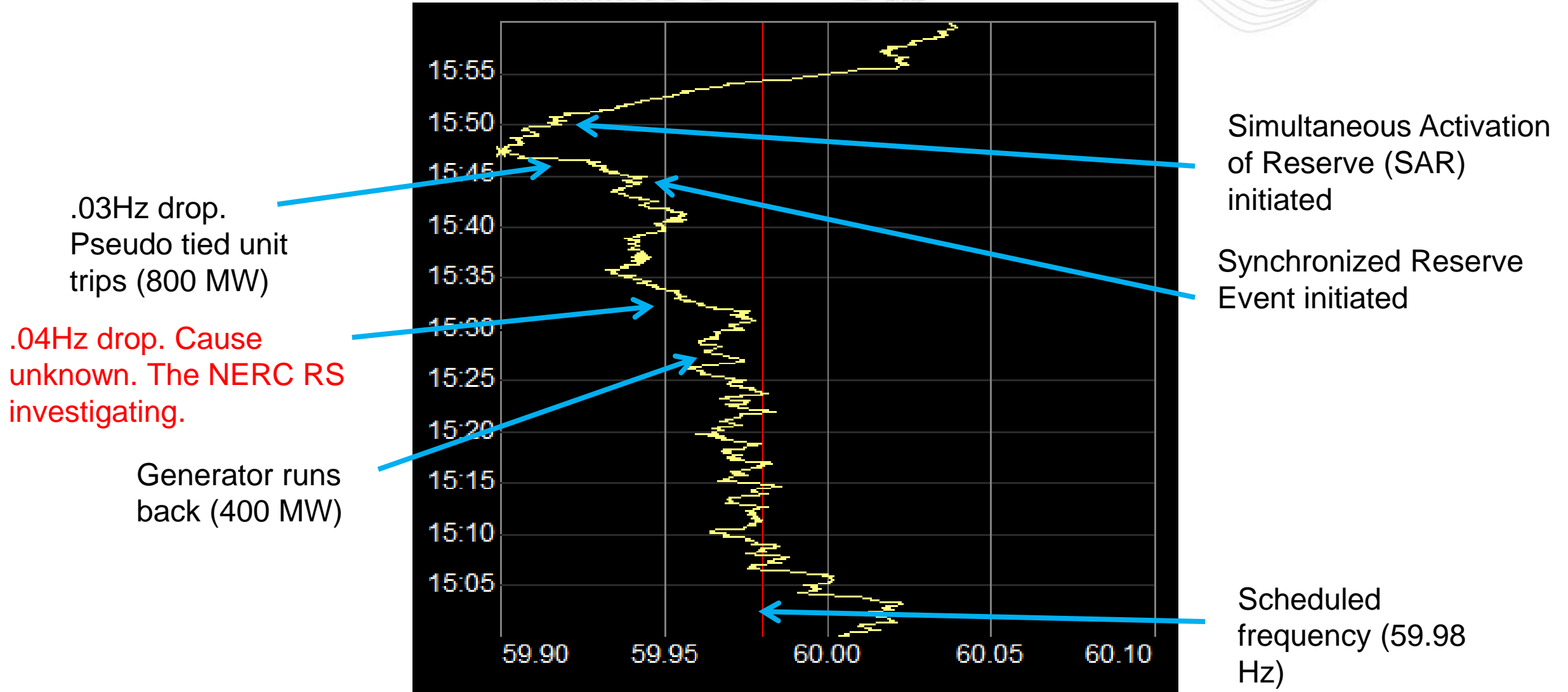




# July 10, 2018, ACE/Frequency Excursion Apparent Cause Analysis Report

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On July 10, 2018, PJM observed a low ACE of -2,942 MW along with a low frequency of 59.903 Hz at approximately 15:49. There were several factors which lead up to this event, including multiple unit trips, non-approved cases from RTSCED, a drop in eastern interconnect frequency and poor synchronized reserve response.



## Time error correction during hot weather alert

Root Cause	Recommendations
Procedures – Details Need Improvement	Add recommendations around not approving time error corrections during emergency procedures (e.g., hot/cold weather alerts) or recalling time error corrections during events such as frequency excursions
Training – Continuing Training Needs Improvement	Improve training related to not approving time error corrections during emergency procedures (e.g., hot/cold weather alerts) or recalling time error corrections during events such as frequency excursions

## No response from units called online

Root Cause	Recommendations
Procedures – Ambiguous Instructions	Improve PJM Manual 13 language to include reference to PJM Manual 11 section 2.3.4 (Minimum Generator Operating Parameters – Parameter Limited Schedules)
	Discuss changes to the emergency procedures messages to more clearly notify participants that resources could be committed on their unit-specific parameters from their parameter-limited schedule
	Provide operations update on PJM Manual 13 revisions related to parameter-limited schedules
Training – Continuing Training Needs Improvement	Reinforce training with PJM members to highlight how unit-specific parameters and “real-time values” are utilized during emergency procedures (e.g., hot/cold weather alerts, maximum generation alerts, maximum generation emergency) (PJM Manual 11 Section 2.3.4)

## Multiple unit trips

Root Cause	Recommendations
Tolerable Failure – Random Equipment Failures, Difficult to Predict	Track a list of unit trips and perform analysis on tripping frequency specifically looking for any trends by unit or unit type

## RTSCED cases not approved

Root Cause	Recommendations
Procedure Enhancement	Create a procedure detailing the steps around monitoring system conditions and deciding when RTSCED case data is valid
Training – Continuing Training Needs Improvement	Additional training for dispatchers and dispatch supervisors on the new procedure and tools/displays related to monitoring RTSCED case data
Human Engineering – Displays/Tools Need Improvement	Improve dispatcher displays to show an operational representation of the RTSCED case data. Additional displays will help dispatch validate cases
	Make improvements to dispatch applications to increase accuracy and dispatcher trust in the solved cases. RTSCED can be configured to account for a portion of committed CTs that are due online

## Unexplained drop in eastern interconnect frequency

Root Cause	Recommendations
Other – Insufficient Information to Identify Root Cause	Work with NERC Resources Subcommittee to investigate the source of the unexplained drop in eastern interconnect frequency on 7/10/2018 15:31 to 15:37



## Poor synchronized reserve event response

Root Cause	Recommendations
Management System – Procedure Not Strict Enough	Make changes to synchronized reserve market to better incentivize resources for participation in the market. This should include a combination of improved penalty and incentive structures

Tier 2 resource response aggregated by resource type

Unit Type	Tier 2 Response (%)
CT	39%
Hydro	83%
Steam	57%
DR	65%
<b>Total</b>	<b>62%</b>

Tier 1 Response (%)	
<b>Total</b>	<b>67%</b>