**FAQ: Stakeholder Questions**

Link to Large Load Workshop: [Here](https://www.ercot.com/calendar/06132025-Large-Load-Workshop)

Link to Market Notice: [Here](https://www.ercot.com/services/comm/mkt_notices/M-B062325-01)

Link to May LLWG Meeting Presentations: [Here](https://www.ercot.com/calendar/05162025-LLWG-Meeting-_-Webex)

If you would like to add additional questions to this list, please submit them to contact the LLWG Chair and Vice Chair (Bob Wittmeyer [bob@longhornpwr.com](mailto:bob@longhornpwr.com) and Patrick Gravois "Gravois, Patrick" [Patrick.Gravois@ercot.com](mailto:Patrick.Gravois@ercot.com) ) by July 3rd EOB.

# Questions Pertaining to ERCOT Studies (May LLWG)

## Load Loss Threshold Analysis (Presented by Luis Hinojosa)

1. Can ERCOT elaborate on how they determined what base case operating conditions to use for the analysis? Is there a single quantifiable metric to capture “worst-case grid conditions” for frequency response capability?
   1. Our analysis reviewed 2 primary factors. Inertia of the system and “down Physical Responsive Capability (PRC)” capability. Down PRC is the amount of capacity that is available to respond to a high frequency event and limited by the droop characteristics of the Resource. Lower inertia conditions would represent periods where frequency is more susceptible to change, but low inertia conditions would typically occur with higher amounts of wind and solar being available, which in turn means more down PRC availability. Hence, we identified a historic case with the lowest down PRC available at a moderate inertia condition.
2. To what extent did generation and transmission outages in the study base case contribute to frequency response capabilities of the system?
   1. Our original study utilized the base case as is from the real time historical snapshot from 03/12/2024 2:47 AM. No changes or adjustments were made for outages.
3. How often are real-time grid conditions (minimal inertia, minimal foot room, etc.) equal to or worse than the conditions presented in the base case used for the analysis? Said another way, was the study done using a 95th percentile (or 99th percentile, etc.) frequency response capability condition?
   1. Our original analysis looked for the most limiting case we had found in our historical operational data. ERCOT plans to provide more data on various conditions at a future LLWG meeting.
4. Does ERCOT know what the load loss threshold for the system is when frequency response capability conditions are not as bad? Does ERCOT have some idea of what a curve of this relationship would look like?
   1. We are actively expanding the analysis to additional inertia and down PRC combinations to identify the relationship in question. We will provide this information at a future LLWG meeting.
5. Considering that the analysis was based on previous operating conditions from over a year ago (03/12/2024 2:47 AM), did ERCOT account for new generation (including ESRs) and transmission added to the system since then? If so, how was this done? If not, does ERCOT plan to update the study base case conditions on a regular basis to incorporate evolving grid conditions?
   1. We used the original case as is from our real-time historical snapshot. We did not model any new generation, load or transmission. We are expanding the study to include more recent cases to evaluate updated grid conditions and available Resources. We will continue to evaluate the conditions and provide limit updates in future discussions.
6. Can ERCOT comment on the extent to which BESS provided foot room for frequency response capability in the analysis? How large of a role did this foot room have in determining the study results?
   1. ESRs provided 582 MW of down-PRC capacity in the study case.
7. Did the study assume that load remained offline after tripping, or was it assumed that the load returned to the system after several seconds of interruption (such as is seen in some Large Electronic Load (LEL) Uninterruptible Power Supply (UPS) configurations)?
   1. The study assumed the load tripped and remained offline and did not return.

## Preliminary Load Loss Assessment of Operational Large Loads (Presented by Yunzhi Cheng)

1. Could ERCOT elaborate on the methodology for modeling operational loads in the study case? The studied value of 3,055 MW is significantly higher than the observed Large Load non-coincident peak of 2,026 MW (as reported at TAC). Were energization ramp schedules, seasonal profiles, or IT/HVAC proportions considered in the analysis?
   1. In this study, 3,055 MW Large Load was modeled. It is the approved capacity for the operational Large Electronic Loads in the West Load Zone at the time of the assessment.
2. Did this analysis evaluate the ride-through response from all loads greater than 75 MW in the West Load Zone or just LELs?
   1. The 3,055MW is for LELs in the West Load Zone.
3. Considering load energization ramp schedules, what study year does ERCOT first see an area wide VRT event that exceeds the limits evaluated in the Load Loss Threshold Analysis? Is it today? 1 year out? 2 years out, etc.?
   1. The full approved capacity was assumed in the assessment. ERCOT is currently conducting additional stability studies to identify the timing of when an area-wide VRT limit will need to be enforced in real-time.

