

Synchronized Reserve Events: SCED

SRDTF

April 30, 2021

IMM



Monitoring Analytics

Background

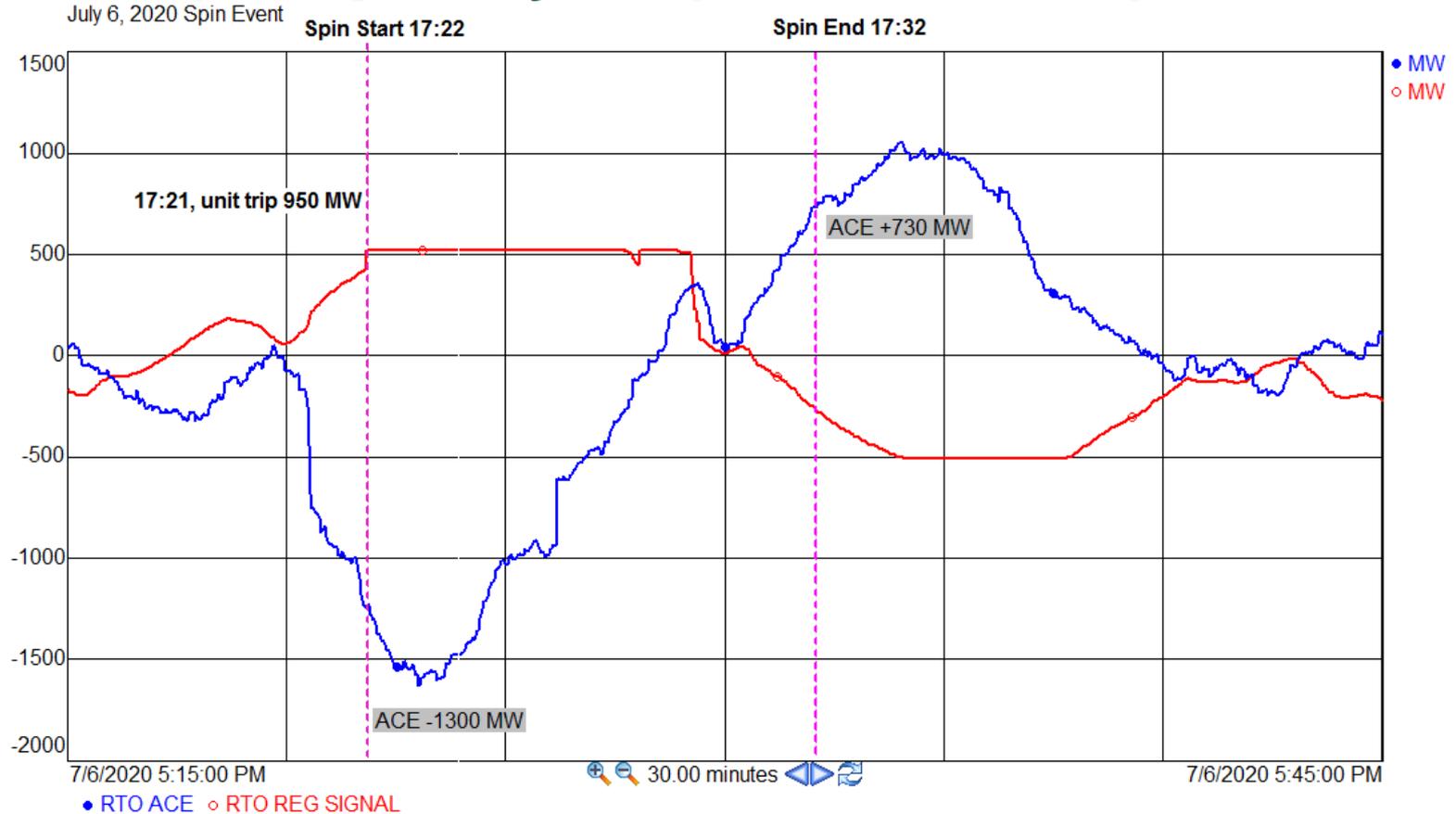
- **Issue Charge states:**

1. The pre-event RT SCED case dispatch signals and prices may remain in effect, when a new RTSCED case that reflects the unit loss is not yet approved. The RTSCED case approved prior to the event does not adequately reflect the verbal instructions from the PJM operator, nor do they adequately reflect the system conditions during the synchronized reserve event.

