



# Odessa Disturbance 2 Update

IBRTF Meeting

August 12th, 2022

## Odessa Disturbance 2: Event Summary

- Event initiated by lightning arrester fault on 345 kV level in Odessa area
- Fault occurred on June 4<sup>th</sup> at 12:59:25 PM
- Estimated loss of 2,560 MW of thermal and IRR generation
  - 1,709 MW of IRR generation loss from 14 solar facilities
  - 851 MW of thermal generation loss
- System Frequency declined to 59.700 Hz and recovered to 60 Hz in 1 min 20 sec
- 1,227 MW of RRS deployed
- 1,116 MW of Load Resources deployed
- Categorized as NERC Cat 3a event (gen loss > 2000 MW)

# Real Time PMU Voltage

- Lowest recorded voltage of 0.714pu from PMU in Odessa area on 345 kV line
- Highest recorded voltage of 1.102pu from PMU in Del Rio area on 138 kV line
- Attempted reclose ~10 seconds later
- Faults cleared in ~3 cycles
- Within VRT “No Tripping” zone in NOG 2.9.1



# Real Time PMU Frequency

- Most PMUs lowest freq. of 59.7 Hz after LOG
- Single PMU near Laredo had lowest freq. of 59.62 Hz
- Couple other PMUs in South dipped below 59.7 Hz
- Local transient freq. seen as low 58.83 Hz and high as 60.26 Hz in Far West
- Protection settings should not be set on transient freq.



# Solar Generation Loss

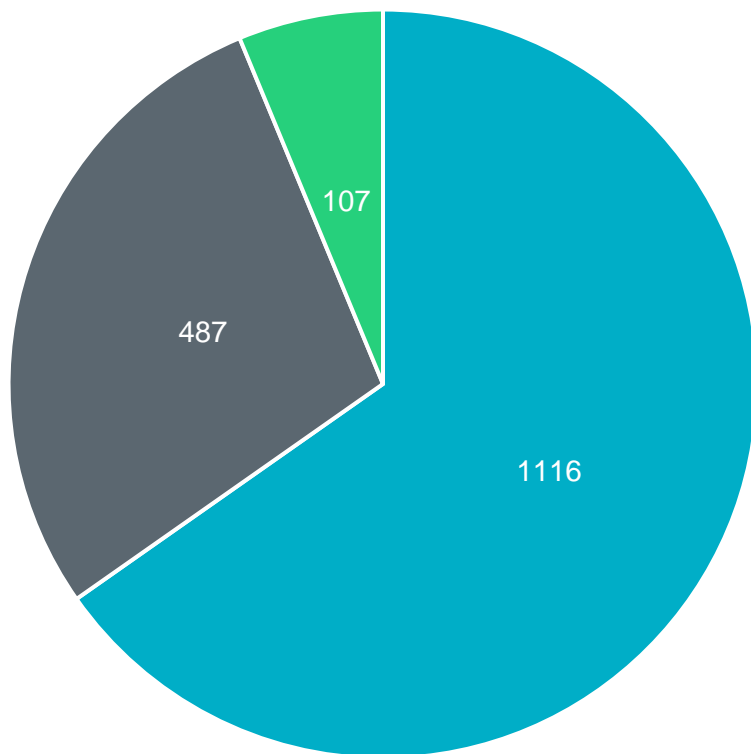
Facility	Inverter OEM	MW Loss 2021	MW Loss 2022	Recovery time 2022	Recovery MW 2022
Plant A	OEM3	28	N/A	N/A	N/A
Plant B	OEM1	150	133	8 min	Full
Plant C/D	OEM1	64	56	5 min	Full
Plant E*	OEM1	21	295	1 min	65%
Plant F	OEM3	48	47	6 min	90%
Plant G/H	OEM1	239	N/A	N/A	N/A
Plant I/J	OEM1	205	196	13 min	Full
Plant K/L	OEM2	153	131	2 min	Full
Plant M	OEM2	147	147	1 min	Full
Plant N/O	OEM3	23	50	30 min	Full
Plant P	OEM1	N/A	259	2 min	90%
Plant Q	OEM2	N/A	94	8 min	30%
Plant R	OEM1	N/A	176	6 min	74%
Plant S	OEM2	N/A	104	Offline till Next Day	0%
Plant T	OEM2	N/A	12	5 min	Full
Plant U	OEM3	9	10	5 min	Full

