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| PGRR Number | [054](http://www.ercot.com/mktrules/issues/PGRR054) | PGRR Title | Stability Limits in the Full Interconnect Study |
| Date Posted | | November 15, 2016 | |
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| Requested Resolution | | Normal | |
| Planning Guide Sections Requiring Revision | | 5.4.2, Full Interconnection Study  5.4.3, Steady-State Analysis  5.4.5, Dynamic and Transient Stability (Unit Stability, Voltage, Subsynchronous Resonance) Analysis  5.4.5.1, Subsynchronous Resonance Studies  5.4.8, FIS Study Report and Follow-up  5.4.10 Confidentiality  5.7.5, Interconnection Process Timetables  7.1, Planning Data and Information | |
| Related Documents Requiring Revision/Related Revision Requests | | Planning Guide Revision Request (PGRR) 052, Stability Assessment for Interconnecting Generation  PGRR053, Addition of Proposed All-Inclusive Generation Resources to the Planning Models  NPRR809, GTC or GTL for New Generation Interconnection | |
| Revision Description | | This Planning Guide Revision Request (PGRR) clarifies the content, review period and process for posting the results of a Full Interconnection Study (FIS). This PGRR also establishes a process for identifying, proposing, and implementing solutions to stability issues identified during the FIS. | |
| 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 | | A number of recent FISs have identified stability limits associated with generating levels below the full capacity of newly interconnecting generating unit(s). During the commissioning process for these units, the Interconnecting Entity (IE) provided updates to the model data used in the FIS having the potential to impact the results of the stability limit identified in the FIS.  In these instances, ERCOT established a Generic Transmission Constraint (GTC) in order to ensure that the new unit could be brought On-Line with the expectation of being able to reliably operate the system. However, due to time constraints, these GTCs had to be established based on the FIS without consideration given to the new model data obtained from the IE.  There is the potential for transmission system changes which were not reflected in the FIS to be implemented between completion of the FIS and the date when an IE first seeks to connect to the transmission system.  In addition, some Market Participants have raised concerns that the existing time table allows FIS study results to be released to an IE prior to the FIS being available to all Market Participants. Therefore, this PGRR establishes that FIS study results be made available to the IE at the same time that it is made available to all Market Participants. | |

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| Proposed Guide Language Revision |

5.4.2 Full Interconnection Study

(1) An FIS consists of the set of steady-state, dynamic, short-circuit, facility studies, along with other relevant studies that are necessary to determine the reliability impact on affected Transmission Facilities and identify the Transmission Facilities that are needed to reliably interconnect the new or modified Generation Resource to the ERCOT System, in accordance with the Planning Guides. The FIS is not intended to determine the deliverability of power from the proposed Generation Resource to market or to ensure that the proposed Generation Resource does not experience any congestion-related curtailment.

(2) The IE must provide the appropriate Stability Modeling Fee and proof of site control.

(3) The IE can request an FIS at any time after ERCOT deems the initial GINR application complete, which can be before completion of the Security Screening Study, but must respect the timeline set forth in paragraph (5) of Section 5.4.1, Security Screening Study. Requesting both studies at the same time may shorten the overall time to complete the GINR process due to overlap of work on both studies.

(4) ERCOT shall manage a confidential email list (Transmission Owner Generation Interconnection) to facilitate communication of confidential GINR-related information among TSP(s) and ERCOT. Membership to this email list will be limited to ERCOT and appropriate TSP personnel.

5.4.3 Steady-State Analysis

(1) The steady-state interconnection study base case shall be created from the most recently approved Steady State Working Group (SSWG) base case. TSP(s) or ERCOT may remove any future (currently nonexistent) facility from the steady-state interconnection study base case if either determines that the facility may significantly affect the interconnection study results and the facility has not already undergone appropriate review by the Regional Planning Group (RPG). In addition, ERCOT and TSP(s) may include other publicly disclosed GINRs in the steady-state interconnection study base case. ERCOT may request a list of the interconnection requests included in the FIS by the TSP(s). Modifications to the SSWG base case, necessary to evaluate the study results, shall be documented in the FIS but not to the extent that documenting the modifications would reveal Protected Information.

