

**Customer Name:**

**CRM#:**

**Report Date:**

**Prepared by:**

**Approved by:**

**DER PQ**

**Benchmark/Compliance Report**



# ­­­­Introduction

The purpose of this report is to present a summary and supporting data to confirm the DER facility meets FortisAlberta DER-02/PQ-SPEC-01 compliance requirements when connecting to the FortisAlberta distribution system.

***All texts in bold are for customer to fill in.***

# Customer Description

Customer Name (Site ID, CRM#) at Location (LSD) in the area of Feeder is a DER customer with generation type **Type of Generation** and a maximum power output of **Maximum allowed generation (MW)** with power factor of **Power Factor**.

## Monitored Devices and Installations

The power quality monitor equipment for the purpose of power quality benchmark report shall be installed at the PCC and conforming to IEC 61000-4-30 Class A measurement standards.

The monitoring device shall be installed and take the measurement on the primary side (25kV). It is recommended that the customer provide a single line diagram indicating the location of monitoring in their facility.

*Note: Either one of the following periods needs to be specified depending on the type of report (Benchmark or Compliance).*

7 days of Benchmark monitoring period (Before generation): From **Year-Month-Date** to **Year-Month-Date**.

7 days of Compliance monitoring period (After Commissioning with normal generation): From **Year-Month-Date** to **Year-Month-Date**.

**[Insert facility SLD indicating location of monitoring]**

# Data Analysis and Graphs

## VRMS

**Voltage RMS Graph**

**[Insert Voltage RMS Graph here]**

*Note: Vrms 95% weekly value should meet CSA C235 nomal operating conditions.*

Based on rms voltage graph/data, the average voltage statistical data shows the following:

|  |  |
| --- | --- |
| 5th percentile |  |
| Average |  |
| 95th percentile |  |

## IRMS

**Current RMS Graph**

**[Insert Current RMS Graph here]**

## Voltage Unbalance

**Voltage Unbalance Graph**

**[Insert Voltage Unbalance Graph here]**

*Note: Voltage unbalance (based on sequence components) should not exceed the limit of 3%.*

## Voltage THD and Individual Voltage Harmonics Summary

The voltage harmonics are represented as a percentage (%) of the fundamental (60Hz) voltage for each phase accordingly.

