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June 27, 2022

***VIA ELECTRONIC FILING***

Public Service Commission of Utah  
Heber M. Wells Building, 4<sup>th</sup> Floor  
160 East 300 South  
Salt Lake City, UT 84114

Attn: Gary Widerburg  
Commission Administrator

Re: **Docket 22-035-34 – In the Matter of Rocky Mountain Power’s Request to the Establish Reporting for Power Quality**  
*Proposed Reporting for Power Quality*

PacifiCorp d/b/a Rocky Mountain Power (“the Company”) hereby submits for filing a template for a new Power Quality Report to be filed annually with the Public Service Commission of Utah (“Commission”) as described below.

**Background**

On May 1, 2020, the Company filed its semi-annual Service Quality Review (“SQR”) report for the period of January through December 2019 in Docket No. 20-035-22 (“2020 SQR”). In comments filed June 1, 2020, the Division of Public Utilities (“Division”) recommended that the Commission establish a service quality review workgroup (“Workgroup”) to review the reliability baseline standards, specifically the System Average Interruption Duration Index (“SAIDI”) and System Average Interruption Frequency Index (“SAIFI”) values, for possible changes. The Commission adopted the Division’s recommendation in an order dated June 23, 2020 and established a Workgroup that was open to interested parties to review the baseline SQR standards.

The Company and Division along with representatives from the Office of Consumer Services (“Office”) and industrial customer groups convened a Workgroup. The Workgroup met on several occasions and developed changes to the SAIDI and SAIFI metrics, which were first reflected in the Company’s subsequent SQR report that was filed on October 30, 2020 and has been reflected in all SQR reports since.

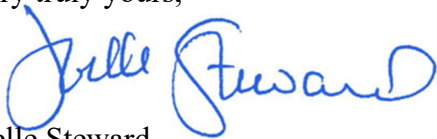
During the Workgroup sessions certain industrial customers raised a separate concern regarding power quality. Once the changes to the SAIDI and SAIFI metrics were implemented, the Workgroup decided to continue to meet to discuss power quality concerns. On December 21, 2020, the Division filed a memorandum informing the Commission of the plans for the Workgroup to continue to meet to discuss power quality.

**New Reporting for Power Quality**

As planned, the Workgroup has continued its discussions regarding power quality concerns. Through these discussions, the Company has agreed to implement a new Power Quality report to be filed with the Commission annually (“PQ Report”). A template of the proposed PQ Report is included as Attachment A, which was developed by the Company and reviewed and approved by the Workgroup. The template provided in Attachment A contains sample data to show the information and format the will be used in the PQ Reports. The Company notes that the report is for informational purposes to allow the Commission and interested parties to monitor power quality and does not contain any specific metrics or standards related to power quality. The Company proposes to file a PQ Report on or around February 15 of each year reporting on the previous calendar year. The first PQ Report will be filed on or around February 15, 2023, for the January through December 2022 reporting period.

Questions may be directed to Jana Saba at (801) 220-2823.

Very truly yours,



Joelle Steward

Senior Vice President, Regulation and Customer & Community Solutions

cc: Service List



Rocky Mountain Power

# Utah Power Quality Report

Voltage Sag Analysis for Utah's Transmission System

PacifiCorp Power Quality Engineering  
5-6-2022

## Contents

Glossary .....	2
Power Quality Introduction.....	3
Report Scope.....	3
Customer Ride-Through Capability.....	3
Power Quality Monitor Locations .....	4
Voltage Sag Event Summary .....	6
Voltage Sag Event Site Index .....	6
Voltage Sag Event Site Map.....	7
Voltage Sag Event Categorization.....	8

## Glossary

**CE** – Product marking indicating Conformité Européenne, conforming to European Union standards for health and safety of electrical components.

