study areas.¹⁹ RMP's 2022 power quality report contained data from 24 monitoring points throughout the state. In this year's Report, RMP has retained 18 of those initial monitoring points and added 23 new locations in relation to the reporting areas.²⁰ RMP's monitors captured 116 total events, 74 unique voltage sag events captured on multiple meters, and 48 events from new meters.²¹ RMP reports this year's unique voltage sag events is a 50% increase over 2022. Albeit 41% of this year's reported unique sag events is purportedly the result of the new meters.²² The Division asked RMP to explain the calculations and numbers in Table 1, Site Event Index, in DPU DR 1.1, include as Attachment 1 to these comments. The Division appreciates RMP's responses to its data request questions to help it better understand the reported voltage sag numbers.

RMP compiles the meter data from the four reporting regions throughout Utah into major event causes. The Division notes that the event cause categories may differ slightly from year-to-year but still serves as an important year-over-year comparison of major events leading to power quality issues and remedies. Illustration II shows this reporting period's major event causes as a percentage of the total events.

¹⁷ *Id.*, at 4.

¹⁸ Docket No. 23-035-21, *Acknowledgment Letter from the Public Service Commission* filed December 12, 2023, <https://pscdocs.utah.gov/electric/23docs/2303521/331230AckLtrfromPSC12-12-2023.pdf>.

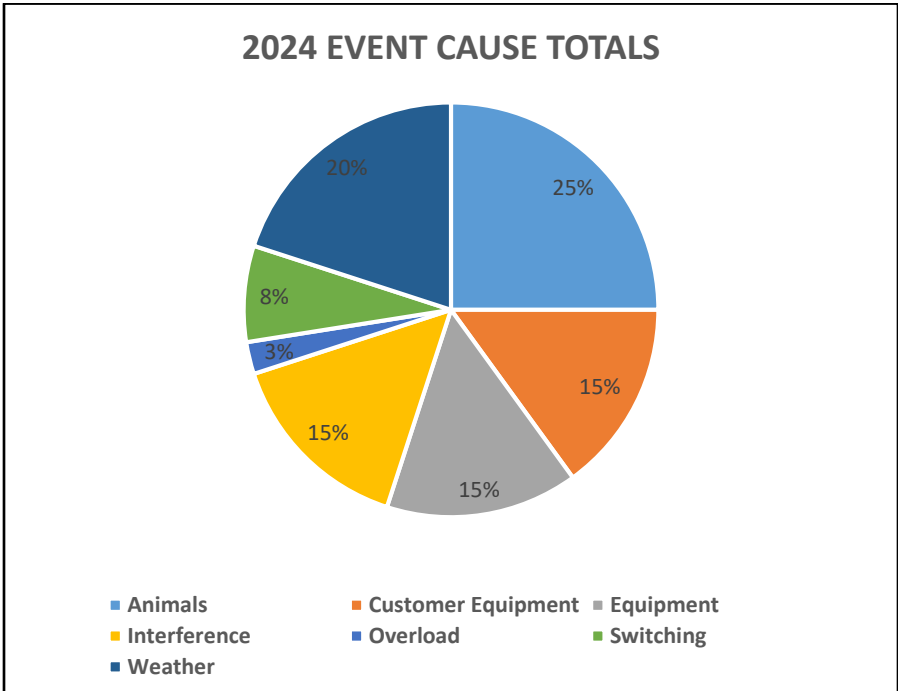
¹⁹ Docket No. 24-035-06, *Rocky Mountain Power's Power Quality Report for 2023*, February 15, 2024, <https://pscdocs.utah.gov/electric/24docs/2403506/3324252023UPwrQltyRprt2-15-2024.pdf>. These areas differ from the five regions reported in the service quality reporting.

²⁰ *Id.*, *Voltage Sag Event Site Index*, Table 1, at 4.

²¹ *Id.*, pgs. 7-8. The Division notes that according to RMP's response to Data Request DPU DR 1.1(1) there are 112 Total Events based on RMP's calculation method.

²² *Id.*, at 7. The Division was unable to verify the year-over-year reported change of 50%. Last year's Event Cause Total of 37 compared to this year's 74 Unique Events is a 100% change.