(2) The TSP(s) shall perform contingency analyses as required by the NERC Reliability Standards, Protocols, this Planning Guide and the Operating Guides and identify any additional facilities that may be necessary to ensure that expected system performance conforms to these standards. All facilities necessary to reliably interconnect the proposed generation will be determined and clearly identified in the report for this part of the FIS. Any facility that cannot be constructed or otherwise completed in time to accommodate Initial Synchronization will be identified and reported to the IE along with any likely limitations of generation output that may result.

(3) Loss-of-generation analyses shall assume that the lost generation will be replaced from all remaining Generation Resources in proportion to their nominal capacity (i.e., inertial response), and shall consider the generation limit of each Generation Resource.

(4) The lead TSP is responsible for completing an analysis of any contingency events or Outages that could result in a violation of the NERC Reliability Standards, Protocols, this Planning Guide and the Operating Guides, regardless of which TSP owns the facilities involved. The results of this analysis will be shared with TSP(s) that have facilities involved in planning criteria violations and those affected TSP(s) will be responsible for attempting to evaluate the validity of the anticipated violations.

5.4.5 Dynamic and Transient Stability (Unit Stability, Voltage, Subsynchronous Resonance) Analysis

(1) At the discretion of the TSP(s) or ERCOT, the TSP will perform transient stability studies if necessary to meet NERC Reliability Standards, Protocols, this Planning Guide or the Operating Guides applicable to the Generation Resource or the ERCOT System.

(2) If the TSP(s) in charge of these stability studies decides not to conduct the studies, the TSP(s) must provide a written justification in lieu of the study report. When performing such studies, all existing or publicly committed Generation Resource in the area of the study will normally be represented at full net output, although some Combined Cycle Generation Resources or coal plants might be modeled at full gross output (including auxiliary load). Any resulting increase in generation will be balanced as addressed in the FIS scope agreement.

(3) Stability study base cases shall be formed from the latest available approved SSWG base cases consistent with the most recently approved Dynamics Working Group (DWG) stability data base. The initial transmission configuration in the area of study included in a stability study base case shall be identical to that used in the steady-state studies of the same period. Any previously identified transmission improvements that will not be in service prior to the Initial Synchronization of the proposed Generation Resource shall not be included in the stability study base case.

(4) Transient stability studies will analyze the performance of the proposed Generation Resource and the ERCOT System in terms of angular stability, voltage stability and excessive frequency excursions. Additional studies may include small signal stability or critical clearing time analyses where the number of cycles for which a transmission line can sustain a fault without causing loss of synchronism of any of the Resource is compared to the response of the protection systems. Such studies should incorporate reasonable and conservative assumptions regarding plant operating conditions. Proposed analyses shall be identified and defined in the FIS scope agreement.

(5) All stability studies shall be performed in accordance with NERC Reliability Standards, Protocols, this Planning Guide and the Operating Guides. The stability study portion of the FIS shall document any instability identified through performance of the study.

(6) If the TSP identifies instability (other than instability identified for extreme events) in the stability portion of the FIS, the following steps will be taken subsequent to the FIS being deemed complete and posted in the MIS Secure Area in accordance with Section 5.4.8, FIS Study Report and Follow-up:

(a) The IE and TSP shall investigate alternative solutions to resolve the instability through changes to the proposed Generation Resource and report their findings to ERCOT. If changes to the Generation Resource are determined by ERCOT to be feasible, the IE shall implement the changes prior to Initial Synchronization.

(b) If ERCOT determines that changes to the proposed Generation Resource are not feasible to resolve the identified instability, the TSP shall investigate a transmission improvement to resolve the instability and report their findings to ERCOT.