**Company** – Represents the entity PacifiCorp d.b.a Rocky Mountain Power

**IEC** – International Electrotechnical Commission

**IEEE** – Institute of Electrical and Electronics Engineers

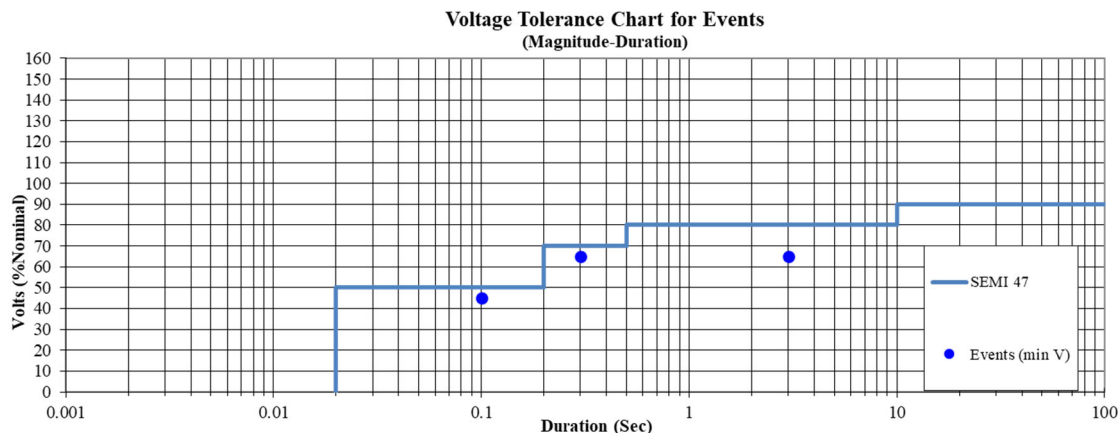
**ITE** – Information technology equipment

**kV** – kilovolt

**Monitor** – Device with a primary purpose to measure system values at an increased sampling rate to determine utility and customer compliance with Company power quality standards

**Meter** – Device with a primary purpose of recording energy use by a customer with ancillary power quality monitoring capabilities.

**SEMI-F47 Curve** – A voltage sag ride-through curve developed by the semiconductor manufacturing industry to ensure that control and manufacturing equipment would not require operator intervention in the event of a voltage sag. Implementation of the ride-through curve requirements to applicable control equipment ensures that equipment drop-off is not a result of PLC or control terminal sensitivity but determined by the equipment’s operational limitations and safety requirements of the attached load.



**UL** – Underwriters Laboratories certification of safety for electrical equipment

**Voltage sag** – A short duration reduction in voltage. The severity of a voltage sag is defined by how deep the voltage is reduced as a percentage of its normal operating value, and the duration of the voltage reduction.

**VFD** – Variable Frequency Drive

## Power Quality Introduction

### Report Scope

This report identifies the quantity and sources of voltage disturbances, primarily voltage sags, observed at 46-345 kV Company substations. This report includes data collected during 2022. Subsequent reports will be provided on an annual basis and include the prior year's data. The report utilizes existing power quality monitors located within transmission substations in various locations throughout Utah. Any future deployment of power quality monitoring devices will be incorporated into this report going forward.

### Customer Ride-Through Capability

Customers are encouraged to be able to ride through less severe voltage sags. The Company recommends customers utilize the SEMI-F47 curve as a guideline to determine the voltage sag ride-through parameters of their equipment. Events below the SEMI-F47 curve will likely cause customers' equipment to shut off, whereas customers are encouraged to ride through events occurring above the line. Voltage sag events occurring below the SEMI-F47 curve during the data collection period are identified in this report.

The Company has found that the items in the bullet list below are common methods customers have utilized to mitigate the impact of voltage sags. These identified methods are examples of actions taken by customers, however a detailed analysis of a customer's systems and processes is typically required to enable voltage sag resilience.

- **UL & CE Listed** – Equipment with both markings are tested to IEC power quality standards and have improved ride-through capabilities
- **Update Ice Cube Relays** – Update from electromechanical styled relays to solid state
- **Ferroresonant Transformer** – Low voltage transformers that can maintain voltage during sags
- **Static Transfer Switch** – Provides an unaffected source in the event of an outage
- **VFD Settings** – Configuration of the VFD controllers can expand the allowable operation window

## Power Quality Monitor Locations

Monitoring locations selected for this report are located at Company transmission substations. Monitor data availability at each location is not guaranteed as power quality monitors may have communication issues, hardware/software reset needs and monitor failure.

