|  |  |  |  |
| --- | --- | --- | --- |
| PGRR Number | [115](https://www.ercot.com/mktrules/issues/PGRR115) | PGRR Title | Related to NPRR1234, Interconnection Requirements for Large Loads and Modeling Standards for Loads 25 MW or Greater |
| Date Posted | | May 28, 2024 | |
|  | |  | |
| Requested Resolution | | Normal | |
| Planning Guide Sections Requiring Revision | | 2.1, Definitions  4.1.1.1, Planning Assumptions  4.1.1.2, Reliability Performance Criteria  5.2.10, Required Interconnection Equipment (new)  5.3.5, ERCOT Quarterly Stability Assessment  6.6, Modeling of Large Loads (new)  6.6.1, Modeling of Large Loads Not Co-Located with a Generation Resource, Energy Storage Resource (ESR), or Settlement Only Generator (SOG) (new)  6.6.2, Modeling of Large Loads Co-Located with an Existing Generation Resource, Energy Storage Resource (ESR), or Settlement Only Generator (SOG) (new)  6.6.3, Modeling of Large Loads Co-Located with a Proposed Generation Resource, Energy Storage Resource (ESR), or Settlement Only Generator (SOG) (new)  9, Large Load Additions at New or Existing Interconnection(s) (new)  9.1, Introduction (new)  9.2, General Provisions (new)  9.2.1, Applicability of the Large Load Interconnection Study Process (new)  9.2.2, Submission of Large Load Project Information and Initiation of the Large Load Interconnection Study (LLIS) (new)  9.2.3, Modification of Large Load Project Information (new)  9.2.4, Load Commissioning Plan (new)  9.2.5, Required Interconnection Equipment (new)  9.3, Interconnection Study Procedures for Large Loads (new)  9.3.1, Large Load Interconnection Study (LLIS) (new)  9.3.2, Large Load Interconnection Study Scoping Process (new)  9.3.3, Large Load Interconnection Study Description and Methodology (new)  9.3.4, Large Load Interconnection Study Elements (new)  9.3.4.1, Steady-State Analysis (new)  9.3.4.2, System Protection (Short-Circuit) Analysis (new)  9.3.4.3, Dynamic and Transient Stability (Load Stability, Voltage) Analysis (new)  9.4, LLIS Report and Follow-up (new)  9.5, Interconnection Agreements and Responsibilities (new)  9.5.1, Interconnection Agreement for Large Loads not Co-Located with a Generation Resource Facility Registered as a Private Use Network (new)  9.5.2, Interconnection Agreement for Large Loads Co-Located with one or more Generation Connected to Resource Facilities Registered as a Private Use Network (new)  9.6, Initial Energization and Continuing Operations for Large Loads (new) | |
| Related Documents Requiring Revision/Related Revision Requests | | Nodal Protocol Revision Request (NPRR) 1234, Interconnection Requirements for Large Loads and Modeling Standards for Loads 25 MW or Greater | |
| Revision Description | | This Planning Guide Revision Request (PGRR) creates a new process for studying the reliability impacts of all Large Loads (as defined in the accompanying NPRR1234) seeking to interconnect to the ERCOT System. As with the Full Interconnection Study (FIS) required for proposed Generation Resources, this PGRR requires a Large Load Interconnection Study (LLIS) for each new Large Load meeting applicability requirements that is proposed to interconnect to the ERCOT System. Like the FIS, the LLIS will consist of a similar suite of studies conducted by one or more affected Transmission Service Providers (TSPs). This PGRR describes these studies in detail and establishes timelines for the review of these studies and the completion of other steps in the interconnection process.  This PGRR also:   * Requires all Large Loads evaluated via the LLIS to be included in the existing quarterly stability assessment prior to Initial Energization; * Adds additional reliability performance criteria for the inclusion and evaluation of Large Loads in planning studies; * Adds requirements that must be met prior to including a Large Load in the ERCOT Network Operations Model; and * Establishes required interconnection equipment for both Generation Resources and Large Loads. | |
| Reason for Revision | | [Strategic Plan](https://www.ercot.com/files/docs/2023/08/25/ERCOT-Strategic-Plan-2024-2028.pdf) Objective 1 – Be an industry leader for grid reliability and resilience  [Strategic Plan](https://www.ercot.com/files/docs/2023/08/25/ERCOT-Strategic-Plan-2024-2028.pdf) Objective 2 - Enhance the ERCOT region’s economic competitiveness with respect to trends in wholesale power rates and retail electricity prices to consumers  [Strategic Plan](https://www.ercot.com/files/docs/2023/08/25/ERCOT-Strategic-Plan-2024-2028.pdf) Objective 3 - Advance ERCOT, Inc. as an independent leading industry expert and an employer of choice by fostering innovation, investing in our people, and emphasizing the importance of our mission  General system and/or process improvement(s)  Regulatory requirements  ERCOT Board/PUCT Directive  *(please select ONLY ONE – if more than one apply, please select the ONE that is most relevant)* | |
| Justification of Reason for Revision and Market Impacts | | As detailed in the Business Case for the related NPRRXXX, Large Loads present greater risks to system reliability. With an increase in the number of operational and proposed Large Loads on the ERCOT System, a commensurately greater need exists to evaluate the reliability impacts of these Loads before they are allowed to energize. The interconnection process described in this PGRR replaces the interim interconnection process that ERCOT established on March 25, 2022. As with the interim process, the interconnection process described in this PGRR ensures that ERCOT can meet its obligations to evaluate interconnections of new Loads under NERC Reliability Standard FAC-002-3. | |

|  |  |
| --- | --- |
| Sponsor | |
| Name | Bill Blevins |
| E-mail Address | [Bill.Blevins@ercot.com](mailto:Bill.Blevins@ercot.com) |
| Company | ERCOT |
| Phone Number | 512-248-6691 |
| Cell Number |  |
| Market Segment | Not applicable |

|  |  |  |  |
| --- | --- | --- | --- |
| **Market Rules Staff Contact** | | | |
| **Name** | | Cory Phillips | |
| **E-Mail Address** | | [cory.phillips@ercot.com](mailto:cory.phillips@ercot.com) | |
| **Phone Number** | | 512-248-6464 | |
|  | |  | |
| **Market Rules Notes** | | | |

