



DISTRIBUTED GENERATION INTERCONNECTION SYSTEM IMPACT STUDY

VERMONT ELECTRIC COOPERATIVE

NOVUS 242 3750 KW SOLAR PV PROJECT
PROJECT NO. 195180

REVISION 1

APRIL 13, 2026

Disclaimer

1898 & Co.[®] is a part of Burns & McDonnell that performs or provides business, technology, and consulting services. 1898 & Co. does not provide legal, accounting, or tax advice. The reader is responsible for obtaining independent advice concerning these matters. That advice should be considered by reader, as it may affect the content, opinions, advice, or guidance given by 1898 & Co. Further, 1898 & Co. has no obligation and has made no undertaking to update these materials after the date hereof, notwithstanding that such information may become outdated or inaccurate. These materials serve only as the focus for consideration or discussion; they are incomplete without the accompanying oral commentary or explanation and may not be relied on as a stand-alone document.

The information, analysis, and opinions contained in this material are based on publicly available sources, secondary market research, and financial or operational information, or otherwise information provided by or through 1898 & Co. clients whom have represented to 1898 & Co. they have received appropriate permissions to provide to 1898 & Co., and as directed by such clients, that 1898 & Co. is to rely on such client-provided information as current, accurate, and complete. 1898 & Co. has not conducted complete or exhaustive research, or independently verified any such information utilized herein, and makes no representation or warranty, express or implied, that such information is current, accurate, or complete. Projected data and conclusions contained herein are based (unless sourced otherwise) on the information described above and are the opinions of 1898 & Co. which should not be construed as definitive forecasts and are not guaranteed. Current and future conditions may vary greatly from those utilized or assumed by 1898 & Co.

1898 & Co. has no control over weather; cost and availability of labor, material, and equipment; labor productivity; energy or commodity pricing; demand or usage; population demographics; market conditions; changes in technology, and other economic or political factors affecting such estimates, analyses, and recommendations. To the fullest extent permitted by law, 1898 & Co. shall have no liability whatsoever to any reader or any other third party, and any third party hereby waives and releases any rights and claims it may have at any time against 1898 & Co. and any Burns & McDonnell affiliated company, with regard to this material, including but not limited to the accuracy or completeness thereof.

Any entity in possession of, or that reads or otherwise utilizes information herein is assumed to have executed or otherwise be responsible and obligated to comply with the contents of any Confidentiality Agreement and shall hold and protect its contents, information, forecasts, and opinions contained herein in confidence and not share with others without prior written authorization.

Revision History

Revision No.	Date	Updates
0	04/08/2026	Initial Draft
1	04/13/2026	Incorporated feedback from VEC review



CONTENTS

- 1.0 Introduction.....8**
 - 1.1 Project Background 8
 - 1.2 Study Scope..... 8
 - 1.3 Objectives 8
 - 1.4 Study Criteria 8
 - 1.4.1 Voltage Criteria 8
 - 1.4.2 Thermal Criteria..... 8
 - 1.4.3 Standards Criteria..... 9
 - 1.5 Steady State Analyses 9
 - 1.6 Time Series Analyses 9
 - 1.7 Short Circuit Analyses 10

- 2.0 Inputs and Assumptions..... 11**
 - 2.1 Jay Substation and Area Electric Power System..... 11
 - 2.2 Project Background 12
 - 2.3 Project Generator 13
 - 2.4 Service Configuration..... 14
 - 2.5 Monitoring Information 14
 - 2.6 Steady State Analyses Assumptions 14
 - 2.7 Long-Term Dynamics Analyses Assumptions 15

- 3.0 Steady State Analysis 16**
 - 3.1 Load Flow Analysis 16
 - 3.1.1 Criteria..... 16
 - 3.1.2 Scenarios 17
 - 3.1.3 Methodology 17
 - 3.1.4 Load Flow Analysis Results..... 17
 - 3.1.5 Reverse Power Flow 19
 - 3.1.6 Recommendations..... 19
 - 3.2 Voltage Flicker Analysis 19
 - 3.2.1 Criteria..... 19
 - 3.2.2 Scenarios 21
 - 3.2.3 Results 22
 - 3.2.4 Recommendations..... 22

- 4.0 Time Series Analysis 23**
 - 4.1 Time Series Analysis Scenarios 23
 - 4.2 Voltage Flicker Analysis 23
 - 4.2.1 Criteria..... 23
 - 4.2.2 Voltage Flicker Results 24
 - 4.2.3 Voltage Flicker - Observations 24

4.2.4	Switched Device Analysis	24
5.0	Short Circuit Analysis	26
5.1	Short Circuit Analysis	26
5.1.1	Criteria.....	26
5.1.2	Results	26
5.1.3	Short Circuit - Observations	26
5.1.4	Recommended System Improvements	26
5.2	Temporary Overvoltage on Distribution System	27
5.3	Temporary Overvoltage on Transmission Supply	27
5.4	Effective Grounding.....	27
5.5	Inverter Protection Settings.....	27
5.5.1	Voltage Setting Requirements / Ride Through	28
5.5.2	Frequency Setting Requirements / Ride Through	28
5.6	Disconnect Switch	28
5.7	Unintentional Islanding.....	28
5.8	Frequency	28
6.0	System Impact Study Recommendations	29
6.1	Recommended System Improvements.....	29
6.2	Interconnection Customer Responsibility.....	29
6.3	Conclusion	29

APPENDICES

Appendix A - Interconnection Application

Appendix B - Steady State Load Flow Results

Appendix C - Time Series Analysis Results

FIGURES

Figure 2-1: Substation Single-Line Diagram.....	11
Figure 2-2: Project Single Line Diagram.....	12
Figure 3-1: IEEE 519 GE Flicker Curve	21



TABLES

Table 2-1: Project Generator Information	13
Table 2-2: Loading Scenarios (Non-coincident)	14
Table 2-3: Aggregated DER on Electrical Power System	15
Table 2-4: Existing Station Regulator Settings	15
Table 3-1: Load Flow Analysis Scenarios	17
Table 3-2: Peak Load Results	17
Table 3-3: Minimum Load Results	18
Table 3-4: IEEE 1453-2022 Voltage Fluctuations producing Pst=0.9 and Pst=1.0	20
Table 3-5: Voltage Flicker Analysis Scenarios	21
Table 3-6: Voltage Flicker - Peak Load (Project Output Change: 0% to 100%)	22
Table 3-7: Voltage Flicker - Peak Load(Project Output Change: 100% to 0%)	22
Table 3-8: Voltage Flicker - Minimum Load(Project Output Change:0% to 100%)	22
Table 3-9: Voltage Flicker - Minimum Load(Project Output Change:100% to 0%)	22
Table 4-1: Long-Term Dynamics Analysis Scenarios	23
Table 4-2: Voltage Flicker Analysis	24
Table 4-3: Tap Changing Summary (2-hour period) - Substation Regulator	25
Table 5-1: Short Circuit Study Results.....	26

Executive Summary

The Novus 242 Solar Project (“Project”; “Interconnecting Customer”) is a 3750 kW (AC) solar project requesting to interconnect to the Vermont Electric Cooperative (“VEC”; “Company”) Jay substation 12.47 kV distribution system. The Project is proposed to be located approximately 2.3 miles from the Jay substation, served by a single power transformer, and connected via the 17-4A grounded-Wye distribution circuit. The power transformer has a nameplate rating of 5/6.25 MVA. The net peak load on the 17-4A circuit is 353 kW. Aggregate DER on the 17-4A circuit and Jay substation (including the Project) is 3,962 kW (approximately).

1898 & Co., a part of Burns & McDonnell, was retained by VEC to perform the System Impact Study (“Study”) for the proposed interconnection of the Project to the VEC Jay substation 12.47/7.2 kV distribution system and presents the conclusions of the Study herein. The objective of the Study was to determine adverse system impacts, operating restrictions, and required system upgrades on the VEC distribution system to accommodate interconnection of the Project in accordance with Vermont Public Utility Commission (“PUC”) Rules and other applicable codes and standards. The Study also identified the responsible party for the required system upgrades.

Analyses were performed to understand the adverse system impacts and identify mitigation projects to resolve the issues identified. To identify criteria exceptions attributed to the interconnection of the Project, analyses were performed to compare system performance both with and without the interconnection of the Project. Analyses included load flow, short circuit, voltage flicker, and unintentional islanding. The steady state analyses were performed using Milsoft WindMil® (“WindMil”) and the Long-Term Dynamics module of the CYME Power Engineering software suite (“CYME”). For the purposes of the Study, VEC provided an existing distribution planning model and load allocation was performed using historical data from the Jay substation and 17-4A circuit. The steady state analysis was conducted with the Project assuming unity power factor.

To serve the Customer, a three-phase primary overhead line must be extended to the Project location. The line extension will be from “span_26395” to the Project PCC. Following the required upgrades to facilitate the Project interconnection, no thermal criteria violations during minimum or peak load conditions were observed on conductors or equipment. After reviewing the Project addition, there are no adverse effects on the voltage for the system. No voltage violations were observed.

During the time series analysis, the CYME Long-Term Dynamics Analysis module was utilized to perform analysis that assists in understanding the impacts of load variations, irradiance variations, wind fluctuations, and ancillary market service signals on equipment such as regulators, load tap changers, and capacitor switching. Control coordination and voltage control settings for regulators, tap changers, shunt caps and their sensitivities were monitored during this analysis. The time series analyses were conducted over a two-hour period with one-second time intervals. The intent was to determine the frequency and magnitude of the voltage changes caused by a varying output from the Project. No flicker violations against the IEEE 1453-2022 standard were observed in all study scenarios, prior to or after the interconnection of the Project.

A short circuit analysis was performed using WindMil to evaluate the incremental impact of the Project on system protection and adequacy of existing circuit breakers, other fault current interrupting devices, and related equipment on the Company EPS. The results indicate fault current contribution exceeding 10% at the project PCC when the project is online. The Project was evaluated using the Sandia National Laboratories risk-of-islanding screening tool. Results of the screening indicate that the Project presents a non-negligible risk of unintentional islanding; therefore, further evaluation is recommended.