\*Plant E has additional unit from 2021



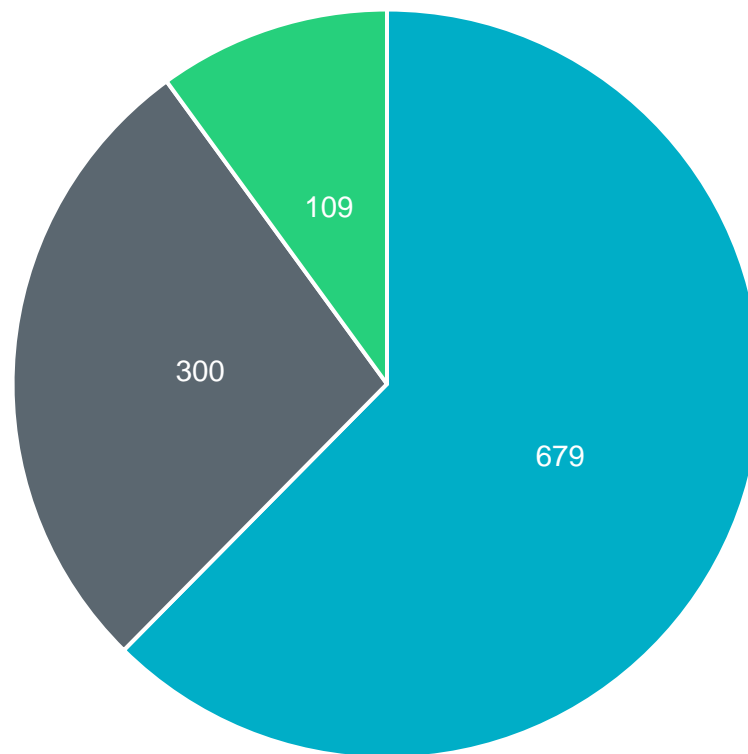
# MW Loss per Inverter Type

2022



■ OEM1 ■ OEM2 ■ OEM3