Please note that the following PGRR(s) also propose revisions to the following section(s):

* PGRR107, Related to NPRR1180, Inclusion of Forecasted Load in Planning Analyses
  + Section 4.1.1.1
* PGRR112, Dynamic Data Model and Full Interconnection Study (FIS) Deadline for Quarterly Stability Assessment
  + Section 5.3.5
* PGRR113, Related to NPRR1198, Congestion Mitigation Using Topology Reconfigurations
  + Section 4.1.1.2

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

## 2.1 DEFINITIONS

**Load Commissioning Plan**

A schedule for connecting a Large Load, in the format prescribed by ERCOT, detailing dates, cumulative peak Demand amounts, and required transmission upgrades from the Initial Energization date up to the final amount of peak Demand.

**4.1.1.1 Planning Assumptions**

(1) A contingency loss of an element includes the loss of an element with or without a single line-to-ground or three-phase fault.

(2) A common tower outage is the contingency loss of a double-circuit transmission line consisting of two circuits sharing a tower for 0.5 miles or greater.

(3) Unavailability of a single generating unit includes an entire Combined Cycle Train, if no part of the train can operate with one of the units Off-Line as provided in the Resource Registration data.

(4) The contingency loss of a single generating unit shall include the loss of an entire Combined Cycle Train, if that is the expected consequence.

(5) The following assumptions may be applied to the SSWG base cases for use in planning studies:

(a) Reasonable variations of Load forecast;

(b) Reasonable variations of generation commitment and dispatch applicable to transmission planning analyses on a case-by-case basis may include, but are not limited to, the following methods:

(i) Production cost model simulation, security constrained optimal power flow, or similar modeling tools that analyze the ERCOT System using hourly generation dispatch assumptions;

(ii) Modeling of high levels of intermittent generation conditions; or

(iii) Modeling of low levels of or no intermittent generation conditions.

(6) Assumed Direct Current Tie (DC Tie) imports and exports will be curtailed as necessary to meet reliability criteria in planning studies.

(7) Each Large Load included in a planning study shall be set to a level of Demand consistent with the current Load Commissioning Plan.

|  |
| --- |
| ***[PGRR098: Insert paragraph (8) below upon system implementation:]***  (8) Manual System Adjustments shall not increase the amount of consequential Load loss following a common tower outage, or the contingency loss of a single generating unit, transmission circuit, transformer, shunt device, FACTS device, or DC Tie Resource or DC Tie Load, with or without a single line-to-ground fault. |

**4.1.1.2 Reliability Performance Criteria**

(1) The following reliability performance criteria (summarized in Table 1, ERCOT-specific Reliability Performance Criteria, below) shall be applicable to planning analyses in the ERCOT Region:

(a) With all Facilities in their normal state, following a common tower outage with or without a single line-to-ground fault, all Facilities shall be within their applicable Ratings, the ERCOT System shall remain stable with no cascading or uncontrolled Islanding, and there shall be no non-consequential Load loss;

(b) With all Facilities in their normal state, following an outage of a Direct Current Tie (DC Tie) Resource or DC Tie Load with or without a single line-to-ground fault, all Facilities shall be within their applicable Ratings, the ERCOT System shall remain stable with no cascading or uncontrolled Islanding, and there shall be no non-consequential Load loss;

(c) With all Facilities in their normal state, following an outage of a Large Load with or without a three-phase fault, all Facilities shall be within their applicable Ratings, and the ERCOT System shall remain stable with no cascading or uncontrolled Islanding. There shall be no non-consequential Load loss;

(d) With any single generating unit unavailable, followed by Manual System Adjustments, followed by a common tower outage, the opening of a line section without a fault, or outage of a DC Tie Resource or DC Tie Load with or without a single line-to-ground fault, all Facilities shall be within their applicable Ratings, the ERCOT System shall remain stable with no cascading or uncontrolled Islanding, and there shall be no non-consequential Load loss;

(e) With any single transformer, with the high voltage winding operated at 300 kV or above and low voltage winding operated at 100 kV or above unavailable, followed by Manual System Adjustments, followed by a common tower outage, the opening of a line section without a fault, or the contingency loss of a single generating unit, transmission circuit, transformer, shunt device, flexible alternating current transmission system (FACTS) device, or DC Tie Resource or DC Tie Load with or without a single line-to-ground fault, all Facilities shall be within their applicable Ratings, the ERCOT System shall remain stable with no cascading or uncontrolled Islanding, and there shall be no non-consequential Load loss. An operational solution may be planned on a permanent basis to resolve a performance deficiency under this condition; and