(c) If ERCOT determines that a proposed transmission improvement is feasible to resolve the identified instability the TSP shall proceed with implementing the transmission improvement, in accordance with Protocol Section 3.11.4, Regional Planning Group Project Review Process, identified in paragraph (b) above after the requirements of Section 6.9, Addition of Proposed Generation Resources to the Planning Models, have been met for the proposed Generating Resource.

(d) If the transmission improvement identified in paragraph (b) or (c) above cannot be implemented prior to Initial Synchronization, ERCOT shall determine the appropriate operating limit, including evaluating the feasibility of a proposed Remedial Action Scheme (RAS) that may mitigate the limit, in accordance with Section 5.9, Quarterly Stability Assessment, prior to Initial Synchronization.

5.4.5.1 Subsynchronous Resonance (SSR) Studies

(1) ERCOT shall establish criteria for evaluating SSR studies.

(2) If the Security Screening Study determines that an additional SSR study is required, the interconnecting TSP shall perform the more detailed study for the IE prior to Initial Synchronization. However, to the extent that the IE can demonstrate with sufficient documentation that the Generation Resource is not vulnerable to SSR and has no negative impact to the ERCOT System, then ERCOT and the interconnecting TSP shall determine whether the IE’s documentation obviates the need for the affected TSP to perform the more detailed study. The SSR study shall determine which system configurations create a vulnerability to SSR and endeavor to identify possible measures to mitigate the risk of SSR.

(3) If studies indicate that a design proposal for a proposed Generation Resource is vulnerable to SSR with the ERCOT Transmission Grid, ERCOT shall consult with the IE and any affected interconnecting TSP(s) and may require a mitigation plan as a condition of interconnection of a Generation Resource. ERCOT may require that the TSP(s) mitigate this vulnerability on the ERCOT Transmission Grid and/or the IE mitigate this vulnerability at the generation project prior to Initial Synchronization . ERCOT shall approve all mitigation plans. Any mitigation plan shall be consistent with NERC Reliability Standards, Protocols, this Planning Guide, Nodal Operating Guides, and Other Binding Documents.

5.4.8 FIS Study Report and Follow-up

(1) The TSP(s) will present a preliminary report of its findings and recommendations for each of the study elements to ERCOT and to the other TSP(s) via the confidential Transmission Owner Generation Interconnection email list.

(2) Any questions, comments, proposed revisions, or clarifications by any party shall be made in writing to the TSP(s) within ten Business Days after the issuance of each study report, which may cover one or more study elements. ERCOT can extend this review period by an additional 20 Business Days by notifying the affected TSP(s) and the IE that it needs additional time to review the report.

(3) After considering the information received from ERCOT and other TSPs, the study element(s) report will be deemed complete and a final report shall be provided to ERCOT and all TSPs. The TSP(s) conducting the FIS shall submit the dynamic and transient stability analysis and any sub-synchronous oscillation analysis as separate documents from the remainder of the report. The ten Business Day review period will be used by ERCOT to determine if any transmission upgrades proposed and clearly identified in the Steady-State Study Report need to be submitted to the RPG review process. Protocol Section 3.11, Transmission Planning, provides more information on the process to review transmission upgrades that are unrelated to the direct connection of new or modified generation.

(4) ERCOT shall post to the MIS Secure Area the final study element(s) report within ten Business Days after the study element(s) report has been deemed complete. After being posted, the TSP(s) shall send the final study element(s) report to the IE. Study element(s) reports shall not be sent to the IE prior to being posted to the MIS Secure Area.

(5) The study element(s) report shall not contain sensitive information including, but not limited to, confidential plant design information including stability study model data and parameters and contingencies causing instability. The TSP(s) shall provide this information to ERCOT and other TSP(s) upon request.