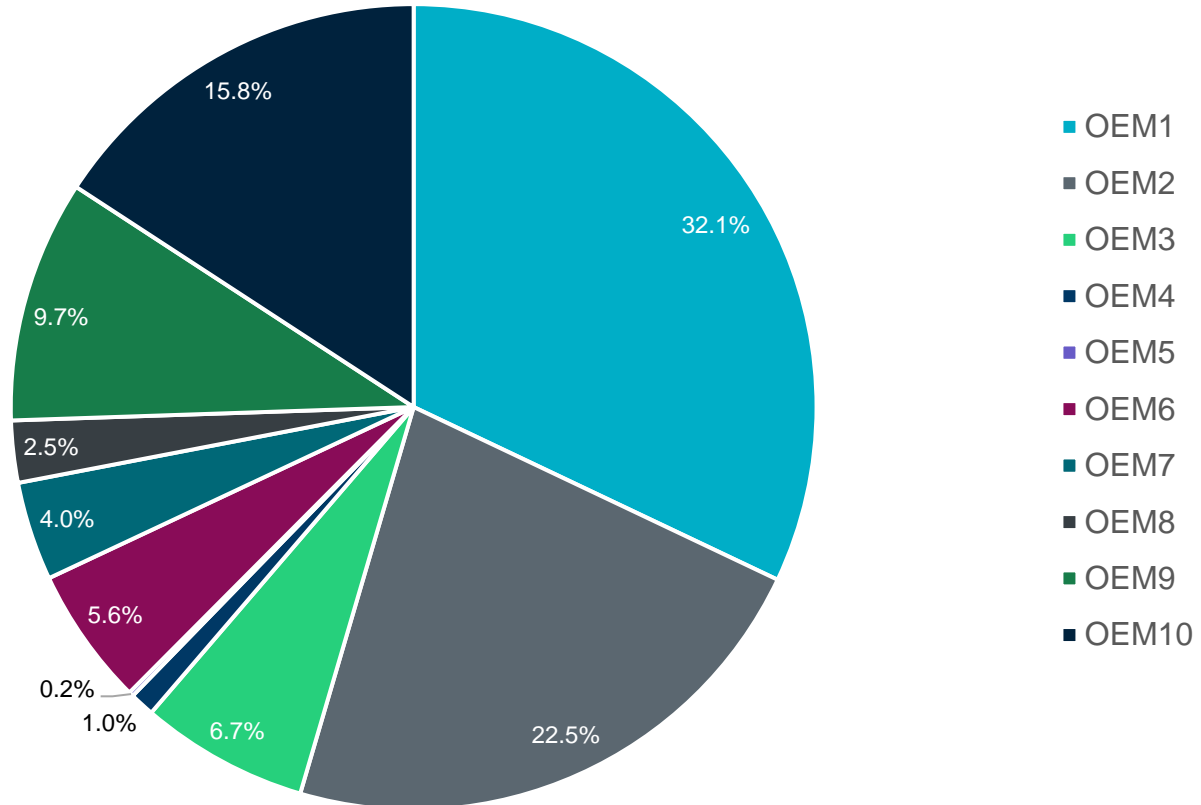
2021



■ OEM1 ■ OEM2 ■ OEM3

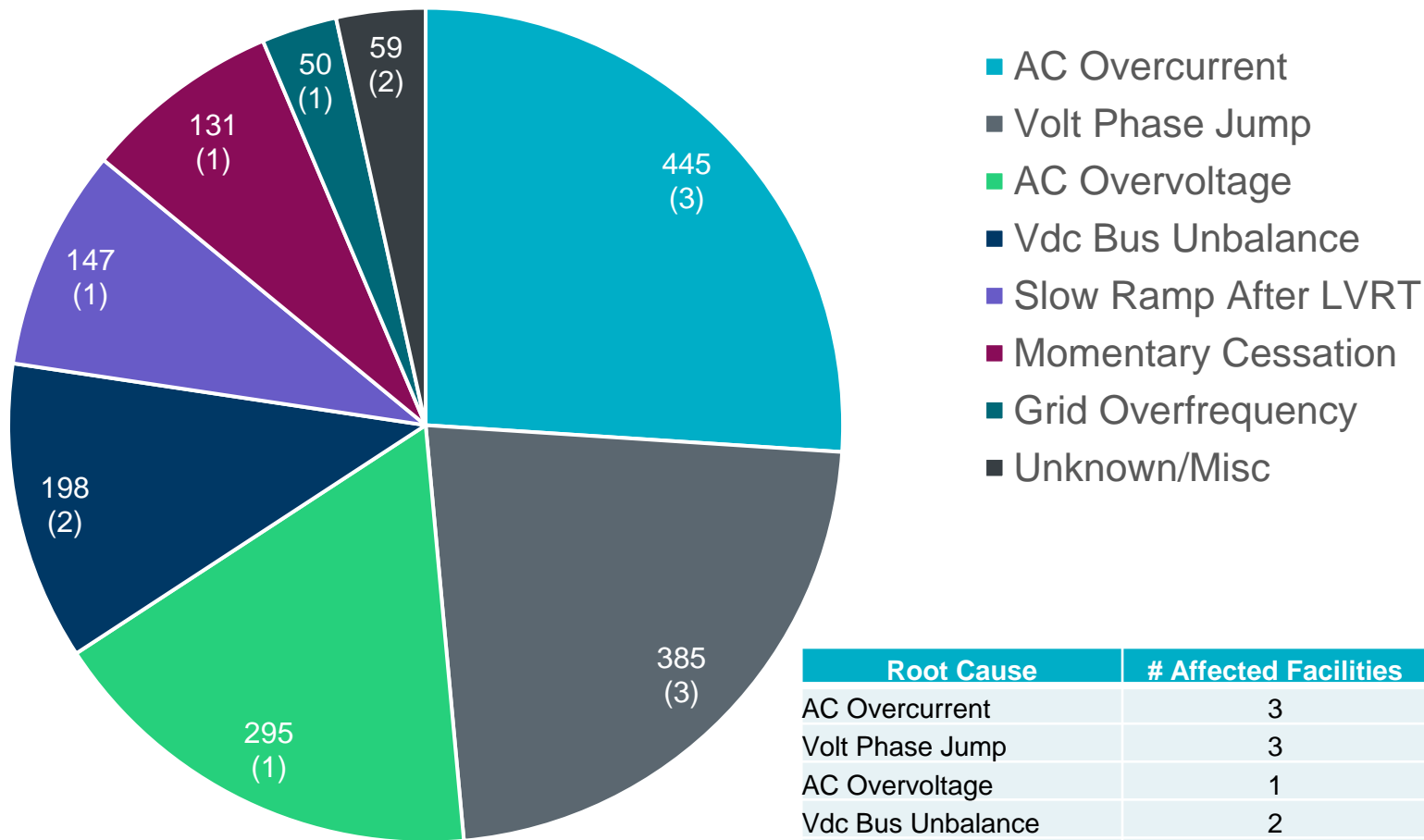
# Total OEM Capacity

% Solar Capacity



