

Tri-County Water Board of Management Agenda

January 26, 2021, 7:00 p.m.
Electronic Participation Meeting via Zoom

Due to the COVID-19 Pandemic this meeting will be held electronically. Please contact the Clerk's Department if you require an alternate format or accessible communication support or wish to receive the link to the meeting, at 519-785-0560 or by email at clerk@westelgin.net.

Pages

1. Call to Order

2. Adoption of Agenda

Recommendation:

That Tri-County Water Board hereby adopts the Agenda for January 26, 2021 as presented.

3. Disclosure of Pecuniary Interest

4. Minutes

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Recommendation:

That minutes of the Tri-County Water Board meeting on December 15, 2020 be adopted as circulated and printed.

5. Business Arising from Minutes

6. Staff Reports

6.1. Financials as of December 31, 2020

6

6.2. Tri-County Plant Update: Incoming power supply and transformer project

8

6.3. M. Taylor and S. Budden - Verbal Update on West Lorne Standpipe

6.4. Dates of 2021 Tri-County Water Board Meetings

Recommendation:

That the dates of the Regular Tri-County Water Board meetings for 2021 shall be:

April 27

July 27

October 26

December 14

7. Closed Session

Recommendation:

That Tri-County Water Board hereby adjourn into Closed Session at _____ p.m. under Section 239(2)(f) of the *Municipal Act*, consideration will be given to advice that is subject to solicitor-client privilege.

8. Report from Closed Session

9. Adjournment

Recommendation:

That the Tri-County Water Board hereby adjour at ____ to reconvene on April 27, 2021 at 7:00 p.m. or at the Call of the Chair.

Tri-County Water Board of Management

Minutes

December 15, 2020, 7:00 p.m.

Electronic Participation Meeting via Zoom

Present: Allan Mayhew, Southwest Middlesex
Angela Cammaert, West Elgin
Bonnie Rowe, West Elgin
Duncan McPhail, West Elgin
Ken Loveland, Dutton Dunwich
Marigay Wilkins, Southwest Middlesex
Taraesa Tellier, West Elgin
Tim Sunderland, Chatham-Kent
Bob Purcell, Chair
Mike Hentz, Dutton Dunwich
Diane Brewer, Newbury

Regrets: Michael Noe, Newbury
Doug Bartlett, Southwest Middlesex

Staff Present: Jana Nethercott, Recording Secretary
Magda Badura, CAO/Treasurer

Also Present: Jill Belchamber-Glaizer, Southwest Middlesex

Due to the COVID-19 Pandemic and physical distancing requirements, this meeting will be held electronically.

1. Call to Order

Chair B. Purcell called the meeting to order at 7:02 p.m.

2. Adoption of Agenda

Moved: Angela Cammaert

Seconded: Marigay Wilkins

That Tri-County Water Board hereby adopts the Agenda for December 17, 2020 as presented.

For (9): Angela Cammaert, Bonnie Rowe, Duncan McPhail, Ken Loveland, Marigay Wilkins, Taraesa Tellier, Tim Sunderland, Mike Hentz, and Diane Brewer

Absent (3): Allan Mayhew, Doug Bartlett, and Michael Noe

Disposition: Carried (9 to 0)

3. Disclosure of Pecuniary Interest

No disclosures

Allan Mayhew joined the meeting at 7:05 p.m.

4. Minutes

Moved: Mike Hentz

Seconded: Duncan McPhail

That minutes of the Tri-County Water Board meeting on October 27, 2020 be adopted as circulated and printed.

For (10): Allan Mayhew, Angela Cammaert, Bonnie Rowe, Duncan McPhail, Ken Loveland, Marigay Wilkins, Taraesa Tellier, Tim Sunderland, Mike Hentz, and Diane Brewer

Absent (2): Doug Bartlett, and Michael Noe

Disposition: Carried (10 to 0)

5. Business Arising from Minutes

No business

6. Staff Reports

6.1 Third Quarter Operations Report

Mike Taylor presented the Third Quarter Operations Report. Mr. Taylor reported that there have been higher flows from the plant this past summer, which he believes that is directly tied to the COVID-19 and more people being home.

Moved: Taraesa Tellier

Seconded: Ken Loveland

That Tri-County Water Board hereby receives the 2020 Third Quarter Operations Report from OCWA.

For (10): Allan Mayhew, Angela Cammaert, Bonnie Rowe, Duncan McPhail, Ken Loveland, Marigay Wilkins, Taraesa Tellier, Tim Sunderland, Mike Hentz, and Diane Brewer

Absent (2): Doug Bartlett, and Michael Noe

Disposition: Carried (10 to 0)

6.2 Extension of Auditing Services

Moved: Allan Mayhew

Seconded: Tim Sunderland

That the Tri-County Water Board hereby approve the extension of External Audit Services by Scrimgeour & Company CPA Professional Company at a cost of \$3,700 for five years until December 31, 2025.

For (10): Allan Mayhew, Angela Cammaert, Bonnie Rowe, Duncan McPhail, Ken Loveland, Marigay Wilkins, Taraesa Tellier, Tim Sunderland, Mike Hentz, and Diane Brewer

Absent (2): Doug Bartlett, and Michael Noe

Disposition: Carried (10 to 0)

6.3 2021 Insurance Renewal

M. Badura presented the 2021 Insurance renewal. Ms. Badura reported that she has submitted a letter of reconsideration for the increase of over 26% and has not heard a response. Tri-County Water Board directed staff to get quotes on insurance for 2022.

Moved: Diane Brewer

Seconded: Bonnie Rowe

That the Tri-County Water Board hereby approves the renewal of insurance coverage with Frank Cowan at an annual cost of \$18,285 plus applicable taxes.

For (10): Allan Mayhew, Angela Cammaert, Bonnie Rowe, Duncan McPhail, Ken Loveland, Marigay Wilkins, Taraesa Tellier, Tim Sunderland, Mike Hentz, and Diane Brewer

Absent (2): Doug Bartlett, and Michael Noe

Disposition: Carried (10 to 0)

7. 2021 Proposed Budget

Mike Taylor presented information on the work that was done in 2020 on phragmites in the water around the intake pipe for the plant. Mr. Taylor stated that phragmites has encroached significantly on the treatment area of the plant and needs to be addressed in 2021. The quotes provided in the budget covers the cost of equipment and staff required for spraying and cutting of phragmites and the work could be scheduled for early July if approved in the Budget.

Mr. Taylor presented a video taken of the West Lorne Standpipe to show the issues discovered in the inspection. The inspection company has recommended that work is required both inside and outside of the standpipe. Staff are to report back to Tri-County Water Board regarding options for financing the work required and with recommendations on a workplan moving forward.

Mr. Taylor presented the information on the required software updates. Due to the construction of the plant, there is only one vendor able to provide the software for the equipment and the update is required.

Moved: Duncan McPhail

Seconded: Mike Hentz

That the Tri-County Water Board hereby adopt the 2021 Operating and Capital Budgets as presented.

For (10): Allan Mayhew, Angela Cammaert, Bonnie Rowe, Duncan McPhail, Ken Loveland, Marigay Wilkins, Taraesa Tellier, Tim Sunderland, Mike Hentz, and Diane Brewer

Absent (2): Doug Bartlett, and Michael Noe

Disposition: Carried (10 to 0)

8. New Business

8.1 Election of Chair & Vice Chair for 2021

Chair Purcell stated that he and Vice Chair McPhail are willing stay on if no one else wishes to run for these positions. There were no volunteers to run.

Moved: Allan Mayhew

Seconded: Tim Sunderland

That Bob Purcell and Duncan McPhail are hereby re-appointed as Chair and Vice Chair of the Tri-County Water Board for the 2021 year.

For (10): Allan Mayhew, Angela Cammaert, Bonnie Rowe, Duncan McPhail, Ken Loveland, Marigay Wilkins, Taraesa Tellier, Tim Sunderland, Mike Hentz, and Diane Brewer

Absent (2): Doug Bartlett, and Michael Noe

Disposition: Carried (10 to 0)

9. Adjournment

Moved: Marigay Wilkins

Seconded: Ken Loveland

That the Tri-County Water Board hereby adjourn at 8:50 p.m. to reconvene on January 26, 2021 at 7:00 p.m. or at the Call of the Chair.

For (10): Allan Mayhew, Angela Cammaert, Bonnie Rowe, Duncan McPhail, Ken Loveland, Marigay Wilkins, Taraesa Tellier, Tim Sunderland, Mike Hentz, and Diane Brewer

Absent (2): Doug Bartlett, and Michael Noe

Disposition: Carried (10 to 0)

Bob Purcell, Chair

Jana Nethercott, Recording
Secretary

Tri-County Water

Income Statement As of December 31, 2020

Revenue	2020 Actuals	2020 Budget
02-7315-6110 BANK INTEREST	-	6,000.00
02-7315-6190 REBATES	- 10,636.50	-
02-7315-6590 WATER REV - MUNICIPAL	- 1,223,665.00	- 1,294,451.00
Expenses		
02-7315-7500 HYDRO	251,255.35	340,000.00
02-7315-7501 GAS	19,132.94	19,000.00
02-7315-7510 INSURANCE	15,639.48	15,639.48
02-7315-7511 TAXES	66,036.41	67,475.62
02-7315-7529 ADMINISTRATION EXPENSE	6,000.00	6,000.00
02-7315-7601 TELEPHONE & INTERNET	8,622.08	8,500.00
02-7315-7675 LEGAL	3,946.83	-
02-7315-7676 AUDIT	3,765.12	3,765.12
02-7315-7680 CONTRACTED SERVICES	434,155.00	434,155.00
02-7315-7900 TRANSFER TO RESERVE	-	53,430.78
02-7315-7901 TRANSFER FROM RESERVES	-	-
Capital		
02-7315-8000 CAPITAL OVER \$10,0000	378,733.21	352,485.00
	-\$ 47,015.08	\$ -

Notes:

Note 1 Rebates:

Compressor - Hydro One IESO Rebate	\$ 6,836.50
Lighting Upgrade	3,800.00
	\$ 10,636.50

Note 2 Water Revenue:

All residents of West Elgin read on November 16, 2020
Meter chambers read on November 30, 2020

YTD Consumption as of November 30 2020	Actual (m³)	Budget (m³)
SWM	339,350	
Newbury	45,417	474,967
Chatham-Kent	86,777	
Dutton-Dunwich	270,569	316,756
West Elgin	475,475	545,205
	1,217,588	1,336,928

Note 3 Hydro

Billed until December 16, 2020

Note 4 Gas

Billed until January 7, 2021



ELECTRICAL POWER MONITORING

AT

WEST ELGIN PUMPING STATION
WEST ELGIN, ON

PREPARED FOR

ONTARIO CLEAN WATER AGENCY

DECEMBER 2020

Prepared by: *Vince Klingenberg, Eng. Tech.*
Roman Bulla, P. Eng.

POWERCORE ENGINEERING LTD
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WWW.POWERCORE.CA



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- 1.2.2. Load Flow Measurements - Main Service Entrance – Observations**
- 1.2.3. Power Quality Measurements - Main Service Entrance**
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5. MEASUREMENT SUMMARY TABLES & CHARTS



1. INTRODUCTION AND RESULTS

1.1. Introduction

Power Supply Monitoring was performed by PowerCore Engineering at the following locations:

1.1.1. WEST ELGIN PUMPING STATION 1600A/600V MAIN SERVICE ENTRANCE

Please see the following sections for detailed results.



