

Synchronized Reserve Event Response

SRDTF

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Monitoring Analytics

Background

- **Issue Charge states:**

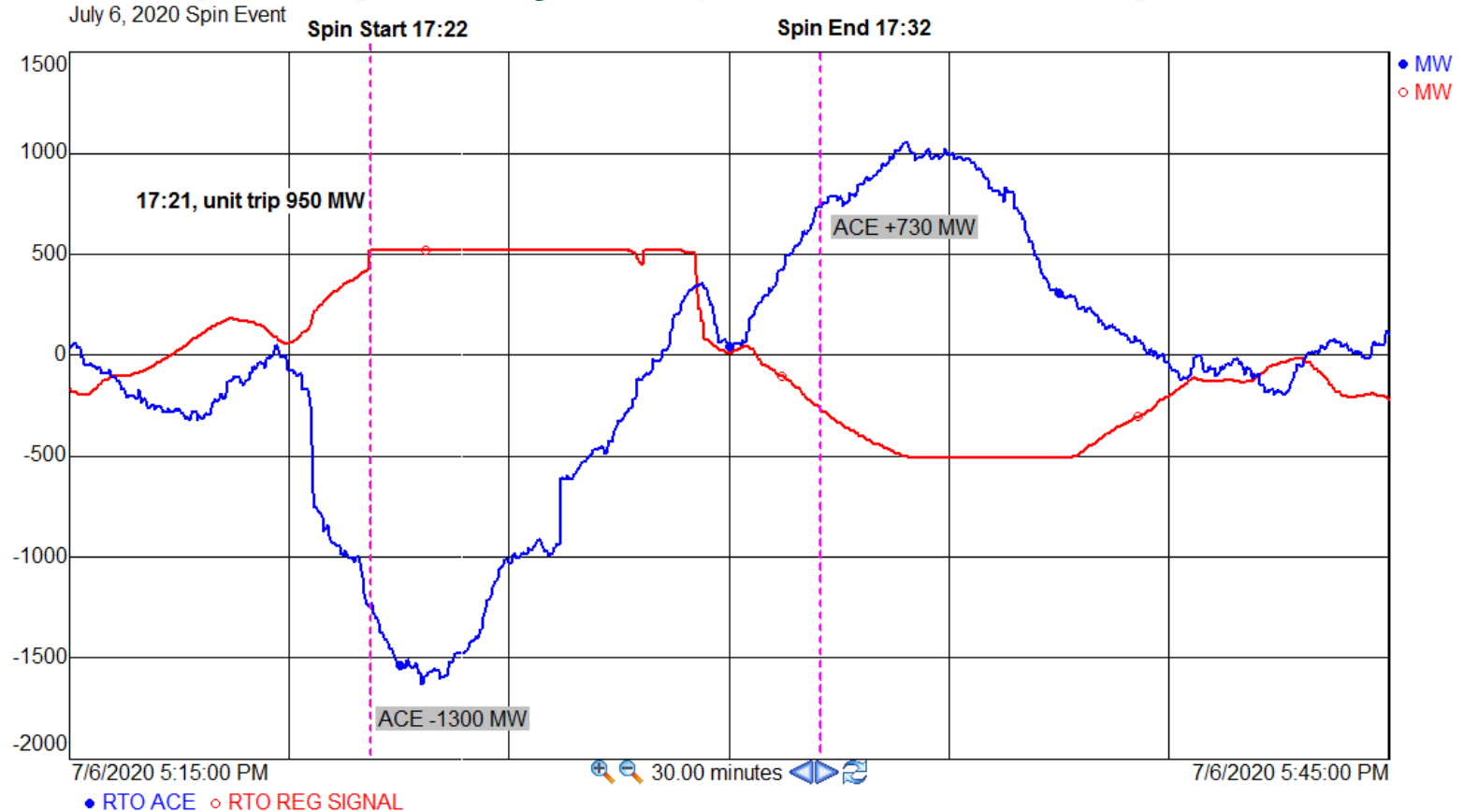
3. The level of unit response is not controlled or limited by PJM in any manner. This results in a mix of over and under response across different units depending on how they respond.

4. As generators shift from following RT SCED dispatch signals to manual control, PJM tends to experience a slow initial recovery, followed by an extended over response.