# Root Causes for Solar Generation Loss 2022

MW Loss by Root Cause



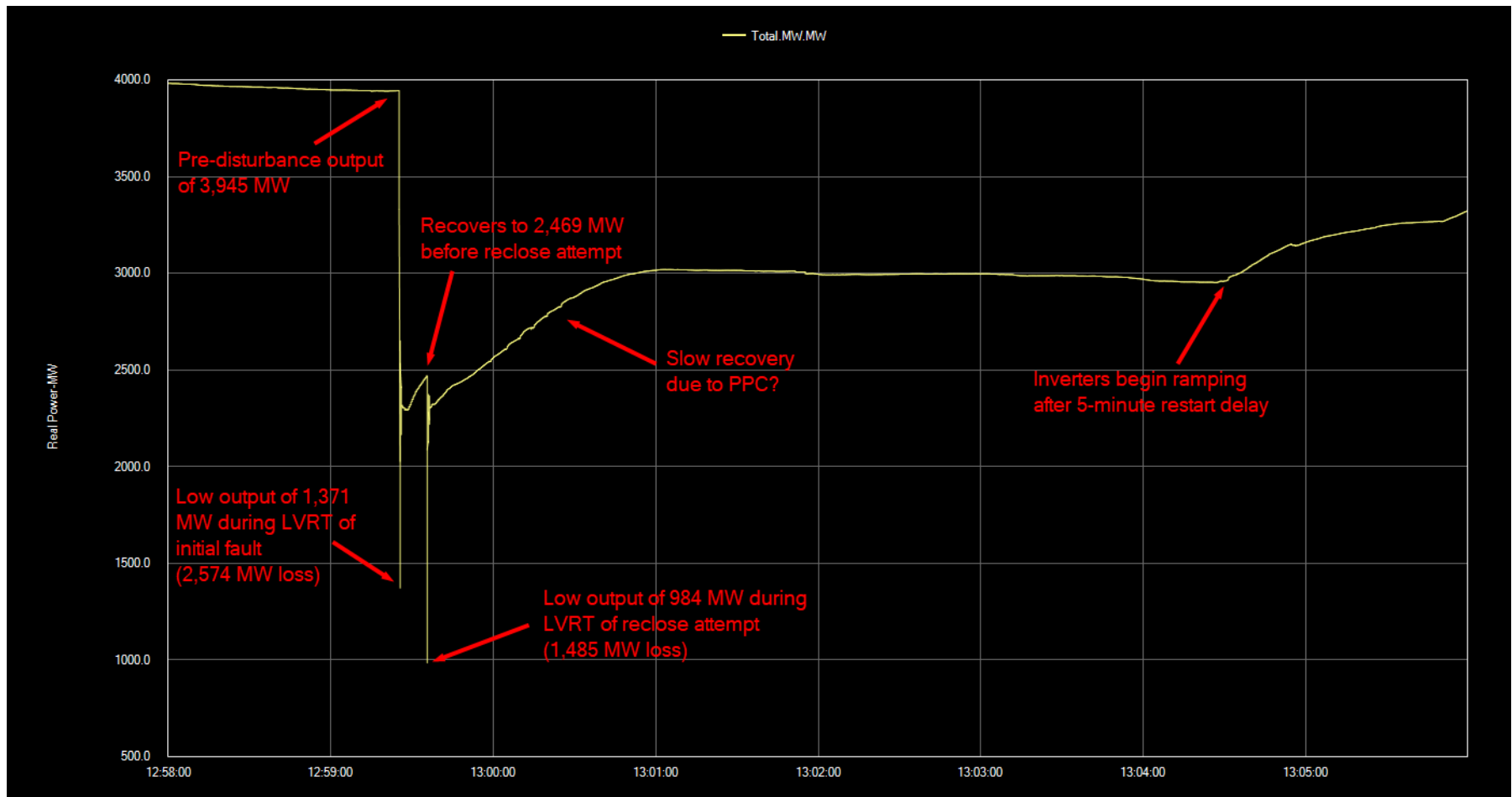
Root Cause	# Affected Facilities	MW Loss
AC Overcurrent	3	445
Volt Phase Jump	3	385
AC Overvoltage	1	295
Vdc Bus Unbalance	2	198
Slow Ramp After LVRT	1	147
Momentary Cessation	1	131
Grid Overfrequency	1	50
Unknown/Misc	2	59