*Note: Compliant column is required for the compliance report but not required for benchmark report.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| V Harmonic | Average (%) | Maximum (%) | CP 95 (%) | Compliant (Yes/No) |
| V THD A |  |  |  |  |
| V THD B |  |  |  |  |
| V THD C |  |  |  |  |
| V H2 A |  |  |  |  |
| V H2 B |  |  |  |  |
| V H2 C |  |  |  |  |
| V H3 A |  |  |  |  |
| V H3 B |  |  |  |  |
| V H3 C |  |  |  |  |
| V H4 A |  |  |  |  |
| V H4 B |  |  |  |  |
| V H4 C |  |  |  |  |
| V H5 A |  |  |  |  |
| V H5 B |  |  |  |  |
| V H5 C |  |  |  |  |
| V H6 A |  |  |  |  |
| V H6 B |  |  |  |  |
| V H6 C |  |  |  |  |
| V H7 A |  |  |  |  |
| V H7 B |  |  |  |  |
| V H7 C |  |  |  |  |
| V H8 A |  |  |  |  |
| V H8 B |  |  |  |  |
| V H8 C |  |  |  |  |
| V H9 A |  |  |  |  |
| V H9 B |  |  |  |  |
| V H9 C |  |  |  |  |
| V H10 A |  |  |  |  |
| V H10 B |  |  |  |  |
| V H10 C |  |  |  |  |
| V H11 A |  |  |  |  |
| V H11 B |  |  |  |  |
| V H11 C |  |  |  |  |
| V H12 A |  |  |  |  |
| V H12 B |  |  |  |  |
| V H12 C |  |  |  |  |
| V H13 A |  |  |  |  |
| V H13 B |  |  |  |  |
| V H13 C |  |  |  |  |
| V H14 A |  |  |  |  |
| V H14 B |  |  |  |  |
| V H14 C |  |  |  |  |
| V H15 A |  |  |  |  |
| V H15 B |  |  |  |  |
| V H15 C |  |  |  |  |
| V H16 A |  |  |  |  |
| V H16 B |  |  |  |  |
| V H16 C |  |  |  |  |
| V H17 A |  |  |  |  |
| V H17 B |  |  |  |  |
| V H17 C |  |  |  |  |
| V H18 A |  |  |  |  |
| V H18 B |  |  |  |  |
| V H18 C |  |  |  |  |
| V H19 A |  |  |  |  |
| V H19 B |  |  |  |  |
| V H19 C |  |  |  |  |
| V H20 A |  |  |  |  |
| V H20 B |  |  |  |  |
| V H20 C |  |  |  |  |
| V H21 A |  |  |  |  |
| V H21 B |  |  |  |  |
| V H21 C |  |  |  |  |
| V H22 A |  |  |  |  |
| V H22 B |  |  |  |  |
| V H22 C |  |  |  |  |
| V H23 A |  |  |  |  |
| V H23 B |  |  |  |  |
| V H23 C |  |  |  |  |
| V H24 A |  |  |  |  |
| V H24 B |  |  |  |  |
| V H24 C |  |  |  |  |
| V H25 A |  |  |  |  |
| V H25 B |  |  |  |  |
| V H25 C |  |  |  |  |
| V H26 A |  |  |  |  |
| V H26 B |  |  |  |  |
| V H26 C |  |  |  |  |
| V H27 A |  |  |  |  |
| V H27 B |  |  |  |  |
| V H27 C |  |  |  |  |
| V H28 A |  |  |  |  |
| V H28 B |  |  |  |  |
| V H28 C |  |  |  |  |
| V H29 A |  |  |  |  |
| V H29 B |  |  |  |  |
| V H29 C |  |  |  |  |
| V H30 A |  |  |  |  |
| V H30 B |  |  |  |  |
| V H30 C |  |  |  |  |
| V H31 A |  |  |  |  |
| V H31 B |  |  |  |  |
| V H31 C |  |  |  |  |
| V H32 A |  |  |  |  |
| V H32 B |  |  |  |  |
| V H32 C |  |  |  |  |
| V H33 A |  |  |  |  |
| V H33 B |  |  |  |  |
| V H33 C |  |  |  |  |
| V H34 A |  |  |  |  |
| V H34 B |  |  |  |  |
| V H34 C |  |  |  |  |
| V H35 A |  |  |  |  |
| V H35 B |  |  |  |  |
| V H35 C |  |  |  |  |
| V H36 A |  |  |  |  |
| V H36 B |  |  |  |  |
| V H36 C |  |  |  |  |
| V H37 A |  |  |  |  |
| V H37 B |  |  |  |  |
| V H37 C |  |  |  |  |
| V H38 A |  |  |  |  |
| V H38 B |  |  |  |  |
| V H38 C |  |  |  |  |
| V H39 A |  |  |  |  |
| V H39 B |  |  |  |  |
| V H39 C |  |  |  |  |
| V H40 A |  |  |  |  |
| V H40 B |  |  |  |  |
| V H40 C |  |  |  |  |
| V H41 A |  |  |  |  |
| V H41 B |  |  |  |  |
| V H41 C |  |  |  |  |
| V H42 A |  |  |  |  |
| V H42 B |  |  |  |  |
| V H42 C |  |  |  |  |
| V H43 A |  |  |  |  |
| V H43 B |  |  |  |  |
| V H43 C |  |  |  |  |
| V H44 A |  |  |  |  |
| V H44 B |  |  |  |  |
| V H44 C |  |  |  |  |
| V H45 A |  |  |  |  |
| V H45 B |  |  |  |  |
| V H45 C |  |  |  |  |
| V H46 A |  |  |  |  |
| V H46 B |  |  |  |  |
| V H46 C |  |  |  |  |
| V H47 A |  |  |  |  |
| V H47 B |  |  |  |  |
| V H47 C |  |  |  |  |
| V H48 A |  |  |  |  |
| V H48 B |  |  |  |  |
| V H48 C |  |  |  |  |
| V H49 A |  |  |  |  |
| V H49 B |  |  |  |  |
| V H49 C |  |  |  |  |
| V H50 A |  |  |  |  |
| V H50 B |  |  |  |  |
| V H50 C |  |  |  |  |