1.2. Measurements Summary

1.2.1. LOAD FLOW MEASUREMENTS - MAIN SERVICE ENTRANCE LOAD FLOW MEASUREMENTS HAVE FOUND THAT:

1. Maximum Real Time Current Load throughout the monitoring period was found to be app. **503 A** (instantaneous peak current) at 5:40 PM on Oct-09-2020
This is well within the feeder's capacity.
2. Maximum Sliding Demand Load was **305 kVA** (sliding demand interval – 15 min average) at 3:30 PM on Oct-13-2020.
This is well within the feeder's capacity.
3. Maximum Real Time Voltage recorded throughout the monitoring period was found to be **+6.5% (639 V)** at 7:06 AM on Nov-21-2020.
Minimum Real Time Voltage recorded throughout the monitoring period was found to be **-100% (0 V)** at 12:42 PM on Oct-27-2020.
These voltage levels are Outside the recommended limits of +/- 5%.
4. Maximum Voltage Imbalance Of **82.9%** was recorded at 05:51 PM on Dec-01-2020.
This imbalance exceeds the 0.5% standard limit.

1.2.2. LOAD FLOW MEASUREMENTS - MAIN SERVICE ENTRANCE – OBSERVATIONS The examination of the Load Flow measurements suggests that:

- Loading on this feeder is well below its capacity 😊
- Voltage was above the +/-5 % limit 😊
- Voltage Imbalance was recorded outside normal limits 😞



1.2.3. POWER QUALITY MEASUREMENTS - MAIN SERVICE ENTRANCE

Power Quality measurements have found that:

1. The Voltage Total Harmonic Distortion (THD) on the MAIN SERVICE ENTRANCE has reached maximum of **6.9%** during the monitored period (IEEE Std. 519-1992 max limit is 5%). On average it remained around **3%** during the monitored period.
2. The Mean Current Total Harmonic Distortion (THD) on the main feeder was around **40%** during peak load times. This is well above the 12% recommended limits as per IEEE Std. 519-1992 for this type of distribution system.
3. Several sub-cycle transient events were recorded during the power monitoring. These transient waveforms recordings (Current & Voltage) are shown as a waveform snapshot in the back of this report:
 - A. Periodic Transient Events – see Event # 1 Waveform
This event occurred on Dec-01 at 5:51 pm
 - B. Periodic Transient Events – see Event # 2 Waveform
This event occurred on Nov-15 at 12:59 pm
 - C. Periodic Transient Events – see Event # 3 Waveform
This event occurred on Dec-01 at 12:01 pm

1.2.4. POWER QUALITY MEASUREMENTS - MAIN SERVICE ENTRANCE - OBSERVATIONS

The examination of the Power Quality measurements suggests that:

- Current Harmonic distortion was found to be outside limits during peak load times. 😞
- Voltage Harmonic distortion average was around **3%** which is within IEE-519 limits. 😊
- Voltage Sag and Swell transient events did translate into any current disturbances in the system. 😊



2. POWER SYSTEM MEASUREMENT EXPLANATION

The pages in the Appendix of this report contain the load measurement summary and typical daily profile graphs for the measurements at the main breaker.

Three types of charts are included in this report:

2.1. Load Profiles

These charts depict typical daily profiles for selected monitored parameters: Phase voltages and currents, kVA Demand & Power Factor (if available), Voltage & Current Imbalance and Voltage Total Harmonic Distortion (THD).

2.2. Event Recorders

These Waveform charts depict a recording of abnormal events recorded during the monitored period.

Few typical events are usually selected for your consideration.

2.3. Harmonic Components Graphs

These Bar Graphs show the Harmonic component breakdown (Fourier Transform) for selected waveforms – normally for a transient waveform (during an event) and a typical waveform for normal operating conditions.

The following criteria should be taken into consideration when reviewing the load and harmonic measurement results:

2.4. Evaluation Criteria

- Recommended maximum voltage variation should not exceed $\pm 5\%$.
- IEEE Power quality standard 519-1992 recommends a limit for Voltage total harmonic distortion of 5% THD at the point of common coupling (i.e. main transformer secondary). Distortion above these limits can cause equipment malfunctioning, computer flicker, PLC problems, capacitor failures etc.
- IEEE Power quality standard 519-1992 recommends a limit for Thermal Demand total Current harmonic distortion of 8-12 % THD TD for your type of 120-208V system. These limits can be momentarily exceeded by 50%.
- Power Factor at the peak Sliding Demand Load (15 minute integration period – SD Value) should be kept above 90% to avoid low power factor penalty.



3. RECOMMENDATIONS

As a result of Load Flow & Power Quality measurements of the Main 600V/1600A Service Entrance at the West Elgin Pumping Station, we offer you the following recommendations for your consideration:

1. **Dynamic Voltage Restoration** – A series compensation device that protects sensitive electrical loads from power quality problems such as voltage sags, swells, unbalance and distortion. This is a **VERY COSTLY OPTION** that can be installed at the service entrance or at sensitive affected equipment.
2. **Report Incoming Service Voltage Disturbances** – Several Voltage disturbances were recorded during the monitored period ranging from sub-cycle voltage pull down (Transient Event #1), Voltage Sags (Transient Event #2 & #4), and Voltage Swells (Transient Event #3) which resulted in obstructive current reactions. In a constant torque application, a voltage sag for several cycles (+ 7 cycles in some of the cases we captured) will cause constant torque equipment (ie variable frequency drives) to increase current consumption to compensate for the loss of voltage. This can result in over current conditions for some of the equipment on the system (seen at the end of Transient Event #3). We recommend reporting these events to the utility provider and request the issues be reviewed to find a solution that protects the facility from further interruptions.
3. We recommend that you perform periodic electrical maintenance testing and inspections of your power distribution system as per NETA recommendations.

Thank you for this opportunity to be of service to you. If you have any questions regarding the recommendations in this report or any other matter, please contact our Engineering Services office at (519) 474-1175.

Sincerely,

PowerCore Engineering Ltd

Roman Bulla, P. Eng.
Power Systems Engineer

Roman Bulla, E. Tech.
Electrical Engineering Technologist



4. APPENDIX – LIST OF ACRONYMS

Several acronyms may have been used throughout this report:

ACRONYMS USED:

[parameter] RT	Real Time value (RMS value based on a 2 cycle measurement)
[parameter] SD	Sliding Demand equivalent value (15 minute integration period average value - utility standard)
[parameter] TD	Thermal Demand equivalent value (30 minute integration period average value)
THD [parameter]	Total Harmonic Distortion of the measured parameter (i.e. Voltage or Current) in percent.
TEHD [parameter]	Total Even Harmonic Distortion of the measured parameter in percent.
TOHD [parameter]	Total Odd Harmonic Distortion of the measured parameter in percent.
A IMBAL, V IMBAL	Three Phase Current or Voltage Imbalance in percent




5. MEASUREMENT SUMMARY TABLES & CHARTS



Pumping Station - West Elgin, ON
Main Service Entrance, Power Monitoring

Real Time Voltage Min/Max Tables

Long-term min/max - Voltage			Long-term min/max - Current			Long-term min/max - PF/Freq		
Min			Max					
	Value	Captured on		Value	Captured on			
Vln a	0 V	10/27/2020 12:42:16.000 PM	Vln a	363 V	11/21/2020 07:06:25.000 AM			
Vln b	0 V	10/27/2020 12:42:16.000 PM	Vln b	364 V	11/21/2020 07:06:25.000 AM			
Vln c	0 V	10/27/2020 12:42:16.000 PM	Vln c	370 V	11/21/2020 07:06:25.000 AM			
Vll ab	0 V	10/27/2020 12:42:16.000 PM	Vll ab	629 V	11/21/2020 07:06:25.000 AM			
Vll bc	0 V	10/27/2020 12:42:16.000 PM	Vll bc	639 V	11/21/2020 07:06:25.000 AM			
Vll ca	0 V	10/27/2020 12:42:16.000 PM	Vll ca	630 V	11/21/2020 07:06:25.000 AM			
V unbal	0.0 %	10/27/2020 12:42:16.000 PM	V unbal	82.9 %	12/1/2020 05:51:47.000 PM			

 Reset Min/Max

Note:
Reset Min/Max resets long term min/max values for Voltages, Currents, Power Factor and Frequency.

Device Time : 12/2/2020 10:51:27.358 AM
Device Type : 8000



Pumping Station - West Elgin, ON
Main Service Entrance, Power Monitoring

Real Time Current Min/Max Tables

OCWA,MainPM8000

[Back to Volts/Amps](#)



Long-term min/max - Voltage

Long-term min/max - Current

Long-term min/max - PF/Freq

	Value	Min Captured on
I a	0 A	10/27/2020 12:42:16.000 PM
I b	0 A	10/27/2020 12:42:16.000 PM
I c	0 A	10/27/2020 12:42:16.000 PM
I 4	0 A	9/29/2020 03:05:46.000 PM
I 5	0 A	9/29/2020 03:05:46.000 PM

	Value	Max Captured on
I a	499 A	10/9/2020 05:40:39.000 PM
I b	501 A	10/9/2020 05:40:39.000 PM
I c	503 A	10/9/2020 05:40:39.000 PM
I 4	0 A	9/29/2020 03:05:46.000 PM
I 5	0 A	9/29/2020 03:05:46.000 PM



Reset Min/Max

Note:
Reset Min/Max resets long term min/max values for Voltages, Currents, Power Factor and Frequency.

Device Time : 12/2/2020 10:54:12.241 AM

Device Type : 8000



Pumping Station - West Elgin, ON
Main Service Entrance, Power Monitoring


Real Time PF/Frequency Min/Max Tables

OCWA.MainPM8000

[Back to Volts/Amps](#)



Long-term min/max - Voltage			Long-term min/max - Current			Long-term min/max - PF/Freq		
Min			Max					
	Value	Captured on		Value	Captured on		Value	Captured on
PF lag	33 %	10/16/2020 10:27:36.000 PM	PF lag	100 %	9/29/2020 11:15:37.000 PM			
PF lead	54 %	10/21/2020 04:49:54.000 AM	PF lead	100 %	9/29/2020 11:15:48.000 PM			
Freq	58.85 Hz	11/30/2020 09:11:58.000 AM	Freq	60.08 Hz	10/9/2020 12:57:46.000 PM			


Reset Min/Max

Note:
Reset Min/Max resets long term min/max values for Voltages, Currents, Power Factor and Frequency.

