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| SCR Number |  | SCR Title | Recommended Changes Needed to Incorporate GIC Modeling Data into Existing Modeling Applications |
| Date Posted | | September 2, 2021 | |
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| Requested Resolution | | Normal | |
| Supporting Protocol or Guide Sections/Related Documents | |  | |
| System Change Description | | For compliance with North American Electric Reliability Corporation (NERC) Reliability Standard, TPL-007-4, Transmission System Planned Performance for Geomagnetic Disturbance Events, for the Electric Reliability Council of Texas, Inc. (ERCOT) planning area, this System Change Request (SCR) proposes to modify the ERCOT Network Model Management System (NMMS) and Topology Processor to incorporate Geomagnetically-Induced Currents (GIC) modeling data for maintaining GIC System models for the ERCOT planning area. The NMMS and Topology Processor should allow applicable Entities to provide the necessary data for the GIC System Model, per Section 6.11 of the ERCOT Planning Guide and in accordance with ERCOT’s GIC System Model Procedure Manual. Additional changes are requested to include automated email notifications of the need for the GIC modeling data submittals and updates. | |
| Reason for Revision | | Addresses current operational issues.  Meets Strategic goals (tied to the [ERCOT Strategic Plan](http://www.ercot.com/content/news/presentations/2013/ERCOT%20Strat%20Plan%20FINAL%20112213.pdf) or directed by the ERCOT Board).  Market efficiencies or enhancements  Administrative  Regulatory requirements  Other: (explain)  *(please select all that apply)* | |
| Business Case | | This modification would support the development and maintenance of GIC System Models for the ERCOT planning area per ERCOT’s approved schedule for building the models. GIC System Models are direct current (DC) resistance models of the transmission system used to calculate GICs and system reactive power losses. These models are required for studies to assess the performance of the ERCOT System during Geomagnetic Disturbance (GMD) events and to satisfy requirements of NERC Reliability Standard, TPL-007-4 Transmission System Planned Performance for Geomagnetic Disturbance Events, to complete the benchmark and supplemental GMD Vulnerability Assessments of the Near-Term Transmission Planning Horizon at least once every 60 calendar months. This modification would improve the GIC System Model development process by aligning the process for building the GIC System Models with the existing process for building Steady-State and Near-Term Transmission Planning Horizon Models and improve the efficiency of maintaining the GIC data of operational equipment. The alignment will facilitate the creation of accurate GIC System Models from the NMMS. | |

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| Proposed System Change |

To satisfy requirements of NERC Reliability Standard, TPL-007-4 Transmission System Planned Performance for Geomagnetic Disturbance Events, ERCOT and applicable TSPs and REs are required to develop and maintain the GIC System Models for ERCOT’s Transmission System to perform the benchmark and supplemental GMD Vulnerability Assessments of the Near-Term Transmission Planning Horizon at least once every 60 calendar months.

By 07/01/2019, ERCOT/TSPs/REs completed the following steps:

* Through the Planning Geomagnetic Disturbance Task Force (PGDTF), ERCOT, Transmission Service Providers (TSPs), and Resource Entities (REs) jointly developed a schedule to complete the data collection during the initial GIC System Model build.
* Through the PGDTF, ERCOT, TSPs, and REs jointly developed the necessary data requirements and data templates used to develop and update the GIC System Models. The template for the required data was developed based on the appropriate sources, through research, and by participation in the NERC GMDTF and technical conferences.
* After associated ERCOT Protocol and Guide changes, ERCOT, TSPs and REs collected data on existing energized equipment and equipment expected to be in-service by the year selected by PGDTF to be modeled in the Steady-State base case representing the studied year.
* ERCOT developed a custom application to store data and incorporate it into the planning cases. Data was stored and included in planning cases by ERCOT via the custom-developed application.
* To ensure that GIC data remains protected as defined in ERCOT Planning Guide Section 6.11, ERCOT designated a secure data transmission method to receive TSP’s GIC data submissions and to post the GIC System Models.
* The final GIC System Model for 2022 was posted on MIS on 07/11/2019.

