|  |  |  |  |
| --- | --- | --- | --- |
| PGRR Number | [109](https://www.ercot.com/mktrules/issues/PGRR109) | PGRR Title | Dynamic Model Review Process Improvement for Inverter-Based Resource (IBR) Modification |
| Date Posted | July 18, 2023 |
|  |  |
| Requested Resolution  | Normal  |
| Planning Guide Sections Requiring Revision  | 5.2.1, Applicability5.5, Generator Commissioning and Continuing Operations |
| Related Documents Requiring Revision/Related Revision Requests | None |
| Revision Description | This Planning Guide Revision Request (PGRR) introduces a new requirement for Interconnecting Entities (IEs) associated with Inverter-Based Resources (IBRs) to undergo a dynamic model review process prior to Resource Commissioning Date. Additionally, this PGRR mandates that Resource Entities owning or controlling operational IBRs must undergo a review process before implementing any changes to settings or equipment (e.g., protection and control settings) that could impact electrical performance and necessitate dynamic model updates.As part of the review process, ERCOT shall review the model quality tests submitted by an IE or Resource Entity. In the case of operational IBRs, the review process may require the interconnecting Transmission Service Provider (TSP) conducting a limited dynamic stability study to compare and evaluate the electrical performance before and after the proposed modifications. |
| Reason for Revision |  Addresses current operational issues. Meets Strategic goals (tied to the [ERCOT Strategic Plan](http://www.ercot.com/content/wcm/lists/144926/ERCOT_Strategic_Plan_2019-2023.pdf) or directed by the ERCOT Board). Market efficiencies or enhancements Administrative Regulatory requirements Other: (explain) Improves dynamic model review process.*(please select all that apply)* |
| Business Case | IBRs have distinct design and operational characteristics compared to conventional synchronous generators. Unlike synchronous generators, the performance of IBRs relies mainly on power electronics controls, which make them highly responsive and sensitive to even minor adjustments in control settings. Therefore, even minor adjustments to control settings can have a substantial impact on the grid.Currently, there is no review process in place for IBRs before the Resource Commissioning Date to ensure that the "as-built" data accurately represent the parameters and performance of the as-studied data that were used in the quarterly stability assessment. Before a new IBR can commence commercial operation, it should provide substantial evidence demonstrating that its as-built performance and installed control parameters align with the model utilized in the quarterly stability assessment.In addition, if modifications to operational IBRs fall outside of applicability as described in paragraph (1)(c) of Section 5.2.1, Applicability, Resource Entities are not required to undergo any review process. The only requirement is for Resource Entities to submit dynamic model updates, model quality tests, and plant verification reports after implementing the changes in the field. Modifications made to settings or equipment by Resource Entities without undergoing a review process can potentially result in unexpected trips or unstable responses during disturbances. Having a proper review process in place is crucial to ensuring that such modifications are thoroughly reviewed before being implemented in the field.This PGRR is aligned with the recommendations from the North American Electric Reliability Corporation (NERC) as described in the 2022 Odessa Disturbance report.  |

|  |
| --- |
| Sponsor |
| Name | Sun Wook Kang  |
| E-mail Address | sunwook.kang@ercot.com  |
| Company | ERCOT |
| Phone Number | 512-248-4159 |
| Cell Number |   |
| Market Segment | Not Applicable |

|  |
| --- |
| **Market Rules Staff Contact** |
| **Name** | Erin Wasik-Gutierrez |
| **E-Mail Address** | Erin.Wasik-Gutierrez@ercot.com  |
| **Phone Number** | 413-886-2474 |

|  |
| --- |
| Proposed Guide Language Revision |

5.2 General Provisions

***5.2.1 Applicability***

(1) The requirements in Section 5, Generator Interconnection or Modification, apply to the following:

(a) Any Entity proposing to interconnect any generator with an aggregate nameplate capacity of one MW or greater, including but not limited to any Generation Resource or Energy Storage Resource (ESR), to the ERCOT System;

(b) Any Entity proposing to interconnect a Settlement Only Generator (SOG) to the ERCOT System; or

(c) Any Resource Entity seeking to modify a Generation Resource, ESR, or SOG that is connected to the ERCOT System by:

(i) Increasing the real power rating from that shown in the latest Resource Registration data by one MW or greater within a single year;

(ii) Changing the inverter, turbine, generator, or power converter associated with a facility with an aggregate real power rating of ten MW or greater, unless the replacement is in-kind;

(iii) Changing any settings or equipment associated with Inverter-Based Resources (IBRs) in a manner that is deemed to require further study in accordance with the process outlined in paragraph (4) of Section 5.5, Generator Commissioning and Continuing Operations;

(iv) Changing or adding a Point of Interconnection (POI) to a facility with an aggregate real power rating of ten MW or greater; or

(v) Increasing the aggregate nameplate capacity of a generator less than ten MW to ten MW or greater.

(2) For the purposes of Section 5, the term “generator” includes but is not limited to a Generation Resource, SOG, and ESR.

(3) For the purposes of determining the appropriate requirements in Section 5, a generator is considered a “large generator” if it currently has or is proposed to have an aggregate nameplate capacity of ten MW or greater. A generator is considered a “small generator” if it currently has or is proposed to have an aggregate nameplate capacity of less than ten MW.

(4) Notwithstanding paragraph (3), above, if a Resource Entity is proposing to increase the real power rating of an existing generator by one MW or greater but less than ten MW, that generator shall be considered a small generator for the purposes of the interconnection process described in Section 5.

(5) Notwithstanding paragraphs (3) and (4), above, if a Resource Entity is proposing to increase a generator’s real power rating by ten MW or more, or is proposing to increase a generator’s real power rating from less than ten MW to ten MW or more, that generator shall be considered a large generator for the purposes of the interconnection process described in Section 5.

