



Voltage Ride Through Near Series Caps

Jonathan Rose
ERCOT Dynamic Studies

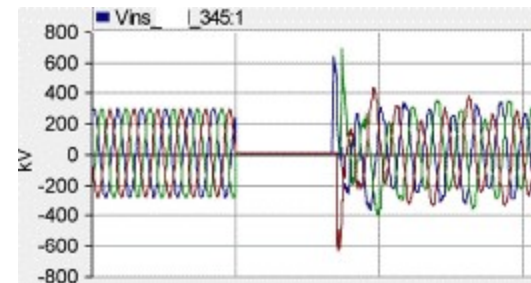
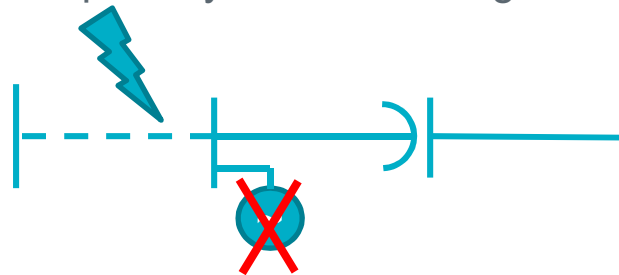
June 23, 2020

Summary

- ERCOT has highlighted difficulties connecting near series capacitors:
 - RPG, 11/14/2017
http://www.ercot.com/content/wcm/key_documents_lists/108892/ERCOT_Building_Near_Series_Capacitors.pptx
 - RPG, 1/22/2019
http://www.ercot.com/content/wcm/key_documents_lists/165270/ERCOT_Building_Near_Series_Capacitors_2019.pptx
 - Also mentioned at RI Workshop
- ERCOT has observed several recent SSR studies with transient voltage ride through concerns that are difficult for OEMs to resolve and could lead to reliability concerns

Increased Tripping Concerns, Projects Close to Series

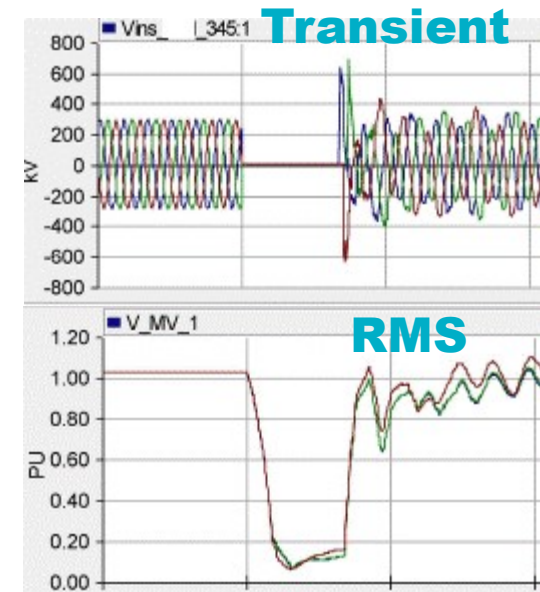
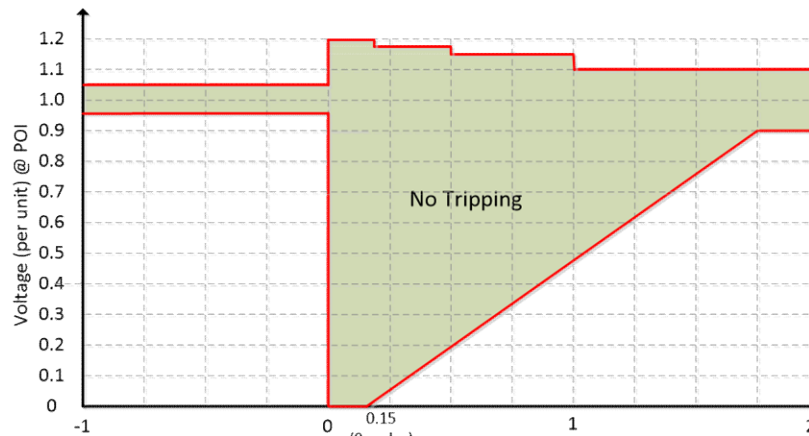
- ~6 GW of public GINR projects are very close to series caps
- Ride through difficulties often occurs for projects tapping a series-compensated line:
 - The key contingency is an N-1 (single event contingency)
 - Transient energy discharge from series capacitors usually causes very high transient voltages at the POI, causing generators to trip
 - Manufacturer spends weeks adjusting the controls but ultimately the transient is difficult to ride through
 - Allowing projects to trip could create reliability concerns
 - E.g., especially for N-1 contingencies, possibly others