- **This presentation focuses on:**

- **The response to synchronized reserve events**
- **ACE recovery during actual spin events**
- **Details of the metrics for unit response**

July 6, 2020: ACE



July 6, 2020

- Event starts at 17:22 (t); ACE recovers to zero by 17:30 (t + 8 minutes); ACE continues to increase to +730 MW by 17:32 (t + 10 minutes).
- Settlement statistics:

Event	Settlements Tier 1		Tier 1 Total Response MW	Settlements Tier 2		Tier 2 Total Response MW
	Response MW			Response MW		
	Generation	DR		Generation	DR	
July 6, 2020	1,538.9	15.6	1,554.5	370.4	44.7	415.1

Tier 2 Performance

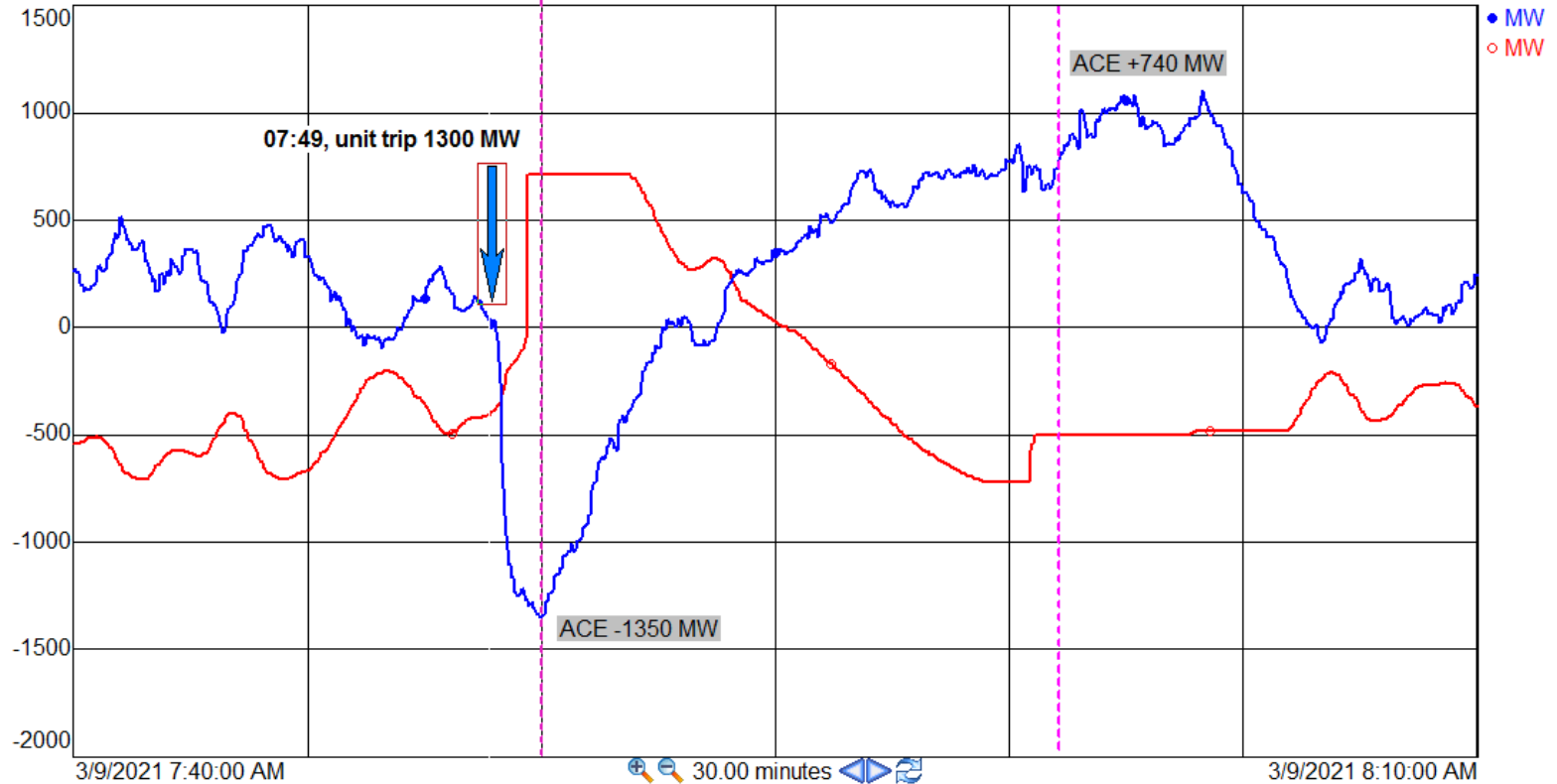
Date	Resource Class	Tier 2	Tier 2	Response Percent
		Cleared MW	Response MW	
July 6, 2020	Gen	413.8	370.4	89.5%
	DR	65.9	44.7	67.9%

March 9, 2021: ACE

March 9, 2021 Spin Event

Spin Start 07:50

Spin End 08:01



• RTO ACE • RTO REG SIGNAL

March 9, 2021

- Event starts at 07:50 (t); ACE recovers to zero by 07:54 (t + 4 minutes); ACE continues to increase to +750 MW by 08:00 (t + 10 minutes).
- Settlement Statistics

