Per the request of the DPS and JU, the Industry has compiled our opinions on the previously provided JU Rapid Voltage Change document. The following is the result of internal conversations and reflects the Industry’s latest opinion:

1.0 - IEEE 1547-2018 Section 7.2.2 - Rapid Voltage Change (RVC)

The Industry feels that in order to have a well-framed discussion around the 3% and 5% RVC screens currently included in the CESIR, we must review Section 7.2.2 in its entirety. The language below is pulled directly from said standard and will be referenced throughout this document:

When the PCC is at medium voltage, the DER shall not cause step or ramp changes in the RMS voltage at the PCC exceeding 3% of nominal and exceeding 3% per second averaged over a period of one second. When the PCC is at low voltage, the DER shall not cause step or ramp changes in the RMS voltage exceeding 5% of nominal and exceeding 5% per second averaged over a period of one second. Any exception to the limits is subject to approval by the Area EPS operator with consideration of other sources of RVC within the Area EPS.

These RVC limits shall apply to sudden changes due to frequent energization of transformers, frequent switching of capacitors or from abrupt output variations caused by DER misoperation. These RVC limits shall not apply to infrequent events such as switching, unplanned tripping, or transformer energization related to commissioning, fault restoration, or maintenance.107

107 Subclause 7.2.2 is not intended to address issues associated with slow voltage variations, which can be caused by cloud shadow passage, wind speed changes, etc.
2.0 - Rapid Voltage Change Evaluation - 3% Threshold & Assumptions

The Industry has several concerns with the current JU interpretation of the 3% RVC thresholds utilized in the CESIR. These concerns in order of priority are listed below:

1. No Standardization of Assumptions or Evaluation Methods

2. Applicability of “abrupt output changes caused by DER misoperation” to the CESIR

3. Unrealistic Magnitude of the “step or ramp changes”

Due to these concerns, the Industry strongly suggests that the JU consider revising this screen and standardizing its application across NY with phasing from static to more dynamic evaluating methods. Our recommendation, which will be elaborated on in Section 2.4, is to standardize around the geographically correlated output fluctuation assumptions used into PSEG-LI’s\textsuperscript{1} RVC evaluation with quasi-dynamic evaluation being conducted by National Grid.

2.1 - Standardization of Assumptions or Evaluation Methods

The Industry’s primary concern is that the current application of this screen is not consistent across the members of the JU. The Industry took the following notes on each utility’s approach at the ITWG meeting held on May 5th, 2020:

- **Central Hudson Gas & Electric** - Assumes 100% output fluctuation for PV with locked regulators at peak and minimum daylight static load points.
- **Consolidated Edison** - Assumes 100% output fluctuation for PV with locked regulators at peak and minimum daylight static load points.
- **PSEG-LI\textsuperscript{1}** - Assumes 80% output fluctuation for PV with additional geographic correlation factor to assess voltage changes at various loads. Unknown whether regulators are locked or unlocked.
- **National Grid** - Assumes 75% & 100% output fluctuations for PV with both locked and unlocked regulator scenarios. Performs analysis with CYME long-term dynamic module to more accurately evaluate voltage fluctuation risks.
- **NYSEG/RGE** - Assumes 100% output fluctuation for PV with unlocked regulators at peak and minimum daylight load.
- **Orange & Rockland** - Assumes 100% output fluctuation for PV with locked regulators at peak and minimum daylight static load points.

The lack of standardization for this screen causes significant confusion for developers and should be a focal point for the ITWG during this CESIR Screen Review initiative.
2.2 - Applicability of “abrupt output changes caused by DER misoperation” to CESIR

In their ‘Applicability’ section of their letter, the JU utilized the aforementioned quote from IEEE 1547-2018 Section 7.2.2 in order to justify their current evaluating and assumption practices, however, they did not adequately support their claim of how this justifies many of their 100% output fluctuation change assumptions. The Industry disagrees with the implementation of this scenario as it contradicts the intent of the CESIR screening process which is to evaluate how the DER, while operating as intended, will impact the grid during both steady-state and transient conditions. No other CESIR evaluation is conducted on the base assumption that the DER device is not operating as it has been designed and tested to perform.

The Industry feels that “Section IV - Disconnection of the Unit” (copied below) of the SIR adequately outlines the disconnection process when a DER is misoperating therefore this evaluation assumption is not relevant to the CESIR.