# Questions Pertaining to the Large Load Interconnection (LLI) Process Changes

1. For LELs that are already in the category of “Planning Studies Approved” or have completed their stability study or the LLIS process, can ERCOT provide explicit direction on the expectations for needing to perform a new stability study? Would LELs updating generic models to detailed models be expected to perform a new stability study?
   1. In accordance with (soon to be un-grayboxed) Planning Guide Section 9.2.3(2), if the studies were approved then the lead TSP for the interconnection studies determines if the studies need to be rerun if the models were changed.
2. In the event a new stability study is needed, will the study assumptions (study case, inclusion of other Large Load projects, etc.) remain the same as the original stability study, or will the load be “un-approved” and new assumptions need to be used? If assumptions are changed, will a new steady-state study be needed as well?
   1. ERCOT will provide a response to this question as soon as possible and repost to LLWG landing page.
3. If a LEL is prepared to energize their site today (have submitted DWG survey and updated model), does ERCOT have all the necessary tools, standards, and procedures in place to facilitate the energization on the timeline requested by the load? If not, when will those tools and procedures be ready?
   1. ERCOT has a process to study load voltage ride-through characteristics and is working on developing a timeline for review.
4. Since ERCOT indicated in the Large Load Workshop that their desired solution is load curtailment but have not yet provided a methodology for implementing that solution, will ERCOT currently allow an LEL to energize if it cannot ride-through and the interim assessment indicates a potential System Operating Limit (SOL) or Interconnection Reliability Operating Limit (IROL) violation?
   1. ERCOT will provide a response to this question as soon as possible and repost to LLWG landing page.
5. How much time does ERCOT expect the interim LEL ride-through evaluation process to add to the energization schedule of LELs?
   1. ERCOT is still evaluating the timeline.
6. Can ERCOT elaborate on the statement that “ERCOT may require the Interconnecting Large Load Entity (ILLE) or Customer to provide information that confirms the LEL's dynamic model accurately reflects the LEL's dynamic characteristics”? Does this imply some sort of model validation testing or commissioning process? If so, please explain how that process will be facilitated.
   1. ERCOT believes that some form of dynamic model validation will be necessary, but we are still evaluating what form this may take.
7. Do **non-grid connected backup generators** of any type (BESS, Diesel, Natural Gas, etc.) larger than 10 MW (not injecting to the grid) must go through any interconnection process? If yes, why?
   1. FTM Load
   2. Co-located Load
8. If the generators are stand-alone and will not be synchronized with the grid, then they don’t have to go through the interconnection process. If they will be synchronized with the ERCOT grid for any time, then they need to go through the interconnection process to evaluate the impacts on the grid.

# Questions Pertaining to Implementation of LEL Curtailment for Loads that Cannot Ride-Through

1. What are the quantifiable conditions in which curtailment of LELs will be utilized, and how frequently does ERCOT expect these conditions to occur on the system?
   1. While ERCOT presented its initial findings at the June 13, 2025 Large Load Workshop, evaluations are still underway to determine when and where a Large Load SOL is required. This includes the process and procedures by which the exceedance of a Large Load SOL will be managed and mitigated. Additional details will be shared once evaluations and processes are solidified.
2. Will curtailment of LELs be used as a last case scenario? If so, please outline the order of actions ERCOT plans to take prior to utilizing LEL curtailment.
   1. See answer to 1.
3. Can ERCOT please explain their current thinking on how curtailment will be facilitated from an operational perspective?
   1. See answer to 1.
4. How will the total necessary curtailment be allocated across different LELs within a single region binding under an SOL or IROL?
   1. See answer to 1.
5. How long ahead of time will LEL operators be alerted of the need to curtail or potentially curtail?
   1. See answer to 1.
6. How much time will LELs have to comply with an order to curtail?
   1. See answer to 1.
7. Does ERCOT plan to implement any price adjustments due to the reliability deployment? If yes, how will this be implemented?
   1. The Wholesale Market Subcommittee has recently assigned the task of investigating price adjustments for transmission-related load shed to the Wholesale Market Working Group. Please participate in WMWG discussions for more information on this topic.
8. Will LELs on Under Frequency Load Shed (UFLS) circuits or carrying ancillary services as a load resource be required to curtail?
   1. See answer to 1.

# Questions Pertaining to Large Load Dynamic Models and Survey

1. For operational and approved to energize LELs, will extensions for submitting the DWG survey be accepted if requested?
2. If you are unable to complete the DWG Large Load Survey and/or update the dynamic model for a Large Electronic Load (LEL) by August 31, 2025, please notify ERCOT as soon as possible. Your notification should include the reason for the delay and an estimated timeline for completion.