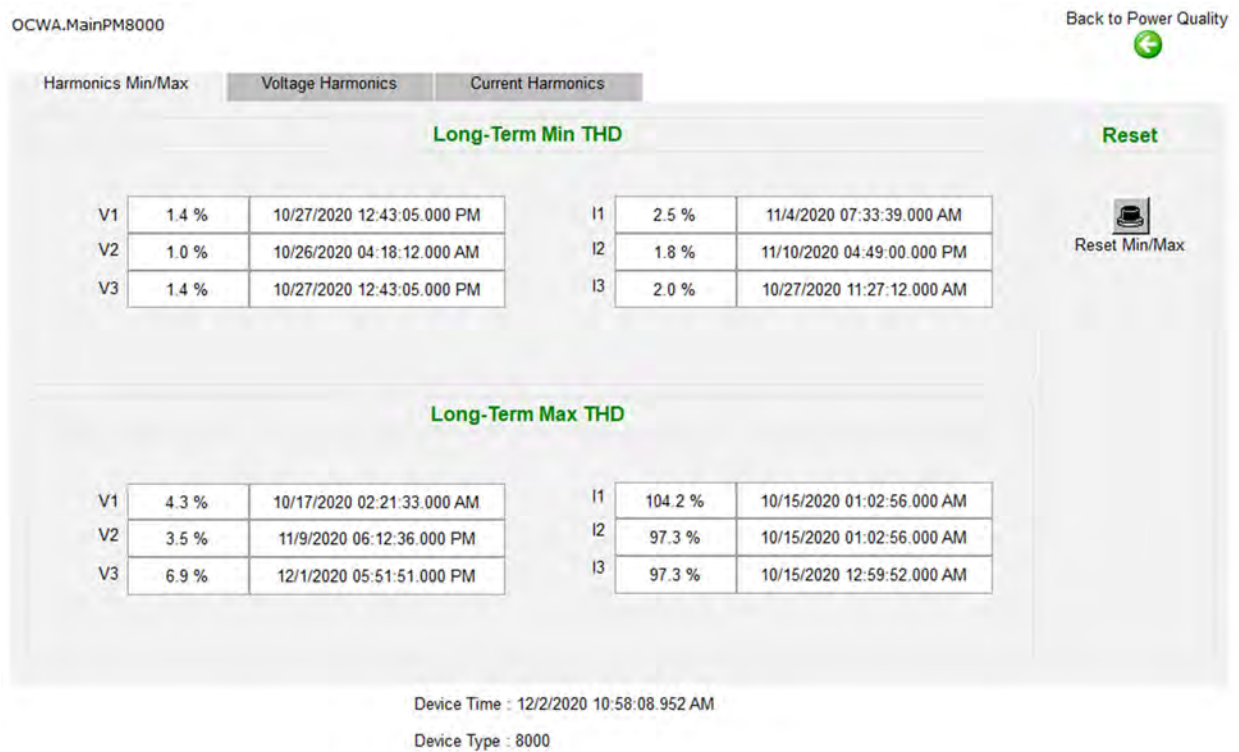
Device Time : 12/2/2020 10:55:20.896 AM

Device Type : 8000



Pumping Station - West Elgin, ON
Main Service Entrance, Power Monitoring

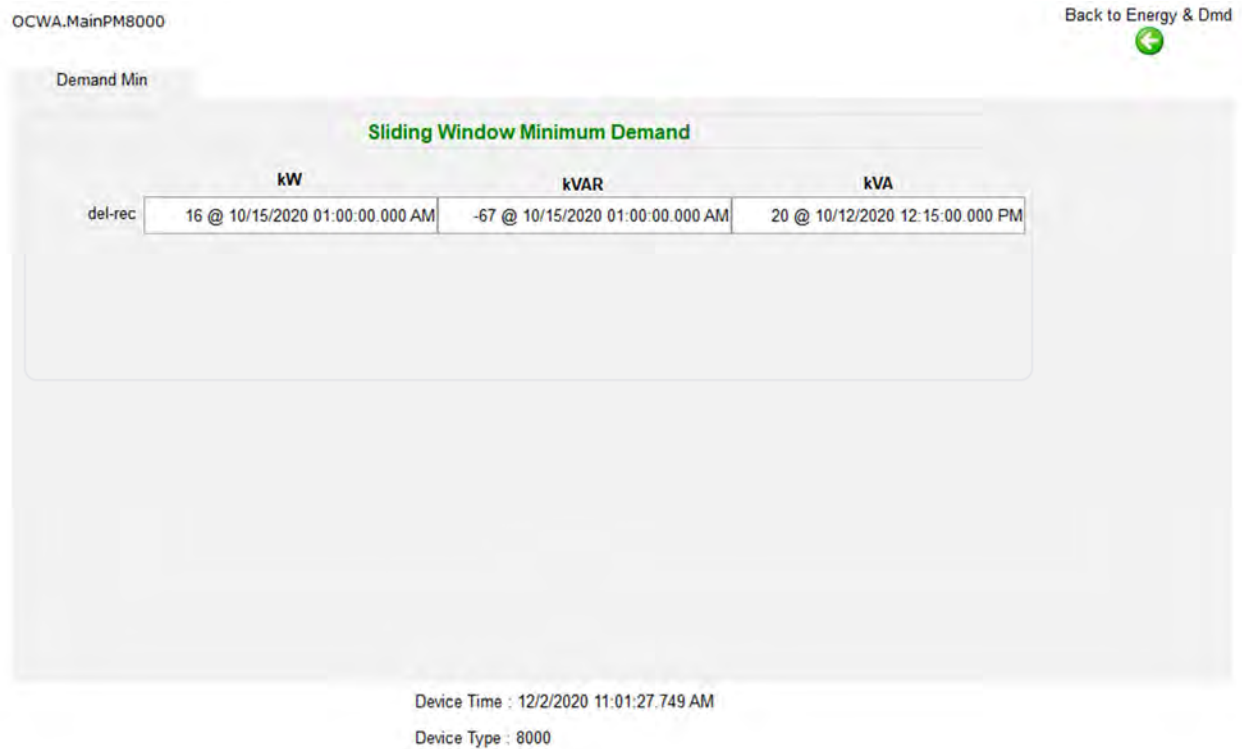
Real Time THD (Total Harmonic Distortion) Min/Max Tables





Pumping Station - West Elgin, ON
Main Service Entrance, Power Monitoring

Sliding Window Demand (15 min. avg.) Min Tables





Pumping Station - West Elgin, ON
Main Service Entrance, Power Monitoring

Sliding Window Demand (15 min. avg.) Max Tables

OCWA.MainPM8000 Back to Energy & Dmd

Peak Demand

Sliding Window Peak Demand

	kW	kVAR	kVA
del	301 @ 10/13/2020 03:30:00.000 PM	63 @ 10/14/2020 03:45:00.000 PM	305 @ 10/13/2020 03:30:00.000 PM
rec	0 @ 9/29/2020 03:15:00.000 PM	77 @ 10/15/2020 01:00:00.000 AM	0 @ 9/29/2020 03:15:00.000 PM
del-rec	301 @ 10/13/2020 03:30:00.000 PM	63 @ 10/14/2020 03:45:00.000 PM	305 @ 10/13/2020 03:30:00.000 PM
del+rec	301 @ 10/13/2020 03:30:00.000 PM	88 @ 10/15/2020 01:00:00.000 AM	305 @ 10/13/2020 03:30:00.000 PM

Reset

Peak Demand Reset Count

0

Peak demand reset

Sliding Window Peak Demand by Quadrant

	kW	kVAR	kVA
Q1	301 @ 10/13/2020 03:30:00.000 PM	63 @ 10/14/2020 03:45:00.000 PM	305 @ 10/13/2020 03:30:00.000 PM
Q2	0 @ 9/29/2020 03:15:00.000 PM	0 @ 9/29/2020 03:15:00.000 PM	0 @ 9/29/2020 03:15:00.000 PM
Q3	0 @ 9/29/2020 03:15:00.000 PM	0 @ 9/29/2020 03:15:00.000 PM	0 @ 9/29/2020 03:15:00.000 PM
Q4	91 @ 10/11/2020 12:30:00.000 PM	77 @ 10/15/2020 01:00:00.000 AM	91 @ 10/11/2020 12:30:00.000 PM

Device Time : 12/2/2020 11:00:28.647 AM

Device Type : 8000



Average Voltage RMS – Historic Trend

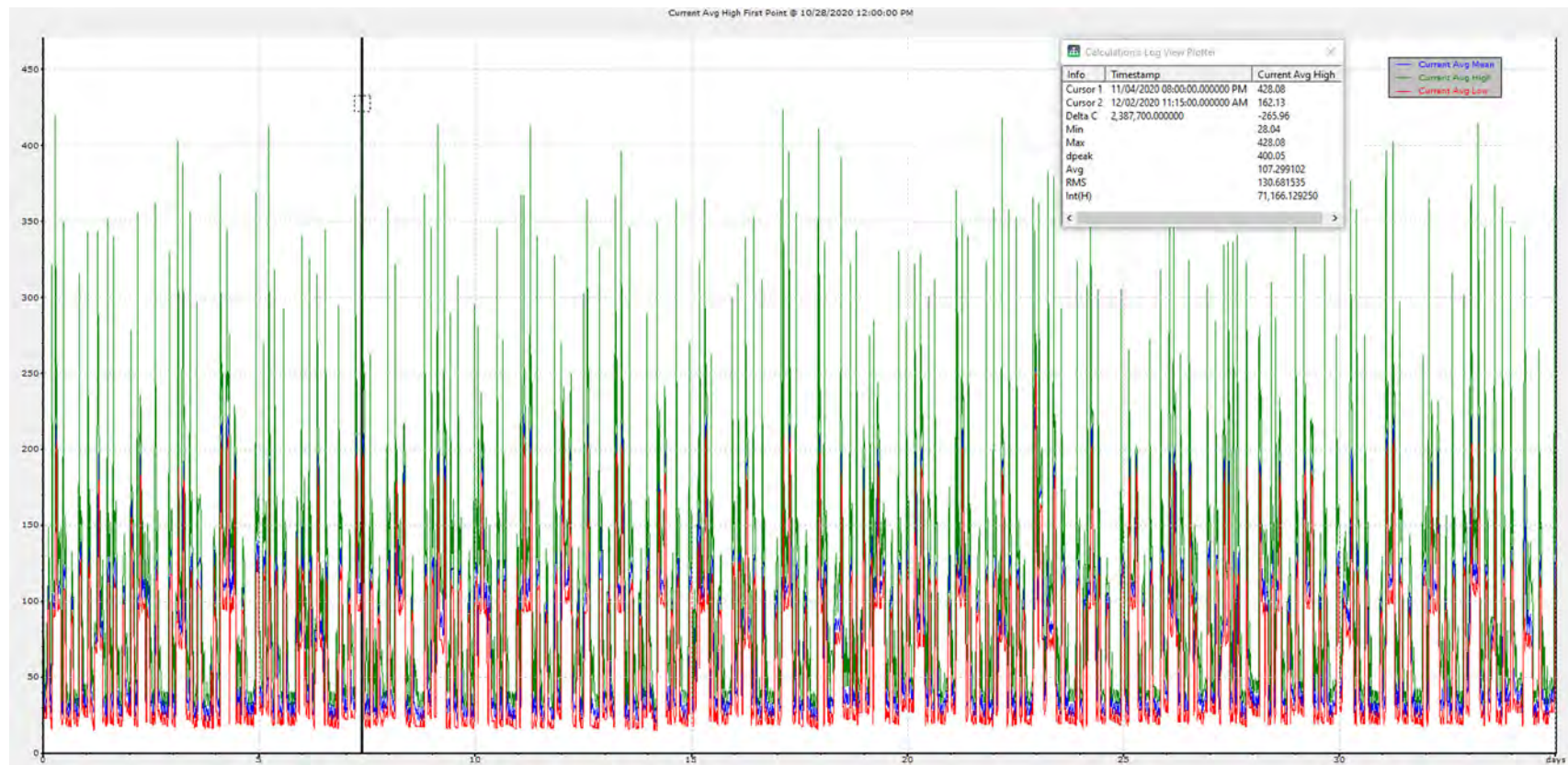


Notes:

- mean value represents mean average throughout a 5 minute interval
- high value represents a maximum Real Time value (2 cycle RMS value) reached during the 5 minute interval
- low value represents a minimum Real Time value (2 cycle RMS value) reached during the 5 minute interval