*Note: Please refer to specific sections of the PQ-SPEC-01 for detailed compliance limits*

**95th Percentile VTHD and Individual Harmonic Spectrum Graph**

**[Insert 95th Percentile VTHD and Individual Harmonic Spectrum Graph here]**

## Voltage Interharmonics Summary

The voltage interharmonics are represented as a percentage (%) of the fundamental (60Hz) voltage for each phase accordingly.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| IH  Order | VaIH avg (%) | VaIH max (%) | VaIH C95 (%) | VbIH avg (%) | VbIH max (%) | VbIH C95 (%) | VcIH avg (%) | VcIH max (%) | VcIH C95 (%) |
| 1 |  |  |  |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |  |  |  |
| 4 |  |  |  |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |  |  |  |
| 6 |  |  |  |  |  |  |  |  |  |
| 7 |  |  |  |  |  |  |  |  |  |
| 8 |  |  |  |  |  |  |  |  |  |
| 9 |  |  |  |  |  |  |  |  |  |
| 10 |  |  |  |  |  |  |  |  |  |
| 11 |  |  |  |  |  |  |  |  |  |
| 12 |  |  |  |  |  |  |  |  |  |
| 13 |  |  |  |  |  |  |  |  |  |
| 14 |  |  |  |  |  |  |  |  |  |
| 15 |  |  |  |  |  |  |  |  |  |
| 16 |  |  |  |  |  |  |  |  |  |
| 17 |  |  |  |  |  |  |  |  |  |
| 18 |  |  |  |  |  |  |  |  |  |
| 19 |  |  |  |  |  |  |  |  |  |
| 20 |  |  |  |  |  |  |  |  |  |
| 21 |  |  |  |  |  |  |  |  |  |
| 22 |  |  |  |  |  |  |  |  |  |
| 23 |  |  |  |  |  |  |  |  |  |
| 24 |  |  |  |  |  |  |  |  |  |
| 25 |  |  |  |  |  |  |  |  |  |
| 26 |  |  |  |  |  |  |  |  |  |
| 27 |  |  |  |  |  |  |  |  |  |
| 28 |  |  |  |  |  |  |  |  |  |
| 29 |  |  |  |  |  |  |  |  |  |
| 30 |  |  |  |  |  |  |  |  |  |
| 31 |  |  |  |  |  |  |  |  |  |
| 32 |  |  |  |  |  |  |  |  |  |
| 33 |  |  |  |  |  |  |  |  |  |
| 34 |  |  |  |  |  |  |  |  |  |
| 35 |  |  |  |  |  |  |  |  |  |
| 36 |  |  |  |  |  |  |  |  |  |
| 37 |  |  |  |  |  |  |  |  |  |
| 38 |  |  |  |  |  |  |  |  |  |
| 39 |  |  |  |  |  |  |  |  |  |
| 40 |  |  |  |  |  |  |  |  |  |
| 41 |  |  |  |  |  |  |  |  |  |
| 42 |  |  |  |  |  |  |  |  |  |
| 43 |  |  |  |  |  |  |  |  |  |
| 44 |  |  |  |  |  |  |  |  |  |
| 45 |  |  |  |  |  |  |  |  |  |
| 46 |  |  |  |  |  |  |  |  |  |
| 47 |  |  |  |  |  |  |  |  |  |
| 48 |  |  |  |  |  |  |  |  |  |
| 49 |  |  |  |  |  |  |  |  |  |
| 50 |  |  |  |  |  |  |  |  |  |

**95th Percentile Individual Voltage Interharmonic Spectrum Graph**

**[Insert 95th Percentile Individual Voltage Interharmonic Spectrum Graph here]**

## Current TDD and Individual Current Harmonics Summary

*Note: Compliant column is required for the compliance report but not required for benchmark report.*