(f) With any single DC Tie Resource or DC Tie Load unavailable, followed by Manual System Adjustments, followed by a common tower outage, the opening of a line section without a fault, or the contingency loss of a single generating unit, transmission circuit, transformer, shunt device, FACTS device, or DC Tie Resource or DC Tie Load, with or without a single line-to-ground fault, all Facilities shall be within their applicable Ratings, the ERCOT System shall remain stable with no cascading or uncontrolled Islanding, and there shall be no non-consequential Load loss. An operational solution may be planned on a permanent basis to resolve a performance deficiency under this condition.

| **Initial Condition** | | **Event** | **Facilities within Applicable Ratings and System Stable with No Cascading or Uncontrolled Outages** | **Non-consequential Load Loss Allowed** |
| --- | --- | --- | --- | --- |
| 1 | Normal System | Common tower outage, DC Tie Resource outage, DC Tie Load outage, or the outage of a Large Load | Yes | No |
| 2 | Unavailability of a generating unit, followed by Manual System Adjustments | Common tower outage, DC Tie Resource outage, or DC Tie Load outage, or opening of a line section without a fault | Yes | No |
| 3 | Unavailability of a transformer with the high voltage winding operated at 300 kV or above and low voltage winding operated at 100 kV or above, followed by Manual System Adjustments | Common tower outage; opening of a line section without a fault; or  Contingency loss of one of the following:  1. Generating unit;  2. Transmission circuit;  3. Transformer;  4. Shunt device;  5. FACTS device; or  6. DC Tie Resource or DC Tie Load | Yes | No |
| 4 | Unavailability of a DC Tie Resource or DC Tie Load, followed by Manual System Adjustments | Common tower outage; Opening of a line section without a fault; or  Contingency loss of one of the following:  1. Generating unit;  2. Transmission circuit;  3. Transformer;  4. Shunt device;  5. FACTS device; or  6. DC Tie Resource or DC Tie Load | Yes | No |

Table 1: ERCOT-specific Reliability Performance Criteria

(2) ERCOT and the TSPs shall endeavor to resolve any performance deficiencies as appropriate. If a Transmission Facility improvement is required to meet the criteria in this Section 4.1.1.2, but the improvement cannot be implemented in time to resolve the performance deficiency, an interim solution may be used to resolve the deficiency until the improvement has been implemented.

(a) A Remedial Action Scheme (RAS) shall not be planned to resolve a planning criteria performance deficiency unless it is expected that system conditions will change such that the RAS will no longer be needed within the next five years.

***5.2.10 Required Interconnection Equipment***

(1) Each Point of Interconnection (POI) for a Generation Resource, Energy Storage Resource (ESR), or Settlement Only Generator (SOG) interconnected at transmission voltage to the ERCOT System must have a permanent configuration consisting of a station with breakers capable of interrupting fault current to sectionalize the transmission lines connecting the station to the ERCOT System. The breakers shall be under the remote control of the applicable TO and capable of being operated remotely to comply with an instruction from ERCOT.

***5.3.5 ERCOT Quarterly Stability Assessment***

(1) ERCOT shall conduct a stability assessment every three months to assess the impact of planned large generators and Large Loads connecting to the ERCOT System.

(a) For large generators with planned Initial Synchronization in the period under study, the assessment shall derive the conditions to be studied with consideration given to the results of the FIS stability studies.

(b) For Large Loads with planned Initial Energization in the period under study, the assessment shall derive the conditions to be studied with consideration given to the results of the LLIS stability studies.

(c) ERCOT may study conditions other than those identified in the FIS or LLIS stability studies.

(2) Large generators that are not included in the assessment as described in this Section as result of the IE failing to meet the prerequisites by the deadlines as listed in the table below will not be eligible for Initial Synchronization during that three-month period. Large Loads that are not included in the assessment as described in this Section as result of failing to meet the prerequisites by the deadlines as listed in the table below will not be eligible for Initial Energization during that three-month period. The timeline for the quarterly stability assessment shall be in accordance with the following table:

|  |  |  |
| --- | --- | --- |
| **Generator Initial Synchronization or Large Load Initial Energization Date** | **Last Day for an IE, Resource Entity, or TSP to meet prerequisites as listed in paragraphs (4) and (5) below** | **Completion of Quarterly Stability Assessment** |
| Upcoming January, February, March | Prior August 1 | End of October |
| Upcoming April, May, June | Prior November 1 | End of January |
| Upcoming July, August, September | Prior February 1 | End of April |
| Upcoming October, November, December | Prior May 1 | End of July |

(3) If the last day for an IE, Resource Entity, or TSP to meet prerequisites or if completion of the quarterly stability assessment as shown in the above table falls on a weekend or holiday, the deadline will extend to the next Business Day.

(4) Prerequisites to be satisfied prior to the large generator being included in the quarterly stability assessment:

(a) The generator has met the requirements of Section 6.9, Addition of Proposed Generation to the Planning Models.

(b) The IE has provided all generator data in accordance with the Resource Registration Glossary, Planning Model column, including but not limited to steady state, system protection and stability models.

(i) The dynamic data model will be reviewed by ERCOT prior to the quarterly stability assessment and shall be submitted by the IE 30 days before the quarterly stability assessment deadline. If this review cannot be completed prior to the quarterly stability assessment deadline, ERCOT may refuse to allow Initial Synchronization of the Generation Resource or Settlement Only Generator (SOG) in the three-month period associated with the quarterly stability assessment deadline. ERCOT shall include the Generation Resource or SOG in the next quarterly stability assessment period provided that the review of the dynamic data model has been completed prior to the next quarterly stability assessment’s deadline.