Average Current RMS – Historic Trend



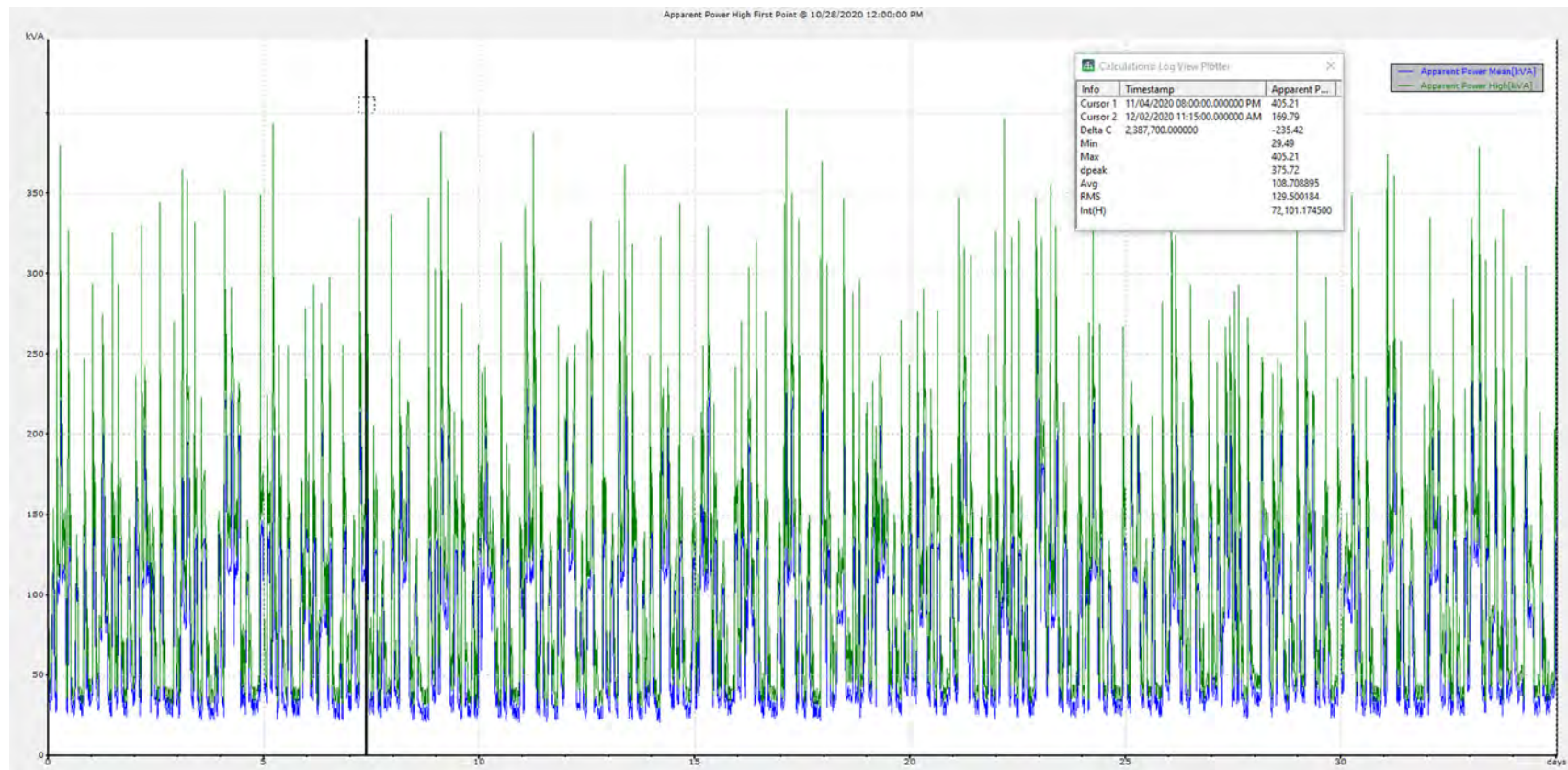
Pumping Station - West Elgin, ON
Main Service Entrance, Power Monitoring

Notes:

- mean value represents mean average throughout a 5 minute interval
- high value represents a maximum Real Time value (2 cycle RMS value) reached during the 5 minute interval
- low value represents a minimum Real Time value (2 cycle RMS value) reached during the 5 minute interval



kVA – Historic Trend



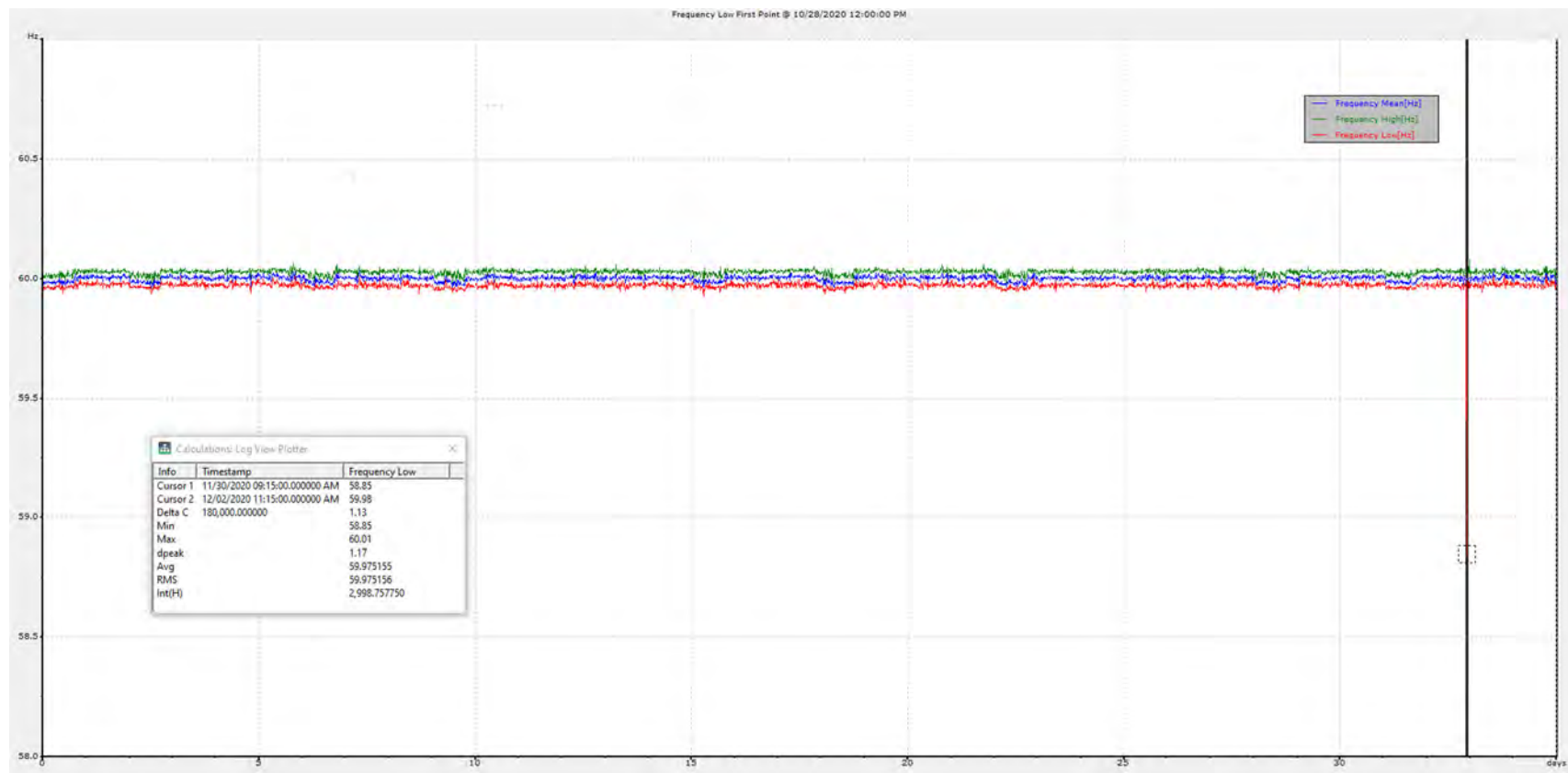
Pumping Station - West Elgin, ON
Main Service Entrance, Power Monitoring

Notes:

- mean value represents mean average throughout a 5 minute interval
- high value represents a maximum Real Time value (2 cycle RMS value) reached during the 5 minute interval



Frequency – Historic Trend



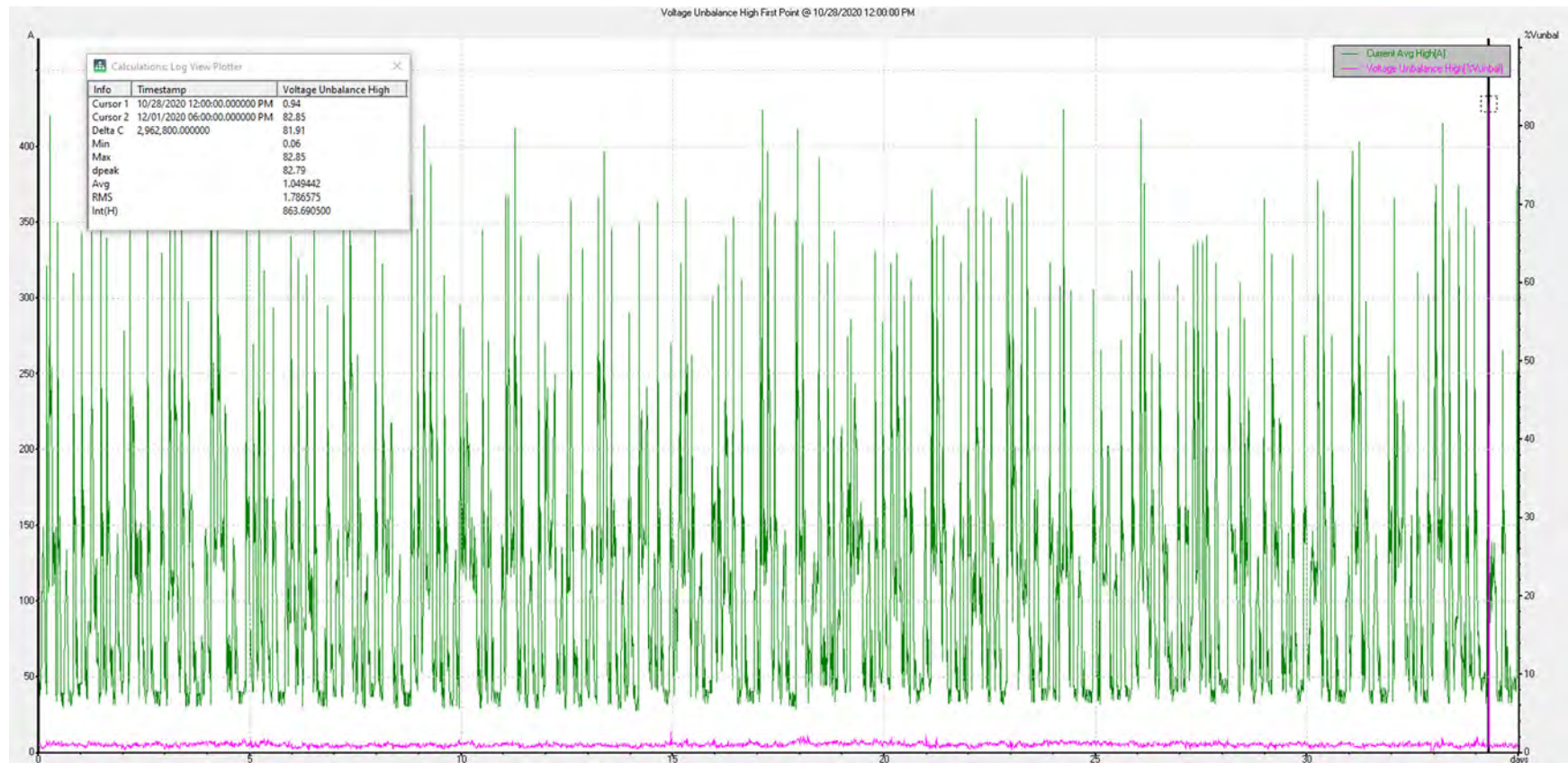
Pumping Station - West Elgin, ON
Main Service Entrance, Power Monitoring