(6) The TSP issuing the final FIS element(s) report shall indicate that the report is the final report required by the FIS. At the end of the ten Business Day review period following the issuance of the final FIS element(s) report, the FIS will be deemed complete and the IE and TSP may execute an SGIA. If an economic study of the direct interconnection facilities is required, pursuant to Section 5.4.7, Economic Study, and has not yet been completed, the IE and TSP may agree that the completion of the economic study is not required before the FIS is deemed complete.

(7) Should the IE wish to proceed with the proposed GINR, the IE must execute an SGIA with the respective TSP within 180 days following the completion of the FIS (includes all major study element(s) reports).

(8) If during the time after the FIS is completed and before meeting Section 6.9 requirements changes occur that substantially differ from the assumptions used for the FIS, ERCOT and the TSP(s) shall determine the impact of the changes on the results of the FIS. All changes shall be submitted to ERCOT through the Resource Registration process for a change comparison. If the changes are determined by ERCOT to have the potential to materially alter the conclusions documented in the FIS, the TSP(s) will make appropriate modifications to the FIS. The updated FIS reports will be submitted to ERCOT and to the other TSP(s) via the confidential Transmission Owner Generation Interconnection email list. Any questions, comments, proposed revisions, or clarifications by any party shall be made in writing to the TSP(s) within ten Business Days after the issuance of an updated study report.

5.4.10 Confidentiality

(1) All data, documents or other information regarding the GINR, including the identity of the IE, will remain Protected Information until ERCOT receives written Notice from the IE that this information may be made public or until the IE requests an FIS. Since the FIS scope agreement contains possibly confidential cost estimates and represents an agreement between the IE and the lead TSP, it will remain Protected Information and will not be released to parties other than those who are members of the confidential Transmission Owner Generation Interconnection email list except as required in a court of law or by regulatory authorities having jurisdiction. Once classified as a public project through one of these steps, ERCOT will post on the ERCOT MIS Secure Area the project description, all FIS reports, the results of the economic analysis of direct interconnection facilities costing over $25,000,000, and any information developed throughout the interconnection study process about transmission improvement projects that may be submitted for RPG review as a result of the new generation.

(2) The lead TSP will notify the RPG email list within ten Business Days of the signing of an SGIA when the cost of the direct interconnection facilities is greater than $25,000,000.

5.7.5 Interconnection Process Timetables

(1) P.U.C. Subst. R. 25.198, Initiating Transmission Service, provides deadlines for ERCOT and TSP(s) to complete and report on the required interconnection studies provided that the IE submits all required data and appropriate fee(s). Therefore, the IE must ensure that ERCOT and the TSP(s) performing these studies receive all required data in order to establish reasonable study models and assumptions that provide meaningful results and recommendations for interconnecting the proposed generating project.

(2) Because the FIS is generally the critical path item in the GINR process, ERCOT recommends that a timetable for the FIS be developed and included in the study scope agreement. In addition, major improvements to the transmission system resulting from interconnection requests should be identified as early in the process as possible so project validity can be considered before the parties go forward with extensive interconnection studies. Once the FIS is underway, the parties may determine whether an adjustment to the original estimated completion date is necessary. Should a schedule adjustment become necessary, the parties must provide Notice to ERCOT and the TSP(s) as soon as practicable, indicating the revised expected completion date.

(3) The following timetable complies with P.U.C. Subst. R 25.198. It is intended to serve as a guideline only and the times stated are not requirements unless stated elsewhere in this section. If the number of days shown is less than 30, these are Business Days; if the number of days shown is 30 days or more, these are calendar days.