In summary, the System Impact Study found that the interconnection of the Project should have no adverse impacts on the Area EPS safety and reliability, provided the following recommended operating conditions and system modifications to the Company's EPS are implemented.

Recommended System Improvements

1. Install a line extension of approximately 470 feet of three-phase overhead 4/0 AAAC conductor from the end of "span_26395" to the Project PCC recloser.
2. Fuses for the line extension will be reviewed and evaluated by VEC.
3. The company will install a three-phase recloser upstream from the Project and at the Project PCC.
4. The Project will have a three-phase pole-mounted primary metering package or other VEC-approved metering package that accounts for transformer loss compensation installed upstream of (or on) a new customer riser pole.
5. Installation of real-time (SCADA) communications from the Project to VEC.
6. System protection coordination review of all circuits fed by the Jay substation by VEC.
7. Further evaluation to determine if additional anti-islanding protection is required due to the Project.

Interconnection Customer Responsibility

The following is a summary of all items that were determined to be the responsibility of the interconnecting Project.

1. Procuring and installing all Customer-owned components associated with the Project.
2. All costs associated with system upgrades required to interconnect the Project as described in Recommended System Improvements, unless specifically noted as the responsibility of the Company.
3. Providing necessary communications for data reporting.
4. Providing inverter model information and specifications and ensuring compliance with UL 1741 SA and IEEE 1547-2018 standards.

5. Providing under- and over-frequency and voltage settings for the inverters prior to the Facilities Study. Inverter settings shall be in compliance with the ISO-NE SRD, IEEE 1547-2018 standard, the NPCC Directory 12 Figure 1 Curve requirements for the Eastern Interconnection.
6. Ensuring that the Project complies with ISO-NE SRD, UL 1741 SA, IEEE 1547-2018, and the Vermont Electric Cooperative Interconnection Guidelines at all times.

If the recommended system modifications are made to the 17-4A circuit and the Project, the Project should not have a negative impact on system thermal capability and voltage of the Area EPS, under normal steady state and dynamic operating conditions.

If an event occurs with a recorded overvoltage at the PCC exceeding ANSI C84.1 Range A limitations and/or any reported damage to customer equipment, the Company reserves the right to disconnect the Project from the EPS. The interconnecting customer will be responsible for all associated claims and for mitigation to prevent recurrence.

The Company reserves the right to disconnect the Project during times of temporary load transfers or if abnormal conditions develop.

This Study has been completed using information provided by the Interconnecting Customer, Novus 242 Solar LLC, who submitted an Interconnection Application Form dated November 05, 2025.

In accordance with the Vermont Public Utility Commission Rule 5.500, the Company has completed a System Impact Study to determine the scope of the required modifications to its EPS to provide the requested interconnection service.

The conclusions and recommendations specified herein are exclusive to the Project and are based upon the information submitted by the Interconnecting Customer at the time the Interconnection Application (“IA”) was submitted and 1898 & Co.’s understanding of the VEC system at the time of study. Any subsequent design changes made by the Interconnecting Customer without 1898 & Co.’s and/or VEC’s knowledge, review, and/or approval may render the findings of this report null and void.

1.0 Introduction

1.1 Project Background

The Novus 242 Solar Project (“Project”; “Interconnection Customer”) is proposed at a size of 3750 kW (AC) PV and is requesting to interconnect to the Vermont Electric Cooperative (“VEC”) Jay substation and the 17-4A 12.47/7.20 kV grounded-wye distribution line. The Project is proposed to be located approximately 2.3 miles from the Jay substation and served by a single power transformer, connected via the 17-4A distribution circuit. The power transformer has a nameplate rating of 5/6.25 MVA. The peak load on the 17-4A circuit and Jay substation is 1,032 kW. As of the date of this Study, the aggregate DER on the 17-4A circuit and Jay substation (including the Project) is approximately 3,962 kW.

1.2 Study Scope

1898 & Co., a division of Burns & McDonnell Engineering Company, Inc. (hereinafter called “1898 & Co.”), was retained by VEC to complete a System Impact Study that will provide the Company with an understanding of any adverse impacts or operating restrictions related to the interconnection of the Project to the Jay substation and 17-4A 12.47/7.20 kV grounded-wye distribution circuit.

1.3 Objectives

The overall objective of the study is to identify adverse system impacts, operating restrictions, and required system upgrades on the VEC distribution system to accommodate interconnection of the Project in accordance with Vermont Public Utility Commission (“PUC”) Rules and other applicable codes and standards. The system impact study will also identify the responsible party for the required system upgrades.

1.4 Study Criteria

1.4.1 Voltage Criteria

As required by VEC, the following voltage criteria were utilized during the Study analysis.

1. Steady State: Within ANSI C84.1-2016 distribution voltage limits
2. Reconnection: Within ANSI C84.1-2016 distribution voltage limits
3. Voltage Imbalance: All three phases are less than three (3) percent before and after the project
4. Sag, swell, flicker criteria: Flicker shall be in compliance with IEEE 1547-2018, Section 7.2.3 based upon IEEE 1453-2022.

1.4.2 Thermal Criteria

As required by VEC, the following thermal criteria were utilized during the Study analysis.

With the aggregate generation on circuit 17-4A, including the Project, with generation output at 100 percent and minimum load, thermal conditions shall not exceed:

1. 80 percent of the phase pickup of an electronic recloser
2. 90 percent of the conductor ampacity rating;
3. 100 percent of a sectionalizing fuse continuous rating;
4. 100 percent of the load tap changer or regulator continuous rating;
5. 100 percent of a hydraulic recloser continuous rating; and

1.4.3 Standards Criteria

The Project shall be compliant with the following applicable codes, standards, and guidelines:

1. Vermont Public Utility Commission Rule 5.500, Section 5.510 Codes and Standards
2. Vermont Electric Cooperative Distributed Resource Interconnection Guidelines
3. ISO-NE Source Requirement Document ("SRD")
4. IEEE 1547-2018 - IEEE Standard for Interconnection and Interoperability of Distributed Energy Resources with Associated Electric Power Systems Interfaces
5. IEEE 1547.3-2007 - IEEE Guide for Monitoring, Information Exchange, and Control of Distributed Resources Interconnected to Power Systems
6. IEEE 1453-2022 - IEEE Standard for Measurement and Limits of Voltage Fluctuations and Associated Light Flicker on AC Power Systems
7. ANSI C84.1-2020 - American National Standard for Power Systems and Equipment Voltage Ratings (60 Hz)
8. IEEE Standard C37.90.1-2012 - IEEE Standard for Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus

1.5 Steady State Analyses

To identify criteria exceptions attributed to the interconnection of the Project, load flow, short circuit, voltage flicker, and unintentional islanding analyses were performed to compare system performance both with and without the interconnection of the Project. The results of the analyses were evaluated using the applicable standards and industry best practices listed in Standards Criteria.

1.6 Time Series Analyses

DERs, such as photovoltaic ("PV") systems and battery energy storage systems ("BESS") that act as variable generation sources, introduce complexity to the distribution system. Within CYME, the Long-Term Dynamics Analysis module is capable of performing analysis that assists in understanding the impacts of load variations, irradiance variations, and ancillary market service signals on equipment such as regulators, load tap changers, and capacitor switching. Generation and load curves were developed to assess how the distribution circuit and its components would respond and perform under these scenarios. Control coordination and voltage control settings for regulators, tap changers, shunt caps and their sensitivities were monitored during this analysis. The results of the analyses were evaluated using the applicable standards and industry best practices listed in Standards Criteria.

Flicker may arise due to variable loads and distributed energy resources. The IEEE Recommended Practice for Measurement and Limits of Voltage Fluctuations and Associated Light Flicker on AC Power Systems, IEEE 1453-2022 provides guidance on flicker and voltage fluctuations. Flicker values were assessed for compliance with the GE Flicker Visibility curve throughout the duration of the simulation. Statistical methods and probabilities are utilized in IEEE 1453-2022 to analyze flicker performance. For the Study, using the CYME Long-Term Dynamics Analysis module, rolling 10-minute windows were applied when evaluating the frequency of voltage flicker measured against the GE Visibility Flicker curve. The 10-minute averaging windows helped to identify persistent flicker violations during the Long-Term Dynamics analysis.

The existing and proposed DERs on the circuit were evaluated following two-hour generator curves developed using historical measured data from existing facilities. The PV generation curve for existing PV system sites represented a period of high output variability, simulating the impacts of fast-moving cloud cover.

1.7 Short Circuit Analyses

The purpose of the short circuit analysis is to evaluate the fault current levels against the interrupting capability of existing equipment, as well as evaluating the fault current contribution of the Project.

2.0 Inputs and Assumptions

2.1 Jay Substation and Area Electric Power System

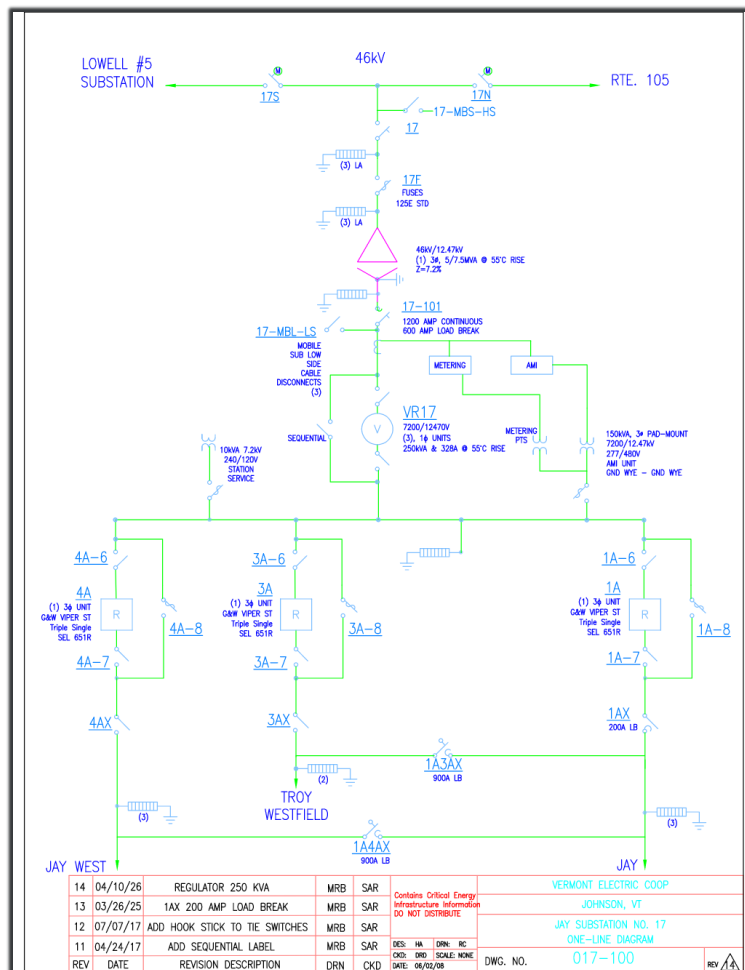
The Jay substation is a distribution substation supplied from a 46 kV sub-transmission system. It serves three (3) circuits: 17-1A ,17-3A and 17-4A via one 46 kV/12.47 kV power transformer. The existing power transformer has a base and maximum nameplate rating of 5 MVA and 6.25 MVA, respectively.

