



ERCOT Large Load Loss/Reduction Events 2020-2024

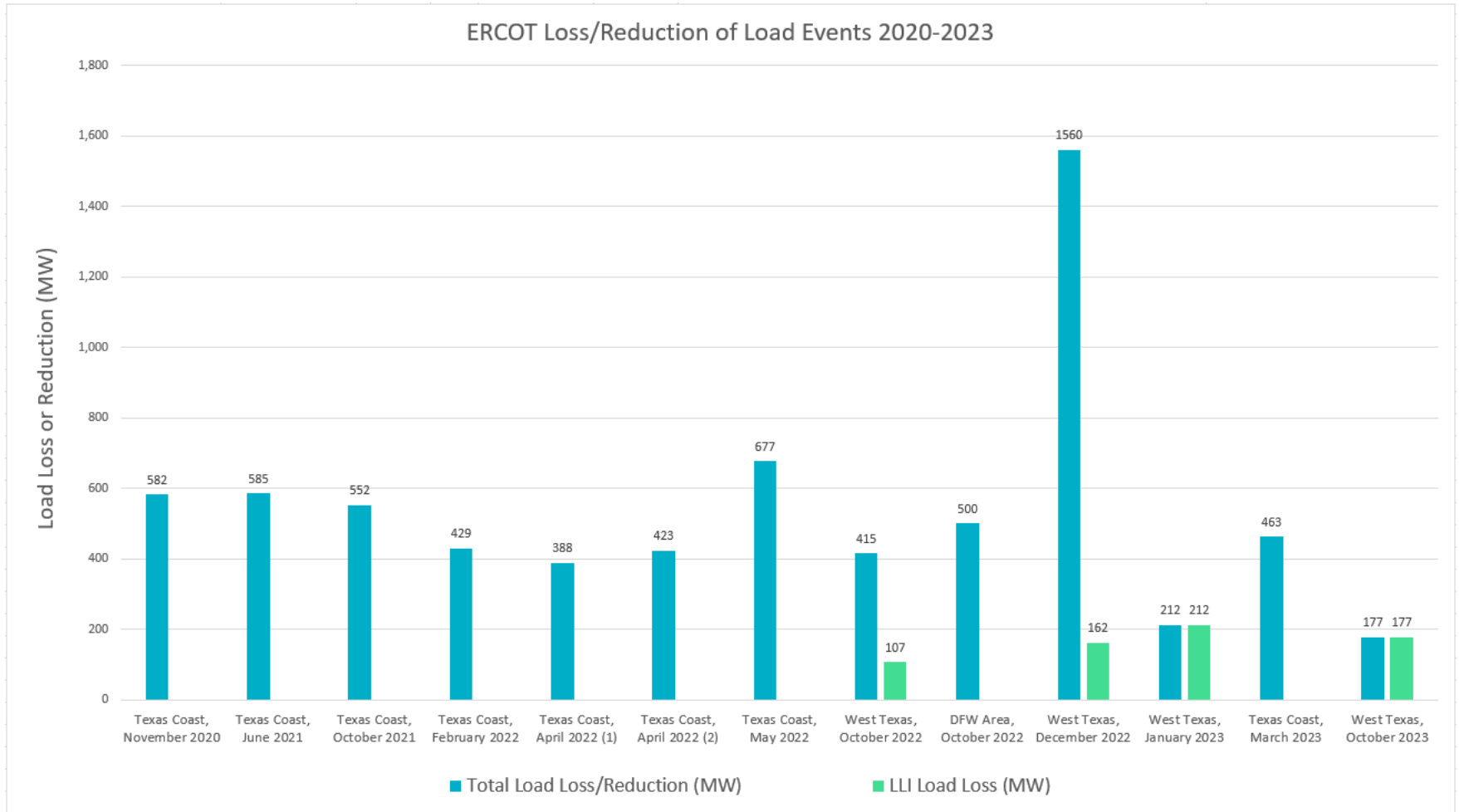
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PDCWG Meeting
November 19, 2024

ERCOT Loss/Reduction of Load Events 2020-2023

- Originally presented at LFLTF in April 2024
 - All events involved system fault followed by reduction of one or more large loads
- Reviewed events to distinguish reduction of large loads that have gone through interim Large Load Interconnection (LLI) process
 - LLI loads may include crypto, AI, data center, or hydrogen fuel cell loads
 - All LLI loads involved in events are crypto (to our knowledge)
- 8 events involve a single large load on the Texas coast
- 3 events involve either multiple 3-phase faults or significantly delayed fault clearing
 - Events involve wide-spread reduction of consumption of many loads
- 2 events involve simultaneous loss of both IBR generation and LLI loads
- All events identified by Operations near real-time