The current distortion and harmonics are based on CSA 22.3 No.9-08 standard.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| I Harmonic | Average (%) | Maximum (%) | CP 95 (%) | Limit (%) | Compliant (Yes/No) |
| I TDD A |  |  |  | 5 |  |
| I TDD B |  |  |  | 5 |  |
| I TDD C |  |  |  | 5 |  |
| I H2 A |  |  |  | 1 |  |
| I H2 B |  |  |  | 1 |  |
| I H2 C |  |  |  | 1 |  |
| I H3 A |  |  |  | 4 |  |
| I H3 B |  |  |  | 4 |  |
| I H3 C |  |  |  | 4 |  |
| I H4 A |  |  |  | 1 |  |
| I H4 B |  |  |  | 1 |  |
| I H4 C |  |  |  | 1 |  |
| I H5 A |  |  |  | 4 |  |
| I H5 B |  |  |  | 4 |  |
| I H5 C |  |  |  | 4 |  |
| I H6 A |  |  |  | 1 |  |
| I H6 B |  |  |  | 1 |  |
| I H6 C |  |  |  | 1 |  |
| I H7 A |  |  |  | 4 |  |
| I H7 B |  |  |  | 4 |  |
| I H7 C |  |  |  | 4 |  |
| I H8 A |  |  |  | 1 |  |
| I H8 B |  |  |  | 1 |  |
| I H8 C |  |  |  | 1 |  |
| I H9 A |  |  |  | 4 |  |
| I H9 B |  |  |  | 4 |  |
| I H9 C |  |  |  | 4 |  |
| I H10 A |  |  |  | 1 |  |
| I H10 B |  |  |  | 1 |  |
| I H10 C |  |  |  | 1 |  |
| I H11 A |  |  |  | 2 |  |
| I H11 B |  |  |  | 2 |  |
| I H11 C |  |  |  | 2 |  |
| I H12 A |  |  |  | 0.5 |  |
| I H12 B |  |  |  | 0.5 |  |
| I H12 C |  |  |  | 0.5 |  |
| I H13 A |  |  |  | 2 |  |
| I H13 B |  |  |  | 2 |  |
| I H13 C |  |  |  | 2 |  |
| I H14 A |  |  |  | 0.5 |  |
| I H14 B |  |  |  | 0.5 |  |
| I H14 C |  |  |  | 0.5 |  |
| I H15 A |  |  |  | 2 |  |
| I H15 B |  |  |  | 2 |  |
| I H15 C |  |  |  | 2 |  |
| I H16 A |  |  |  | 0.5 |  |
| I H16 B |  |  |  | 0.5 |  |
| I H16 C |  |  |  | 0.5 |  |
| I H17 A |  |  |  | 1.5 |  |
| I H17 B |  |  |  | 1.5 |  |
| I H17 C |  |  |  | 1.5 |  |
| I H18 A |  |  |  | 0.375 |  |
| I H18 B |  |  |  | 0.375 |  |
| I H18 C |  |  |  | 0.375 |  |
| I H19 A |  |  |  | 1.5 |  |
| I H19 B |  |  |  | 1.5 |  |
| I H19 C |  |  |  | 1.5 |  |
| I H20 A |  |  |  | 0.375 |  |
| I H20 B |  |  |  | 0.375 |  |
| I H20 C |  |  |  | 0.375 |  |
| I H21 A |  |  |  | 1.5 |  |
| I H21 B |  |  |  | 1.5 |  |
| I H21 C |  |  |  | 1.5 |  |
| I H22 A |  |  |  | 0.375 |  |
| I H22 B |  |  |  | 0.375 |  |
| I H22 C |  |  |  | 0.375 |  |
| I H23 A |  |  |  | 0.6 |  |
| I H23 B |  |  |  | 0.6 |  |
| I H23 C |  |  |  | 0.6 |  |
| I H24 A |  |  |  | 0.15 |  |
| I H24 B |  |  |  | 0.15 |  |
| I H24 C |  |  |  | 0.15 |  |
| I H25 A |  |  |  | 0.6 |  |
| I H25 B |  |  |  | 0.6 |  |