At the time of the Study, the aggregate DER on the 17-4A circuit and Jay substation (including the Project) is 3,962 kW.

Additionally, the characteristics of the 17-4A distribution circuit are as follows:

- The peak and minimum load data used in the Study are provided in Table 2-2: Loading Scenarios (Non-coincident).
- The 17-4A circuit voltage is regulated at the Jay 17 12.47 kV substation by 3-250kVA 328-Amp regulators with settings provided in Table 2-4.

Figure 2-1: Substation Single-Line Diagram



2.3 Project Generator

The Project is proposed to be located at 75 Mountain View Drive, Jay, Vermont. The Project will be normally served from the Jay substation transformer, via the 17-4A 46/12.47 kV grounded-wye distribution circuit. The Project is proposed to be located approximately 2.3 miles from the Jay substation. Table 2-1 shows details of the Project generator, including general information, PCC details, and inverter specifications.

Table 2-1: Project Generator Information

Project Information	
Name	Novus 242 Solar
Developer	Norwich Solar
Generation Type	Photovoltaic (Solar)
Maximum Export Capability Requested (kW)	3750 kW (AC)
Auxiliary Power Requirement (kW)	None
Interconnecting Voltage	12.47 kV
Point of Common Coupling	
Description	3-phase 12.47 kV Line
GPS Coordinates	44.938472, -72.470417
Location	75 Mountain View Drive, Jay, VT 05859
Substation	Novus
Circuit	17-4A
Generator Step Up Transformer	
Transformer Size	2-2000 kVA
Impedance	5.75 % (Nameplate)
kVA Base	2000 kVA
Primary Voltage (LV Winding)	600 V
Configuration	Wye-grounded
Secondary Voltage (HV Winding)	12.47 kV
Configuration	Wye-grounded
X/R Ratio	4 (Assumed)
Tap Changer (Yes/No)	No
Primary-Side AC Load Break Disconnect and Fuses	Yes
Inverters	
Manufacturer	Chint Power Systems (CPS)
Model Name	CPS SCH250K-T-US-600
Capacity	250 kVA (each)
Quantity	15
Output Rating (AC)	600 V, 3Ø, 60 Hz

2.4 Service Configuration

In accordance with VEC requirements, all inverter-based projects exceeding 500 kW require the installation of a dedicated three-phase recloser at the PCC. Additionally, the Company requires the interconnection GSU transformers to be equipped with manual tap changing capability. The manual tap changing capability of the interconnection GSU transformers was not able to be confirmed because transformer data sheets were not provided by the Project with the interconnection application.

The PCC will be designated as the Project side of the Company-installed primary meter. The point of DER connection (“PoC”) is the point where a DER unit is electrically connected in a Local EPS and meets the requirements of IEEE 1547-2018.

To serve the Customer, a three-phase primary overhead line must be extended to the Project location. Additionally, the company will install a three-phase recloser upstream from the Project and at the Project PCC. The Project will have a three-phase pole-mounted primary metering package or other VEC-approved metering package that accounts for transformer loss compensation installed upstream of (or on) a new customer riser pole. All electrical facilities beyond this point will be installed, owned, and operated by the Project.

2.5 Monitoring Information

Per IEEE 1547-2018, Section 10.5, the DER shall be capable of providing monitoring information through a local DER communication interface at the reference point of applicability and shall include at a minimum: active power, reactive power, voltage, frequency, operational state of the DER, connection status, and alarm status.

The Project will be considered an Independent Power Producer, planning to install 3750 kW PV; therefore, bi-directional metering provisions are required. The Company intends to meet this requirement through bi-directional metering installed at the PCC. Real-time monitoring via a SCADA feed will also be required for this Project due to its significant impact on the dynamic loading condition of the distribution system.

2.6 Steady State Analyses Assumptions

The steady-state analyses were performed using Milsoft Engineering Analysis software, WindMil® 25.1. For the purposes of the Study, VEC provided an existing distribution planning model, and load allocation was performed using historical data for the Jay substation and 17-4A circuit from VEC’s Supervisory Control and Data Acquisition (“SCADA”) system. The analysis was conducted with the 3750 kW PV project assuming unity power factor.

The study models were created by adding the Project to the 17-4A distribution circuit of Jay Substation. The SCADA system recorded peak and minimum load values on the 17-4A distribution circuit used for the study are shown in Table 2-2. The aggregate existing and proposed DERs on the 17-4A circuit and Jay substation transformer (including the Project) are summarized in Table 2-3.

Table 2-2: Loading Scenarios (Non-coincident)

Load Profile	Element	SCADA System Recorded Load	
		MW	MVar
Peak	JAY #17 XFMR	1.032	-0.035
	17-4A	0.353	-0.029

Minimum	JAY #17 XFMR	0.187	-0.083
	17-4A	0.079	-0.032

Table 2-3: Aggregated DER on Electrical Power System

Element	Existing DER(kW)	Project DER (kW)	Aggregate DER Existing & Proposed w/ Project (kW)
JAY #17 XFMR	212	3,750	3,962
17-4A	32	3,750	3,782

The transformer at Jay substation is not equipped with a Load Tap Changer (“LTC”). Voltage is regulated on the 17-4A circuit via 250 kVA 328-Amp regulators (one per phase) installed at the substation with settings shown below in Table 2-4. The 17-4A circuit also includes one (1) fixed single-phase 50 kVAR shunt capacitor

Table 2-4: Existing Station Regulator Settings

Regulator				
Control Settings				
Operating Mode			Regulator Terminal	
Reverse Sensing Mode			Locked Forward	
Forward & Reverse Tap Settings				
Phase	Voltage	Bandwidth	R	X
Phase A	123.5	3.0	0	0
Phase B	123.5	3.0	0	0
Phase C	123.5	3.0	0	0

2.7 Long-Term Dynamics Analyses Assumptions

The Long-Term Dynamics analyses were conducted over a two-hour period with one-second time intervals utilizing the CYME Long-Term Dynamics Analysis module. The intent was to determine the frequency and magnitude of the voltage changes caused by a varying output from the Project. A typical load curve was used for peak and minimum loads to represent fluctuating load for the relevant circuit(s). A generation curve for existing PV system sites that represented a period of high variability in output was used to simulate the impacts of fast-moving cloud cover. The purpose was to simulate worst-case conditions by simulating existing PV systems at high variability in output with fast-moving cloud cover using the high variability PV generation curve.

3.0 Steady State Analysis

To identify criteria exceptions attributed to the interconnection of the Project, load flow, short circuit, and voltage flicker analyses were performed to compare system performance with and without the interconnection of the Project.

3.1 Load Flow Analysis

The purpose of the load flow analysis was to evaluate thermal loading (current flow), voltage profiles, voltage drop, and power factor with and without the interconnection of the Project. Impacts associated with the Project were evaluated for peak and minimum load conditions. Under normal operating conditions, it is expected that VEC meets its obligations for ANSI C84.1 with the Project interconnected and the interconnecting circuit in its normal configuration.

3.1.1 Criteria

The load flow analysis was evaluated against the following criteria to identify the violations.

1. Thermal

- a. With the aggregate generation on the 17-4A, including the Project, with generation output at 100 percent and the circuit at minimum load:
 - i. None of the following equipment shall exceed 100 percent of the manufacturer recommended continuous rating:
 - (1) Sectionalizing fuse
 - (2) Load tap changer
 - (3) Hydraulic recloser
 - (4) Regulator (without load bonus)
 - ii. No conductor shall exceed 90 percent of the conductor ampacity rating.
- b. Under no-load condition with aggregate generation at 100 percent output, the per-phase rating of the windings of the substation transformer shall not be exceeded.

2. Voltage

- a. During steady state and reconnection conditions, service voltages must be between the range of 114 V and 126 V (± 5 percent) on a 120 V scale (ANSI C84.1 Range A).
 - b. All three phases are less than three (3) percent unbalanced before and after interconnection of the Project.
 - c. Sag, swell, flicker criteria: Flicker shall be in compliance with IEEE 1547-2018, Section 7.2.3 based upon IEEE 1453-2022.
3. The power factor at the substation recloser was also monitored to evaluate any severe degradation from base case results.

3.1.2 Scenarios

Table 3-1 outlines the Load Flow Analysis Scenarios that were considered for evaluation with the regulators and capacitor unlocked for the simulations, and thus able to react to system changes. Each scenario was studied on the 17-4A circuit with existing DER operating at 100 percent output. Alternate sources were not considered in this study. If the Project desires to generate while sourced from an alternate circuit, additional analysis should be performed to understand and address the impacts on the alternate circuit.