(c) The following elements must be complete:

(i) FIS studies;

(ii) Reactive Power Study; and

(iii) System improvements or mitigation plans that were identified in these studies as required to meet the operational standards established in the Protocols, Planning Guide, Nodal Operating Guides, and Other Binding Documents prior to synchronizing the generator.

(d) The data used in the studies identified in paragraph (4)(c) above is consistent with data submitted by the IE as required by Section 6.9.

(5) The following prerequisites must be satisfied prior to the inclusion of a Large Load in the quarterly stability assessment:

(a) The Large Load has met the requirements of Section 9.4, LLIS Report and Follow-up, and Section 9.5, Interconnection Agreements and Responsibilities;

(b) The interconnecting TSP has provided all necessary modeling data. The model data must include, but is not limited to steady state, system protection, and stability models;

(i) The dynamic data model will be reviewed by ERCOT prior to the quarterly stability assessment and shall be submitted by the interconnecting TSP 45 days before the quarterly stability assessment deadline. If this review cannot be completed prior to the quarterly stability assessment deadline, ERCOT may refuse to allow Initial Energization in the three-month period associated with the quarterly stability assessment deadline. ERCOT shall include the Large Load in the next quarterly stability assessment period provided that the review of the dynamic data model has been completed prior to the next quarterly stability assessment’s deadline;

(c) The following elements must be complete;

(i) Reactive Power Study, if required according to Protocol Section 3.15, Voltage Support; and

(ii) SSR Study, if required according to Protocol Section 3.22.1.4, Large Load Interconnection Assessment; and

(d) The data used in the studies identified in paragraph (c) above is consistent with data used in the final LLIS studies approved per Section 9.4, LLIS Report and Follow-up.

(6) At any time following the inclusion of a large generator or applicable Large Load in a stability assessment, but before the Initial Synchronization of the generator or Initial Energization of the Large Load, if ERCOT determines, in its sole discretion, that the generator or Large Load no longer meets the prerequisites described in paragraphs (4) or (5) above, or that an IE or ILLE has made a change to the design of the generator or Large Load that could have a material impact on ERCOT System stability, then ERCOT may refuse to allow Initial Synchronization of the generator or Initial Energization of the Large Load. ERCOT shall include the generator or Large Load in the next quarterly stability assessment period that commences after identification of the material change or after the generator or Large Load meets the prerequisites specified in paragraphs (4) or (5) above, as applicable. If ERCOT determines, in its sole discretion, that the change to the design of the generator or Large Load would not have a material impact on ERCOT System stability, then ERCOT may not refuse to allow Initial Synchronization of the generator or Initial Energization of the Large Load due to this change.

(7) ERCOT shall post to the MIS Secure Area a report summarizing the results of the quarterly stability assessment within ten Business Days of completion.

**6.6 Modeling of Large Loads**

***6.6.1 Modeling of Large Loads Not Co-Located with a Generation Resource, Energy Storage Resource (ESR), or Settlement Only Generator (SOG)***

(1) The interconnecting Transmission Service Provider (TSP) shall not add a Large Load to the Network Operations Model until the following conditions have been met:

(a) The LLIS has been completed and communicated per paragraph (7) of Section 9.4, LLIS Report and Follow-up;

(b) The TSP has satisfied all conditions of 9.5.1, Interconnection Agreement for Large Loads not Co-Located with a Generation Resource Facility Registered as a Private Use Network; and

(c) The Large Load has been included in a completed QSA.

***6.6.2*** ***Modeling of Large Loads Co-Located with an Existing Generation Resource, Energy Storage Resource (ESR), or Settlement Only Generator (SOG)***

(1) The addition of a Large Load to an existing Generation Resource, ESR, or SOG is considered a material modification of the Resource Registration as described in paragraph (8) of Section 6.8.2. The Resource Entity (RE) shall update the Resource Registration data to reflect the new or increased Load.

(2) The RE shall not update the Resource Registration data to reflect the new or increased Load until the following requirements have been satisfied:

(a) ERCOT has communicated the completion of the LLIS as described in paragraph (7) of Section 9.4, LLIS Report and Follow-up;

(b) All required interconnection agreements have been executed and acknowledged by all parties as prescribed in Section 9.5.2, Interconnection Agreement for Large Loads Co-Located with one or more Generation Resource Facilities Registered as a Private Use Network;

(c) The Large Load has been included in a completed QSA.

***6.6.3 Modeling of Large Loads Co-Located with a Proposed Generation Resource, Energy Storage Resource (ESR), or Settlement Only Generator (SOG)***

(1) A Large Load co-located with a proposed Generation Resource, ESR, or SOG shall be included in the data provided by the IE or RE during the Resource Registration process.

(2) The Large Load shall not be included in the Network Operations Model until the following requirements have been satisfied:

(a) ERCOT has communicated the completion of the LLIS as described in paragraph (7) of Section 9.4, LLIS Report and Follow-up;

(b) All required interconnection agreements have been executed and acknowledged by all parties as prescribed in Section 9.5.2, Interconnection Agreement for Large Loads Co-Located with one or more Generation Resource Facilities Registered as a Private Use Network;

(c) The Large Load has been included in a completed QSA; and

(d) All applicable requirements of Section 6.9 have been completed.