| I H25 C |  |  |  | 0.6 |  |
| I H26 A |  |  |  | 0.15 |  |
| I H26 B |  |  |  | 0.15 |  |
| I H26 C |  |  |  | 0.15 |  |
| I H27 A |  |  |  | 0.6 |  |
| I H27 B |  |  |  | 0.6 |  |
| I H27 C |  |  |  | 0.6 |  |
| I H28 A |  |  |  | 0.15 |  |
| I H28 B |  |  |  | 0.15 |  |
| I H28 C |  |  |  | 0.15 |  |
| I H29 A |  |  |  | 0.6 |  |
| I H29 B |  |  |  | 0.6 |  |
| I H29 C |  |  |  | 0.6 |  |
| I H30 A |  |  |  | 0.15 |  |
| I H30 B |  |  |  | 0.15 |  |
| I H30 C |  |  |  | 0.15 |  |
| I H31 A |  |  |  | 0.6 |  |
| I H31 B |  |  |  | 0.6 |  |
| I H31 C |  |  |  | 0.6 |  |
| I H32 A |  |  |  | 0.15 |  |
| I H32 B |  |  |  | 0.15 |  |
| I H32 C |  |  |  | 0.15 |  |
| I H33 A |  |  |  | 0.6 |  |
| I H33 B |  |  |  | 0.6 |  |
| I H33 C |  |  |  | 0.6 |  |
| I H34 A |  |  |  | 0.15 |  |
| I H34 B |  |  |  | 0.15 |  |
| I H34 C |  |  |  | 0.15 |  |
| I H35 A |  |  |  | 0.3 |  |
| I H35 B |  |  |  | 0.3 |  |
| I H35 C |  |  |  | 0.3 |  |
| I H36 A |  |  |  | 0.075 |  |
| I H36 B |  |  |  | 0.075 |  |
| I H36 C |  |  |  | 0.075 |  |
| I H37 A |  |  |  | 0.3 |  |
| I H37 B |  |  |  | 0.3 |  |
| I H37 C |  |  |  | 0.3 |  |
| I H38 A |  |  |  | 0.075 |  |
| I H38 B |  |  |  | 0.075 |  |
| I H38 C |  |  |  | 0.075 |  |
| I H39 A |  |  |  | 0.3 |  |
| I H39 B |  |  |  | 0.3 |  |
| I H39 C |  |  |  | 0.3 |  |
| I H40 A |  |  |  | 0.075 |  |
| I H40 B |  |  |  | 0.075 |  |
| I H40 C |  |  |  | 0.075 |  |
| I H41 A |  |  |  | 0.3 |  |
| I H41 B |  |  |  | 0.3 |  |
| I H41 C |  |  |  | 0.3 |  |
| I H42 A |  |  |  | 0.075 |  |
| I H42 B |  |  |  | 0.075 |  |
| I H42 C |  |  |  | 0.075 |  |
| I H43 A |  |  |  | 0.3 |  |
| I H43 B |  |  |  | 0.3 |  |
| I H43 C |  |  |  | 0.3 |  |
| I H44 A |  |  |  | 0.075 |  |
| I H44 B |  |  |  | 0.075 |  |
| I H44 C |  |  |  | 0.075 |  |
| I H45 A |  |  |  | 0.3 |  |
| I H45 B |  |  |  | 0.3 |  |
| I H45 C |  |  |  | 0.3 |  |
| I H46 A |  |  |  | 0.075 |  |
| I H46 B |  |  |  | 0.075 |  |
| I H46 C |  |  |  | 0.075 |  |
| I H47 A |  |  |  | 0.3 |  |
| I H47 B |  |  |  | 0.3 |  |
| I H47 C |  |  |  | 0.3 |  |
| I H48 A |  |  |  | 0.075 |  |
| I H48 B |  |  |  | 0.075 |  |
| I H48 C |  |  |  | 0.075 |  |
| I H49 A |  |  |  | 0.3 |  |
| I H49 B |  |  |  | 0.3 |  |
| I H49 C |  |  |  | 0.3 |  |
| I H50 A |  |  |  | 0.075 |  |
| I H50 B |  |  |  | 0.075 |  |
| I H50 C |  |  |  | 0.075 |  |

