TPL-007-1

Transmission System Planned Performance for Geomagnetic Disturbance Events

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Transmission Planning
Planning Committee
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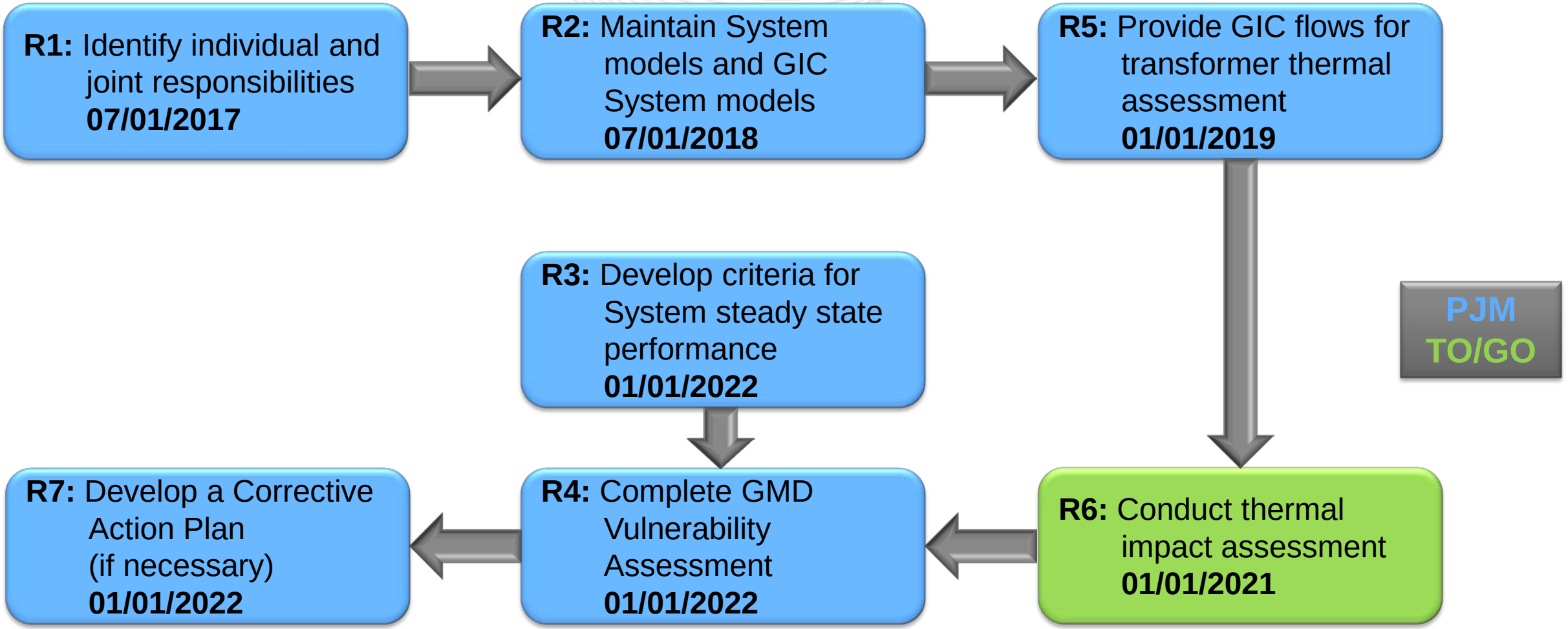
- **Purpose:**
  - Establish requirements for Transmission system planned performance during geomagnetic disturbance (GMD) events.

- **Applicable to:**
  - Planning Coordinator
  - Transmission Planner
  - Transmission Owner
  - Generator Owner

  With Facilities that include power transformer(s) with a high side, wye-grounded winding with terminal voltage greater than 200 kV

Implementation Schedule



Requirement R2

R2: Maintain System models and GIC System models
07/01/2018

- Transmission Owners
  - Data request sent May 10th
  - Modeling information to be submitted via Excel spreadsheet
  - Only responsible for providing the requested information for the equipment that they own
  - It would be helpful (but not required) to assist with GO mapping where possible (substation/bus)
  - Spreadsheet contains both TO & GO information
    - Not easy to separate who owns what in loadflow case

Requirement R2

R2: Maintain System models and GIC System models
07/01/2018

- Generator Owners
  - Data request sent July 6th
  - Modeling information to be submitted through Gen Model
  - Generator Owners are only responsible for providing the requested information for the equipment that they own

Requirement R2 Continued

R2: Maintain System models and GIC System models
07/01/2018

- 2016 RTEP (2021 5-year case) is the data source
  - Only known data is being requested at the present time (i.e. substations and equipment already in service)
  - PJM will request future updates as data becomes available (i.e. when new substations and equipment are placed into service)
- TO & GO data to be returned by October 1, 2017
- TO data to be submitted to NERC.Transmission.Planner@pjm.com
- GO data to be submitted through Gen Model

Requirement R2: GIC System Model Data Continued

- Guidance for developing the GIC System model is provided in NERC's GIC Application Guide:
  - GIC Application Guide 2013_approved – NERC
  - Provides good coverage on each network component
  - Identifies most appropriate data for accurate modeling
  - Identifies best alternative estimate when data is not available
  - Identifies sources for the data

NERC GIC Application Guide – Table 2 Excerpt

- PJM is requesting this level of accuracy
- If not possible, PJM is requesting specifics on what model data is being provided

Table 2: Summary of network component and associated resistive data for a one-phase GIC network model

Network Component	Most Appropriate Data For Accurate Modeling	Best Alternative Estimate - When Desired Model Data Is Not Available	Data Sources and Comments
Grounded wye winding of conventional transformer	Measured dc resistance of the winding at nominal tap and adjusted to 75 °C and divided by 3 (see note)	50% of the total per-unit copper loss resistance converted to actual ohms at winding base values and divided by 3	dc resistance and copper loss resistance are obtained from transformer test records. Transformer copper loss resistance from power flow model data base.
Autotransformer series windings	Measured dc resistance of each winding at nominal tap and adjusted to 75 °C and divided by 3 (see note)	50% of the total per-unit copper loss resistance converted to actual ohms at full winding base values and divided by 3	dc resistance and copper loss resistance are obtained from transformer test records. Transformer copper loss resistance from power flow model data base.
Autotransformer common winding	Measured dc resistance of each winding at nominal tap and adjusted to 75 °C and divided by 3 (see note)	50% of the total per-unit copper loss resistance converted to actual ohms at V_H winding base values and divided by $(V_H/V_X-1)^2$ and divided by 3	dc resistance and copper loss resistance are obtained from transformer test records. Transformer copper loss resistance from power flow model data base.

Questions?