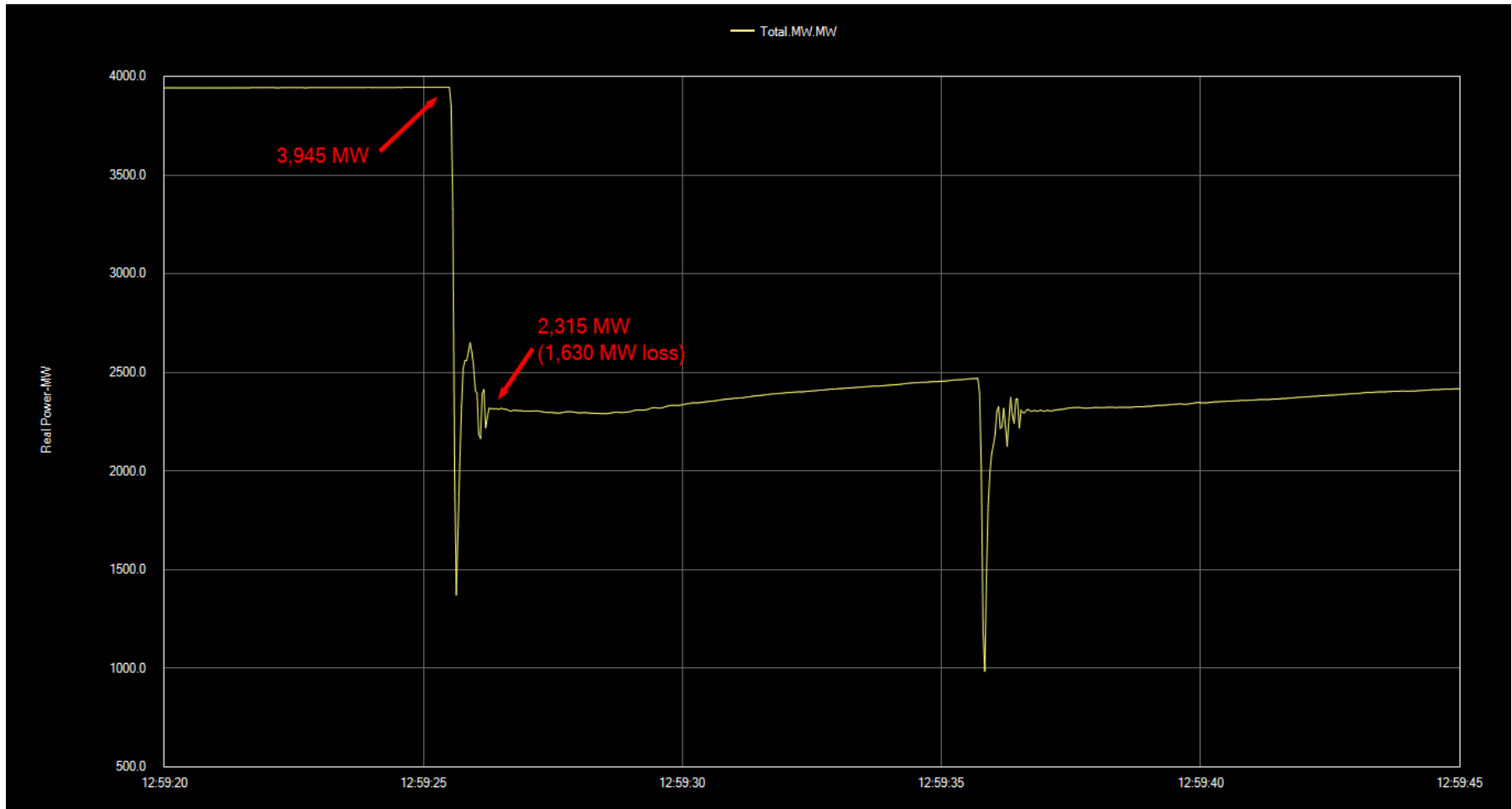
# Recent and Ongoing Work

- NERC Cat 3a Brief Report submitted to TRE on July 11
- Scheduling follow up conference calls with all 14 facilities included in brief report
- Calls will include ERCOT engineers and Compliance, TRE and NERC event analysis engineers, RE technical staff, and OEM representatives
- Discuss updates on investigations into root causes and potential corrective actions (also remaining work from Odessa 2021)
- Calls to be scheduled late August through September
- PUCT has received NERC Brief Report and expecting update once calls completed
- ERCOT, NERC, and TRE to collaborate on detailed NERC event analysis report to be published publicly