Illustration II

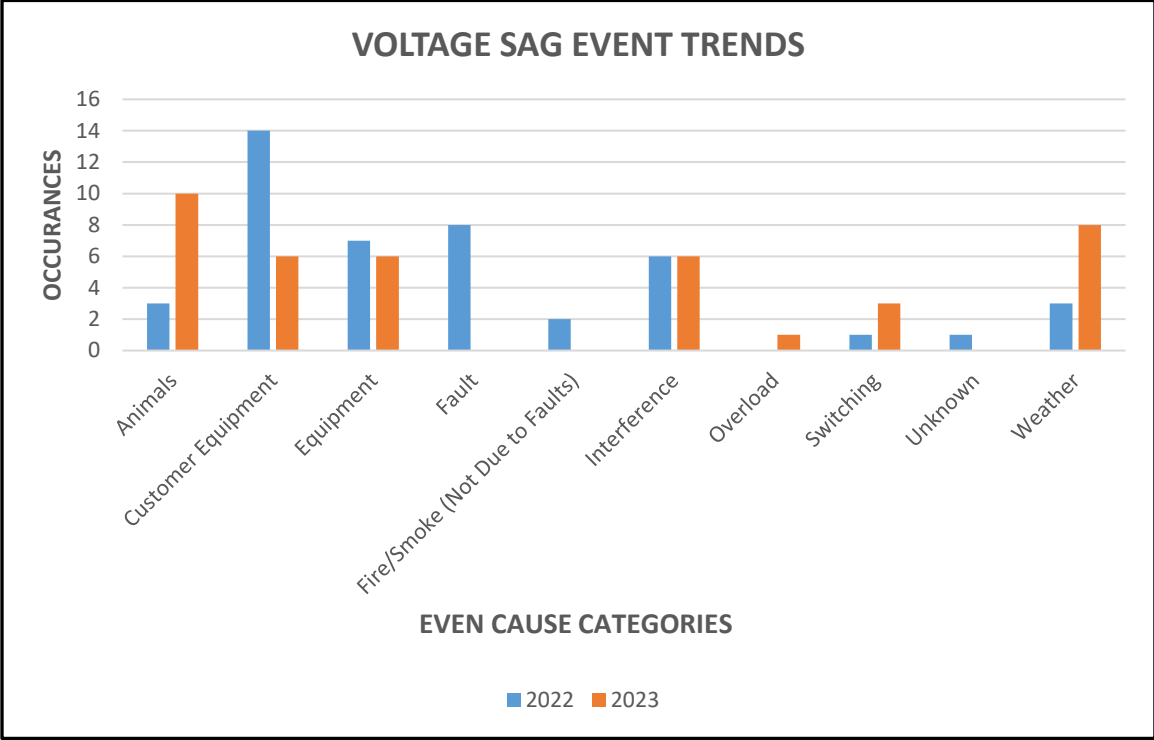


RMP reports the 40 main event causes during 2023 of: 10 Animals, 6 Customer Equipment, 6 Utility Equipment, 6 Interference, 1 Overload, 3 Switching, and 8 Weather events.²³ The Division notes that the 40 major event causes reported this year are an improvement from last year’s 45 major event causes.

The Division concludes that tracking the major event causes year-over-year is important for interested parties to better understand the major event causes leading to poor power quality sag events. Illustration III provides a trend of 2022 and 2023 major event causes. While two years of data does not provide significant results, the Division hopes trending this data will provide a better understanding of power quality in the future.

²³ *Id.*, at 10.

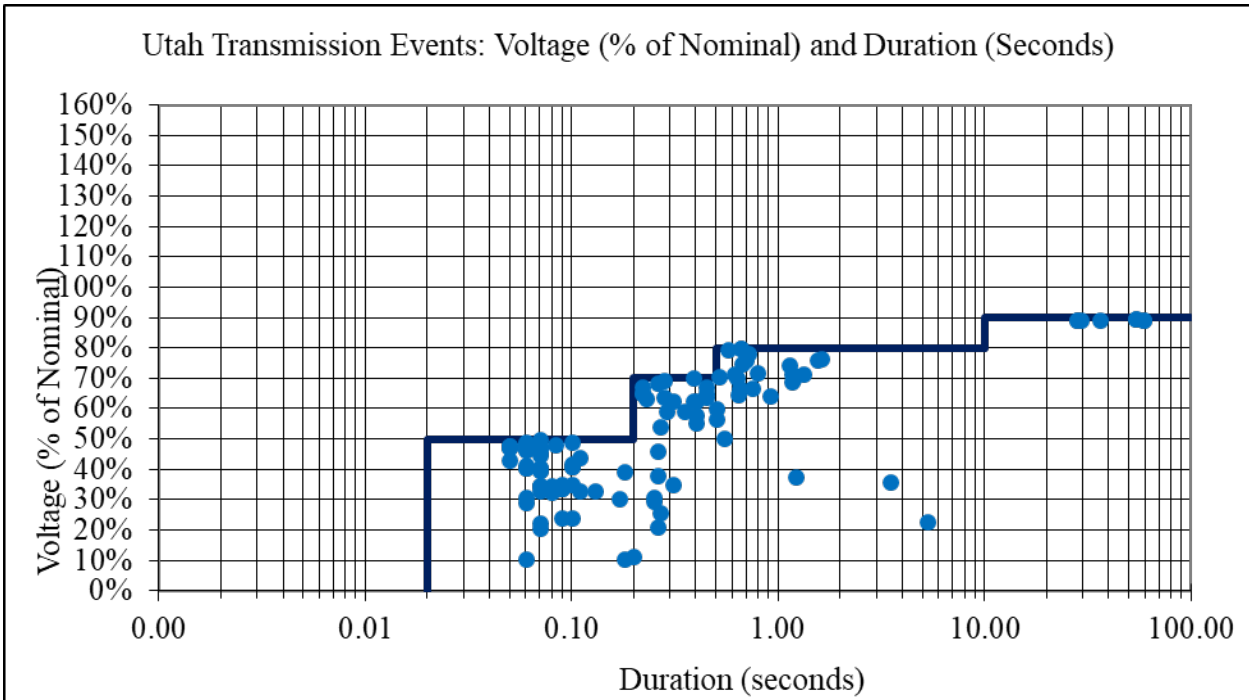
Illustration III
Voltage SAG Event Cause Trends