Depending on the location, the over-voltage may be 1.4 per-unit or more and last 0.5 to 2 cycles

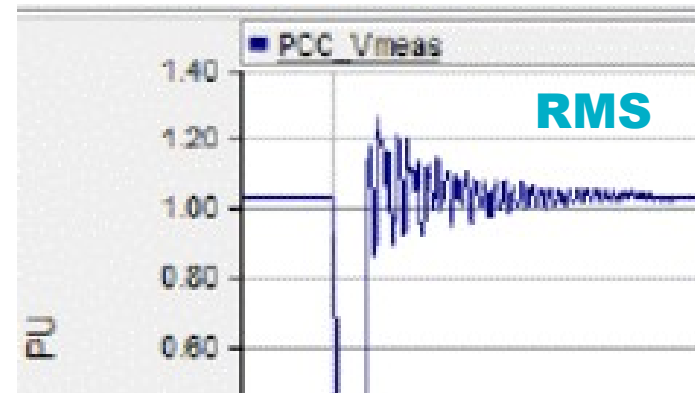
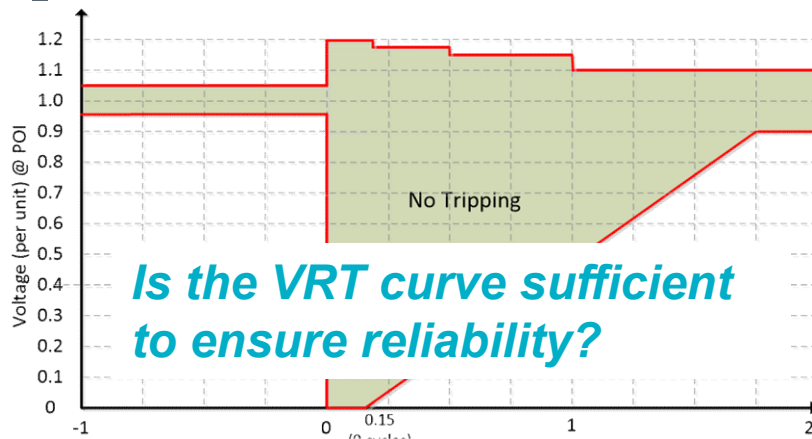
Current ERCOT VRT Requirements

- Curve depicts RMS voltage at the POI.



- White space outside curve is NOT a “Must Trip” zone
 - Gens should aim to ride through if hardware allows
- Curve doesn’t define *transient* overvoltage capability (e.g. <1 cycle)
 - ERCOT expects inverter devices have some transient overvoltage capability
 - For figure above right, the RMS voltage is <1.2. Thus ride through would be expected.

What do we do?



- Recent SSR studies have revealed voltages at the POI that are >1.2 per-unit RMS.
 - Allowing multiple generators to trip could quickly become a serious reliability concern
- The purpose of the ERCOT ride through requirements is to ensure that generators stay online
 - When NOG 2.9.1 was proposed, it was anticipated that grid disturbances would typically remain inside the ride through curve. Thus providing assurance.
 - The curve wasn't envisioned for the special conditions close to series capacitors.

Options: To Be Discussed at Next RI Workshop

- We'll discuss options at the next Resource Integration workshop.
- May need to strengthen SSR study requirements on ride through
 - Require ride-through under certain situations regardless of overvoltage?
Other suggestions?

Questions?

Email: Jonathan.Rose@ercot.com