ERCOT Loss/Reduction of Load Events 2020-2023



- LLI Load Loss included in Total Load Loss

ERCOT Loss/Reduction of Load Events 2020-2023

Texas Coast Load Loss Events (8 Events from Nov. 2020 – Mar. 2023)

- Single large industrial load
- Repeated large load reductions due to faults in the area
- 5 events identified as Frequency Measurable Events (FME); high system frequencies up to ~60.11 Hz with 7-minute recovery time
- Updated variable frequency drive settings and internal systems to improve ride-through capabilities
- Improved performance seen in 2024

West Texas Event – Oct. 12, 2022 @ 05:56 CT – 415 MW load reduction

- Multiple normally cleared Three-Phase Line-to-Ground (3LG) faults within one minute at 345 kV station
- ~60 loads in West Texas reduced a combined ~415 MW during the event
- 7 LLI loads reduced a combined 107 MWs during the event (all crypto)
- System frequency increased to 60.086 Hz

DFW Event – Oct. 31, 2022 @ 23:12 CT – 500 MW load reduction

- 3LG fault at 138 kV station with delayed ~10 cycle clearing due to breaker misoperation
- ~100 loads in the area temporarily reduced ~500 MW during the event
- No LLI load loss during the event
- System frequency increased to 60.132 Hz

ERCOT Loss/Reduction of Load Events 2020-2023

West Texas Event – Dec. 7, 2022 @ 03:50 CT – 1560 MW load reduction

- Multiple Single-Phase Line-to-Ground (SLG) faults and a 3LG ground fault at 138 kV station with delayed 19-cycle clearing due to beaker failure
- Hundreds of loads in Far West Weather zone reduced ~1,560 MW during the event due to extended low voltage period
- 10 LLI loads reduced a combined ~162 MW during the event
- Largest load reduction (~420 MW) from oil and gas production, processing, and delivery facilities
- Identified as FME; System frequency increased to 60.235 Hz and recovered in 12m27s

West Texas Event – Jan. 23, 2023 @ 12:19 CT

- SLG fault at 138 kV station with normal 3-cycle clearing
- 5 LLI loads reduced a combined 212 MWs during the event
- 253 MW of IBR generation loss (all solar)

West Texas Event – Oct. 26, 2023 @ 10:28 CT

- SLG Fault at 138 kV station with normal 4-cycle clearing
- 6 LLI loads reduced a combined 177 MWs during event
- 246 MW of IBR generation loss (all solar)