# Aggregate MW Loss During LVRT (22 Resources with available PMU data)



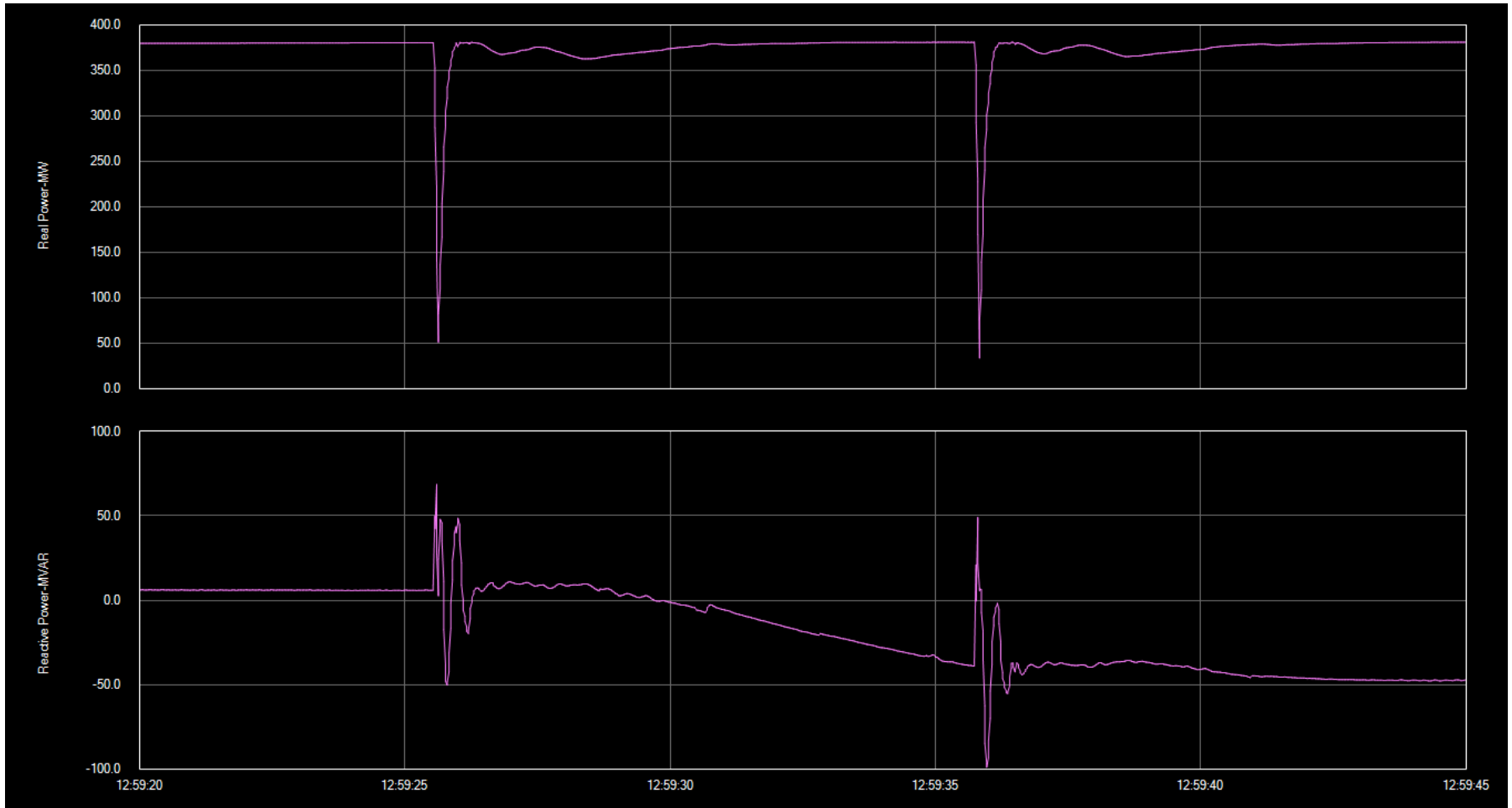
# Aggregate MW Loss During LVRT (PMU data only)