**9** **Large Load additions at new or existing INTERCONNECTION(S)**

**9.1** **Introduction**

(1) This Section defines the requirements and processes used to facilitate new or modified Large Load interconnections with the ERCOT System. This process will be referred to as the Large Load Interconnection Study (LLIS) process. The requirements are designed to:

(a) Facilitate studies to identify potential system limitations and determine facilities needed to interconnect new or modify an existing Large Load to the ERCOT network;

(b) Facilitate orderly and organized Large Load interconnections, while allowing ERCOT to determine whether the interconnection of the proposed Large Load would comply with North American Electric Reliability Corporation (NERC) Reliability Standards, ERCOT Protocols, ERCOT Planning and Operating Guides, TSP criteria, and any Applicable Legal Authority (ALA);

(c) Specify the communications required between Interconnecting Large Load Entities (ILLEs), Transmission Service Providers (TSPs), Resource Entities (REs), Interconnecting Entities (IEs), and ERCOT;

(d) Provide the best information on future Large Load additions for use in identifying, forecasting, and analyzing short- and long-range ERCOT capabilities, demands, and reserves; and

(e) Provide ERCOT accurate data about new and modified Large Load subject to the provisions detailed in section 9.2.1, Applicability of the Large Load Interconnection Study Process, to ensure that ERCOT and stakeholders have the information necessary for planning purposes.

(2) Submission of all project data, study documents, and other communications described in this Section shall be in the manner and format prescribed by ERCOT. ERCOT shall publicly post the format of such submissions on the ERCOT website.

(3) ERCOT shall manage a confidential email list (Transmission Owner Load Interconnection) to facilitate communication of confidential Large Load-related information among TSPs and ERCOT. Membership to this email list will be limited to ERCOT and appropriate TSP personnel.

9.2 General Provisions

***9.2.1*** ***Applicability of the Large Load Interconnection Study Process***

(1) Any request to interconnect or modify a Load Facility that meets one or more of the following criteria shall be subject to the Large Load Interconnection Study (LLIS) process:

(a) A new Large Load;

(b) A modification of any existing Load Facility that increases the aggregate peak Demand of the Facility by 75 MW or more;

(c) A modification of an existing Load Facility that is not a Large Load such that, after modification, the peak Demand of the Load Facility is increased by 20 MW or more and the Load Facility qualifies as a Large Load; or

(d) A modification of an existing Large Load that changes or adds a Point of Interconnection or Service Delivery Point to a different electrical bus on a different electrical circuit.

9.2.2 Submission of Large Load Project Information and Initiation of the Large Load Interconnection Study (LLIS)

(1) For any Load request meeting one or more criteria defined in paragraph (1) of Section 9.2.1, Applicability, the following actions shall be completed prior to the initiation of the LLIS process described in Section 9.3, Interconnection Study Procedures for Large Loads.

(a) Submission of all information, of the type and in the format prescribed by ERCOT, needed to define, model, and study the Load request;

(b) Submission of a complete Load Commissioning Plan;

(c) A formal request to initiate the LLIS process described in Section 9.3; and

(d) Payment of the LLIS Application Fee to ERCOT as described in paragraph (3).

(2) The interconnecting Transmission Service Provider (TSP) shall submit the information described in paragraphs (1)(a) through (1)(c) above on behalf of the Interconnecting Large Load Entity (ILLE).

(3) The ILLE shall pay to ERCOT the LLIS Application Fee, as described in the ERCOT Fee Schedule prior to the commencement of the LLIS. The interconnecting TSP, RE, or IE may submit this fee to ERCOT on the behalf of the ILLE. Payment of the ERCOT LLIS Application Fee shall not affect the independent responsibility of the ILLE to pay for interconnection studies conducted by the interconnecting TSP or for any DSP studies.

**9.2.3 Modification of Large Load Project Information**

(1) The interconnecting Transmission Service Provider (TSP) shall update any project information submitted per paragraph (1) of Section 9.2.2 within five Business Days of being notified by the ILLE of a material change.

(2) If a change to Load composition or technology that differs substantially from the dynamic models used in the LLIS Stability Study as described in Section 9.3.4.3, Dynamic and Transient Stability (Load Stability, Voltage) Analysis, is made at any time after the initiation of the LLIS, the lead TSP shall perform a new Stability Study that reflects the new composition of the proposed Load.

(3) If a material change is made such that the interconnection request no longer meets the applicability criteria of Section 9.2.1, Applicability, the interconnecting TSP shall not interconnect the Load above any Demand limit identified in any completed LLIS study elements.

**9.2.4 Load Commissioning Plan**

(1) The Load Commissioning Plan shall be maintained and updated by the interconnecting Transmission Service Provider (TSP). The plan shall reflect the most currently available project information.

(2) Upon the completion of the LLIS, as described in Section 9.4, the interconnecting TSP shall update the Load Commissioning Plan to not exceed the level(s) of Demand approved in the LLIS. If one or more levels of Demand in the Load Commissioning Plan are contingent on one or more transmission upgrade projects as determined in paragraph (6) of Section 9.4, those transmission projects shall be identified in the updated Load Commissioning Plan.

(3) Upon the execution of any required agreements prescribed in Sections 9.5.1 or 9.5.2, the interconnecting TSP shall update the Load Commissioning Plan to reflect the amount of peak Demand in the executed interconnection agreement.

(4) The interconnecting TSP shall continue to maintain the Load Commissioning Plan after Initial Energization until the Large Load reaches its full requested peak Demand.

