



GMDVA Final Results

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Transmission Planning Assessment

November 2021 PGDTF

Past Presentations

- ERCOT presented a brief [GMD introduction](#) at the May 2020 RPG meeting
- An overview of the [Benchmark GMDVA scope and preliminary results](#) was given at the July 2020 RPG meeting
- An overview of the [Supplemental GMDVA scope and preliminary results](#) was given at the May 2021 RPG meeting
- The [Benchmark and Supplemental GMDVA Scope and Process](#) is posted on the May 2021 RPG meeting page

Study Inputs and Assumptions

- The final GIC system models (DC and AC) posted in November 2019 were used as the GMDVA start cases
 - The models represented 2022 Summer Peak Load and Minimum Load conditions
- The benchmark GMD event used a geoelectric field amplitude of 8 V/km while the supplemental GMD event used an amplitude of 12 V/km
- Both the benchmark and the supplemental GMD events were applied to the entire ERCOT footprint

GMD Outage Collection

- Equipment that may experience protection system operation or misoperation due to harmonics from a GMD event were collected from TSPs and REs through Market Notices
- Submitted equipment was categorized by TSPs and REs as either:
 - Category A:
 - Equipment anticipated to have a high probability of tripping offline due to harmonics during the benchmark or supplemental GMD event and may be studied simultaneously in the benchmark/supplemental GMDVA
 - Category B:
 - Equipment anticipated to have a lower probability of tripping offline due to harmonics during the benchmark or supplemental GMD event and may be studied one at a time in the benchmark/supplemental GMDVA

Base Case Updates to Incorporate GMD Impacts

- Transformer thermal impact assessment results were incorporated into the GIC base cases
- Category A outages were applied (simultaneously) to the GIC base cases
- A degree scan was then performed in 10-degree increments to determine the reactive power losses for each orientation (from 0 – 180 degrees)
- The reactive power losses were applied to the GIC AC base cases to create a study case for each orientation

GMD Study Cases

- The GMDVA study cases created for each orientation were updated as follows:
 - Steady state system voltage limits were updated based on information received from TSPs during the RTP process
 - Applicable stability limits were incorporated
 - Voltage tuning was performed
 - The 2022 Summer Peak cases were updated with the ERCOT coincident peak load forecast, and the renewable dispatch was based on historical data analysis
 - The 2022 Minimum Load cases were updated to reflect a wind dispatch based on historical data analysis
- Category B outages were applied (individually) on top of the study case for each orientation

GMDVA Study Criteria

- **Steady-State Voltage Performance Analysis Criteria:**
 - The steady-state voltage criteria outlined in Planning Guide Section 4.1.1.4, specifically the post contingency voltage performance criteria, was used following the occurrence of the benchmark and supplemental GMD events
 - The voltage deviation criteria outlined in Planning Guide Section 4.1.1.4 was used following the occurrence of the benchmark and supplemental GMD events
- **Cascading Analysis Criteria:**
 - Transmission Facilities (100 kV and above) that exceeded the lower of their relay loadability limit or 125% of their emergency rating were assumed to trip automatically and removed from service
 - Load at buses with known UVLS protection schemes where the voltage fell below their under-voltage set point were assumed to trip automatically
 - Generators with buses on the low side of a Generator Step Up (GSU) transformer that experienced voltages lower than their under-voltage trip limits or higher than their over-voltage trip limits were assumed to trip automatically

Final Results and Next Steps

- For both the benchmark and supplemental GMDVAs:
 - No steady state voltage criteria violations were identified
 - No cascading events were identified
- Therefore, no CAPs were needed for the benchmark or supplemental GMD events
- Next Steps:
 - ERCOT will draft and post the GMDVA report by December 31, 2021
 - ERCOT will also post the study cases by December 31, 2021

Questions?

Please send any questions or comments to

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