(6) For the purposes of determining the appropriate requirements in Section 5, ERCOT may require two or more separate generator interconnection requests to the same substation to follow the interconnection process applicable to the large generators, if, following the proposed change, those generators would have an aggregate nameplate capacity of ten MW or greater, and the projects are proposed by the same Entity or Affiliates.

(7) For a new or modified generator that has been designated as a Self-Limiting Facility or as a component of a Self-Limiting Facility, the categorization of the generator as a small generator or large generator pursuant to paragraphs (3) through (5) above shall be determined using the Self-Limiting Facility’s established limit on the total MW Injection, or if applicable, the proposed increase in that value instead of the nameplate capacity of the Self-Limiting Facility.

5.5 Generator Commissioning and Continuing Operations

(1) Each Interconnecting Entity (IE) shall meet the conditions established by ERCOT before proceeding to Initial Energization, Initial Synchronization, and commercial operations. These conditions may require proof of meeting applicable ERCOT requirements, which may include, but are not limited to, reactive capability, voltage ride-through standards, dynamic model template submission, Automatic Voltage Regulator (AVR), Primary Frequency Response (PFR), Power System Stabilizer (PSS), Subsynchronous Resonance (SSR) models, and telemetry.

(2) Prior to the Resource Commissioning Date of an IBR, the IE associated with the IBR shall submit the appropriate dynamic models for the “as-built” data and the data submitted for the quarterly stability assessment, documentation clearly indicating any differences, results of the model quality tests of the “as-built” data overlaid with the results of the data submitted for the quarterly stability assessment, and associated simulation files pursuant to paragraph (5)(c) of Section 6.2, Dynamics Model Development. Submissions shall be sent electronically to Dynamicmodels@ercot.com for ERCOT review, and the phrase "IBR prior to commissioning" must be included in the subject line of the submission email. ERCOT shall respond to the IE within 10 Business Days of the submission, indicating whether the submission is acceptable or if additional information is required. If additional time is needed for review, ERCOT can extend this review period by an additional 20 Business Days, and an email will be sent to notify the IE that it needs additional time to review the submission.

(3) No later than 30 days following the Resource Commissioning Date, the IE shall submit updates to the resource dynamic planning and operations models through the online Resource Integration and Ongoing Operations (RIOO) system based on “as-built” data and provide a plant verification report as required by paragraph (5)(b) of Section 6.2. Pursuant to paragraph (5)(c) of Section 6.2, the IE shall include model updates with model quality tests.

(4) During continuing operations:

(a) Prior to the implementation of any modification to settings or equipment associated with IBRs that affects electrical performance and requires dynamic model updates, the proposed modification shall be reviewed by the interconnecting Transmission Service Provider (TSP) and ERCOT;

(i) The Resource Entity shall submit the appropriate dynamic model for the proposed modification, results of the model quality tests overlaid with the results before the modification, and associated simulation files pursuant to paragraph (5)(c) of Section 6.2. Submissions shall be sent electronically to Dynamicmodels@ercot.com for ERCOT review, and the phrase "IBR proposed modification" must be included in the subject line of the submission email. The Resource Entity may withdraw its modification plan at any time during the review process if the Resource Entity no longer wishes to proceed with the modification.

(ii) ERCOT shall respond to the Resource Entity within 10 Business Days of the submission in paragraph (i) above, indicating whether the submission is acceptable or if additional information is required. ERCOT can extend this review period by an additional 20 Business Days, and an email will be sent to notify the Resource Entity that it needs additional time to review the submission.

(iii) Upon completing its review of the model quality tests, ERCOT shall notify the Resource Entity and the interconnecting TSP of its determination. The notification will indicate one of the following:

1. ERCOT recommends that the interconnecting TSP conduct a limited dynamic stability study comparing electrical performance before and after the proposed modification, and reasonably evaluate whether the proposed modification may present dynamic stability risks that should be subject to further study.
2. The proposed modification is applicable to paragraph (1)(c)(iii) of

Section 5.2.1, Applicability. The Resource Entity shall initiate a Generator Interconnection or Modification (GIM) request through RIOO.

1. The proposed modification is deemed unacceptable.
2. The proposed modification is deemed acceptable without need for a dynamic stability study.

(iv) Within 90 days of the receipt of the accepted submission in paragraph (iii)(A) above, the interconnecting TSP shall submit its dynamic stability study report to ERCOT electronically to Dynamicmodels@ercot.com.

(v) ERCOT shall review the dynamic stability study report submitted by the interconnecting TSP within 10 Business Days.  ERCOT can extend this review period by an additional 20 Business days, and an email will be sent to notify the interconnecting TSP and the Resource Entity that it needs additional time to review the dynamic stability study report.

(vi) Upon completing its review and ERCOT acceptance of the dynamic stability study report, ERCOT shall notify the Resource Entity and the interconnecting TSP of its determination. The notification will indicate one of the following:

1. The proposed modification is deemed acceptable.
2. The proposed modification is applicable to paragraph (1)(c)(iii) of Section 5.2.1. The Resource Entity shall initiate a GIM request through RIOO.

(vii) ERCOT, in consultation with the interconnecting TSP, may allow the proposed changes to be temporarily implemented prior to the completion of the above review process in order to address any identified performance deficiency.

(b) Pursuant to paragraph (5)(c) of Section 6.2, the Resource Entity shall include model updates with model quality tests.

(c) The Resource Entity shall provide ERCOT with a plant verification report as required by paragraph (5)(b) of Section 6.2 at the following times:

(i) No later than 30 days after implementing a settings change as required by paragraph (7) of Section 6.2;

(ii) No earlier than 12 months and no later than 24 months following the later of the Resource Commissioning Date or March 1, 2021; and

(iii) A minimum of every ten years.