Notes:

- mean value represents mean average throughout a 5 minute interval
- high value represents a maximum Real Time value (2 cycle RMS value) reached during the 5 minute interval
- low value represents a minimum Real Time value (2 cycle RMS value) reached during the 5 minute interval



Average Current Versus Voltage Imbalance – Historic Trend



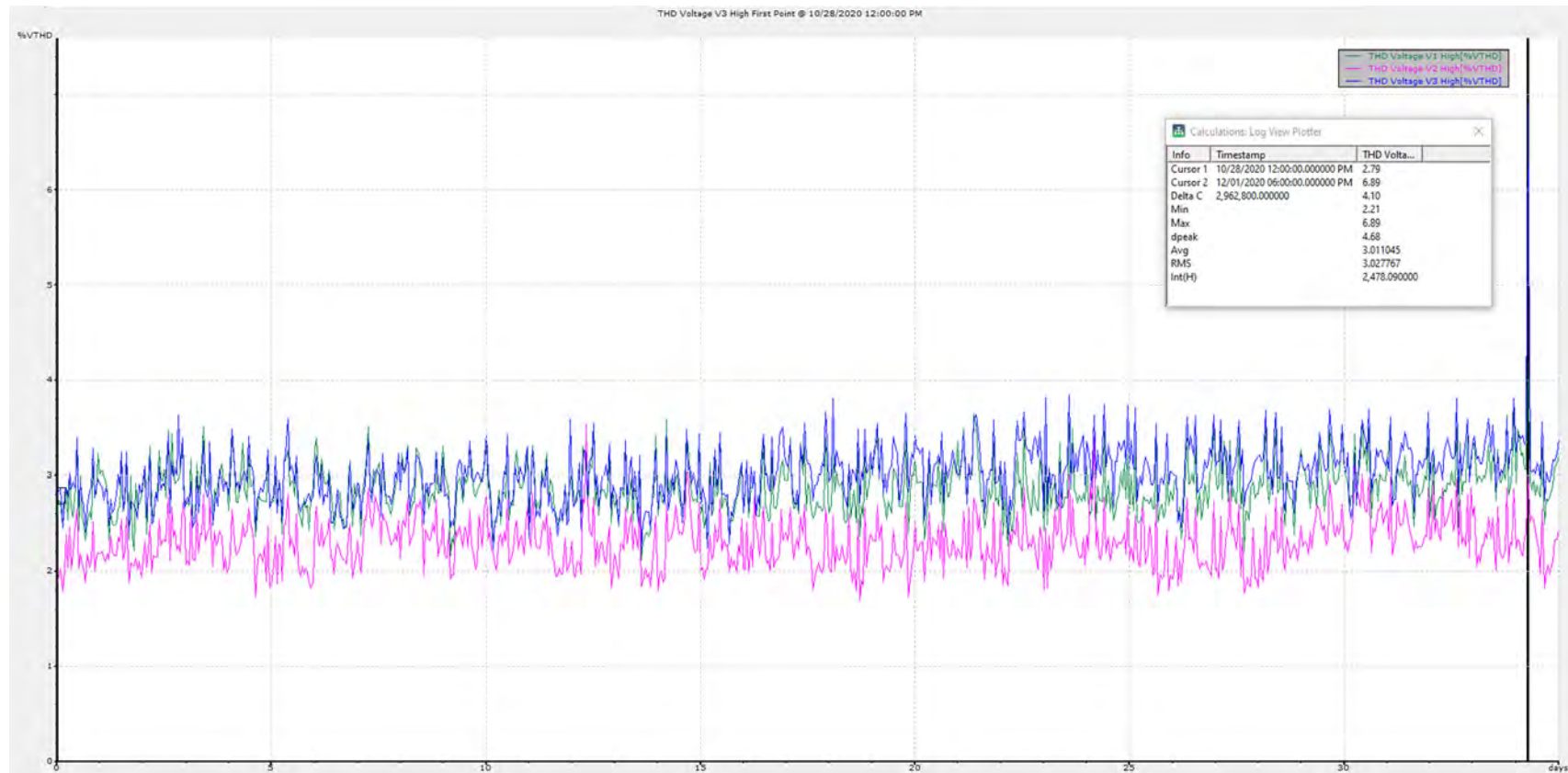
Pumping Station - West Elgin, ON
Main Service Entrance, Power Monitoring

Notes:

- mean value represents mean average throughout a 5 minute interval
- high value represents a maximum Real Time value (2 cycle RMS value) reached during the 5 minute interval
- low value represents a minimum Real Time value (2 cycle RMS value) reached during the 5 minute interval



Voltage Total Harmonic Distortion (THD) – Historic Trend

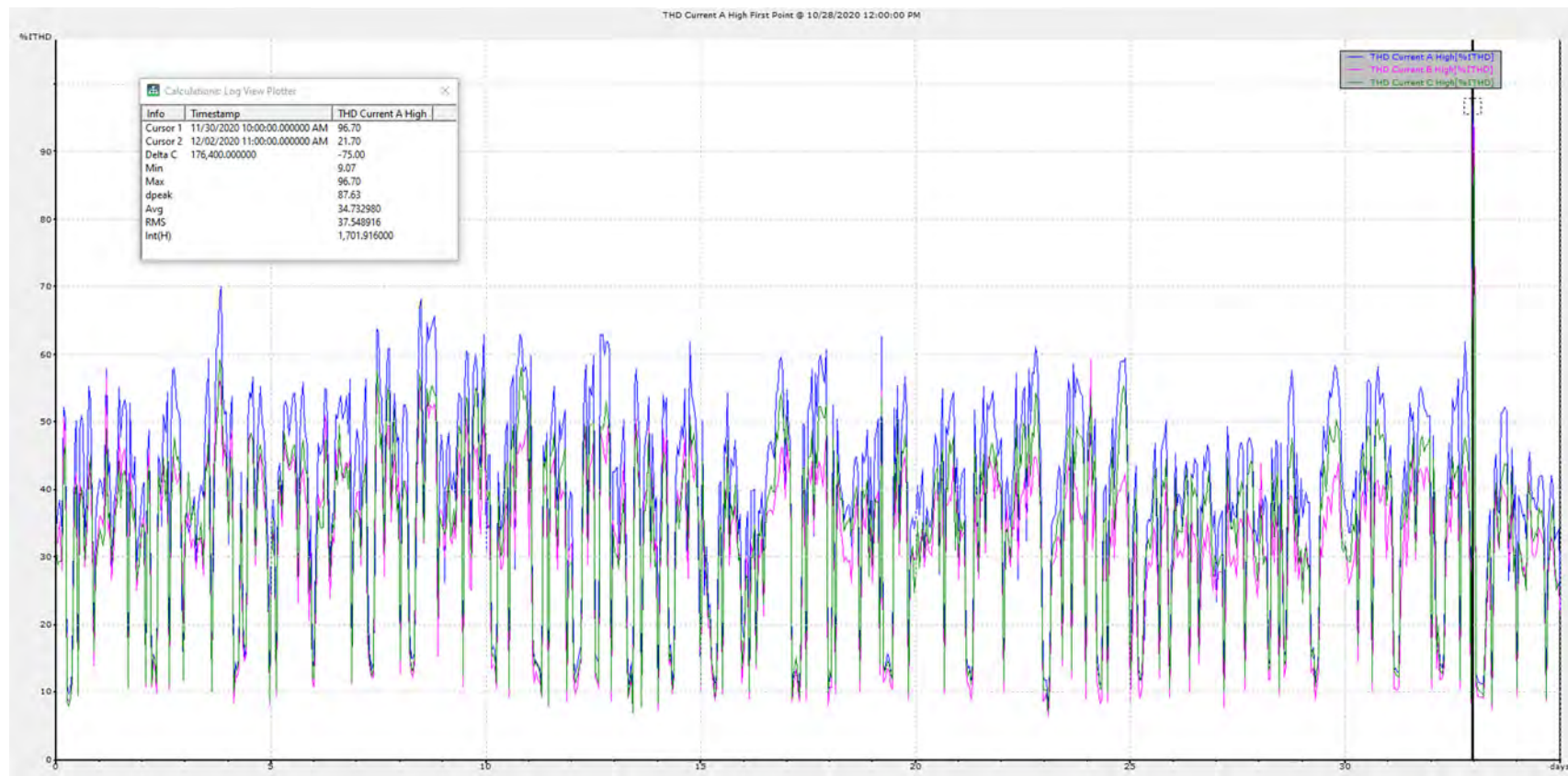


Notes:

- mean value represents mean average throughout a 5 minute interval
- high value represents a maximum Real Time value (2 cycle RMS value) reached during the 5 minute interval
- low value represents a minimum Real Time value (2 cycle RMS value) reached during the 5 minute interval