If the full survey cannot be completed by the deadline, ERCOT requests that you prioritize submitting responses to the questions most critical to assessing voltage ride-through capability and provide a partial survey response as soon as feasible. These priority questions include:

* 1. Q51 through Q58, Q60, and Q61 under Protection Setting Section
  2. Q36 under Dynamic Model Section (note: Q37 is optional but submit PSCAD model if available)
  3. Q39 through Q42 under Back Up Section
  4. Q17 if it is behind the existing generation, under Basic Load Information Section

Please note the Market Notice also cautions that **“***failure to timely submit the information may require ERCOT to use conservative assumptions for the ride-through capability of the LEL.***”**

1. For LELs currently going through the large load study process, is there a predefined set of conservative assumptions recommended by ERCOT for either a generic model or the specific questions that likely cannot be answered upon initiation of the LLIS due to long leads on equipment or current unavailability of equipment specifications? Should the ITIC curve be used for preliminary generic modeling?

As indicated in Market Notice M-B062325-01 and ERCOT Planning Guide Section 9, the responsibility for providing an appropriate and representative dynamic model rests with the Interconnecting Large Load Entity (ILLE). It is therefore the ILLE’s responsibility to work with its engineering consultant(s), equipment vendor(s), and the interconnecting TDSP to develop a model that accurately reflects the expected performance of the load.

# Questions Pertaining to ERCOT’s VRT Assessment

1. How is ERCOT defining voltage ride-through for the sake of this interim assessment?
   1. ERCOT plans to assess the grid impact with credible planning contingencies as defined in the NERC Reliability Standard TPL-001-5.
2. Why does the current study scope plan to study LELs at their total approved MW rather than in accordance with their Load Commissioning Plan, as is done for LLIS studies?
   1. The ERCOT VRT assessment is based on the approved MW level as the Load Commissioning Plan is not currently binding.
3. For the initial assessment including all energized and approved LELs projected to connect by the end of 2025, will ERCOT be confirming all loads in question are still expecting to request energization this year?
   1. The VRT assessment will include all LELs that are either in operation or approved for energization. All the new energization requests will be assessed to identify their impact to the grid before being approved.
4. What does ERCOT consider a “credible transmission event” for the sake of this assessment?
   1. NERC Reliability Standard TPL-001-5 planning events
5. Does ERCOT have a target date that the initial VRT assessment will be completed by?
   1. ERCOT expects to complete the initial assessment in Q4 2025.
6. How frequently will subsequent VRT assessments be performed?
   1. It is expected to be conducted with any new energization request.

# Other Miscellaneous Questions

1. What is ERCOT’s proposed ride-through standard? If not ready yet, when will it be shared with stakeholders?
   * + - 1. ERCOT presented a ride-through standard proposal at the July 11 LLWG meeting. The presentation titled *ERCOT LEL Ride-Through Criteria\_LLWG final* can be found on the LLWG July 11 meeting page [here.](https://www.ercot.com/calendar/07112025-LLWG-Meeting) ERCOT will begin drafting a NOGRR that will incorporate the ride-through proposal provided in the presentation, with potential modifications from stakeholder feedback, and plans to have a draft to present to stakeholders by end of Q3 or beginning of Q4 2025.
2. Does ERCOT think that a single ride-through curve is appropriate for all LELs, or that different curves should be curated based on the capabilities of different loads?

It is ERCOT’s intent to have a single ride-through curve for all LELs and will proceed with this approach in drafting the NOGRR. However, ERCOT would be willing to explore multiple ride-through curves if stakeholder feedback indicates a technical need to do so and ERCOT determines it is suitable for system reliability.