**9.2.5 Required Interconnection Equipment**

(1) Each Point of Interconnection (POI) or Service Delivery Point for a Large Load interconnected at transmission voltage to the ERCOT System must include one or more disconnect devices capable of interrupting fault current to isolate the Large Load from the ERCOT System. The disconnect devices shall be under the remote control of the applicable TO and capable of being operated remotely to comply with an instruction from ERCOT.

9.3 Interconnection Study Procedures for Large Loads

(1) This Section establishes the procedures for conducting a Large Load Interconnection Study (LLIS) for new or modified Large Loads, as defined by Section 9.2.1, Applicability of the Large Load Interconnection Study Process.

9.3.1 Large Load Interconnection Study (LLIS)

(1) An LLIS consists of the set of steady-state, stability, short-circuit and/or other relevant studies that are necessary to determine the reliability impact of a Large Load interconnection on affected Transmission Facilities and identify the Transmission Facilities that are needed to reliably interconnect the new or modified Large Load to the ERCOT System.

(2) If an Interconnecting Entity (IE) or Resource Entity (RE) submits a large Generation Resource interconnection request, as defined in Section 5.3, Interconnection Study Procedures for Large Generators, that also includes a co-located Large Load, the Full Interconnection Study (FIS) may be used in place of a separate LLIS. The FIS shall reflect the full requested Load amount and conform to all study requirements detailed in Sections 5.3 and 9.3 of this Planning Guide. For any deadlines or timelines set out in this section that conflict with the deadlines or timelines in Sections 5.2 and 5.3, the deadlines or timelines in Sections 5.2 and 5.3 shall govern.

(3) During the LLIS, the interconnecting TSP shall be the lead TSP unless otherwise designated by ERCOT during the study scoping process detailed in Section 9.3.2.

(4) For an interconnection request involving a Large Load interconnecting at distribution voltage, the LLIS shall evaluate only the proposed Load’s transmission-level impacts, if any. The affected Distribution Service Provider (DSP) shall provide the lead TSP with all information concerning the DSP's facilities needed to complete any required studies.

9.3.2 Large Load Interconnection Study Scoping Process

(1) Within five Business Days from the date all requirements detailed in paragraph (1) of Section 9.2.2 have been met, the interconnecting Transmission Service Provider (TSP) shall schedule a kick-off meeting with ERCOT to occur soon thereafter. If the proposed project is co-located with a Generation Resource, the kick-off meeting must also include the Resource Entity (RE) or Interconnecting Entity (IE). The interconnecting TSP shall invite the Interconnecting Large Load Entity (ILLE) to attend the kick-off meeting. The ILLE may attend at its option.

(2) ERCOT will notify all other TSPs of the LLIS request. Each TSP may evaluate if it is directly affected by the interconnection request and determine if it should participate in the LLIS. Examples of a directly affected TSP may include, but are not limited to, a TSP whose facilities are likely to experience changes in voltage or power flow because of the Load interconnection request.

(3) Each directly affected TSP desiring to participate in the LLIS shall promptly notify the lead TSP and ERCOT and must provide a description of the expected effect of the Load interconnection on the TSP’s facilities in its notification. The lead TSP shall include all directly affected TSP(s) in the LLIS kickoff meeting.

(4) At the LLIS kickoff meeting, the interconnecting TSP will present the proposed project and facilitate a general discussion of the preliminary study scope of work for the LLIS.

(5) Any reactive studies required under Protocol Section 3.15, Voltage Support, or SSO studies required under Protocol Section 3.22.1.4, Large Load Interconnection Assessment, shall be scoped simultaneously with the LLIS but do not need to be included as part of the LLIS.

(6) The lead TSP will develop a preliminary LLIS study scope within three Business Days following the kickoff meeting.

(a) The study scope must include all study elements required by Section 9.3.4, Large Load Interconnection Study Elements, unless ERCOT and the TSP(s) determine that one or more studies are unnecessary. If a study element is deemed unnecessary, the lead TSP shall provide a written technical justification for not performing the analysis in lieu of the study report.

(b) The study scope shall specify the base cases and study scenarios that will be used in each LLIS element.

(c) The study scope shall specify the involvement of any directly affected TSPs in the study process. In some cases, it may be necessary for the ILLE to execute study agreements with multiple TSP(s).

(7) The lead TSP shall submit the preliminary study scope for review by ERCOT and all directly affected TSPs. Directly affected TSPs and ERCOT may provide comments on the preliminary study scope within five Business Days of posting.

(8) Upon closing of the comment period described in paragraph (7) above, the lead TSP shall, within five Business Days, submit a final study scope that addresses submitted comments to the extent possible. If the lead TSP, directly affected TSPs, or ERCOT cannot reach agreement on one or more aspects of the study scope, ERCOT shall resolve any remaining dispute(s).

(9) Within five Business Days of the lead TSP submitting the final study scope, ERCOT shall approve the final study scope or return the scope to the lead TSP with comments. The lead TSP shall promptly address ERCOT comments and resubmit according to paragraph (8) above.

9.3.3 Large Load Interconnection Study Description and Methodology

(1) The primary purpose of the LLIS is to determine the amount of Load that may be interconnected by the ILLE’s desired Initial Energization date while maintaining the reliability of the ERCOT System and ensuring compliance with all North American Electric Reliability Corporation (NERC) Reliability Standards, Protocols, this Planning Guide, and the Operating Guides. The LLIS will also identify any transmission improvements needed to serve the full requested Load amount.

(2) The LLIS consists of a series of distinct study elements. The specific elements included in a particular LLIS will be stated in the LLIS scope.