The meter types used by the Company on its transmission system are Electro Industries' Nexus 1252 and Nexus 1500.

*Table 1 Power Quality monitoring locations on the Company transmission network*

<b>PQView Name</b>	<b>Substation</b>	<b>Circuit</b>	<b>Area</b>	<b>kV</b>
<b>Ben Lomond CB107</b>	Ben Lomond	CB107	Ogden	138
<b>Camp Williams SVC</b>	Camp Williams	SVC	Jordan Valley	345
<b>Delta CB47</b>	Delta	CB47	Delta	46
<b>Hatch CB130</b>	Hatch	CB130	Hatch	138
<b>Mountain View CB112</b>	Mountain View	CB112	Jordan Valley	138
<b>Oquirrh CB143</b>	Oquirrh	CB143	Jordan Valley	138
<b>Skunk Ridge CB41</b>	Skunk Ridge	CB41	Tooele	46
<b>St George CB148</b>	St. George	CB148	Cedar City	138
<b>Terminal CB101</b>	Terminal	CB101	SLC Metro	138
<b>Wasatch Springs CB51</b>	Wasatch Springs	CB51	SLC Metro	46
<b>Wheelon CB112</b>	Wheelon	CB112	Tremonton	138

The power quality monitors on the transmission network are plotted in Figure 1:

- Green Marker – 46 & 69 kV
- Red Marker – 138 kV
- Orange – 345kV



Figure 1 Power quality monitor locations for the state of Utah.



## Voltage Sag Event Summary

The results of voltage monitoring during 2022 are included in this section. Each monitor samples the voltage on a regular basis. In addition, monitors capture system events where the voltage deviates outside of 90 to 110 percent of its normal operating voltage.

Table 2 lists each monitor location, its voltage class and the number of voltage sag events that took place at that monitor location and were below the SEMI-F47 curve. Figure 2 scales the number of events that occurred at each location for a geographic representation of where voltage sag events are taking place.

Voltage levels reported from Company monitors may vary from customer monitoring systems due to variables that include the distance of the fault from the customers' monitors as compared to the distance to the Company's monitors.

## Voltage Sag Event Site Index

### **SAMPLE DATA**

*Table 2 Quantity of Voltage Sag Events Below the SEMI-F47 Line*

<b>PQView Name</b>	<b>Substation</b>	<b>kV</b>	<b>Quantity of 2022 SEMI-F47 Events</b>
<b>Ben Lomond CB107</b>	Ben Lomond	138	2
<b>Camp Williams SVC</b>	Camp Williams	345	4
<b>Delta CB47</b>	Delta	69	1
<b>Hatch CB130</b>	Hatch	138	2
<b>Mountain View CB112</b>	Mountain View	138	2
<b>Oquirrh CB143</b>	Oquirrh	138	2
<b>Skunk Ridge CB41</b>	Skunk Ridge	46	1
<b>St George CB148</b>	St. George	138	2
<b>Terminal CB101</b>	Terminal	138	2
<b>Wasatch Springs CB51</b>	Wasatch Springs	46	2
<b>Wheelon CB112</b>	Wheelon	138	2

