

Pterra Presentation on Voltage Flicker

- Focusing on noticeable flicker
- Voltage fluctuations are responsible for noticeable flicker:
 - Could be caused by **rapidly** changing loads / PV generation due to changing cloud cover
 - **Magnitude** and **frequency** of voltage fluctuations
- Noticeable flicker and frequency of voltage fluctuations:
 - 8.8 Hz is most sensitive frequency for human (voltage change as low as 0.5% could cause irritation)
 - People most sensitive around 5 – 10 dips/seconds
 - much less than the 50 Hz or 60 Hz supply frequency
- Different utilities in NY apply the GE curve differently
- IEEE 1453 adopts IEC Standard 6100-4-15
 - A major improvement over the traditional flicker curve:
 - Can be used for voltage fluctuations with different shapes (square wave, gradual sine wave or anything in between)
 - Can be used for completely random fluctuations and combinations of fluctuations
 - Can consider the impact of modulations caused by modern solid- state converters (including inverter-based PV)
 - Will account for the effects that may come from intermittent changes in cloud cover.
- IEEE 1453
 - Considers probability level for both short term and long term flicker impact • Not only flicker severity is important, but also the frequency of occurrence
 - Attempt to measure the buildup of customer annoyance
 - Ensure consistent and fair application to all customers
 - By utilizing a numerical measure of flicker severity that is appropriate for periodic sudden fluctuations, gradual changes, and completely random fluctuations.
 - Can be incorporated into simulation models to estimate future flicker and validate different flicker mitigation methods using formulas for a shape factor, which needs short circuit current data and rated power and uses 1 dip/min.
 - Recommended standard in the industry, internationally accepted, and more technically correct method of accessing voltage flicker from different sources, including PV generation
 - Pterra's studies and screening samples assumed:
 - PV rate of change of 1 to 2 dips per minute
 - PV output from 100% to 0%

Industry Presentation on Voltage Flicker

- Do not believe that visible flicker will be a concern for Solar PV and base rationale on NREL irradiance data analyses.
 - 1 dip/min or 10 dips/hr.
 - One year of data looked at 3 months in winter and 3 months in summer. 10:00 am start for model, 4 clouds per minute (~8 changes/min.)
- IEEE 519 is no longer an active standard
- IEEE 1453 itself acknowledges the inappropriateness of using the GE flicker curves for non-regular, non-square wave changes in load
 - Reference was made to a 2014 National Grid MA impact study posted online that claims to reference IEEE 1453 for the analysis; however, this was clarified how IEEE 1453 was applied. The study overlaid results on the GE Flicker curve and not all aspects of the IEEE 1453 standard are applied.
- "...if our recommendations to eliminate the a priori study of visible flicker within the Supplemental Review and CESIR processes are not adopted, then the solar industry would strongly oppose the application of any standard or analysis methodology other than IEEE 1453 which has been demonstrated to be both practical and effective for the study of variable loads/generation."

JU Presentation on Voltage Flicker

- The NY JU June 14, 2017 response has not changed.
- Open to a technical webinar on the modelling available to meet IEEE 1453 that Xcel Energy is implementing in MN.

JU Presentation on Monitoring and Control

- Near real-time Monitoring and Control is vital for situational awareness to ensure safe and reliable service.
- Provides better estimates of future operational parameters
- Increases DER interconnection, facilitating wholesale, distribution, and ancillary service markets
- Basic control may be required from 50kW to 300kW, i.e., disconnect DG only
- PCC Recloser required at 300kW and greater
- Monitoring is vital for the utility to have this information for safe & reliable operation and system planning plus future use in distribution and NYISO markets. May provide mechanism for interconnection beyond hosting capacity (flexible interconnect).
 - May be required at less than 50kW
 - Shall be required for 50kW to 300kW
 - Shall be required for 300kW and greater including control
- "REVing Up the Energy Vision in New York" outlines parameters that expect near real-time monitoring