(3) Each proposed Large Load interconnection that requires a separate physical transmission interconnection will be treated as an individual study to be analyzed separately from all other such requests unless otherwise agreed by the interconnecting load and TSP(s) in the interconnection study agreement.

(4) The LLIS process includes developing and analyzing various computer model simulations of the existing and proposed ERCOT transmission system. The results from these simulations will be utilized by the TSP(s) to determine the impact of the proposed interconnection.

(5) The study shall include an analysis demonstrating the adequate reliability of any temporary interconnection configurations.

9.3.4 Large Load Interconnection Study Elements

9.3.4.1 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 appropriate for the desired Initial Energization date of the Load. The lead TSP shall remove from the study base case all transmission Facilities it determines may significantly impact study results that will not be in service before Initial Energization of the proposed Load. The steady-state analysis shall include other Large Loads that have a complete LLIS per paragraph (6) of Section 9.4, LLIS Report and Follow-up and that have met the requirements of Section 9.5, Interconnection Agreements and Responsibilities. The lead TSP may include other transmission projects and load interconnection requests in the study base case. All modifications to the SSWG base case made as part of the study assumptions shall be documented in the LLIS report.

(2) The lead TSP shall perform contingency analyses as required by the NERC Reliability Standards, ERCOT Nodal Protocols, this Planning Guide, and the Operating Guides to identify any additional Facilities that may be necessary to ensure that results of the system performance conform to these standards. The study shall identify any system limitations that would prevent the ILLE from achieving the requested load in the desired timeframe. If the study identifies system limitations, the lead TSP shall identify potential transmission system improvements necessary to achieve the requested Load. The results of this analysis shall be shared with TSP(s) that have Facilities identified with planning criteria violations, and those affected TSP(s) will be responsible for evaluating the impact of the Large Load and the validity of the anticipated violations.

(3) When studying the addition of a Large Load the lead TSP shall perform a steady-state analysis using the system Load level defined in the SSWG Procedure Manual. The lead TSP shall also study any additional scenarios under this section where the addition of the Large Load might impact system reliability.

(4) Upon completion of the steady-state study as described in paragraph (2) above, the lead TSP shall identify the amount of load that may be reliably connected by the ILLE’s desired Initial Energization date. The lead TSP shall also identify additional levels of Demand that may be served contingent on transmission upgrades identified in the study becoming operational.

9.3.4.2 System Protection (Short-Circuit) Analysis

(1) The short-circuit study base case shall be created from the most recently approved Steady State Working Group (SSWG) base case appropriate for the desired Initial Energization date of the Load. The initial transmission configuration of the study area shall be identical to the configuration used in the corresponding steady-state study.

(2) The lead TSP will determine the maximum available fault currents at the interconnection substation for determining switching device interrupting capabilities and protective relay settings.

9.3.4.3 Dynamic and Transient Stability (Load Stability, Voltage) Analysis

(1) The stability study base case shall be created from the most recently approved Steady State Working Group (SSWG) base case appropriate for the desired Initial Energization date of the Load, consistent with the most recently approved Dynamics Working Group (DWG) stability database. The initial transmission configuration of the study area shall be identical to the configuration used in the corresponding steady-state study.

(2) All stability studies shall be performed in accordance with NERC Reliability Standards, Protocols, this Planning Guide, and the Operating Guides. Transient stability studies will analyze the performance of 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. Such studies should incorporate reasonable and conservative assumptions regarding impacted facility operating conditions.

(3) The stability study portion of the LLIS shall document any instability identified.

(4) If the lead TSP identifies instability (other than instability identified for extreme events) in the stability portion of the LLIS, the TSP shall investigate alternative solutions, including transmission improvements, to mitigate the instability. The TSP shall implement the mitigation before the Initial Energization of the Large Load in accordance with Protocol Section 3.11.4, Regional Planning Group Project Review Process. If the mitigation cannot be implemented prior to the desired Large Load Energization date, the TSP shall identify the amount of load that may be reliably connected by the ILLE’s desired Initial Energization date.

9.4 LLIS Report and Follow-up

(1) For each of the LLIS study elements, the lead TSP shall submit to ERCOT a preliminary study report. The report shall include a description of the study methodology and assumptions, findings, and recommendations. The report shall also identify the amount of load that can be reliably interconnected by the ILLE’s desired Initial Energization date per the criteria in Section 9.3.4. The lead TSP may include additional information in the study report and may combine multiple LLIS study elements into a single report.

(2) ERCOT shall review the preliminary study report within ten Business Days and provide to the lead TSP any questions, comments, and proposed revisions necessary to ensure the report complies with the requirements in Section 9.3, Interconnection Study Procedures for Large Loads. ERCOT may extend this review period by an additional 20 Business Days and shall notify in writing the lead and directly affected TSPs of the extension. The lead TSP will provide the preliminary study report to the directly affected TSPs, who may provide questions, comments, and proposed revisions during this review period. All feedback shall be provided to the lead TSP in writing.

(3) If, after considering the feedback received from ERCOT and directly affected TSPs, ERCOT or the lead TSP determines additional study is required, the lead TSP shall promptly perform the additional study and submit an updated preliminary study report for review as described in paragraph (1) above.

(4) If no additional study is required as described in paragraph (3) above, the lead TSP shall prepare a final LLIS study report that incorporates all feedback received in paragraph (2) above, to the extent practical, within ten Business Days.

(5) Once complete, the lead TSP shall provide the final report for the LLIS study element(s) to ERCOT and the directly affected TSPs only.