1. Is it ERCOT’s intention to replace the interim VRT assessment with a mandatory LEL VRT standard? Or will a future standard be used to define ride-through for the sake of the assessment?
2. It is ERCOT’s intention to replace the interim VRT assessment with a mandatory LEL VRT standard.
3. Given that previous ERCOT analysis has shown several VRT events from non-LELs (notably 1,398 MW in West Texas, LFLTF Mar 2025) and significant non-LEL growth is expected in some regions of the state, what is the reasoning behind focusing these requirements on power electronic based loads such as crypto miners and datacenters?
4. ERCOT has observed that LELs are more sensitive to minor voltage disturbances than non-electronic Large Loads. Specifically, LELs trip or significantly reduce consumption during system faults that are normally cleared by transmission protection systems within 4-7 cycles, while non-electronic Large Loads typically ride through these disturbances. The West Texas event mentioned above occurred in December of 2022 and involved a single phase-to-ground fault followed by a breaker failure that induced an additional 3-phase fault that had an unusually long delayed clearing time of 20 cycles. Due to the extended voltage sag seen throughout a large area in West Texas, all types of loads, regardless of size and end-use classification, reduced consumption during this event. There were approximately 180 different loads in Far West Texas that reduced more than 2 MW during this event. ERCOT is also considering ride-through requirements for Large Loads with variable frequency drives or rectifiers as these types of equipment are also known to be sensitive to normal grid voltage disturbances, but ERCOT’s top priority at this time is developing ride-through standards for LELs, given the greater reliability risk. This will be discussed further in future stakeholder meetings.
5. Recent ERCOT presentations (LFLTF Mar 2025) on observed ride-through events since 2024 only report on LEL events and refer to monitoring only loads that went through the LLI process (mostly crypto loads). Is ERCOT monitoring for VRT events affecting non-LELs, or have there not been any relevant events in the past year? If there haven’t been any events, what changed?
6. ERCOT has limited ability to closely monitor VRT events involving loads that have not gone through the LLI process. This capability will be improved as TSPs provide additional data that will help with modeling attributes of all loads greater than 25 MW in NMMS. The events involving non-LELs that were observed in 2020-2023 were large enough events that ERCOT observed a significant system frequency spike in real-time that warranted further investigation. Several events involved a unique Large Load (non-LEL) that tripped during normal clearing faults. ERCOT and the interconnecting TSP worked with the Large Load customer to improve ride-through capabilities and has not observed events from this Large Load since 2023. The other noted events in 2022 involved uncommon disturbances including multiple 3-phase faults or delayed clearing that can impact all types of loads, and similar events have not been observed from 2024 to present.
7. Can ERCOT comment on why there is a significant difference between the maximum observed LEL ride-through event loss (432 MW) and pre-disturbance consumption (~800 MW) shown in the market notice, and the conclusions of the studies suggesting as much as 2,500 MW of LEL could trip?
8. The maximum amount of LEL MW that could trip or reduce consumption during the event is dependent on the following factors:

* Fault type (Single phase, line to line, 3-phase, etc.), clearing time, and location
* Amount of LEL consumption at the time of the event
* Proximity of LEL consumption to the fault location
* The specific ride-through capabilities of each LEL site

Studies have shown that if all operational LELs in West Texas were consuming their full approved consumption level (3,055 MW), and a 3-phase fault occurred at a specific location on the 345 kV system, voltage sags at the point of delivery of enough LEL facilities could drop to a level such that we could lose between 1,500 MW to 2,500 MW of LELs. This number depends on trip settings of LELs used in the studies.

The reason we have not seen larger events thus far is that there has not been a recent 3-phase fault on the 345 kV system at a location that would impact a large number of LELs. The risk is expected to grow as more LELs with similar ride-through capabilities become operational.

1. What is ERCOT’s current thinking on managing frequency and voltage deviations due to load VRT events with new or modified ancillary service products or other contracted services?
2. ERCOT is evaluating the potential effectiveness of a new downward frequency response service to improve frequency deviations during load loss events and potential transmission upgrades to improve voltage deviations during fault events. Ancillary services and transmission improvements alone cannot fully mitigate the risk associated with LL VRT events. It is expected that implementation of a ride-through standard for LLs along with ancillary service improvements and transmission improvements will be necessary to maintain reliability during these events.
3. Since ERCOT’s proposals are retroactive, are there any considerations of interim solutions for existing facilities that will need time to comply with new VRT specifications?
4. ERCOT is not intending for new ride-through requirements for Large Loads to be retroactive. ERCOT intends to set a date in the Large Load ride-through NOGRR such that all Large Loads that meet certain to-be-determined milestones after that date would need to meet the ride-through requirements.
5. Regarding LLWG 7/11/2025 Meeting Topic “ERCOT LEL Ride-Through Criteria (Proposal)” - What is the location of the proposed ride through requirements, i.e. POI or data center low voltage equipment?
6. Proposed LEL ride-through requirements would be based on voltage at the point of delivery.
7. Regarding LLWG 7/11/2025 Meeting Topic “Large Load Subsynchronous Oscillation Overview” - Why does the SSO risk increase with co-located loads?
8. The risk would increase due to electric proximity of the Generation Resource to the source of the subsynchronous oscillation; it is not a function of the administrative “co-location” per se. Magnitude of a SSO is typically damped by the transmission system impedance and therefore reduced further away from the source. If the Generation Resource is co-located with the Large Load that is the source of the oscillation, it would be impacted by the full magnitude of the SSO and thus could suffer more damage.