Voltage Sag Event Site Map

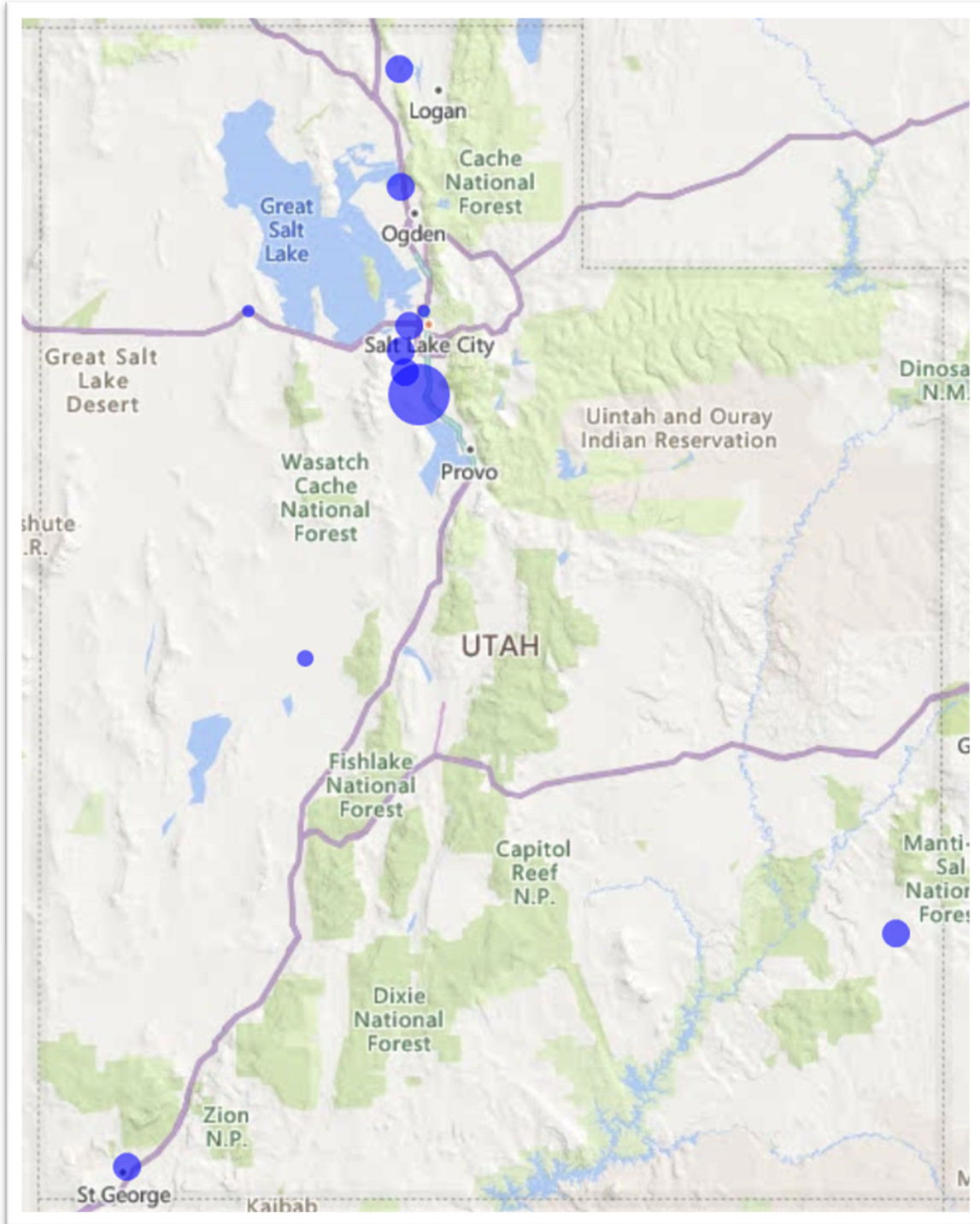


Figure 2 SAMPLE – Scaling voltage sag events

### Voltage Sag Event Categorization

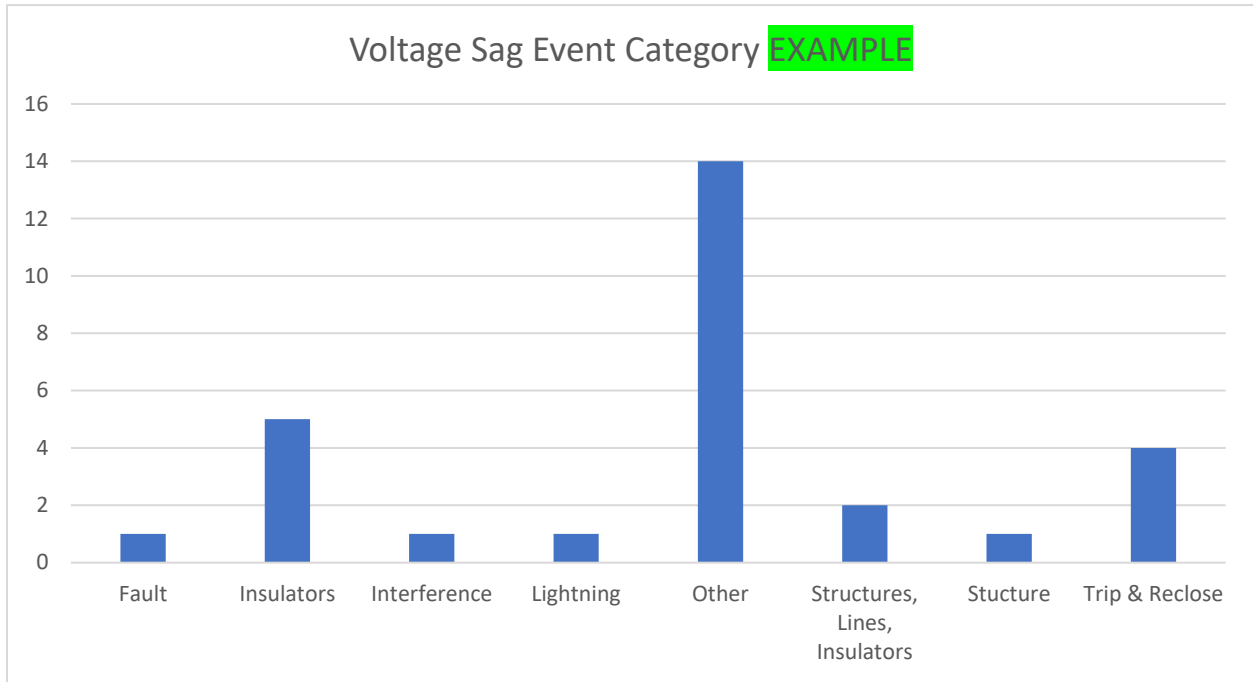
Power quality events captured by the Company are typically associated with faults (short circuit) in the transmission network. Tracking events to identify patterns in system issues can provide preventative maintenance and system improvement recommendations. If a Company system fault occurred at the time of a recorded event, it is assigned a category and short description in Table 3.

Several events were recorded by the monitors but did not have a corresponding Company system fault. Those items are categorized as “Other” in the table below and their origins are unknown.

### SAMPLE DATA

*Table 3 Voltage Sag Event Information*

Time (UTC)	Category	Description <b>EXAMPLE</b>	Event Location	Event KV	Impacted Monitor <b>EXAMPLE</b>
9/28/2021 6:01:02 pm	Transformer	Failed Neutral	Oquirrh - Terminal	345	Terminal
10/8/2021 10:56:03 pm	Fault	Avian	Platte – Standpipe	230	Ben Lomond, Terminal, etc
10/12/2021 10:56:07 am	Insulators	Cracked insulator caused trip	Aeolus – Ekola	230	Ben Lomond
10/14/2021 3:31:21 pm	Lightning	Storm in the area	Aeolus – Anticline	500	Wheelon
11/23/2021 6:26:41 pm	Structure	Structure failure	Garland 9H192	69	Wheelon
12/1/2021 4:21:59 pm	Interference	Debris in line from wind	Emery-Sigurd #1	345	Delta
12/1/2021 4:24:23 pm	Interference	Line to Ground – Cause unknown	Emery-Sigurd #1	345	Hatch



**CERTIFICATE OF SERVICE**

Docket No. 22-035-33

I hereby certify that on June 27, 2022, a true and correct copy of the foregoing was served by electronic mail to the following:

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