RMP does not report voltage spikes that would appear above the SEMI-F47 line. Voltage sags are generally more detrimental to power quality than spikes, however the Commission may wish to require reporting voltage spikes in future power quality reports to provide a more comprehensive view of variations that could affect customers' service and equipment. Illustration IV shows RMP's compiled 2023 SEMI-F47 sag events including the new meter stations and regions.²⁴

²⁴ *Id.*, at 6.

Illustration IV RMP SEMI-F47 2023 Curve



The Division has concerns with the number of events occurring below the SEMI-F47 line, especially events lasting between 1 and 10 seconds. The Division understands that voltage sags are inevitable given the many factors that are generally out of RMP’s control. This year’s report indicates animals and weather as the leading event cause contributors with customer, utility equipment failures, and interference remaining as large contributors to the event causes of power quality issues. Last year’s report was substantially comprised of customer equipment event causes. However, this is RMP’s second power quality report, and the Division has no baseline on which to evaluate its concerns or make recommendations on the current power quality metrics. The Division intends to monitor RMP’s SEMI-F47 curves and the event causes in future years to develop a baseline before offering any recommendations.

Conclusion

The Division reviewed RMP's Power Quality Report for 2023 and determined that it reflects the Commission's approved template. Therefore, the Division recommends the Commission acknowledge RMP's Report.

cc: Jana Saba, RMP
Michele Beck, OCS
Service List

Attachment 1

24-035-06 / Rocky Mountain Power March 6, 2024, DPU Data Request 1.1

DPU Data Request 1.1

In reference to Section Voltage Sag Event Site Index, Table 1, page 7-8, please explain:

- (1) How the 116 Total Events for 2023 is derived.
- (2) How the 74 Unique Events for 2023 is derived.
- (3) How the 48 Events from New Meters is derived.
- (4) Please provide data relating to New Monitor under Event Count Change or explain their significance to the Total Events, Unique Events, and Events from New Meters.
- (5) Please explain the negative numbers under the Event Count Change column.

Response to DPU Data Request 1.1

Referencing Rocky Mountain Power's (RMP) Power Quality Report (PQR) for 2023, specifically Table 1 (Site Event Index), page 7 and 8, the Company responds as follows:

- (1) "Total Events" are a summation of all the voltage sag events noted in column "2023" in Table 1 on pages 7 and 8. Voltage sag events included in column "2023" are all events captured by power quality monitors and below the SEMI-F47 curve.
- (2) "Unique Events" are the number of rows in the "Event Information" table on pages 18 through 26. Because several power quality monitors may capture a single voltage sag event, the "Unique Events" data was created to distinguish between an event captured by a monitor and an event on the system. Row 69 of the "Event Information" table is an example of the aggregation of voltage sag events to a single unique event. On November 11, 2023 a voltage sag event was captured on 11 monitors. That single voltage sag would contribute 11 events to the "Total Events" count and contribute one event to the "Unique Events" count. The two total amounts is to demonstrate the number of events in relation to the number of monitors impacted.
- (3) "Events from New Meters" is a summation in column "2023" with "Event Count Change" identified as "New Monitor" in Table 1. It represents the total number of events under the SEMI-F47 curve captured by monitors not available in the 2022 PQR.
- (4) RMP's PQR for 2023 was created based on data from an additional 23 power quality monitors not available for the 2022 PQR. The 48 "Events from New Meters" was included and distinguished in the 2023 PQR to recognize that an increase in events reported over the 2022 PQR was in part related to new monitoring locations. It should be noted that the terminology of "meters" and "monitors" is used interchangeably in the report.

- (5) The “Event Count Change” is calculated as column “2022” subtracted from column “2023” and is the is the delta of events from year-to-year. The negative numbers indicate a drop of events at that monitoring point from 2022 to 2023.