4.2 Non-Emergency Disconnection Due to Unit Performance: The Utility may disconnect the Unit, after notice to the responsible party has been provided and a reasonable time to correct, consistent with the conditions, has elapsed, if (a) the Interconnection Customer has failed to make available records of verification tests and maintenance of his protective devices; (b) the Unit system interferes with Utility equipment or equipment belonging to other customers of the Utility; (c) the Unit adversely affects the quality of service of adjoining customers; (d) the ESS does not operate in compliance with the operating parameters and limits described in Attachment 1 to this Agreement.

2.3 - Unrealistic Magnitude of Assumed “step or ramp changes”

The current 100% and 75% output fluctuations utilized by the JU for RVC analysis are unrealistic and exaggerated and are ultimately out of line with the standard. Section 7.2.2 of IEEE 1547-2018 states that “RVC limits shall not apply to infrequent events such as switching, unplanned tripping, or transformer energization related to commissioning, fault restoration, or maintenance”. Therefore only the following scenarios should constitute RVC evaluation:

- “[S]tep or ramp changes in the RMS voltage at the PCC exceeding 3% of nominal and exceeding 3% per second averaged over a period of one second.”
- Frequent Energization of Transformers
- Frequent Switching of Capacitors
- Abrupt Output Changes Caused by DER Misoperation
  - Line item already addressed in disconnection procedures detailed in Section 2.2

When considering single-second ramp or step changes, we must be cognizant of the operation of the particular DER operating profile and capabilities. For example, an energy storage project
operating under frequency regulation can have as high as a 200% output fluctuation to support bulk system reliability. A wind project, however, cannot ramp by any significant percentage of its nameplate due to the turbine’s inertia.

The same can be said for PV which, as discussed during our prior flicker conversations, cannot exhibit large step-change fluctuations due to the system’s size weighed against the speed of clouds. Interestingly enough, Section 7.2.2’s footnote explicitly mentions this and wind speed stating “Section 7.2.2 is not intended to address issues associated with slow voltage variations, which can be caused by cloud shadow passage, wind speed changes, etc.” Therefore, in order for us to adequately evaluate whether or not RVC is an issue for any DER, we must come up with better base assumptions for what normal single-second fluctuations at these sites could be. The following are some of the Industry’s recommendations:

- Energy Storage System - Based on Set Ramp Rate
- Wind - RVC Evaluation Not Applicable
- Solar PV - Based on Geographic Correlation Factor for the Site

### 2.4 - Summary of Recommendations

In conclusion, the Industry recommends that the JU adopt the following standardized approach to evaluating 3% Rapid Voltage Change for DERs:

<table>
<thead>
<tr>
<th>Generation Type</th>
<th>Output Variation Assumption</th>
<th>RVC Evaluation Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Storage System</td>
<td>Based on Set Ramp-Rate</td>
<td>Static: Use of peak and minimum daylight load with site/DER specific output variations</td>
</tr>
<tr>
<td>Wind Turbine</td>
<td>Not Applicable</td>
<td>Quasi-Dynamic: Use of load peak and minimum load curves weighed against output curves and site/DER specific output variations</td>
</tr>
<tr>
<td>Solar PV</td>
<td>Based on Site-Specific Geographic Correlation Factor</td>
<td>Dynamic: Use of time-series analysis to evaluate actual DER operating characteristics with circuit load data.</td>
</tr>
</tbody>
</table>

### 3.0 - Rapid Voltage Change Evaluation - 5% Threshold & Assumptions

The Industry has several concerns with the current JU interpretation of the 5% RVC thresholds utilized in the CESIR. These concerns in order of priority are listed below:
1. No Standardization of Assumptions or Evaluation Methods

2. Evaluation Methods are Inconsistent with Rapid Voltage Change

3. Already Evaluated Sufficiently with Other Voltage Analyses

4. Uncertainty in What Real-Life Situation is Being Evaluated

Due to these concerns, the Industry strongly suggests that the ITWG re-evaluate this screen and work towards the implementation of a more practical, standardized screen that has a direct link to real world system conditions.