- Monitoring at the point of generation must include:
 - Per phase voltage and current
 - Three phase values for real and reactive power
 - Power factor
- Any solar PV system requiring control shall also require monitoring.
- General Requirements for monitoring & control:
 - Consensus Recommendation on the JU approach for general M&C requirements
 - PCC recloser or RTU points list shall be mapped in accordance with DNP3, IEC 61850, ANSI/C37.2 or as specified by the utility
 - In addition to meeting monitoring and remote trip capabilities, the RTU or PCC recloser must report the status of the disconnecting device
 - Remote close capabilities will be as required at the individual utility's discretion
- Smart inverters
 - JU has been evaluating smart inverter capabilities in context of readiness for integration
 - Further progress must be made in terms of cyber security, integration, functionality, and standardization before they can be used
 - EPRI commented that inverter manufacturers are currently not standardizing and while the IEEE 1547 update will have some minimum M&C requirements, some of these requirements may not be adequate for utilities (i.e. +/- 5% voltage accuracy)
 - IEEE 15471 implementation – JU will require newly installed smart inverters shall be over-the-air firmware upgradeable
 - Recommend including this requirement in the next NYSSIR revision
- Cost Drivers
 - Cost and Project Variability Drivers
 - Available communication mediums in a geographic area
 - Security
 - Voltage level at the interconnection point
 - Engineering, design, drafting, programming
 - Testing and commissioning
 - Cost reduction opportunities
 - Standardization of design
 - Economies of scale
 - Reduce engineering, design, drafting.....etc. hours
 - Newly emerging tech (balanced with learning curve)
- EPRI Report on Screens
 - DPS Staff input needed on EPRI's final report before moving forward.
 - Demonstration testing of screens first would delay the implementation.

Desire is to have the technical screens defined before the Phase II IOAP is implemented. This will impact its end-2017 deadline, although emphasis now is on the Phase I IOAP full implementation by October 2017.

Discussion

- Flicker
 - General consensus of moving toward 1453
 - Update meeting in the near future (Aug/Sept) regarding thoughts and concerns
 - Workshop/training sometime in September (a little before the ITWG so we can set aside discussion time)
 - Part A is in conceptual move toward 1453 which there is consensus on by the group, however, Part B is determining exactly how utilities will implement this change with internal design/simulation systems. Part B may take a little more time to figure out and agree on
 - Staff to review existing language in NYSSIR to ensure utilities are covered to mitigate flicker issues if they arise after a DG system is installed/operating
- Monitoring and Control
 - Industry doesn't see the urgency today for the JU presented criteria
 - Industry sees value in it, but the timing of it is their concern. Does M&C increase Hosting Capacity for value?
 - 300-700kW projects wouldn't have economic feasibility when to add the cost of a \$75,000 recloser. Looking for cost to be \$5,000 or less on >50kW < 300kW projects.
 - Industry conceptually agreed to the JU's proposed M&C criteria to keep progress of the group moving forward, however, shared concerns that developers in the 50 – 1MW project range may complain about this decision.
 - Agreement to relook/review this decision in 6 months to determine if changes are needed.
- Energy Storage
 - Definitely on the next ITWG, and sooner if everyone would like
 - Commission rule that it's the nameplate rating on the generator that determines the size. Also, evaluation does not rely on control systems or prime mover to govern size output for the generator's electrical characteristics impact to the PCC and Area EPS.
 - NYSERDA is looking at charge/discharge cycles relative to rates and load on system
 - JU needs more information at time of an ESS Application.
 - Developers to list their options & concerns.
 - JU Homework assignment
 - What additional information do the utilities need in an application to be provided by September 9th, due date, gives two weeks until the next ITWG meeting on the 27th.

Next Steps

- Flicker
 - Update meeting in the near future (Aug/Sept) regarding thoughts and concerns toward moving toward IEEE 1543
 - Workshop/training sometime in September. Exact date TBD by Pterra/NYSERDA
 - DPS Staff direction on implementing EPRI's final report on technical screens. Staff/Legal to review current SIR Appendix A "Disconnection of the Unit" provisions, in the event of voltage flicker issues after interconnection.
- Monitoring and Control
 - DPS needs to run the JU's M&C criteria and Solar Industry's position up the chain before any final decisions are made. DPS will get back to group by the end of this week. Subsequent to the meeting, DPS received upper management support to move forward with the JU's M&C criteria.
- Energy Storage
 - May have a following webinar on ESS in October by EPRI.
- Monitoring and Control
 - DPS needs run the JU's M&C criteria and Solar Industry's position up the chain before any final decisions are made. DPS will get back to group by the end of this week.