Table 3-1: Load Flow Analysis Scenarios

Scenario #	Base/Study Case	Load Model	Switched Devices	Existing DER Status	Project Status
1	Base	Peak	Unlocked	On	Offline
2	Study	Peak	Unlocked	On	Online
3	Base	Minimum	Unlocked	On	Offline
4	Study	Minimum	Unlocked	On	Online

3.1.3 Methodology

The steady state analyses were performed using Milsoft Engineering Analysis software, WindMil® 25.1.6 For the purposes of the Study, VEC provided an existing distribution planning model loaded with a Peak Load Profile and a Minimum Load Profile. The steady state analysis was conducted with the 3750 kW PV Project assuming unity power factor.

Prior to the commencement of the Study, a Base Case analysis was conducted to understand and evaluate existing conditions on the system. Any pre-existing conditions were documented and are not considered to be a result of the Project. To serve the Customer, a three-phase primary overhead line must be extended to the Project location. The line extension will be from “span_26395” to the Project PCC.

3.1.4 Load Flow Analysis Results

The following tables and figures show the load flow results (thermal loadings, voltages, current, real and reactive power, and power factor).

3.1.4.1 Peak Load Scenario

Table 3-2: Peak Load Results

Monitored Element	Voltage		Feeder Demand					Generation	Min. Voltage	Max. Voltage	Max. Loading
	Base kVLL	V	kVA	kW	kVAR	Amps	PF (%)	kW	V	V	%
Scenario 1 - Base Case											
Substation XFMR Primary	46.00	120.00	827.03	826.74	-22.14	10.86	-99.96	—	—	—	—
Substation XFMR Secondary	12.47	119.97	826.71	825.94	-35.85	38.30	-99.91	212.37	—	—	13.23
17400	12.47	122.26	322.09	320.73	-29.60	14.71	-99.58	32.26	115.09	122.85	58.36
17100	12.47	122.26	348.41	348.38	4.38	16.12	99.99	142.22	119.37	125.10	67.78
17300	12.47	122.26	157.18	156.82	-10.63	7.22	-99.77	37.89	120.67	123.25	41.28
PCC	12.47	122.14	0.00	0.00	0.00	0.00	—	0.00	—	—	—
Scenario 2 - Project Full Output											
Substation XFMR Primary	46.00	120.00	2822.83	-2798.80	367.56	-35.61	-99.15	—	—	—	—

Substation XFMR Secondary	12.47	119.75	2816.84	-2805.57	251.74	-130.69	-99.60	3962.37	-	-	45.07
17400	12.47	122.82	3320.80	-3310.73	258.37	-150.21	-99.70	3782.26	118.45	125.30	66.84
17100	12.47	122.82	348.37	348.35	4.11	16.04	99.99	142.22	120.03	125.73	67.43
17300	12.47	122.82	157.18	156.82	-10.74	7.18	-99.77	37.89	121.22	123.89	41.10
PCC	12.47	125.25	3709.12	-3704.82	178.48	-164.55	-99.88	3750.00	-	-	-

3.1.4.2 Peak Load - Observations

The following summarizes the observations in the peak load scenarios:

- For the load flow analysis, thermal loadings on all conductors and devices were monitored for the Jay substation.
 - No thermal overloading was observed on VEC’s primary system.
- No voltage violations were observed during peak load conditions.
- The analysis showed reverse power flow of 3,310 kW through feeder 17-4A and 2,798 KW through the Jay Substation Transformer onto VEC’s transmission system.

3.1.4.3 Minimum Load Scenario

Table 3-3: Minimum Load Results

Monitored Element	Voltage		Feeder Demand					Generation	Min. Voltage	Max. Voltage	Max. Loading
	Base kVLL	V	kVA	kW	kVAR	Amps	PF (%)	kW	V	V	%
Scenario 3 - Base Case											
Substation XFMR Primary	46.00	120.00	103.07	102.92	-5.62	1.32	-99.85	-	-	-	-
Substation XFMR Secondary	12.47	120.00	103.07	102.91	-5.83	4.86	-99.84	212.37	-	-	1.65
17400	12.47	122.29	59.20	53.78	-24.73	2.74	-90.85	32.26	120.56	123.16	70.63
17100	12.47	122.29	11.48	7.00	9.11	1.57	60.93	142.22	121.63	125.70	69.07
17300	12.47	122.29	43.25	42.13	9.80	2.02	97.40	37.89	121.52	124.01	38.98
PCC	12.47	122.29	0.00	0.00	0.00	0.00	-	0.00	-	-	-
Scenario 4 - Project Full Output											
Substation XFMR Primary	46.00	120.00	3541.56	-3510.32	469.36	-44.45	-99.12	-	-	-	-
Substation XFMR Secondary	12.47	119.70	3532.81	-3520.60	293.50	-163.96	-99.65	3962.37	-	-	56.52
17400	12.47	122.77	3580.28	-3569.71	274.86	-162.01	-99.71	3782.26	122.83	125.56	71.57
17100	12.47	122.77	11.34	6.99	8.93	1.57	61.64	142.22	122.12	125.73	68.81
17300	12.47	122.77	43.23	42.13	9.71	2.01	97.44	37.89	122.00	124.49	38.83
PCC	12.47	125.31	3709.15	-3704.87	178.34	-164.49	-99.88	3750.00	-	-	-

3.1.4.4 Minimum Load - Observations

The following summarizes the observations in the minimum load scenarios:

- For the load flow analysis, thermal loadings on all conductors and devices were monitored for the Jay substation.
 - No thermal overloading was observed on VEC’s primary system.
- No voltage violations were observed during minimum load conditions.
- The analysis showed reverse power flow of 3,569 KW through Circuit 17-4A and 3,510 KW through the Jay Substation Transformer onto VEC’s transmission system.

3.1.5 Reverse Power Flow

As part of the analysis, the potential of the Project causing reverse power flow was reviewed. When the Project is under full-export condition, the export of the Project, in addition to existing DER projects, could result in reverse power flow through the 17-4A recloser and the substation transformer to the 46 kV system. The maximum contribution of reverse power from the 17-4A circuit through the Jay substation transformer and 17-4A recloser was determined to be 3.541 MVA, during the minimum load scenario with distributed resources operating at 100 percent output. Hence, substation equipment and regulator controls must be properly equipped for reverse power flow. VEC should consider further evaluation of impacts on the sub-transmission system.

3.1.6 Recommendations

The Steady State Analysis found that the interconnection of the Project should have no adverse impacts on the Area EPS safety and reliability, provided the following recommended operating conditions and system modifications to the Company's EPS are implemented.

Recommended System Improvements

1. Install a line extension of approximately 470 feet of three phase overhead 4/0 AAAC conductor towards east from the end of "span_26395" to the Project PCC recloser.
2. Fuses for the line extension will be reviewed and evaluated by VEC.
3. The company will install a three-phase recloser upstream from the Project and at the Project PCC.
4. The Project will have a three-phase pole-mounted primary metering package or other VEC approved metering package that accounts for transformer loss compensation installed upstream of (or on) a new customer riser pole.
5. Installation of real-time (SCADA) communications from the Project to VEC.

3.2 Voltage Flicker Analysis

Voltage flicker analysis was conducted under steady state conditions. IEEE defines voltage flicker as subjective impression of fluctuating luminance caused by voltage fluctuations. The IEEE recommended practice for Measurement and Limits of Voltage Fluctuations and Associated Light Flicker on AC Power Systems, IEEE Std. 1453-2022 provides guidance on flicker and voltage fluctuations. To compute the voltage degradation that could cause a voltage flicker due to the new PV generator interconnection, the Project output was modeled at 100% of the rated capacity to assess the impact of this output on voltages at the PCC.

3.2.1 Criteria

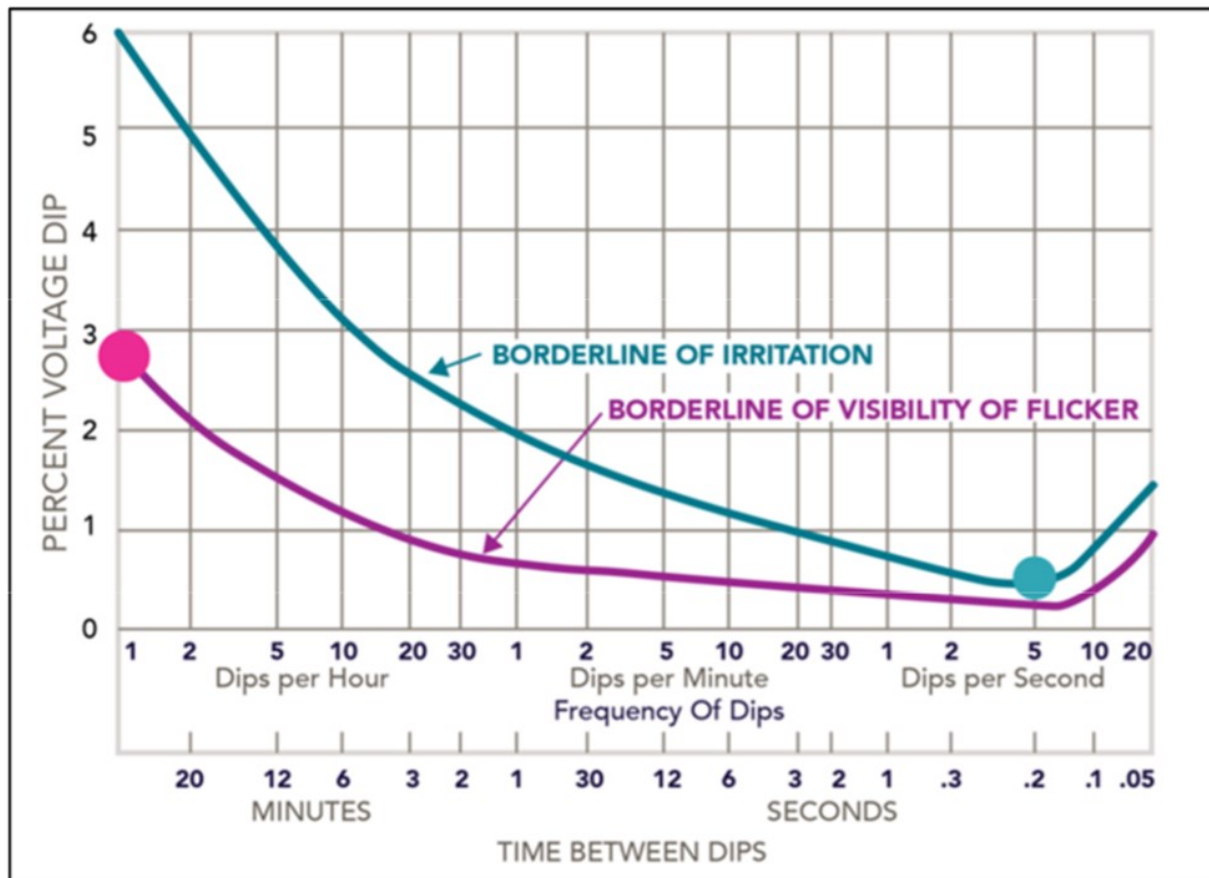
The voltage flicker analysis is performed using peak and minimum load scenarios to test the impacts of interconnecting the Project with the VEC distribution system. The modeling assumptions utilized in the voltage flicker analysis included locking of any capacitor banks and regulators to simulate a conservative response to variability in the output of the Project. A percentage change of greater than 3 percent is considered a violation.

