ERAG Eastern Interconnection Reliability Assessment Group

...to further augment the reliability of the bulk-power system...

ERAG Acceptable Model Working Group

Modeling Notification

GENTPJ Generator Model reclassified as Not Recommended

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The Eastern Interconnection Reliability Assessment Group (ERAG)[1] is a MOD-032 designee under the NERC MOD-032 agreement, authorizing ERAG to establish modeling data requirements and reporting procedures. The Acceptable Model Working Group (AWMG) was established by the ERAG to develop and maintain an Eastern Interconnection acceptable dynamic model list and support the maintenance of the NERC Dynamic Modeling Recommendations[2] document.

The ERAG AMWG has reclassified the GENTPJ synchronous generator model as "Not Recommended" following extensive review of its deficiencies in representing transient response, saturation effects, and ride-through behavior. The ERAG AMWG classifies "Not Recommended" models as dynamic models that can still be applied in interconnection-wide cases, but a different model(s) is identified within the ERAG Eastern Interconnection Dynamic Model List[3] as preferred for use. Models that are identified as "Not Recommended" will be periodically reviewed by the AMWG to determine when they can be phased out.

Drawing on precedent from WECC's retirement actions and universally applicable IEEE standards, ERAG AMWG recommends a transition away from and discontinued use of the GENTPJ model in future transmission planning and interconnection studies. This transition, reinforced through MOD-026 testing and the elimination of GENTPJ in future generator interconnection studies, ensures a more accurate representation of generator dynamics, reduces the risk of model misrepresentation in transient stability analyses, and strengthens reliability assessments across the Eastern Interconnection.

Primary Interest Groups

This notification is directed to Generator Owners (GOs), Generation Operators (GOPs), Transmission Operators (TOPs), Transmission Planners (TPs), Planning Coordinators (PCs), Reliability Coordinators (RCS), and Eastern Interconnection Regional Entities.

Background

The ERAG AMWG is responsible for maintaining a list of dynamic model recommendations for reliability studies on the Eastern Interconnection (EI)[4]. The GENTPJ synchronous generator model is widely used in transient stability studies within the EI and has been supported by AMWG and WECC guidelines. However, recent reviews by WECC and IEEE technical committees have identified limitations in the GENTPJ model's ability to represent generator dynamics under current system conditions. The following items are shared to support the discontinued use of the GENTPJ model.

[1] https://www.rfirst.org/eastern-interconnection-reliability-assessment-group/
[2] https://www.nerc.com/globalassets/our-work/assessments/dynamic-modeling-recommendations-july2023.pdf
[3] https://www.rfirst.org/wp-content/uploads/2025/07/ERAG-Eastern-Interconnection-Dynamic-Model-List.xlsx
[4] https://www.rfirst.org/wp-content/uploads/2025/07/ERAG-Eastern-Interconnection-Dynamic-Model-List.xlsx

Key Issues with GENTPJ

Technical issues identified below support the AMWG recommendation. Validation concerns are from independent analysis of the model's performance. The model deficiencies outlined in the examples below detail where the model falls short in dynamic simulations, and industry transition provides an alternative to the GENTPJ model.

- **Validation Concerns**
  - WECC's *Retirement Plan for GENTPJ Model from WECC Study Cases* (PPMVDWG, January 27, 2022) [5] documents repeated difficulties in matching measured field current and voltage responses.
  - *IEEE Std 1110-2019: IEEE Guide for Synchronous Generator Modeling Practices and Parameter Verification* highlights that older models like GENTPJ fail to capture saturation and transient dynamics compared to modern alternatives.
- **Model Deficiencies**
  - Alters electromagnetic relationships compared to the IEEE Std 1110 second-order circuit.
  - Relies on fundamentally flawed parameter validation.
  - Produces oscillatory and unreliable simulation results.
  - Provides inadequate representation of transient response and ride-through behavior.
  - Has limited capabilities in capturing high-voltage and frequency deviation scenarios.
- **Industry Transition**
  - The ERAG AMWG recommends referencing the AMWG Dynamic Models List in selecting models for replacement.
  - IEEE standards emphasize modern synchronous generator models as more accurate and reliable.
  - WECC's *Approved Dynamic Model Library* [6]*(January 2026)* lists GENTPJ as retired/not recommended and identifies GENQEC as the replacement.