*Note: Please refer to specific sections of the PQ-SPEC-01 for detailed compliance limits*

**95th Percentile ITHD and Individual Harmonic Spectrum Graph**

**[Insert 95th Percentile ITHD and Individual Harmonic Spectrum Graph here]**

## Current Interharmonics Summary

All current interharmonics are a percentage of the rated current or 95 percentiles of the current during the monitoring period.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| IH order | IaIH avg (%) | IaIH max (%) | IaIH C95 (%) | IbIH avg (%) | IbIH max (%) | IbIH C95 (%) | IcIH avg (%) | IcIH max (%) | IcIH C95 (%) |
| 1 |  |  |  |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |  |  |  |
| 4 |  |  |  |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |  |  |  |
| 6 |  |  |  |  |  |  |  |  |  |
| 7 |  |  |  |  |  |  |  |  |  |
| 8 |  |  |  |  |  |  |  |  |  |
| 9 |  |  |  |  |  |  |  |  |  |
| 10 |  |  |  |  |  |  |  |  |  |
| 11 |  |  |  |  |  |  |  |  |  |
| 12 |  |  |  |  |  |  |  |  |  |
| 13 |  |  |  |  |  |  |  |  |  |
| 14 |  |  |  |  |  |  |  |  |  |
| 15 |  |  |  |  |  |  |  |  |  |
| 16 |  |  |  |  |  |  |  |  |  |
| 17 |  |  |  |  |  |  |  |  |  |
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**95th Percentile Individual Current Interharmonic Spectrum Graph**

**[Insert 95th Percentile Individual Current Interharmonic Spectrum Graph here]**

## Voltage Flicker (Pst, Plt)

**Pst/Plt Graph**

**[Insert Pst/Plt Graph here]**

The 95th percentile value of Pst is **Value.**

The 95th percentile value of Plt is **Value.**

*Note: The 95th percentile values of Pst and Plt should be below the standard limit of PQ-SPEC-01.*

## RVC (Rapid Voltage Change)

Refer to 61000-4-30 Class A latest revision for detection and measurement method of RVC event.

**Single transformer energization**

**Voltage RMS Graph**

**[Insert Voltage Graph here]**

**Current RMS Graph**

**[Insert Current Graph here]**

The RVC ofsingle transformer energization **(size of transformer)** results in **(value)**%.

**All transformer energization (If no other switchgears that can automatically do a group of transformer energization)**

**Voltage RMS Graph**

**[Insert Voltage Graph here]**

**Current RMS Graph**

**[Insert Current Graph here]**

The RVC ofall transformer energization **(number of transformer x single transformer size)** simultaneously results in **(value)**%.

Note: If energizing all transformers is not realistic because the facility have switchgear switches that either switch each transformers at a time, or switches a portion of the total transformers at a time, then state the switching philosophy clearly and why capture is obtained for the specific worst case switching scenario.

## Power and Power Factor

**Power and Power Factor Graph**

**[Insert Power and Power Factor Graph here]**

The real power on each phase varies between **range of real power (e.g. kW (load) and -kW (generation))** during the monitoring period, with power factor varying between **range of power factor.**

*Note: The Power Factor setting should be the same as the agreed operating power factor during generation periods.*

# Summary of the Measurement Results

The summary of power quality compliance assessments are shown below assessment period between **Year-Month-Date** and **Year-Month-Date**.

*Note: Summary of the assessment is required for the compliance report but not required for benchmark report.*

Detailed data and charts are presented in following sections for PQ indices that are identified to be not in compliance with the specification.

|  |  |
| --- | --- |
| Assessments | **Compliant (Yes/No)** |
| Voltage THD and Individual Harmonics |  |
| Current TDD and Individual Harmonics |  |
| Voltage Flicker (Pst and Plt) |  |
| RVC |  |

*Note: Please refer to specific sections of the PQ-SPEC-01 for detailed compliance limits*

## Additional Comments

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| --- |
|  |

|  |  |
| --- | --- |
| Provided by: |  |
|  |  |
| Power Producer or Engineering Consultant (name / company) |  |
|  |  |
| Title (P.Eng Required) |  |
|  |  |
| Signature |  |
|  |  |
| Date |  |

**Power Quality report to be reviewed by engineering, customer/consultant shall be contacted directly if any questions regarding the content.**