The Project shall comply with the voltage flicker criterion of IEEE 519™, IEEE Std. 1453™, IEEE 1453.1™, IEEE 1547.7™, and section 4.3.2 of IEEE 1547™, including Table 3-4 shown below.

Table 3-4: IEEE 1453-2022 Voltage Fluctuations producing Pst=0.9 and Pst=1.0

Changes per Minute	Changes per Second	IEEE 1453 Pst=0.9	IEEE 1453 Pst=1.0
1	0.0167	2.3166	3.1660
2	0.0333	1.8790	2.5680
3	0.0500	1.6463	2.2500
5	0.0833	1.3895	1.8990
7	0.1167	1.2402	1.6950
10	0.1667	1.0968	1.4990
22	0.3667	0.8678	1.1860
39	0.6500	0.7639	1.0440
48	0.8000	0.7317	1.0000
68	1.1333	0.6871	0.9390
110	1.8333	0.6154	0.8410
176	2.9333	0.5407	0.7390
273	4.5500	0.4756	0.6500
375	6.2500	0.4346	0.5940
480	8.0000	0.4090	0.5590
585	9.7500	0.3666	0.5010
682	11.3667	0.3256	0.4450
796	13.2667	0.2876	0.3930
1020	17.000	0.2561	0.3500
1055	17.5833	0.2568	0.3510
1200	20.000	0.2715	0.3710
1390	23.1667	0.3205	0.4380

Figure 3-1: IEEE 519 GE Flicker Curve



3.2.2 Scenarios

Table 3-5 outlines the scenarios that were evaluated during the voltage flicker analysis with LTCs, regulators and capacitors locked for the simulations and therefore unable to react to system changes.

Table 3-5: Voltage Flicker Analysis Scenarios

Scenario	Base/Study Case	Load Model	Switched Devices
Scenario 1	Project Offline	Peak	Unlocked
Scenario 2	Project at 100% output	Peak	Locked
Scenario 3	Project at 100% output	Peak	Unlocked
Scenario 4	Project Offline	Peak	Locked
Scenario 5	Project Offline	Min	Unlocked
Scenario 6	Project at 100% output	Min	Locked
Scenario 7	Project at 100% output	Min	Unlocked
Scenario 8	Project Offline	Min	Locked

3.2.3 Results

The following tables show the results from voltage flicker analysis during peak and minimum load conditions. The maximum voltage flicker observed at the PCC is 2.03% during the Peak load scenario when the project output changes from 0% to 100%.

Table 3-6: Voltage Flicker - Peak Load (Project Output Change: 0% to 100%)

Monitored Element	Va		% Change	Vb		% Change	Vc		% Change
	Scenario 1	Scenario 2		Scenario 1	Scenario 2		Scenario 1	Scenario 2	
17-4A	122.29	122.04	-0.20%	122.24	122.09	-0.12%	122.25	121.97	-0.23%
PCC	122.15	124.42	1.86%	122.08	124.55	2.03%	122.20	124.46	1.85%

Table 3-7: Voltage Flicker - Peak Load (Project Output Change: 100% to 0%)

Monitored Element	Va		% Change	Vb		% Change	Vc		% Change
	Scenario 3	Scenario 4		Scenario 3	Scenario 4		Scenario 3	Scenario 4	
17-4A	122.04	122.29	0.20%	122.24	122.09	0.12%	122.25	121.97	0.23%
PCC	124.42	122.15	-1.83%	122.08	124.55	-1.99%	122.20	124.46	-1.81%

Table 3-8: Voltage Flicker - Minimum Load (Project Output Change: 0% to 100%)

Monitored Element	Va		% Change	Vb		% Change	Vc		% Change
	Scenario 5	Scenario 6		Scenario 5	Scenario 6		Scenario 5	Scenario 6	
17-4A	122.24	121.93	-0.25%	122.34	122.04	-0.25%	122.30	121.98	-0.26%
PCC	122.24	124.48	1.83%	122.33	124.58	1.84%	122.29	124.53	1.83%

Table 3-9: Voltage Flicker - Minimum Load (Project Output Change: 100% to 0%)

Monitored Element	Va		% Change	Vb		% Change	Vc		% Change
	Scenario 7	Scenario 8		Scenario 7	Scenario 8		Scenario 7	Scenario 8	
17-4A	122.72	123.03	0.25%	122.04	122.34	0.25%	122.77	123.08	0.25%
PCC	125.27	123.02	-1.80%	124.59	122.33	-1.81%	125.29	123.08	-1.76%

3.2.4 Recommendations

A thorough time series analysis was completed to further evaluate voltage flicker concerns and is provided in the succeeding section.

4.0 Time Series Analysis

DERs, such as PV systems and wind turbine generators, that act as variable generation sources introduce complexity to the distribution system. Within CYME, the Long-Term Dynamics Analysis module is capable of performing analysis that assists in understanding the impacts of load variations, irradiance variations, wind fluctuations, and ancillary market service signals on equipment such as regulators, load tap changers, and capacitor switching. Curves were developed to assess how the distribution circuit and its components would respond and perform under these scenarios. Control coordination and voltage control settings for regulators, tap changers, shunt caps and their sensitivities were monitored during this analysis.

4.1 Time Series Analysis Scenarios

Time series analysis was completed for the combinations of load conditions and generation profiles described in **Error! Reference source not found.**, utilizing the CYME Long-Term Dynamics Analysis module, to quantify the voltage flicker magnitudes and frequencies at the PCC.

Table 4-1: Long-Term Dynamics Analysis Scenarios

Scenario #	Load Model	Switched Devices	Existing DER Status	Project Status	Description
LTD1	Peak	Unlocked	Online	Online	High PV Variability
LTD2	Min	Unlocked	Online	Online	
LTD3	Peak	Unlocked	Online	Online	0% to 100% with (2% per second) soft-start ramp rate per ISO-NE SRD
LTD4	Min	Unlocked	Online	Online	

4.2 Voltage Flicker Analysis

Flicker may arise due to variable loads and distributed energy resources. The IEEE Recommended Practice for Measurement and Limits of Voltage Fluctuations and Associated Light Flicker on AC Power Systems, IEEE Std. 1453-2022 provides guidance on flicker and voltage fluctuations. Flicker values were assessed for compliance with the GE Flicker Visibility curve throughout the duration of the simulation. Statistical methods and probabilities are utilized in IEEE 1453-2022 to analyze flicker performance. For the Study, using the CYME Long-Term Dynamics Analysis module, rolling 10-minute windows were applied when evaluating the frequency of voltage flicker measured against the GE Visibility Flicker curve. 10-minute averaging windows helped to identify persistent flicker violations during this analysis.

4.2.1 Criteria

VEC requires that the Project shall not exceed flicker limits defined in IEEE 1453-2022 at the PCC. The flicker values were assessed for compliance with the recommended short-term flicker severity (Pst) planning threshold of 0.9 (applicable for medium voltage systems). The time step / voltage change frequency limits for Pst=0.9 were conservatively estimated utilizing the Pst=1 value in IEEE Std. 1453-2022, Table 4 and associated shape factors for square wave periodic changes in IEEE Std. 1453-2022, Annex C, Figure C.1.

4.2.2 Voltage Flicker Results

The results of the Voltage Flicker Analysis are provided in Table 4-2 and evaluated against the Maximum Allowable Voltage Fluctuation at the given frequency. The existing load of the circuit was evaluated following a two-hour trend from the maximum load day and a minimum load day.

The existing and proposed PV DERs on the circuit were evaluated following a generator curve that was developed using historical measured data from an existing PV facility. A generation curve for existing PV system sites within VEC territory was developed that represented a period of high variability in output, simulating the impacts of fast-moving cloud cover. The purpose was to simulate worst-case conditions by simulating existing PV systems at high variability in output with fast-moving cloud cover using the high variability PV generation curve. The Project was incorporated into the analysis with existing DER at high variability output to evaluate the contributing impacts of the Project.

The results of the Voltage Flicker Analysis are provided in Table 4-2.

Table 4-2: Voltage Flicker Analysis

BASELINE	0.1 CHANGES PER MINUTE	0.2 CHANGES PER MINUTE	0.4 CHANGES PER MINUTE	0.6 CHANGES PER MINUTE	1 CHANGES PER MINUTE	2 CHANGES PER MINUTE	3 CHANGES PER MINUTE	5 CHANGES PER MINUTE	7 CHANGES PER MINUTE	10 CHANGES PER MINUTE
Maximum Allowable Voltage Fluctuation	6.001	3.828	2.972	2.667	2.317	1.879	1.646	1.390	1.240	1.097
LTD 1	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
LTD 2	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
LTD 3	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
LTD 4	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS

4.2.3 Voltage Flicker - Observations

The following observations are based on the scenarios described in **Error! Reference source not found.**

- No objectionable voltage flicker was observed for existing system conditions.

4.2.4 Switched Device Analysis

Control coordination and voltage control settings for regulators, tap changers, shunt caps and their sensitivities were monitored during this analysis.