### 3.1 - No Standardization of Assumptions or Evaluation Methods

Similar to the previous screen reviewed in Section 2.0 of this document, the Industry’s primary concern regarding the 5% screen is regarding the lack of standardized assumptions and evaluations methods employed by the various JU members. Below is an overview of the assumptions and evaluating methods explained to the Industry by representatives of each utility:

- **Central Hudson Gas & Electric** - Assumes 100% output fluctuation for all DER (unknown regulator setting) at peak and minimum daylight static load points.
- **Consolidated Edison** - Assumes 100% output fluctuation for all DER with locked regulators at peak and minimum daylight static load points.
- **PSEG-LI** - Whether a similar screen is used is unknown.
- **National Grid** - Assumes 100% output fluctuations for all DER with locked and unlocked regulator scenarios. Performs analysis with CYME long-term dynamic module to more accurately evaluate voltage fluctuation risks.
- **NYSEG/RGE** - Assumes 100% output fluctuation for all DER with unlocked regulators at peak and minimum daylight load.
- **Orange & Rockland** - Assumes 100% output fluctuation for all DER with locked regulators at peak and minimum daylight static load points.

The lack of standardization for this screen causes significant confusion for developers and should be a focal point for the ITWG during this CESIR Screen Review initiative.

### 3.2 - Evaluation Methods are Inconsistent with Rapid Voltage Change

One glaring Industry concern is that this screen appears to be unrelated to Rapid Voltage Change as suggested in the latest JU support document. Both this document and the Section 7.2.2 of 1547 state that the 5% RVC threshold is meant to evaluate the RMS voltage changes caused by a DER on a low voltage line. As it currently stands, this evaluation is being
performed at Medium Voltage and at substation bus, neither of which is supported or recommended in Section 7.2.2.

The Industry request further clarification as to what relationship is being drawn between the 5% low voltage RVC limit and the 5% screen in the current version of the CESIR template.

**3.2 - Already Evaluated Sufficiently with Other Voltage Analyses**

Another major complaint with this screen is that the concerns it seems to be attempting to evaluate are already adequately evaluated in other voltage screens. The aforementioned 3% screen is meant to evaluate whether or not an individual project causes an excessive rapid voltage change event which could be harmful to equipment on the grid. The LTC/Regulator screen attempts to determine whether or not aggregate DER downstream of a regulatory device cause excessive tap movements leading to increased wear and tear on utility equipment. The flicker screen is used to determine whether the DER unit causes visible flicker which could impact customer lighting. Finally, the Over and Undervoltage screens evaluate whether or not the aggregate DER causes ANSI C84.1 limits to be exceeded. In our opinion, the combination of these screens seem to cover every steady-state voltage concern there is related to DER.

The Industry request that the JU provide more feedback on exactly what aspect of grid voltage this screen is meant to evaluate that isn’t already sufficiently covered by the other analyses in the CESIR.

**3.3 - Uncertainty in What Real-Life Situation is Being Evaluated**

Lastly, the Industry is still lacking understanding of exactly what reliability event this screen is meant to evaluate. In our May ITWG meeting, a utility mentioned that this screen was meant to evaluate voltage conditions post-circuit-outage to ensure voltage thresholds remain intact during system re-energization. The Industry recognizes this concern, however, being a transient/abnormal condition which could at worst, lead to a single instance of increased regulation equipment tap movements does not seem to indicate any long-term impacts on grid equipment or customers. If anything, proper distribution planning and DER re-energization staging should mitigate any and all concerns.

We also want to note that these transient conditions are not explicitly tied to DER as post-circuit re-energization voltage regulation is a key component of distribution planning but is, to our knowledge the re-energization is not used as the basis for denying the interconnection of additional loads. Instead, regulators and other utility equipment are adjusted to anticipate what potential black-start loads and inrush currents that there might be when re-energizing to limit voltage excursions.
The Industry hopes to discuss these concerns in further detail with the JU to better understand exactly what real-life events they are attempting to evaluate with this screen.

**3.4 - Summary of Recommendations**

In conclusion, the Industry continues to drive towards the implementation of standardized practical screens that have a direct link to real world system conditions. With those goals in mind, the following are recommended:

1. **The calculations in the CESIR screen should be standardized across the JU.** The rate of change and the interaction with regulators continues to be a large discrepancy in the implementation of the screen across the JU.

2. **Identification of the specific scenarios that the JU is attempting to evaluate to assist in drafting better screening assumptions.**

3. **Furthermore, it may be beneficial to add clarification to the individual screens based on the generation technology that is being applied.**

**4.0 Conclusion**

The Industry has concluded that there are substantial changes needed in the 3% and 5% CESIR voltage screens to make their application more acceptable than the current. We want to thank the JU and DPS for taking the time to review our comments and we look forward to additional discussions on this and other CESIR analysis topics.