Event	Settlements Tier 1		Tier 1 Total Response MW	Settlements Tier 2		Tier 2 Total Response MW
	Response MW			Generation	DR	
	Generation	DR				
March 9, 2021	1,599.0	116.8	1,715.8	304.3	236.4	540.7

Tier 2 Performance

Date	Resource Class	Tier 2	Tier 2	Response Percent
		Cleared MW	Response MW	
March 9, 2021	Gen	596.8	304.3	51.0%
	DR	287.2	236.4	82.3%

Tier 1 Response Metric

- The Tier 1 response presented at the Operating Committee only includes response from units that cleared Tier 1 MW in SCED.
- The difference in the Tier 1 MW cleared and Tier 1 MW settled for response is substantial.

Date	SCED Cleared Tier1 MW	Response from SCED Cleared Tier1 (MW)	Settled Tier1 Response (MW)	Tier 1 Response Difference (MW)	Tier 1 Response Difference (MW)		
					Units not Modeled in SCED	Units Deselected in SCED for Tier 1	Units Eligible but Not Cleared Tier 1
July 6, 2020	1,464.0	526.2	1,538.9	1,012.7	17.3	784.9	210.5
March 9, 2021	1,215.0	635.2	1,599.0	963.8	21.7	571.3	370.8

SCED Tier 1 Deselection

- **M11 allows Tier 1 deselection for:**

“resource types include, but are not limited to: Nuclear, Wind, Solar, Energy Storage Resources (ESRs), and Hydro units”

- **Significant response from units deselected for Tier 1 in SCED.**
- **These MW are not considered in synchronized reserve supply in SCED.**

SCED Tier 1 Deselected Unit Type	July 6, 2020 Response MW	March 9, 2021 Response MW
CT	362.6	84.5
Combined Cycle	154.7	133.5
Fossil Steam	91.6	7.9
Wind	80.8	140.7
Nuclear	62.8	51.0
Solar	21.3	112.4
Run of River Hydro	7.4	38.9
RICE	2.7	1.9
Storage	0.9	0.5
Total	784.9	571.3

SCED Tier 1 DGP Adjustments

- **In addition to deselection, the amount of Tier 1 MW cleared by eligible resources is adjusted down by the use of Degree of Generator Performance (DGP).**
- **DGP will no longer be used with long term SCED reforms planned for November 1, 2021, implementation.**

Synchronized Reserve Events

- **ACE data from spin events indicates more response than Operating Committee metrics show.**
 - **Reserves are not the only source of response (e.g. regulation and interchange).**
- **Settlements credits to resources also corroborate additional response.**
- **Difference between SCED cleared reserves and settled response is evidence of inaccurate reserve measurement, and a result of inaccurate generator modeling.**

Synchronized Reserve Events

- **Response from nuclear, wind, solar and hydro tier 1 deselected units during spin events is not zero.**
- **All call is a crude mechanism for response to unit losses of 1,000 – 1,500 MW, given:**
 - **The size of the PJM generation fleet**
 - **Inaccurate reserve measurement**
- **Need a mechanism for partially converting reserves to energy to recover ACE.**
- **Need to ensure regulation signal is consistent with operational needs during event.**

Performance Evaluation

- **Settlements measures response as the difference between maximum telemetered output between (t+9, t+11) and minimum output between (t-1, t+1), where t is the beginning of the event.**
- **It is unclear what level of response from nuclear, wind, solar, storage, and hydro units is really in response to the all call.**
- **Future discussion:**
 - **SCED solution approvals – timing, modeling, and bias.**

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Appendix: Manual 11 Reference

- **Section 4.2.1:**

*Tier 1 estimates for other resource types that cannot reliably provide Synchronized Reserve service shall be set to zero MW during the market clearing process. Such resource types include, but are not limited to: Nuclear, Wind, Solar, Energy Storage Resources (ESRs), and Hydro units. A resource is only credited for Tier 1 Synchronized Reserve if the resource was considered during the market clearing process, **unless such resource actually provides Tier1 Synchronized Reserve** during a Synchronized Reserve Event.”*

Appendix: Manual 11 Reference

- **Section 4.2.11**

The magnitude of each resource's response to a Synchronized Reserve Event (both Tier 1 and Tier 2) is the difference between the resource's output at the start of the event and its output ten (10) minutes after the start of the event. In order to allow for small fluctuations and possible telemetry delays, resource output at the start of the event is defined as the lowest telemetered output between one (1) minute prior to and one (1) minute following the start of the event. Similarly, a resource's output ten (10) minutes after the event is defined as the greatest output achieved between nine (9) and eleven (11) minutes after the start of the event.