4.2.4.1 Criteria

Analysis was conducted for the operation of switched devices in the scenarios described in **Error! Reference source not found.** with a target of reducing operations to approximately 50 changes or less within the 2-hour study period. The analysis focuses on regulator operations only as the capacitor bank on the circuit is fixed.

4.2.4.2 Switched Device Results Discussion

Based on the results of the analysis, all devices are operating within the criteria following the proposed recommendations in the Steady State Analysis. The results for the Project operating under normal conditions are provided in **Error! Reference source not found.**

Table 4-3: Tap Changing Summary (2-hour period) - Substation Regulator

Scenarios	Load Model	Regulator	Phase	Tap Change Count	Minimum Tap	Maximum Tap	Average Tap
Scenario 1	Peak	REG-17001	A	0	3	3	3
			B	0	3	3	3
			C	0	3	3	3
Scenario 2	Min		A	3	0	3	3
			B	0	3	3	3
			C	1	0	3	0
Scenario 3	Peak		A	0	3	3	3
			B	0	3	3	3
			C	0	3	3	3
Scenario 4	Min		A	0	3	3	3
			B	0	3	3	3
			C	0	3	3	3

4.2.4.3 Recommendations

Assuming the recommended system modifications identified in the steady state analysis are implemented, no additional system improvements are required resulting from time series analysis.

5.0 Short Circuit Analysis

5.1 Short Circuit Analysis

The purpose of the short circuit analysis was to evaluate the impact of the Project on the fault current levels on VEC’s distribution system. A short circuit analysis using WindMil was performed to evaluate the incremental impact of the Project on system protection and adequacy of existing circuit breakers, other fault current interrupting devices, and related equipment on the Company EPS. Short circuit analysis was conducted for the case with the Project offline and with the Project online to evaluate the impact of the Project on fault currents on the 17-4A circuit and the VEC Jay Substation.

5.1.1 Criteria

The short circuit analysis was evaluated against the following criteria to identify violations:

- Change in available fault current at the PCC less than 10%.
- No protection device either over-sensitized or desensitized by more than 10%.
- No protection device over 100% of its duty rating.

5.1.2 Results

A short circuit analysis was performed to evaluate the incremental impact of the Project on system protection and adequacy of existing circuit breakers, fault current interrupting devices, and related equipment on the Company EPS. Short circuit analysis was conducted for the case with the Project offline and with the Project online to evaluate the impact of the Project on fault currents on the 17-4A circuit and Jay substation. Following the interconnection of the Project, the available fault current at the PCC increases by more 10 percent, as shown in the results summary in Table 5-1 below.

Table 5-1: Short Circuit Study Results

Equipment/Location	Feeder Id	Pre-Project Case		Post-Project Case		% Increase LLL	% Increase LG
		Max LLL (A)	Max LG (A)	Max LLL (A)	Max LG (A)		
Jay 17 XFMR	–	2,769	2,927	2,953	3,061	6.62%	4.57%
17-4A Recloser	17-4A	2,769	2,927	2,953	3,061	6.62%	4.57%
17-1A Recloser	17-1A	2,769	2,927	2,953	3,061	6.62%	4.57%
17-3A Recloser	17-3A	2,769	2,927	2,953	3,061	6.62%	4.57%
PCC	17-4A	1,672	1,359	1,868	1,441	11.70%	6.01%

5.1.3 Short Circuit - Observations

- The only overcurrent device upstream of the project on VEC’s distribution system is the 17-4A recloser.
- Fault current contribution greater than 10% was observed at the project PCC when the project is online.

5.1.4 Recommended System Improvements

Due to the Project’s fault current contribution exceeding 10% at the PCC, a system protection coordination review is recommended to address identified short circuit concerns.

5.2 Temporary Overvoltage on Distribution System

Reverse power flow was observed in the analysis due to the aggregate generation exceeding the minimum load on the 17-4A circuit. This condition can cause a temporary overvoltage (TOV) as a result of:

- Ground Fault Over Voltage (“GFOV”): Should a line-to-ground fault occur on the 17-4A that causes the circuit breaker or line reclosers to open, the distribution system downstream of these devices loses its reference to the system neutral. The Project itself is considered as ineffectively grounded with three-phase inverter sources. Thus, the neutral can shift, and the inverter may not detect and operate in sufficient time to prevent damaging overvoltage to the system.
- Load Rejection Over Voltage (“LROV”): The inverters act as a constant current source, which can create a transient overvoltage event when a switch opens and forces all of the inverter current through a fixed load impedance.

The Company may require installation of a G&W Viper ST recloser to mitigate EPS impacts associated with load rejection and ground fault overvoltage, unless the Customer provides sufficient test data to show that the project inverters will not cause TGFOV outside of the CBEMA and ITIC acceptable ranges. Additionally, the Company requires all inverter-based projects to meet the settings requirements of the ISO-NE SRD.

5.3 Temporary Overvoltage on Transmission Supply

The Company requires that the minimum load-to-generation ratio on transmission systems be greater than 2 (i.e., total generation excluding direct transfer trip) for all distributed resources. Due to the reverse power flow condition identified in the study, the Company may require a mitigation strategy to address TGFOV on the transmission system.

5.4 Effective Grounding

Effective grounding equivalency is defined as providing adequate protection to limit over-voltages to 125% of rated phase to neutral voltage. VEC requires all interconnecting distributed resources to be designed to support the effective grounding of its distribution circuits. To meet this requirement, inverter-based generators are required to be UL-certified. In addition, VEC requires the use of grounded wye primary winding in the generator step up (GSU) transformer to ensure that the distribution system voltage remains within acceptable during the brief interval required for the Project’s main breaker to clear a fault.

The Project’s GSU transformer uses a grounded wye primary winding as indicated in Table 2-1 and on the Interconnection Application Form submitted by the Customer. Based on the supplied specification sheet, the Project inverters, CPS SCH250K-T-US-600, are compliant with UL1741 and UL1741 SA.

5.5 Inverter Protection Settings

The Company requires that all inverter-based DER, including this Project, be compliant with IEEE 1547-2018 and be certified per the requirements of UL 1741 SA. Specifically, the voltage and frequency settings, including the abnormal performance capabilities (ride through) and other grid support inverter functions setting, shall comply with the ISO-NE SRD.

The Customer is proposing the installation of fifteen (15) CPS SCH250K-T-US-600 inverters rated at 250 kVA. Based on the supplied specification sheet, the CPS SCH250K-T-US-600 is compliant with UL1741, UL1741 SA, IEEE 1547-2018 AND ISO-NE SRD.

5.5.1 Voltage Setting Requirements / Ride Through

For three-phase inverters, the Company requires specific modifications to the overvoltage condition setting of the inverters. As part of ISO-NE SRD requirements, the Company requires the inverters to enter “momentary cessation” for overvoltage conditions while operating in the “Permissive Operation” mode (Table III: Inverters Voltage Ride through Capability and Operational Requirements of ISO-NE SRD). The Company requires the inverters to enter “Permissive Operation with Momentary Cessation” with a Maximum Response Time of 0.1s. If the proposed inverters are not capable of this Maximum Response time, a Category III inverter shall be used instead, which can comply with this requirement. For reference, see IEEE 1547-2018 6.4.2 Table 16.

Inverter responses to under voltages while operating in the “Permissive Operation” mode is specified and can be found in ISO-NE SRD document footnotes A and B.

5.5.2 Frequency Setting Requirements / Ride Through

In the event of abnormal frequencies, the Project shall cease to energize the area EPS according to *Table II: Inverter’s Frequency Trip Settings* of the ISO-NE SRD document requirements.

5.6 Disconnect Switch

Per IEEE 1547-2018 Section 4.8 Isolation device, when required by the Area EPS operating practices, a readily accessible, lockable, visible-break isolation device shall be located between the Area EPS and the PCC. The Company requires a 600 A load break switch (or a Viper ST recloser) to be installed as a sectionalizing device for the line extension to the PCC.

5.7 Unintentional Islanding

The Project was screened using the Sandia National Laboratories risk-of-islanding screening tool. Results of the screening indicate that the Project presents a non-negligible risk of unintentional islanding. Further evaluation is recommended to determine if additional anti-islanding protection is required.

Per IEEE 1547-2018 Section 8.1 Unintentional Islanding, for an unintentional island in which the DG energizes a portion of the Area EPS through the PCC, the DG interconnection system shall detect the island and cease to energize the Area EPS within two seconds of the formation of an island.

If the Project is unable to detect an unintentional island and cease energizing the Company’s distribution or transmission system within two seconds, the Company may require the installation of a Direct Transfer Trip (DTT) system or equivalent anti-islanding protection to mitigate any islanding risks.

5.8 Direct Transfer Trip

Due to the size of the proposed Project and the resulting low minimum load-to-generation ratio at the Jay substation following interconnection, DTT may be required for this project. The installation of the DTT scheme will be evaluated by VEC to come from the 17-4A recloser.

5.9 Frequency

The Project will consist of fifteen (15) CPS SCH250K-T-US-600 inverters rated at 250 kVA. The Project inverter system is compliant with UL 1741 and IEEE 1547 standards. The ISO-NE SRD requires inverters to have settings that will address any abnormal (over and under) frequency conditions. The Project must meet the ISO-NE SRD requirements.

6.0 System Impact Study Recommendations

6.1 Recommended System Improvements

- Install a line extension of approximately 470 feet of three-phase overhead 4/0 AAAC conductor from the end of “span_26395” to the Project PCC recloser.
- Fuses for the line extension will be reviewed and evaluated by VEC.
- The company will install a three-phase recloser upstream from the Project and at the Project PCC.
- The Project will have a three-phase pole-mounted primary metering package or other VEC-approved metering package that accounts for transformer loss compensation installed upstream of (or on) a new customer riser pole.
- Installation of real-time (SCADA) communications from the Project to VEC.
- System protection coordination review of all circuits fed by the Jay substation by VEC.
- Further evaluation to determine if additional anti-islanding protection is required due to the Project.

6.2 Interconnection Customer Responsibility

The following is a summary of all items that were determined to be the responsibility of the interconnecting Project.