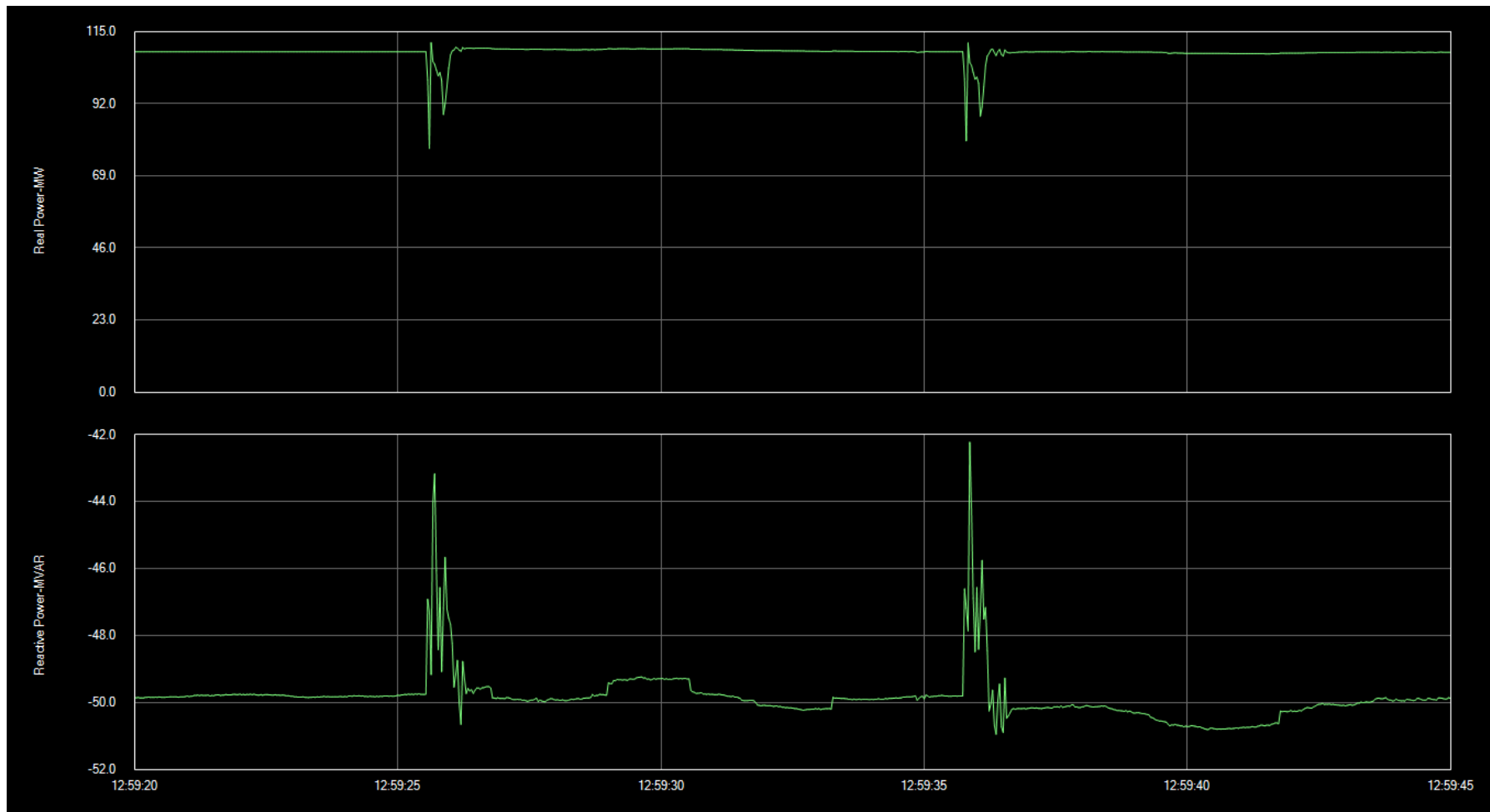
## Notes on Previous Slides

- Reminder – MW loss during LVRT not included in aggregate MW loss for Brief Report (1,709 MW loss)
- PMU data from 22 sites used in plots
- $\sum_{u=1}^{22} (MW_{pre-disturbance}^u - MW_{low\ output}^u) = 3,330\text{ MW}$
- MW loss from additional 6 sites not included in plots
  - DFR event files confirm 186 MW lost during LVRT for 3 sites (only 1 site included in total MW loss in Brief Report)
  - 3 remaining sites only had SCADA data
    - 1 site dropped from 56 to 0 MW (included in Brief Report)
    - Remaining two sites combined 229 MW output and possibly reduced during LVRT

# Common Unit Response



# Better Response?



## Q Priority During LVRT

- Appears many units are set to provide reactive with zero active current during LVRT
- Some inverters have capability for Q priority while active current drops proportional to voltage
- ERCOT looking into reliability risks associated with solar reducing to zero active power during LVRT
- Why is active power to zero response so common?

# Questions?