Current Total Harmonic Distortion (THD) – Historic Trend

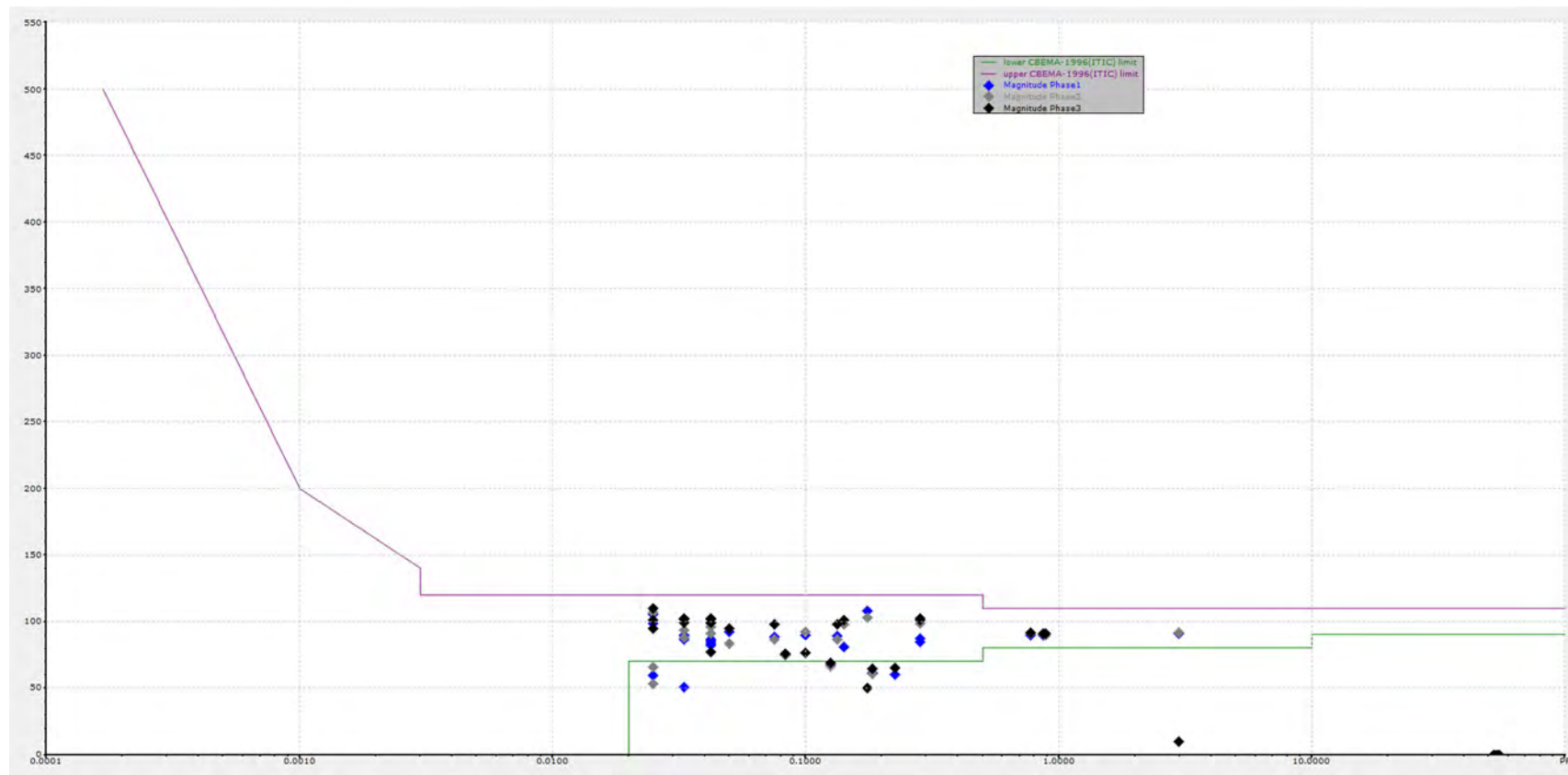


Notes:

- mean value represents mean average throughout a 5 minute interval
- high value represents a maximum Real Time value (2 cycle RMS value) reached during the 5 minute interval
- low value represents a minimum Real Time value (2 cycle RMS value) reached during the 5 minute interval



CBEMA Curve – Historic Summary of Voltage Disturbances

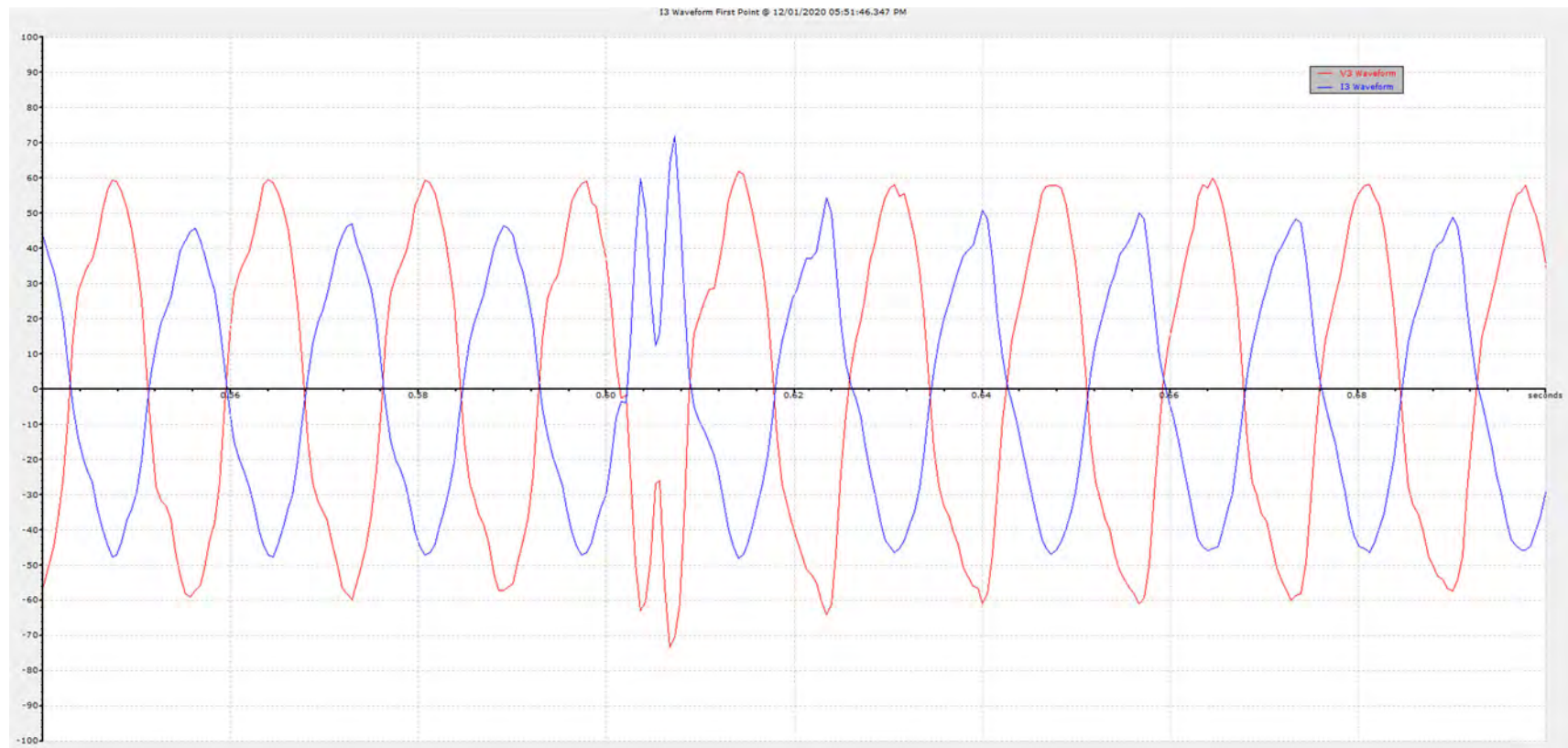


Notes:

- CHART EXPLANATION: X-Axis: Event Duration [seconds], Y-Axis: Event Magnitude [% of Nominal Voltage - 208V]
- All Events falling within the CBEMA envelope should be within the limits that most equipment is capable of handling.
- Some equipment may be more sensitive to short duration events (sub-cycle transients), some may be more sensitive to long duration events (voltage sags / swells)



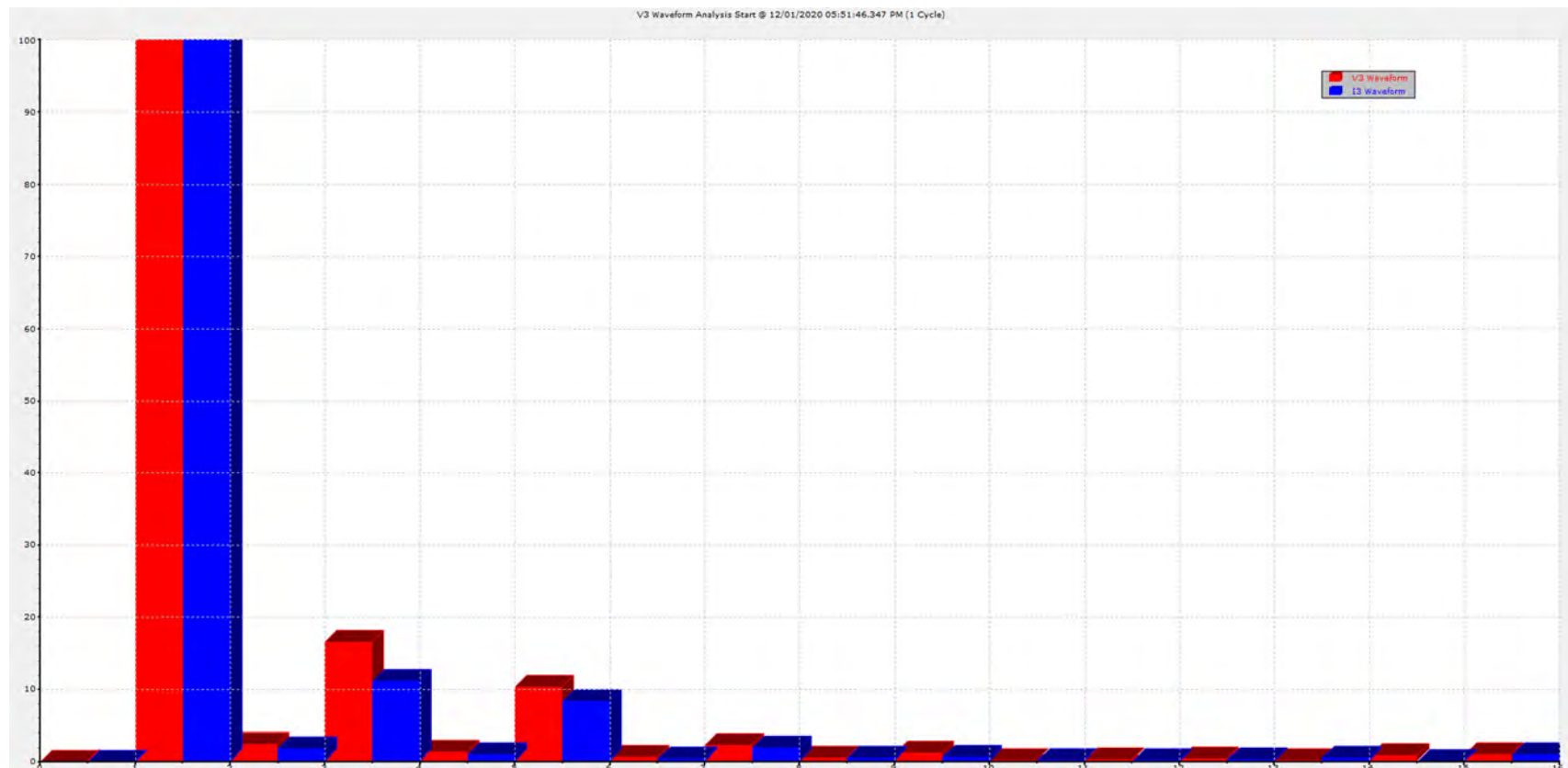
Transient Event #1 Waveform Snapshot – Phase C