**Issue:**

1. The Network Operations Model (NOM) application does not have attributes for the GIC information required to perform the benchmark and supplemental GMD Vulnerability Assessments of the Near-Term Transmission Planning Horizon.
2. The Model On Demand (MOD) application does not have data fields for GIC information required to perform the benchmark and supplemental GMD Vulnerability Assessments of the Near-Term Transmission Planning Horizon. However a future version of MOD is supposed to incorporate this functionality.
3. If it is decided that GIC data needs to be stored in the NOM, then GIC data from the NOM must be incorporated in the Topology Processor functionality to be transferred to MOD.
4. GIC data transmittals, sharing and storing must be protected, especially the latitude and longitude of substations.
5. For the next GMD Vulnerability Assessments ERCOT GIC System Models required to be built in 2022, ERCOT must collect operational data changes for the equipment energized in last GIC model build in 2019, operational data for the equipment that has been energized since the last GIC model build in 2019, and for proposed future planned equipment updates from the TSPs and REs.
6. TSPs do not have a mechanism to maintain their GIC data outside of the GIC case building process. This, combined with the large time between case builds, forces significant data management efforts for each build. All energized equipment since the the previous build must be reviewed and estimated values must be replaced with measured values.

**Resolution:**

1. Update the NMMS to allow GIC data to be included and used for GIC System Model development and maintenance.
2. Update the output of ERCOT Topology Processor to include the GIC data.
3. Add all necessary GIC System Model build attributes to MOD per ERCOT’s GIC System Model Procedure Manual.
4. Secure and maintain the following data for existing and energized equipment to create an accurate DC representation of the ERCOT System.
5. The NMMS and Topology Processor should allow the submitter to confirm that the requested changes related to jointly-owned equipment have been coordinated with the associated Entities.

| **Element** | **Attribute** | **Value** | **Description** | **Example of a Value** |
| --- | --- | --- | --- | --- |
| Substation | Grounding Resistance | RG: Numeric in Ohms | Substation dc grounding resistance (ohms) | 0.1 |
| Line | DC Resistance | RBRN: Numeric in Ohms/Phase | Branch dc resistance in ohms/phase | 0 |
| Transformer Winding | DC Winding Resistance | RDC: Numeric in Ohms/Phase | dc resistance of Winding in ohms/phase at nominal tap and adjusted to 75°C | 0 |
| Transformer Winding | GIC Blocker on Winding | True – GIC Blocker is Present  False – No GIC Blocker on the winding | GIC blocking device in neutral of Winding | False |
| Power Transformer | Vector Group | VecGrp - Alphanumeric | Alphanumeric identifier specifying vector  group based on transformer  winding connections and phase angles | YNynd0 |
| Power Transformer | Core | Core: Alphanumeric | Number of cores in transformer core design | 3 = three phase 3-legged core form |
| Power Transformer | K-Factor | K-Factor: Numeric (no units) | A factor to calculate transformer reactive power loss from GIC flowing in its winding (Mvar/Ampere) | 0.00 |
| Transformer Winding | Winding Grounding DC Resistance | RGDC: Numeric in Ohms | Winding grounding dc resistance in ohms | 0 |

| **Element** | **Attribute** | **Value** | **Description** | **Example of a Value** |
| --- | --- | --- | --- | --- |
| Transformer | Transformer Model | T-Model: Alphanumeric | Transformer Model in GIC dc Network  = 0, two and three winding and autotransformer model as defined by its vector group  = 1, Transformer as T model in dc network | 0 = two and three winding and autotransformer model |
| Shunt | Coil DC Resistance | R: Coil DC Resistance | DC resistance in ohms/phase adjusted to 75°C | 99999 |
| Shunt | Grounding DC Resistance | RG: Numeric in Ohms | Grounding dc resistance in ohms | 99999 |