- Procuring and installing all Customer-owned components associated with the Project.
- All costs associated with system upgrades required to interconnect the Project as described in Recommended System Improvements, unless specifically noted as the responsibility of the Company.
- Providing necessary communications for data reporting.
- Providing inverter model information and specifications and ensuring compliance with UL 1741 SA and IEEE 1547-2018 standards.
- Providing under- and over-frequency and voltage settings for the inverters prior to the Facilities Study as determined by the Company. Inverter settings shall be in compliance with the ISO-NE SRD, IEEE 1547-2018 standard, and the NPCC Directory 12 Figure 1 Curve requirements for the Eastern Interconnection.
- Ensuring that the Project complies with ISO-NE SRD, UL 1741 SA, IEEE 1547-2018, and the Vermont Electric Cooperative Interconnection Guidelines at all times.

6.3 Conclusion

If the recommended system modifications are made to the 17-4A circuit and the Project, the Project should not have a negative impact on system thermal capability and voltage of the Area EPS under normal steady state and dynamic operating conditions.

If an event occurs with a recorded overvoltage at the PCC exceeding ANSI C84.1 Range A limitations and/or any reported damage to customer equipment, the Company reserves the right to disconnect the Project from the EPS. The developer will be responsible for all associated claims and for mitigation to prevent recurrence.

This study has been completed using information provided by the Interconnecting Customer, Novus 242 Solar, who submitted an Interconnection Application Form dated November 5, 2025.

In accordance with the Vermont Public Utility Commission Rule 5.500, the Company has completed a System Impact Study to determine the scope of the required modifications to its EPS to provide the requested interconnection service.

APPENDIX A - INTERCONNECTION APPLICATION

Date and Time Received:
 Unique Application Number :

Certificate of Public Good Case No.

Rule 5.500 Application for Interconnection of Distributed Energy Resources Greater than 150 kW

This form may be made available in an electronically fillable format and it is permissible to submit the form with electronic signatures.

Preamble and Instructions:

An owner of a distributed energy resource who requests interconnection to a State-regulated distribution or transmission facility must submit an application to the Interconnecting Utility. An application is accepted as complete when it provides all applicable information required along with the required Application fee. A site plan and one-line diagram must be supplied with the Application. Additional information to evaluate a request for interconnection may be required after an Application is deemed complete.

I. Applicant Information:

Name:

Address [eSITE ID]:

City: State: Zip:

Telephone (Day): (Alternate):

Email:

Utility Consumption Meter Number (if applicable):

Name of Utility:

Representative: (e.g., System installation contractor or coordinating company, if appropriate)

Name:

Address:

City: State: Zip:

Telephone (Day): (Alternate):

Email:

Will the Generation Resource be used for any of the following? Check all that apply

- Net-Metering? Yes No
- Group Net-Metering? (If yes, please provide group information directly to your utility) Yes No
- Non-Exporting? Yes No
- To participate in the Standard Offer Program? Yes No
- Participate in the wholesale electricity market? Yes No
- Qualifying Facility¹ where 100% of output will be sold to Interconnecting Utility? Yes No
- Qualifying Facility¹ intending to sell power at wholesale to an entity other than Interconnecting Utility? Yes No
- Other (describe):

¹ Evidence of FERC QF Certification will be required prior to commercial operation.

For an energy storage system, check the mode of operation below: (Check all that apply)

- Peak Shaving
- Retail Demand Management
- Emergency/Back-up
- Frequency Regulation
- Wholesale market participation(describe) _____
- Other (describe) _____

2. Project Specifications:

All power ratings should be listed in AC throughout unless otherwise noted

Physical Address [eSITE ID]: Same as above

 City: _____ State: _____ Zip: _____

Is this an amendment to an existing system? Check One Yes No

If YES, what is existing CPG# _____

Please describe the proposed amendment: _____

Requested Point of Interconnection (Include on site plan) _____

Requested in-service date: _____

Energy Source: Check all that apply

- Solar
- Wind
- Hydro
- Energy Storage
- Other: _____

Interconnection Configuration? Check One

- Generation Meter
- Behind Consumption Meter

Total number of inverters to be interconnected pursuant to this Application: _____
 (15) CPS 250 KWAC, CPS SCH250K-T-US-600

Total Aggregate Nameplate Rating for all generators (kW): 3750 KWAC

Generating Export Capacity ² (kW): 3750 KWAC

Individual Generator Data:

Provide for each Generator, use additional sheets if needed.

Type of Generator: Check One

- DC Generator or Solar
 - Synchronous
 - Induction
 - Other _____
- Generator Manufacturer, _____

Model Name & Number: CPS 250kWAC, CPS SCH250K-T-US-600

Power Rating per generator 250 KWAC

² As limited by any export controls.

Photovoltaic (PV) Data

Panel Manufacturer HT-SAAE Jupiter 590 WDC Model HT72-18X(ND)-F

Quantity of PV panels 7200 Power Rating per panel (DC Watts) 590 WDC

Total Power Rating (DC Watts) 4248.0 WDC

Roof Mount

Ground Mount

Other

System Orientation: fixed mount 1-axis tracking 2-axis tracking

Individual Inverter Data (if any):

Provide for each inverter, use additional sheets if needed.

Inverter Manufacturer: CPS 250kWAC

Model Name & Number: CPS SCH250K-T-US-600

Version Number: _____

Nameplate Rating: (kW) 250 kWAC (kVA) 250 kVA (AC Volts) 600 VAC

Quantity of units installed: (15)

If Power Factor not Unity: Inverters to be operated at unity power factor.

Rated Power Factor: (Underexcited) N.A. (Overexcited) N.A.

Minimum Power Factor: (Underexcited) N.A. (Overexcited) N.A.

Do export controls apply to this inverter? (Check one) Yes No

- Is the inverter UL 1741 / IEEE 1547.1 Compliant?
Yes * No
- Is the inverter certified per UL 1741-SA and compliant with ISO-NE's Inverter Source Requirements Document (ISO-NE SRD)?
Yes * No
- Is the inverter certified per UL 1741-SB and compliant with ISO-NE's Default IEEE 1547-2018 Setting Requirements?
Yes * No

If Yes to any of above bullets, include testing certificate or manufacturer a data sheet describing the inverter's UL 1741/IEEE 1547.1 listing.

*Please refer to attached inverter datasheet and Certificate of Compliance.

Induction Generators

Motoring Power (kW):
 I22t or K (Heating Time Constant):
 Rotor Resistance, Rr: P.U. Rotor Reactance, Xr: P.U.
 Stator Resistance, Rs: P.U. Stator Reactance, Xs: P.U.
 Magnetizing Reactance, Xm: P.U.
 Short Circuit Reactance, Xd: P.U.
 Exciting Current: Amps
 Temperature Rise:
 Frame Size:
 Design Letter:
 Reactive Power Required in Vars (No Load):
 Reactive Power Required in Vars (Full Load):
 Total Rotating Inertia, H: Per Unit on kVA Base

3. Transformer and Protective Relay Specifications

Will a transformer be used between the generator and the Point of Common Coupling?
 Yes No
 Will the transformer be provided by the Interconnection Customer?
 Yes No

(a) Transformer Data: (if applicable, for Interconnection Customer-Owned Transformer)

Is the transformer? Single phase Three phase (check one)
 Size: (2) 2000 kVA kVA
 Transformer Impedance: TBD percent on TBD kVA Base
 If Three Phase:
 Transformer Primary 12.47kV Volts Delta Wye Grounded Wye
 Transformer Secondary 600 V Volts Delta Wye Grounded Wye
 Transformer Tertiary N.A. Volts Delta Wye Grounded Wye

(b) Transformer Fuse Data: (if applicable, for Interconnection Customer-Owned Fuse)

Enclose/Attach copy of fuse manufacturer's Minimum Melt and Total Clearing Time-Current Curves
 Manufacturer: TBD Type: TBD
 Size: TBD Speed: TBD

APPENDIX B - STEADY STATE LOAD FLOW RESULTS

Steady State Load Flow Results

Provided as Microsoft Excel file attachments

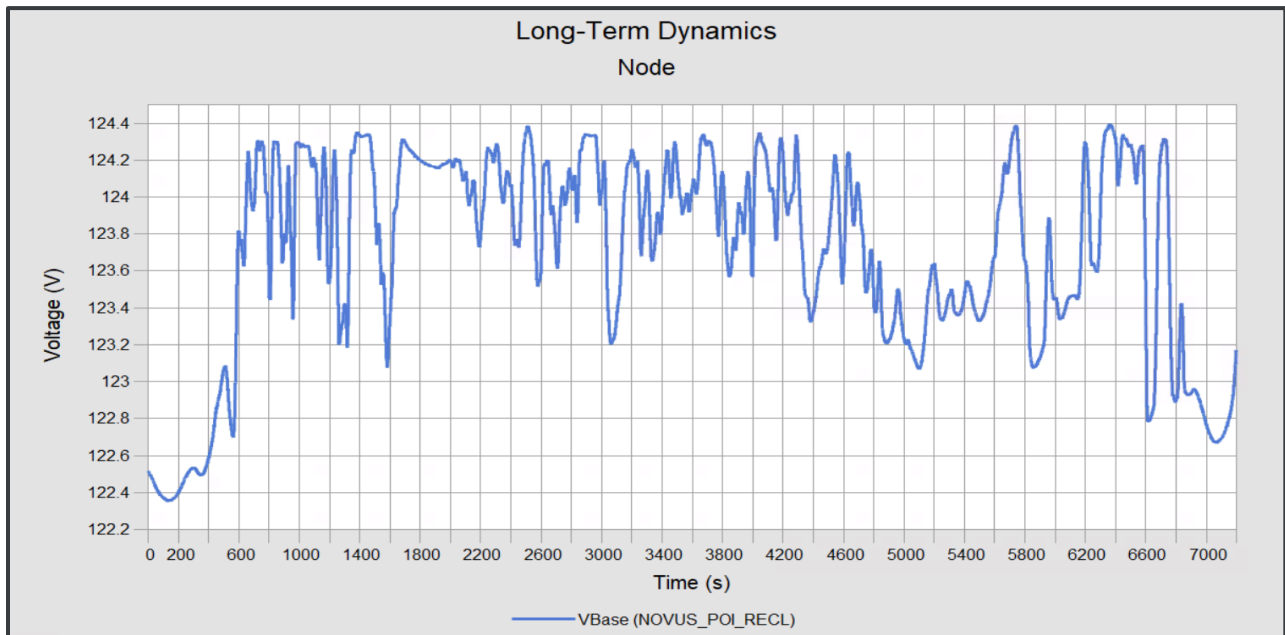
APPENDIX C - TIME SERIES ANALYSIS RESULTS