(6) The LLIS is deemed complete when final reports have been provided for all LLIS study elements. Within five Business Days following the completion of the LLIS, ERCOT shall

(a) Determine the amount of Load approved to interconnect by the Initial Energization date. This amount shall be informed by the most limiting amount identified by the lead TSP from among all the LLIS study elements as described in paragraph (1) above;

(b) Grant conditional approval for the interconnection of additional Load amounts identified in the LLIS that is conditioned on RPG-approved transmission upgrades and transmission upgrades not subject to RPG approval becoming operational; and

(c) Identify any remaining amount of Load requiring one or more new transmission upgrades subject to RPG review as described in Section 3.11.4, Regional Planning Group Project Review Process, in the Nodal Protocols.

(7) ERCOT shall promptly communicate the completion of the LLIS and the amount(s) of Load approved in paragraph (6) to the lead TSP and directly affected TSPs.

(8) The lead TSP may provide a redacted copy of the final report for each LLIS study element to the ILLE upon request. The redacted report(s) shall conform with Nodal Protocols Section 1.3.

(9) If a material change that impacts one or more LLIS study assumptions occurs before the requirements of Section 9.5, Interconnection Agreements and Responsibilities, have been met, ERCOT or the lead TSP may require one or more LLIS study elements be updated. ERCOT and the lead TSP shall have sole discretion to determine if a change impacts any LLIS study assumptions and to require a modification of the study or a restudy be performed. Any modification of the study report shall be treated as a preliminary study and reviewed according to paragraph (1) above.

(10) If the requirements of Section 9.5, Interconnection Agreements and Responsibilities, have not been satisfied within 180 days after the communication of the completion of the LLIS by ERCOT as described in paragraph (7) above, ERCOT may consider the project cancelled.

(11) If the Large Load has not met the requirements for Initial Energization as described in paragraph (1) of Section 9.6, Initial Energization and Continuing Operations for Large Loads, within 365 days after the Initial Energization date identified in the LLIS study report, ERCOT may require one or more LLIS study elements be updated prior to approval of Initial Energization.

***9.5*** ***Interconnection Agreements and Responsibilities***

9.5.1 Interconnection Agreement for Large Loads not Co-Located with a Generation Resource Facility Registered as a Private Use Network

(1) For a Large Load not co-located with a Generation Resource Facility registered as a Private Use Network (PUN), ERCOT shall not allow Initial Energization prior to receiving one of the following:

(a) Confirmation from the interconnecting TSP that:

(i) All required interconnection agreements or equivalent service extension agreements with the Interconnecting Large Load Entity (ILLE) have been executed;

(ii) The TSP has received notice to proceed with the construction of all required interconnection Facilities; and

(iii) The TSP has received the financial security required to fund all required interconnection Facilities; or

(b) A letter from a duly authorized person from a Municipally Owned Utility (MOU) or Electric Cooperative (EC) confirming its intent to construct and operate applicable Large Load and interconnect such Large Load to its transmission system.

9.5.2 Interconnection Agreement for Large Loads Co-Located with one or more Generation Resource Facilities Registered as a Private Use Network

(1) For a Large Load co-located with a Generation Resource Facility registered as a Private Use Network (PUN), ERCOT shall not allow Initial Energization prior to receiving one of the following:

(a) Confirmation from the interconnecting TSP that:

(i) All required interconnection agreements or equivalent service extension agreements with the Resource Entity (RE), Interconnecting Entity (IE), and Interconnecting Large Load Entity (ILLE) have been executed;

(A) If the required agreements include a new Standard Generation Interconnection Agreement (SGIA) or an amendment to an existing SGIA, a copy of this agreement shall be provided to ERCOT once executed per Section 5.2.8.1, Standard Generation Interconnection Agreement for Transmission-Connected Generators.

(B) If no new or amended agreements are required, the TSP shall so notify ERCOT and state affirmatively it agrees to energize the new Load per the approved LLIS studies.

(ii) The TSP has received notice to proceed with the construction of all required interconnection Facilities; and

(iii) The TSP has received the financial security required to fund all required interconnection Facilities;

(b) A letter from a duly authorized person from a Municipally Owned Utility (MOU) or Electric Cooperative (EC) confirming its intent to construct and operate applicable Large Load and interconnect such Large Load to its transmission system.

9.6 Initial Energization and Continuing Operations for Large Loads

(1) Each Large Load shall meet the conditions established by ERCOT before proceeding to Initial Energization. These conditions may include, but are not limited to:

(a) Inclusion of the Load in the Network Operations Model in accordance with Section 6.6, Modeling of Large Loads;

(b) Verification that all required telemetry is operational and accurate;

(c) Completion of the requirements of Planning Guide Section 5.3.5, ERCOT Quarterly Stability Assessment;

(d) Completion and approval of any required Subsynchronous Oscillation (SSO) studies, SSO Mitigation Plan, SSO Countermeasures, and SSO monitoring, if required; and

(e) Submission of a current Load Commissioning Plan meeting the requirements of Section 9.2.4, Load Commissioning Plan.

(2) During continuing operations:

(a) The interconnecting TSP shall not permit a Large Load to exceed any limits on peak Demand established by ERCOT.

(b) The interconnecting TSP shall notify ERCOT when a transmission upgrade identified in a Load Commissioning Plan becomes operational. ERCOT must give written approval before Demand may increase.

(c) Pursuant to Section 6.2, Dynamics Model Development, the interconnecting TSP shall provide updated dynamics data about the Large Load to ERCOT when required.