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Pterra Comments on EPRI Report of October 18, 2017

This report dated October 31, 2017

Pterra has previously provided comments on various drafts of the EPRI report. Pterra's comments for the latest release are focused on voltage-related screens.

For discussion purposes, we will categorize the various voltage-related screens into the following: voltage flicker, steady-state voltage, rapid voltage change (RVC) screens.

1. Voltage Flicker

The EPRI report proposes to replace the existing Supplemental Screen H, which includes flicker, with a new Screen H which focuses on RVC.

Pterra believes the flicker screen using IEEE Std-1453 as presently included in the existing Supplemental Screen H of the SIR is still needed. Even though instances of flicker impact in present systems may be rare or non-existent, it is useful to have the screen in place as DER technologies continue to develop, and penetration levels progressively increase. Furthermore, the upcoming revision of IEEE Std-1547, included in Table 1 of the EPRI report, indicates that a Flicker Limit is going to remain in the standard.

We caution only that if the screening method developed by Pterra based on IEEE-1453 is applied, that the utilities do not impose overly conservative and unrealistic assumptions, which could lead to unnecessary detailed studies or even costly upgrades.

2. Steady-State Voltage

The EPRI report proposes to replace the existing Preliminary Screen F with a simplified steady-state voltage test.

Pterra interprets the existing Screen F as a test for the impact of synchronization of rotating machines on distribution feeders. This is supported by the text of IEEE Std-1547-2003 Section 4.1.3 which uses similar language. This test remains an important test, if only for new interconnecting rotating machines. Pterra recommends that the Screen F be retained but restricted in application to rotating machines.

EPRI's proposed revised Screen F appears to be based on the ANSI allowable steady-state voltage change limits but expressed in terms of DER size. Pterra has several questions regarding the basis in transitioning from the ANSI limits to the relative size test. These are included in Appendix A.

3. Rapid Voltage Change

In the proposed new Screen H: Voltage Change and Quality Test at the PCC, the limits introduced in this section may fall into the following categories:

- Tripping off or ramp up to full output of DER – fast voltage changes due to instantaneous tripping or ramping up of PV that may affect customers on the feeder

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- Cloud cover through PV-based DER – fast voltage changes due to clouds going over PV arrays that may affect cycling of voltage regulators

This subject is not presently addressed in any of the existing screens. It is an important consideration for new interconnections. EPRI proposes a new Screen H for each of the two categories of RVC given above with limits of 1.5%,3%, and 5%. Pterra has several questions to clarify the basis for the proposed screen. These questions are included in Appendix A.

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Appendix A: Questions for EPRI

Following are clarification questions on the new screens proposed.

Questions on the New Screen F

1. Please clarify the meaning of PCC_rating used in revised screen F?
2. For consistency among utilities, please provide the screening method to calculate feeder capacity at the PCC.
3. If the project fails the screen, it may be useful to ask utilities to provide short circuit at the PCC in the preliminary screening report? This would be useful information to decide whether developers would like to continue to the next step(s).

Questions on the New Screen H

1. Do RVC cause a real problem in the area with high PV penetration such as in Hawaii and California? Is there a reported and documented issue with equipment damage or malfunction related to RVC?

2. Is the 3% limit intended for a scenario when a PV trips? This seems to be a very rare event that occurs, for example, due to DER equipment malfunction or a fault on the system.

3. IEEE-1453-2015 indicates RVC is caused by motor starting, inrush currents, or switching operation of equipment. Is there a standard that specifies how RVC is caused by equipment tripping or PV tripping?

4. Is the 3% limit also intended for ramping from zero to full output instantaneously (i.e. square waveform)? Is this a realistic assumption?

5. Please clarify technical basis for the 1.5%, 3%, and 5% limit. Is there a standard that support these limits for inverter based DER? If there is one, is it consistent with the approach presented in the report?

6. Is the time delay of voltage regulator considered when determining the 1.5% limit? Specifically, is there higher limit for the regulator with higher time delay?

7. Is the limit for individual DER or Aggregate DER upstream or downstream the line voltage regulators/LTC?

8. Please describe the screen calculation method for PV with moving clouds.

9. If a project fails this screen, is there a method that exists for assessment in CESIR? Or is there a method for measurement and characterization or detection threshold for RVC?