Based on these findings, the AMWG has determined that the GENTPJ synchronous generator model will be reclassified as *"Not Recommended."* This decision not only aligns with WECC and IEEE guidance but also sets the stage for a structured transition plan to more accurate models.

Model Transition and Next Steps

The model transition plan calls for replacing GENTPJ in MMWG cases and migrating to other AMWG-approved models for future planning and interconnection cases. This transition aligns with the ERAG AMWG recommendations to improve dynamic model accuracy and reliability across the EI.

The ERAG AMWG recommends transitioning the GENTPJ model to the GENQEC model or another AMWG-Acceptable model. Applying the best model available requires testing that demonstrates improved accuracy in plant controls, transient response, saturation effects, and ride-through behavior.

It is important that this transition occurs expeditiously. Continued reliance on GENTPJ risks inaccurate generator dynamic models in the MMWG model set, which could undermine the accuracy and credibility of future transmission planning and interconnection studies. Prompt action will ensure that transmission planning cases remain robust, diverse, and representative of actual system behavior.

To ensure consistency and alignment:

[5] White Paper on GENQEC Model in Power System Studies - draft(7-20)
[6] Approved Dynamic Models January 2026.pdf

- **MOD-026-2:** Replacement of GENTPJ should occur, at a minimum, through MOD-026-2 (Verification and Validation of Dynamic Models and Data) requirements.
- **Generator Interconnection Studies:** GENTPJ should not be used for any future generator interconnection requests. All new generator interconnection studies should adopt AMWG-Acceptable (i.e., GENQEC) or other IEEE-aligned models to ensure reliable representation.
- **Industry Adoption:** Prompt adoption and use of the AMWG acceptable models and other IEEE-aligned models across planning entities.
- **Ongoing Monitoring:** ERAG AMWG will continue to track model performance and update recommendations as IEEE standards evolve.

Conclusion

Reclassifying the GENTPJ model as "Not Recommended" enhances the quality of transmission planning studies by improving the accuracy of generator dynamic modeling, reducing the risk of misrepresentation in stability analyses, and promoting consistency across regions through alignment with IEEE and ERAG AMWG acceptable model list. This transition enables planners to leverage validated parameter libraries and adopt models that more accurately reflect modern system conditions, thereby strengthening reliability assessments across the Eastern Interconnection.

Supporting References

Although some references originate from the Western Interconnection (WECC), their findings provide valuable precedent and technical guidance that are broadly applicable to the Eastern Interconnection. Combined with universally recognized IEEE standards, these sources form the basis for ERAG AMWG's decision to reclassify GENTPJ as *"Not Recommended."*

- WECC Retirement Plan for GENTPJ Model from WECC Study Cases (PPMVDWG, 2022): Documents the retirement of GENTPJ in WECC dynamic databases and provides guidance for transitioning to IEEE-aligned models such as GENQEC.
- WECC Approved Dynamic Model Library (January 2026): Lists GENQEC as an approved synchronous generator model and GENTPJ as retired, offering precedent for ERAG's transition.
- IEEE Std 1110-2019 – Guide for Synchronous Generator Modeling Practices and Parameter Verification: Establishes best practices for synchronous generator modeling and parameter verification, forming the technical basis for adopting GENQEC and retiring legacy models like GENTPJ.
- IEEE Std 115-2019 – Guide for Test Procedures for Synchronous Machines: Provides standardized procedures for acceptance, performance testing, and parameter determination, ensuring accurate dynamic modeling for stability studies across all interconnections.
- 2017 IEEE Conference Paper[7]: Analyzed deficiencies in GENTPJ's direct-axis open-circuit time constants and their impact on dynamic performance, highlighting the need for improved models.
- 2019 IEEE ISGT Asia Paper[8]: Proposed a high-accuracy generator model outperforming GENTPJ, forming the basis for GENQEC development.
- WECC 2021 White Paper [9]on GENQEC Model in Power System Studies: Details GENQEC's structure, parameterization, and migration steps from legacy models, offering technical guidance relevant to the Eastern Interconnection.

[7] GENTPJ model dynamic performance | IEEE Conference Publication | IEEE Xplore
[8] Dynamic Performance of a High Accuracy Generator Model for Stability Analysis | IEEE Conference Publication | IEEE Xplore
[9] White Paper on GENQEC Model in Power System Studies - final.pdf