| Task | Responsible Entity | Time Required to Complete (Days) |
| --- | --- | --- |
| Acknowledgement of GINR Application | ERCOT | 1 to 10 |
| Notification of Additional Information Needed to Complete Application | ERCOT | 1 to 15 |
| Perform Security Screening Study (after application is deemed complete) | ERCOT | 10 to 90 |
| Decision to Pursue FIS (following issuance of Security Screening Study by ERCOT) | IE | Up to 180 |
| Develop Scope Agreement for FIS (following IE’s Notification to ERCOT of desire for FIS and remittance of appropriate fees) | IE, ERCOT, and TSP(s) | Up to 60 |
| Perform FIS (following agreement on scope) |  | 40 to 300 |
| *Steady-State and Transfer Analysis* | TSP(s) | 10 to 90 |
| *System Protection Analysis (following Steady-State Analysis)* | TSP(s) | 10 to 30 |
| *Dynamic and Transient Stability Analysis (following System Protection Study)* | TSP(s) | 10 to 90 |
| *Facility Study* | TSP(s) | 10 to 90 |
| *SSR* | TSP(s) or IE | Prior to Initial Synchronization |
| Study Report Review and Acceptance (following issuance of FIS) | ERCOT, and TSP(s) | 10 to 15 |
| FIS Posted to MIS | ERCOT | Within 10 days of being deemed complete |
| Negotiate and Execute Standard Generation Interconnection Agreement  (SGIA) (following acceptance of FIS) | IE and TSP | 180 |

***7.1 Planning Data and Information***

(1) The information available on the applicable Market Information System (MIS) (i.e., Public, Secure or Certified Areas) includes, but is not limited to, planning information pertaining to the following:

(a) Long-term planning;

(b) Regional transmission planning;

(c) Steady state data;

(d) Resource integration;

(e) Case studies and files used in planning;

(f) Model information; and

(g) Data and information available to specific groups of Market Participants.

(i) Market Participants with a nondisclosure agreement with ERCOT have designated sections on the MIS that allow access to the certified posting of group information.

(ii) Market Participants may access the artifacts posted for their respective groups on the MIS Secure Area.

(2) The list below includes both data set and designated MIS classification of the available planning data and information. Where the information is classified as “Certified,” the appropriate Market Participant category or group is also indicated.

| **Data Set** | **Classification** |
| --- | --- |
| Aggregated Wind Output | Public |
| Annual Planning Model Data Submittal Schedule | Secure |
| Demand and Energy Monthly Reports | Secure |
| Dynamic Data Information | Certified (all Transmission Service Providers (TSPs)) |
| Economic Studies of Transmission Projects for New Generation | Secure |
| ERCOT Long-Term System Assessment | Secure |
| ERCOT Steady State Planning Contingency Files | Secure |
| ERCOT System Operating Limit (SOL) Methodology | Public |
| Generation Data Forms | Secure |
| Documents Initiating a Generation Interconnection or Change Request | Certified (all TSPs) |
| GINR Security Screening Studies and Supporting Documents | Secure |
| Sub-Synchronous Oscillation Studies and Supporting Documents | Certified (all TSPs) |
| FIS: Steady-State, System Protection, Stability, and Facility Studies and Supporting Documents (except for protected information) | Secure |
| FIS: Draft Steady-State, System Protection, Stability, and Facility Studies and Supporting Documents | Certified (all TSPs) |
| IMM and Topology Processor Supporting Documents | Certified (all TSPs) |
| PDCWG Group Documents and Project Files | Certified (PDCWG members) |
| Planning Horizon Transmission Capability Methodology | Public |
| Public Generation Information | Public |
| RAP Review Cases | Certified (all TSPs) |
| RARF Generator Data | Certified (specific Resource Entity) |
| Regional Planning Group Projects | Secure |
| Regional Transmission Plan Postings | Secure |
| Seasonal Voltage Profile Studies | Certified (all TSPs) |
| Special Planning Studies | Secure |
| Steady State Power Flow Base Cases | Secure |
| Steady State Power Flow Case Data | Certified (all TSPs) |
| Steady State Topology Processor Files | Secure |
| Steady State TPIT Procedures | Secure |
| System Protection Short Circuit Data | Secure |
| Transient Stability Screening Study for ERCOT System | Certified (all TSPs) |
| TSP Planning Criteria and Procedures | Secure |
| Voltage Stability Screening Study for ERCOT System | Certified (all TSPs) |