Pumping Station - West Elgin, ON
Main Service Entrance, Power Monitoring



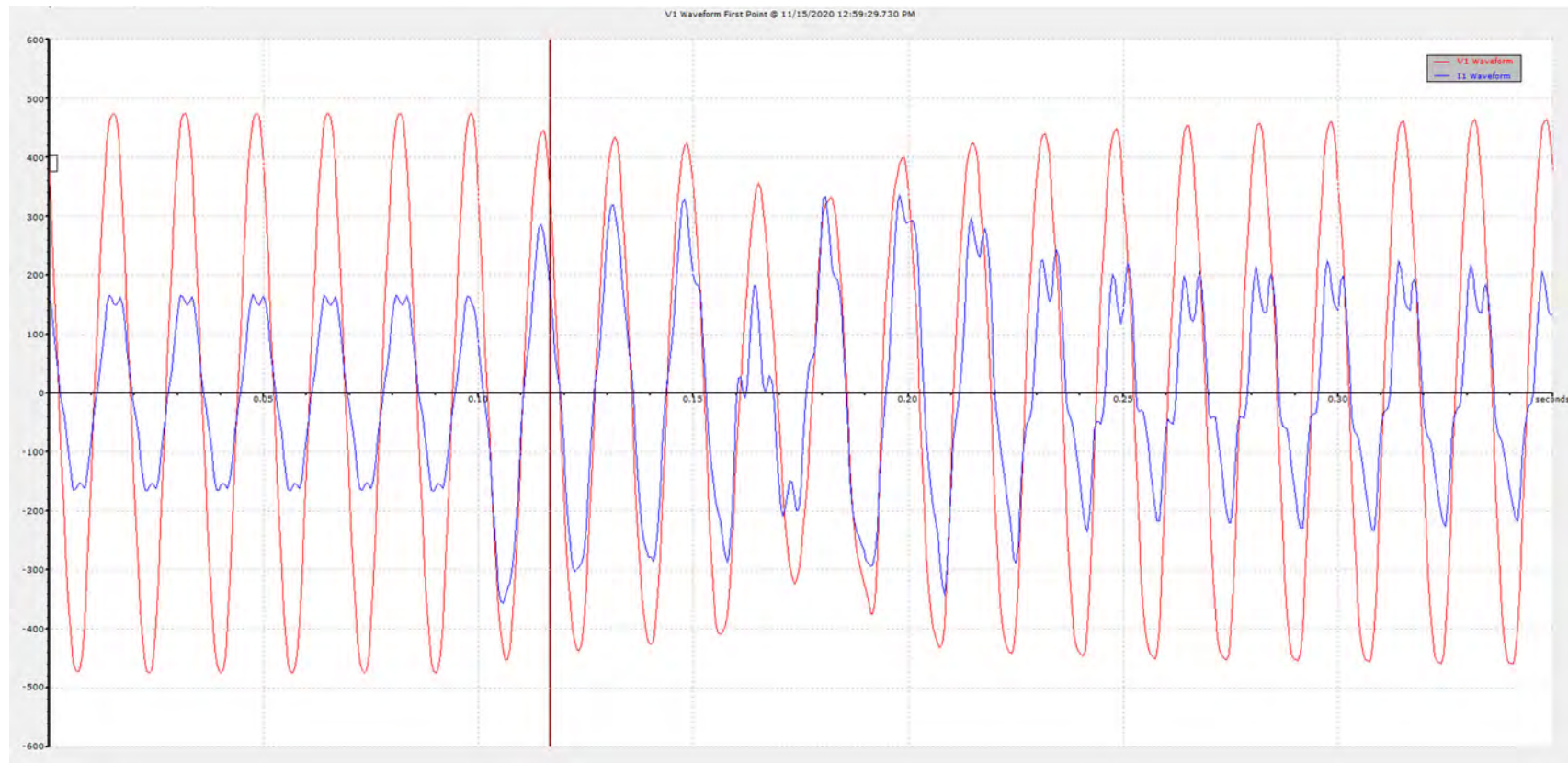
Transient Event #1 Waveform Snapshot – Phase C Harmonic Spectrum



Pumping Station - West Elgin, ON
Main Service Entrance, Power Monitoring



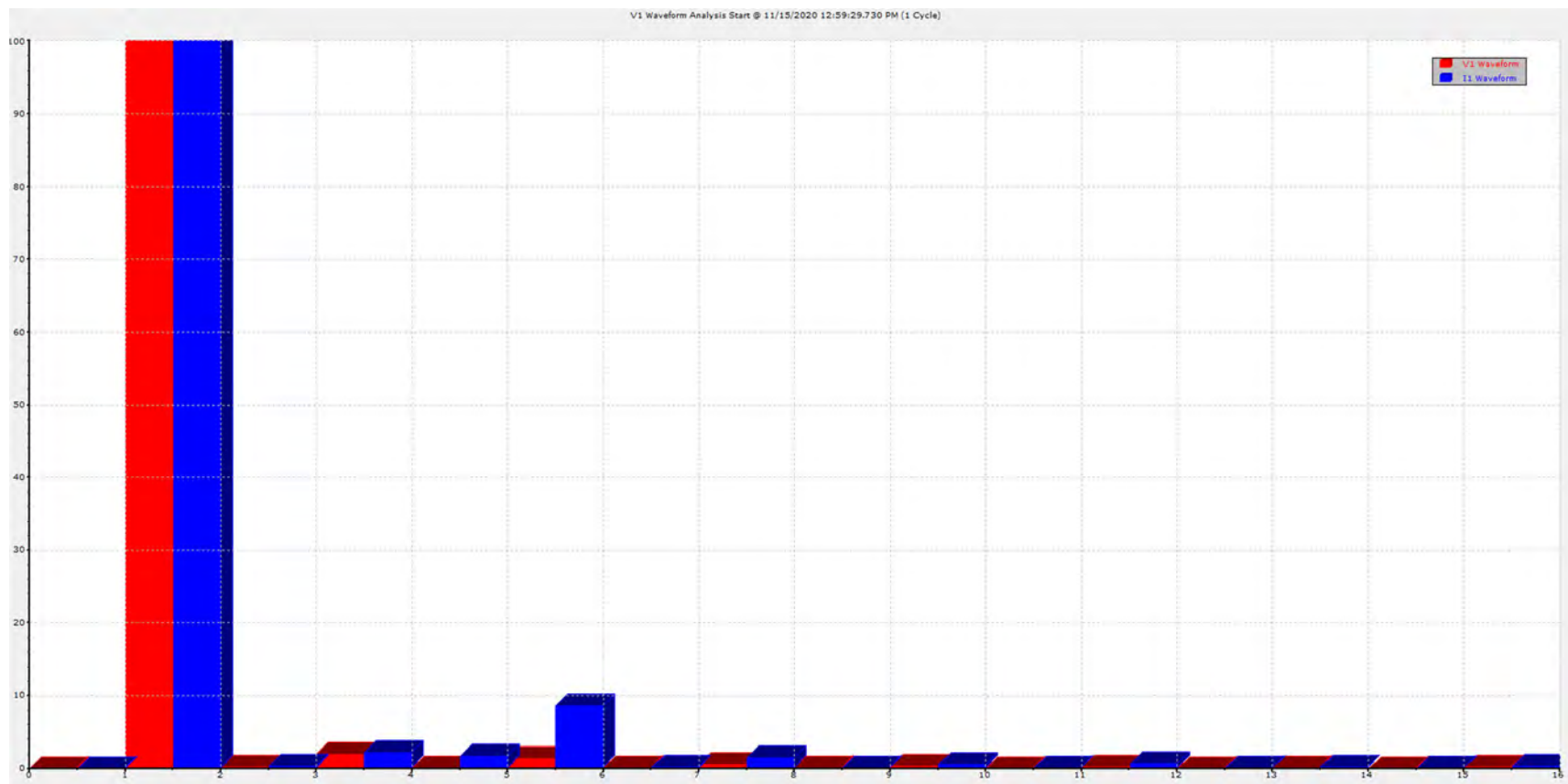
Transient Event #2 Waveform Snapshot – Phase A Direction Detected - Upstream – High Confidence



Pumping Station - West Elgin, ON
Main Service Entrance, Power Monitoring



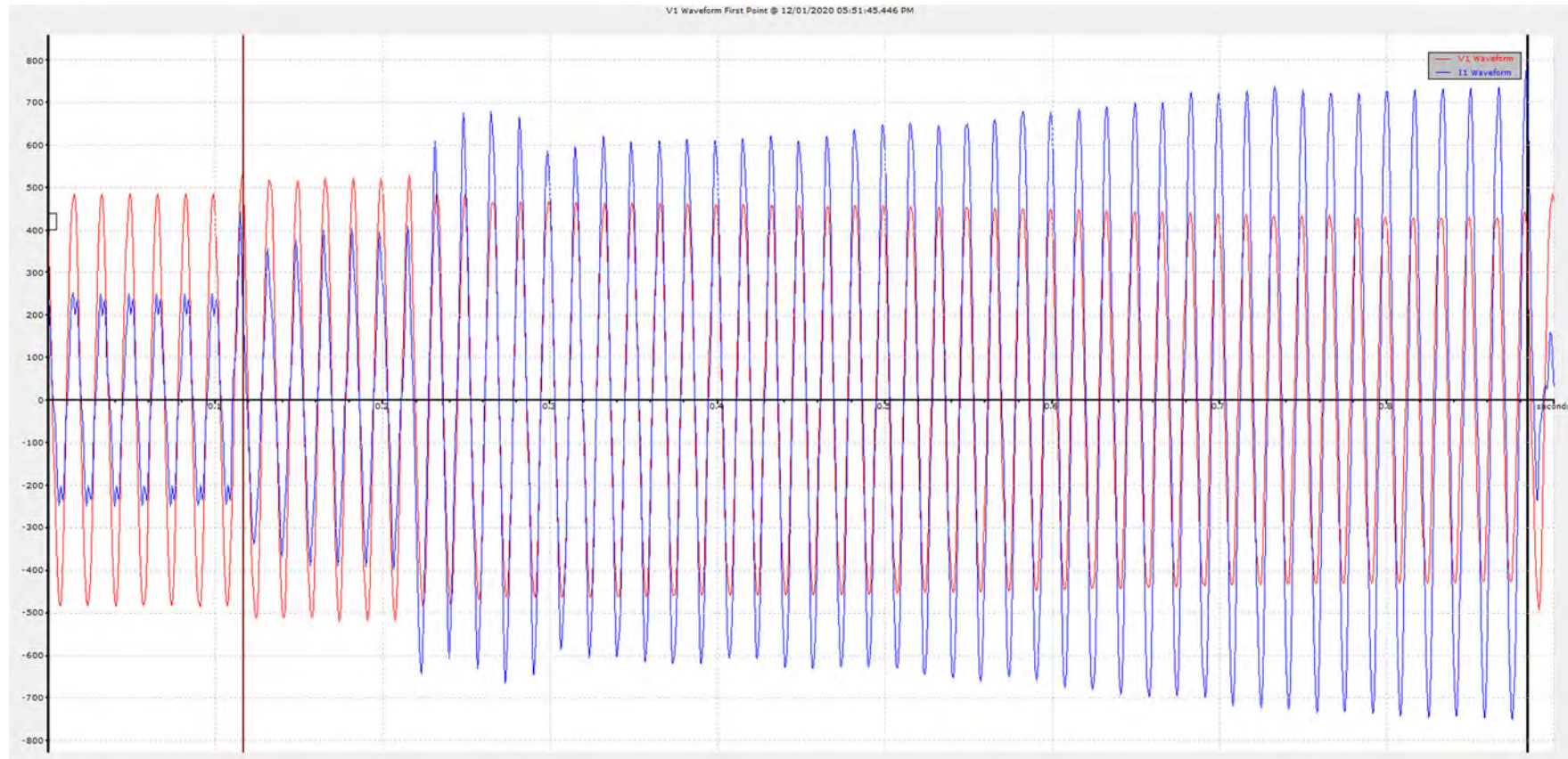
Transient Event #2 Waveform Snapshot – Phase A Harmonic Spectrum Direction Detected - Upstream – High Confidence