Time Series Analysis Results

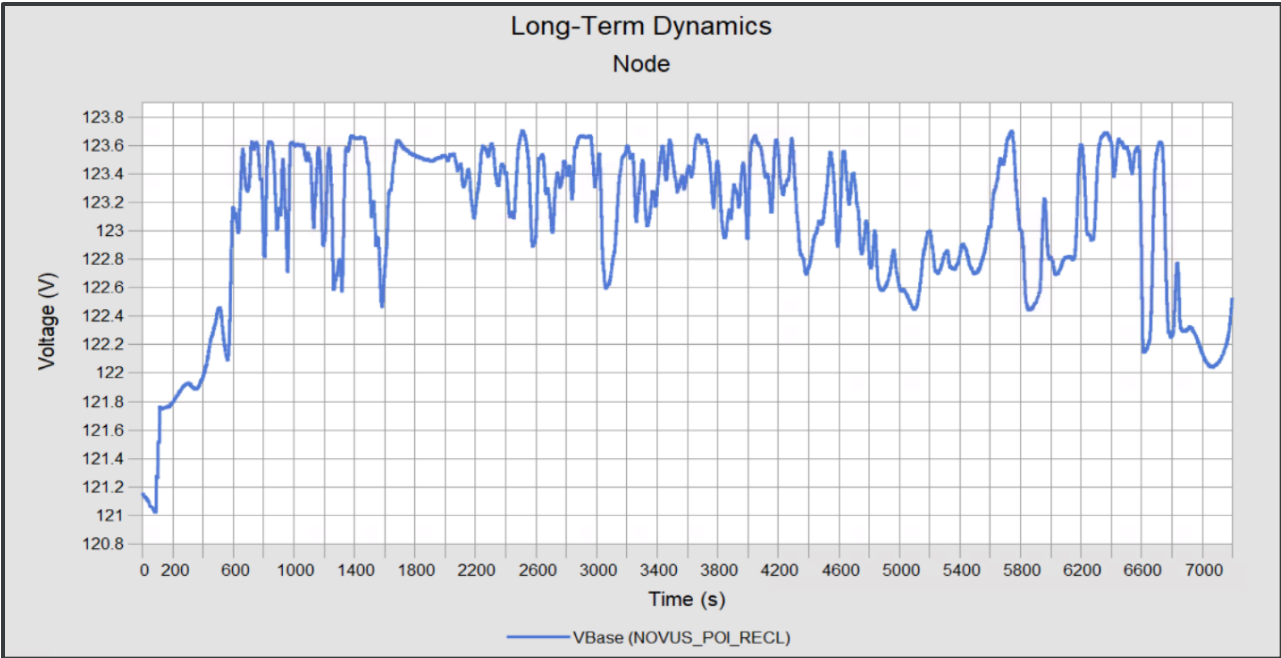
Scenario	0.1	0.2	0.4	0.6	1	2	3	5	7	10	Maximum Flicker %
	CHANGES PER MINUTE	CHANGES PER MINUTE	CHANGES PER MINUTE	CHANGES PER MINUTE	CHANGES PER MINUTE	CHANGES PER MINUTE	CHANGES PER MINUTE	CHANGES PER MINUTE	CHANGES PER MINUTE	CHANGES PER MINUTE	
	6.001	3.828	2.972	2.667	2.317	1.879	1.646	1.39	1.24	1.097	
LTD1	0	0	0	0	0	0	0	0	0	0	0.273%
LTD2	0	0	0	0	0	0	0	0	0	0	0.266%
LTD3	0	0	0	0	0	0	0	0	0	0	0.062%
LTD4	0	0	0	0	0	0	0	0	0	0	0.065%

Detailed Long Term Dynamic Results

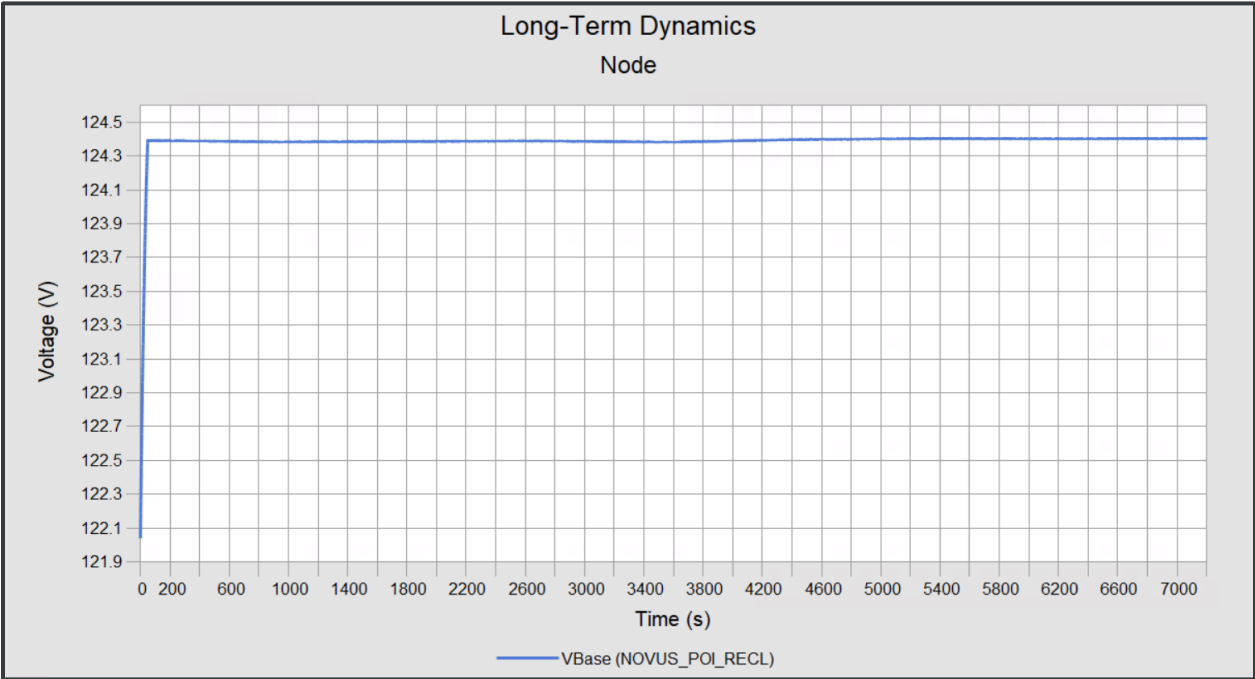
This table shows the greatest number of flicker violations for a given rolling time frame. There were no voltage flicker violations greater than allowed number of changes for the given time. Also shown is the maximum voltage flicker measured during each analysis to verify that the limit of 3% voltage flicker would not be seen at the Novus 242 Solar PCC.



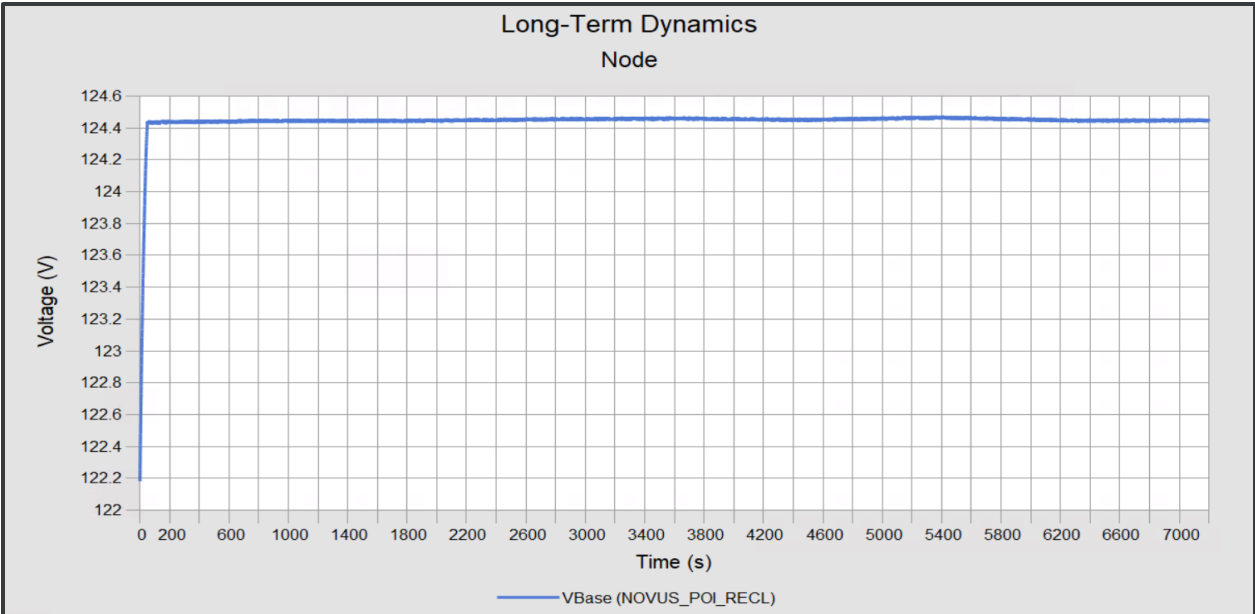
Peak Load High Variability (Scenario 1)



Minimum Load High Variability (Scenario 2)



Peak Load 2 PCT (Scenario 3)



Minimum Load 2 PCT (Scenario 4)

1898  **CO**®

PART OF **BURNS**  **MCDONNELL**

1898andco.com