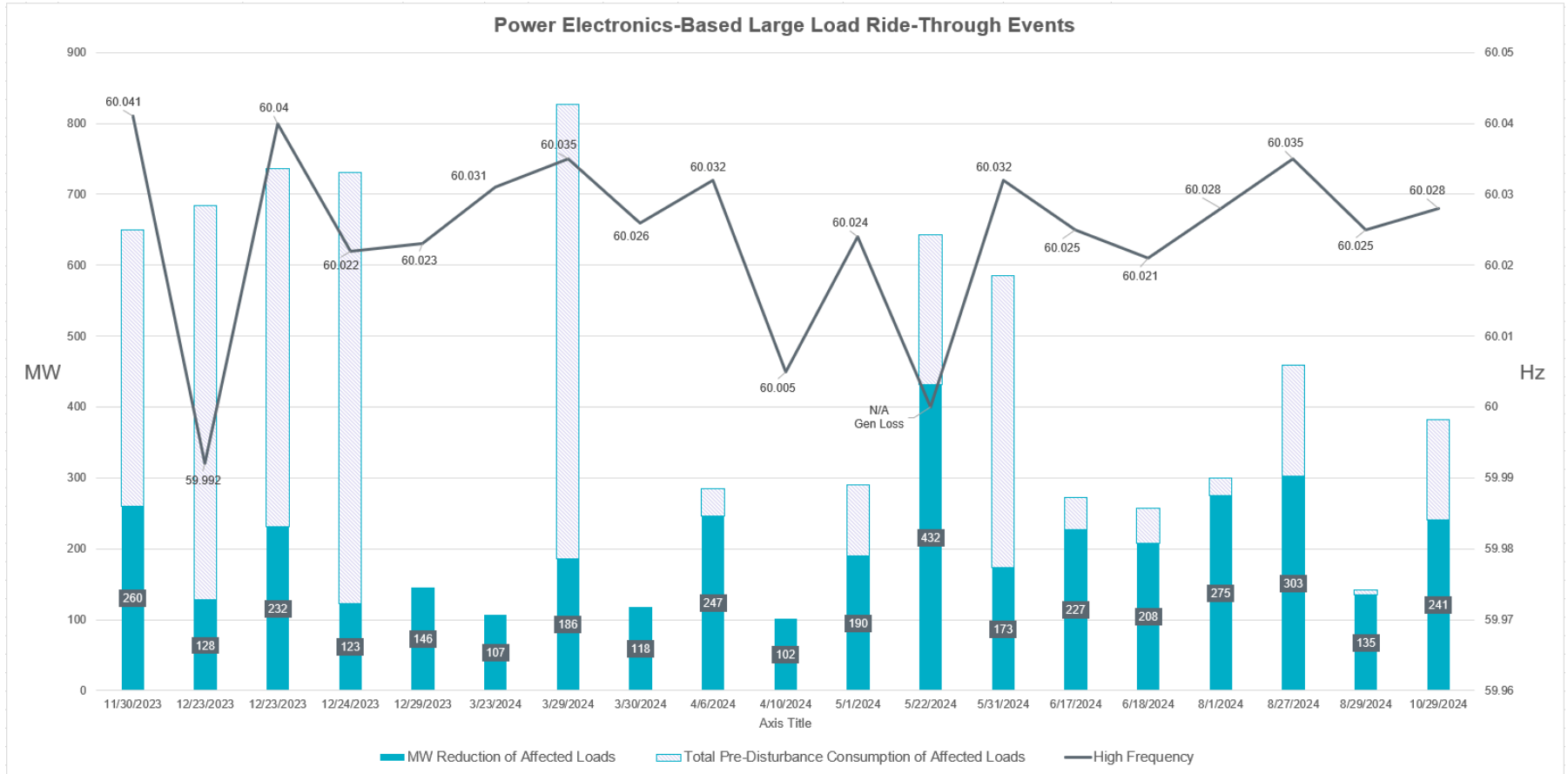
Power Electronics-Based Large Load Ride-Through Events

November 2023 - Present

- Searched for events in which LLI aggregate tag dropped >100 MW combined with PMU fault flag and system frequency spike
- Collected PMU/DFR data at POIB of large loads from interconnecting TSPs
 - Data availability (NOGRR 255)
 - Confirm fault details and low voltage at POIB during events
 - Confirm MW reduction in consumption of large loads
- 19 events from three distinct pockets of power electronics-based large loads (all crypto loads)
 - 8 events involving 4 loads in Central Texas
 - 890 MW of ERCOT approved consumption
 - 7 events involving 5 loads in West Texas (McCamey)
 - 410 MW of ERCOT approved consumption
 - 4 events involving 3 loads in Far West Texas
 - 345 MW of ERCOT approved consumption
 - All consequential loss – loss of line connecting loads during fault

Power Electronic-Based Large Load Ride-Through Events

November 2023 - Present



Key Observations

- Large variance in % of reduction due to similar voltage dips at POI
 - Some power electronic-based large loads more sensitive than others
- SLG faults causing larger reductions than shown in models for shallow positive sequence voltage dips as high as 0.85pu
 - Faulted phase likely reducing to ~0.5pu causing load reductions
- ~1,950 MW of operational large load in Far West Texas weather zone
 - High potential for reductions >1000 MW in Far West Texas with fault on 345 kV during high consumption
 - Additional ~3,500 MW in Far West Texas has been approved or is in Planning review
- Other weaker grid areas may see similar events with projected growth

Key Takeaways and Next Steps

- Operations to continue monitoring and tracking large load ride-through events
- Operations to continue working with TSPs to retrieve event data and ensure proper Disturbance Monitoring Equipment is in place
- High potential for larger events in certain areas with expected large load growth, specifically for 345 kV faults (SLG or 3LG)
- Will present at OWG and next LFLTF (date TBD)
- Challenges and issues to be addressed
 - Determine actual ride-through capabilities of each type of large load
 - Verify and validate load models for accurate representation of ride-through capabilities
 - Develop reliability criteria
 - Examine potential ways to mitigate and/or minimize large load loss during fault events



Questions?