Pumping Station - West Elgin, ON
Main Service Entrance, Power Monitoring



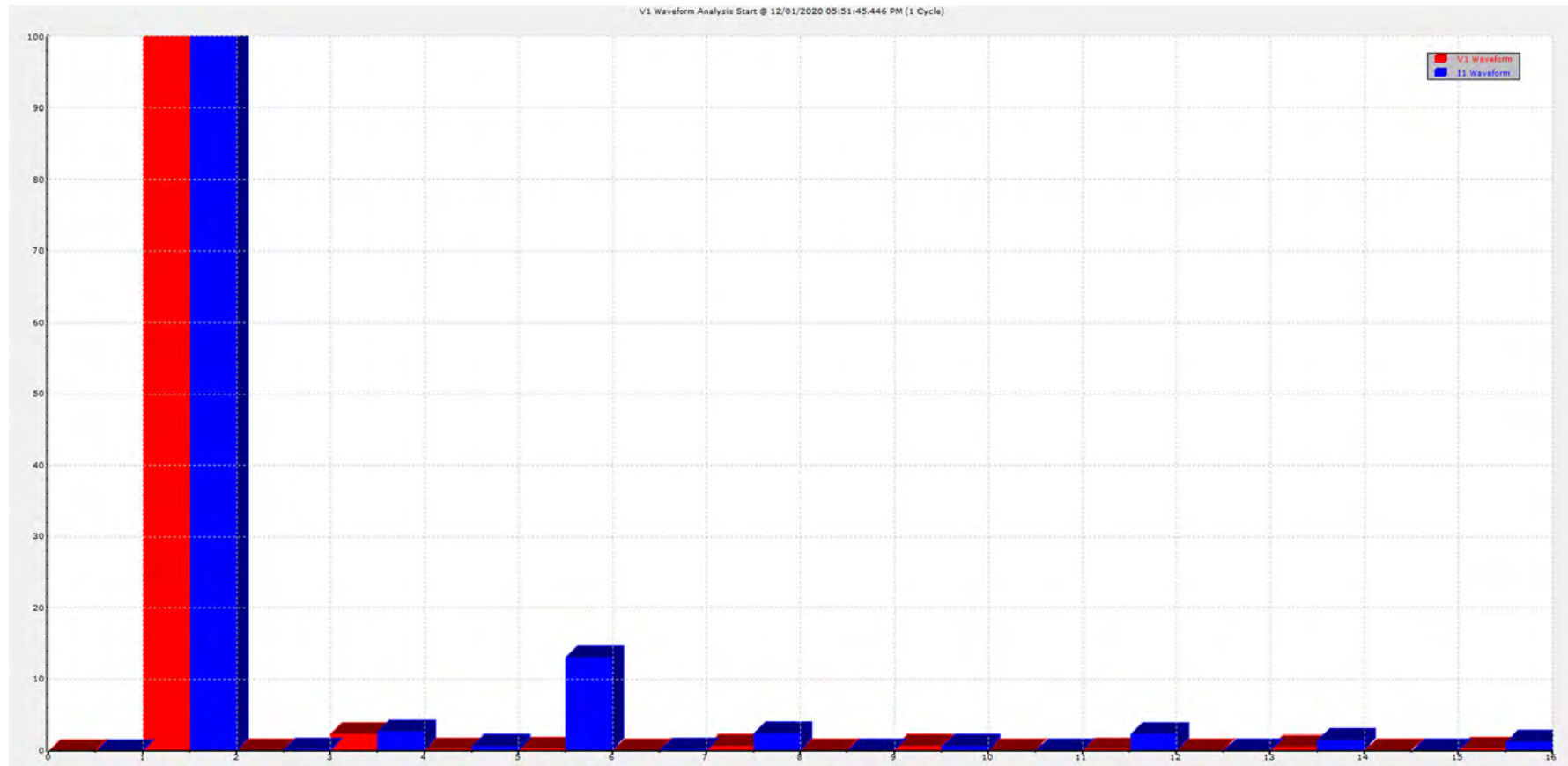
Transient Event #3 Waveform Snapshot – Phase A Direction Detected - Upstream – High Confidence



Pumping Station - West Elgin, ON
Main Service Entrance, Power Monitoring



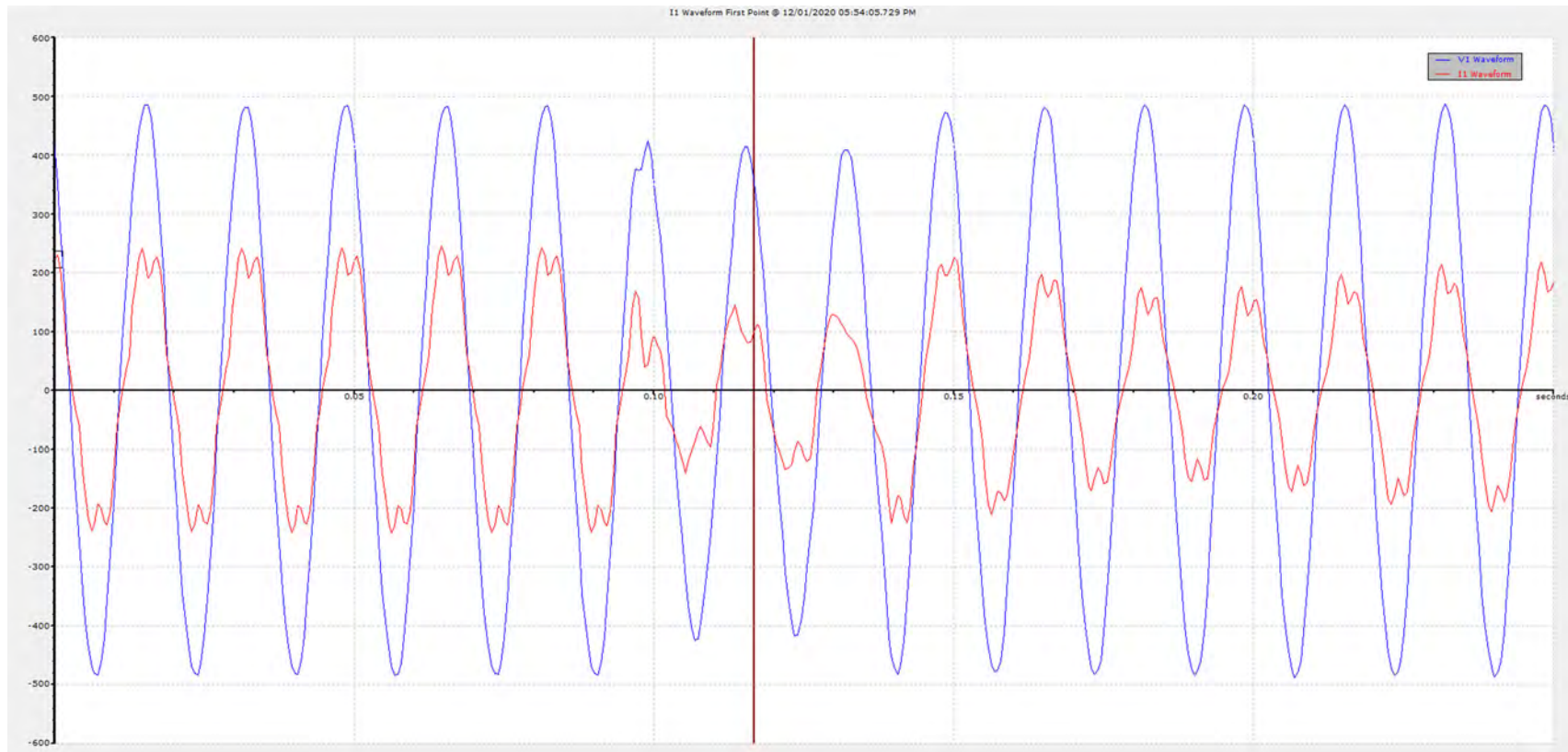
Transient Event #3 Waveform Snapshot – Phase A Harmonic Spectrum Direction Detected - Upstream – High Confidence



Pumping Station - West Elgin, ON
Main Service Entrance, Power Monitoring



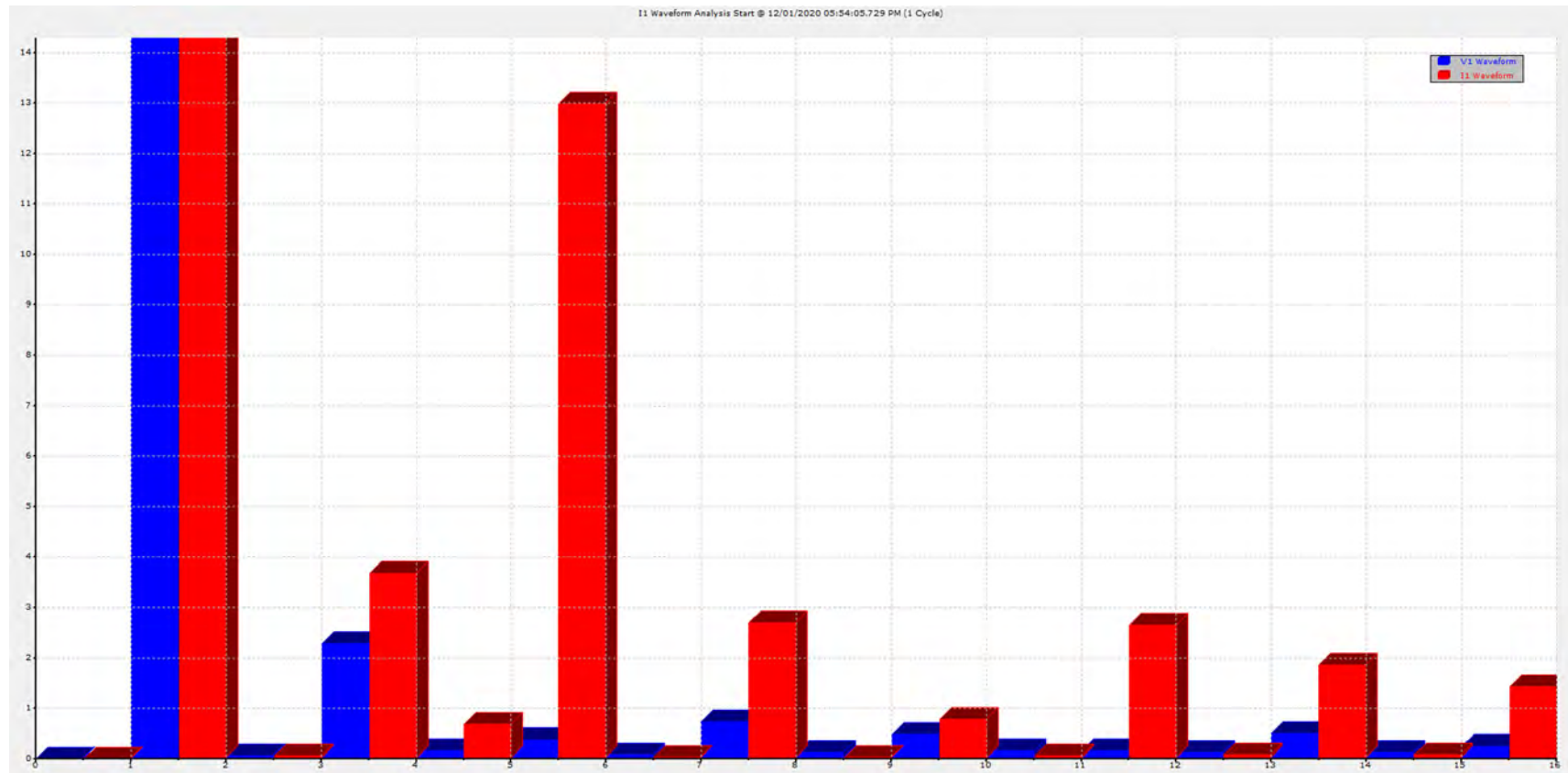
Transient Event #4 Waveform Snapshot – Phase A Direction Detected - Upstream – High Confidence



Pumping Station - West Elgin, ON
Main Service Entrance, Power Monitoring



Transient Event #4 Waveform Snapshot – Phase A Harmonic Spectrum Direction Detected - Upstream – High Confidence



Pumping Station - West Elgin, ON
Main Service Entrance, Power Monitoring