The Joint Utilities of New York

Voltage Flicker Analysis Guidelines

Version 1.0 (5/X/2019)

PURPOSE

This document provides the Voltage Flicker Analysis (VFA) guidelines for the review of interconnected solar photovoltaic (PV) systems. The VFA guidelines in this document were agreed to at the Interconnection Technical Working Group (ITWG) on May X, 2019 by the following stakeholders: Joint Utilities of New York (JU), Industry Representatives (Industry), and Department of Public Services Staff (DPS).

The reason for this guideline is to better align the current VFA tests in Screen H of the Supplemental Review from the Standard Interconnection Requirements October-2018 (SIR-2018) with the IEEE 1453-2015 standard. The ITWG agreed that the current methodologies used for performing VFA were too conservative and worked to create a new analysis that would better reflect the latest standards. An initial attempt to modify this screen between August and December of 2018 showed an increase in failed projects due to Voltage Flicker concerns and led the ITWG to revisit the IEEE 1453-2015 equations. This document will serve to define the current state and outline the revised VFA standard that will be utilized by the JU.

The VFA guideline outlined below shall be applied to all projects in the Supplemental Review stage and Coordinated Electric System Impact Review (CESIR) stage as of May X, 2019. Projects already within these stages as well as those past these stages but where the utility has yet to start their construction on Flicker mitigations may request re-analysis of their project under this new screen to determine new mitigation requirements.

The ITWG also agreed to a set of standard assumptions to be applied to all Time-Series Analysis (TSA) studies requested by developers in the event that Screen H is failed during the Supplemental Review or CESIR process. These requirements have also been listed in the document.

VOLTAGE FLICKER ANALYSIS REQUIREMENTS

REVISIONS TO SCREEN H OF THE SUPPLEMENTAL SCREEN

The existing version of Screen H of the Supplemental Screen from SIR-2018 is adapted from equations (14) and (15) in Section 7.1 of IEEE 1453-2015 for Short Term Flicker Severity (P_{ST})to be discontinued by all members of the JU is as follows:

$$P_{ST} = \left(\frac{d}{d_{P_{st}=1}}\right) \times F \leq 0.35 \;\; and \;\; d = \left(\frac{\Delta V}{V}\right) \approx \frac{\Delta S}{S_{SC}}$$

Where:

$$Relative\ Voltage\ Change\ Caused\ by\ Project\ (d)$$

$$Shape\ Factor\ related\ to\ the\ shape\ of\ expected\ voltage\ fluctuation\ (F)\ =\ 0.2$$
$$Relative\ Voltage\ Change\ that\ Yield\ P_{st}\ value\ of\ unity\ (d_{P_{st}=1})\ =\ 2.56\%$$
$$Voltage\ Change\ at\ PCC\ (\Delta V)$$
$$Nominal\ Voltage\ at\ PCC\ (V)$$
$$Load/Generation\ Power\ Change\ (\Delta S_i)\ =\ 75\%\ of\ Proposed\ Output$$
$$Short-Circuit\ Power\ at\ PCC\ \ (S_{SC})$$

The revised version of Screen H of the Supplemental Review from SIR-2018 adapted from equations (14) and (17) in Section 7.1 of IEEE 1453-2015 for Short Term Flicker Severity (P_{ST})to be used as of the publishing of this document by all members of the JU is as follows:

$$P_{ST} = (\frac{d}{d_{P_{st}=1}}) \times F \leq 0.35\ \ and\ \ d = (\frac{R_L \times \Delta P\ +\ X_L \times \Delta Q}{V_r^{\ 2}})$$

When: $\frac{X_L}{R_L} \leq 5$

OR

$$P_{ST} = (\frac{d}{d_{P_{st}=1}}) \times F \leq 0.35\ \ and\ \ d = (\frac{\Delta V}{V}) \approx \frac{\Delta S}{S_{SC}}$$

When: $\frac{X_L}{R_L} \geq 5$

Where:

$$Positive\ Sequence\ Resistance\ Component\ of\ the\ Circuit\ at\ PCC\ (R_L)$$
$$Positive\ Sequence\ Reactance\ Component\ of\ the\ Circuit\ at\ PCC\ (X_L)$$
$$Change\ in\ Proposed\ Site's\ Real\ Power\ \ (\Delta P)\ =\ 75\%\ of\ Proposed\ Output$$
$$Change\ in\ Proposed\ Site's\ \ Reactive\ Power\ \ (\Delta Q)$$
$$Grid\ Voltage\ at\ the\ PCC\ (V_r)$$

REVISIONS TO THE CESIR VFA METHODOLOGY

The CESIR VFA will be the same as the revised version Screen H of the Supplemental Review defined in the previous section.

REVISIONS TO THE DETAILED TIME-SERIES ANALYSIS PROCEDURES

GEOGRAPHIC SMOOTHING

Geographic smoothing should be applied to all time-series analyses using agreed to tools such as Sandia's Grid PV Tool Box and using realistic maximum cloud speeds to be shared in the Flicker analysis report provided to the Developer.

INDIVIDUAL PROJECT CONTRIBUTION

Flicker shall be analyzed for an individual projects' contribution and not the aggregate on the circuit within a particular radius around the site. Exceptions include sites directly adjacent to each other so long as the requirements in the previous Geographic Smoothing section are satisfied.

PROCESS FOR TIME-SERIES WHEN SCREEN H IS FAILED

If Screen H is failed at either the Supplemental Review or CESIR stage, the Utility shall review the rest of the analysis in said stage per the submitted system size unless given permission by the developer to continue with the analysis at a reduced system size or off-unity power factor.

If Screen H is the only aspect of the analysis failed at the Supplemental Review stage, the developer shall be given the opportunity to perform a time-series analysis without requiring a full CESIR.