- **This presentation focuses on:**

- SCED solutions solved and approved related to spinning events.
- Unit loss modeling, load bias and cleared reserves.

July 6, 2020: ACE



July 6, 2020: SCED Timeline

SCED Case	1	2	3	4	5	6	7	8	9	10	11	12
SE Data T ime	17:00:00	17:05:00	17:10:00	17:15:00	17:18:00	17:19:00	17:22:00	17:22:00	17:25:00	17:30:00	17:35:00	17:40:00
Execution Time	17:01:00	17:06:00	17:11:00	17:16:00	17:19:43	17:21:01	17:23:01	17:23:02	17:26:01	17:31:00	17:36:00	17:41:00
Solution Time	17:02:31	17:07:35	17:12:31	17:17:33	17:21:17	17:22:37	17:24:33	17:24:33	17:27:29	17:32:30	17:37:36	17:42:38
Target Time	17:15:00	17:20:00	17:25:00	17:30:00	17:30:00	17:35:00	17:35:00	17:35:00	17:40:00	17:45:00	17:50:00	17:55:00
Tripped Unit Status	Online	Online	Online	Online	Online	Online	Offline	Offline	Offline	Offline	Offline	Offline
Low Bias (MW)	-500	-1000	-1000	-1000	-1000	-1000	-500	-500	-500	-500	-500	-500
Approved Time	17:03:20											
Med Bias (MW)	0	-500	-500	-500	-500	-500	0	0	0	0	0	0
Approved Time		17:08:12							17:28:55	17:33:17	17:38:15	
High Bias (MW)	500	0	0	0	0	0	500	500	500	500	500	500
Approved Time				17:20:58	17:22:03	17:24:57						17:41:54

- **Each SCED case generates three solutions with different levels of load bias MW (shown as Low, Med, High)**
- **SCED solutions with unit loss modeled were available 2.5 to 3 minutes after spin event began (Cases 7 & 8).**

July 6, 2020: SCED Reserves

SCED Case	1	2	3	4	5	6	7	8	9	10	11	12
SE Data Time	17:00:00	17:05:00	17:10:00	17:15:00	17:18:00	17:19:00	17:22:00	17:22:00	17:25:00	17:30:00	17:35:00	17:40:00
Execution Time	17:01:00	17:06:00	17:11:00	17:16:00	17:19:43	17:21:01	17:23:01	17:23:02	17:26:01	17:31:00	17:36:00	17:41:00
Solution Time	17:02:31	17:07:35	17:12:31	17:17:33	17:21:17	17:22:37	17:24:34	17:24:33	17:27:29	17:32:30	17:37:36	17:42:38
Target Time	17:15:00	17:20:00	17:25:00	17:30:00	17:30:00	17:35:00	17:35:00	17:35:00	17:40:00	17:45:00	17:50:00	17:55:00
Tripped Unit Status	Online	Online	Online	Online	Online	Online	Offline	Offline	Offline	Offline	Offline	Offline
Sync Reserve Req (MW)	1,771	1,772	1,772	1,773	1,773	1,773	1,772	1,772	1,771	1,768	1,770	1,768
Low Bias (MW)	-500	-1000	-1000	-1000	-1000	-1000	-500	-500	-500	-500	-500	-500
Approved Time	17:03:20											
SR MW in excess of Req	75	77	0	0	0	124	0	0	0	0	0	1
Sync Reserve MCP	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$2.5	\$2.5	\$7.5	\$7.5	\$7.5	\$5.0
Med Bias (MW)	0	-500	-500	-500	-500	-500	0	0	0	0	0	0
Approved Time		17:08:12							17:28:55	17:33:17	17:38:15	
SR MW in excess of Req	0	25	0	0	0	34	0	0	0	0	0	0
Sync Reserve MCP	\$0.0	\$0.0	\$3.0	\$1.9	\$4.2	\$0.0	\$5.7	\$5.7	\$27.9	\$18.4	\$14.4	\$7.5
High Bias (MW)	500	0	0	0	0	0	500	500	500	500	500	500
Approved Time				17:20:58	17:22:03	17:24:57					17:41:54	
SR MW in excess of Req	1	0	1	0	0	0	0	0	0	0	0	0
Sync Reserve MCP	\$7.5	\$0.0	\$5.0	\$5.0	\$5.0	\$0.0	\$7.5	\$7.5	\$74.5	\$53.5	\$47.2	\$7.9

July 6, 2020 Reserve Dispatch and Prices

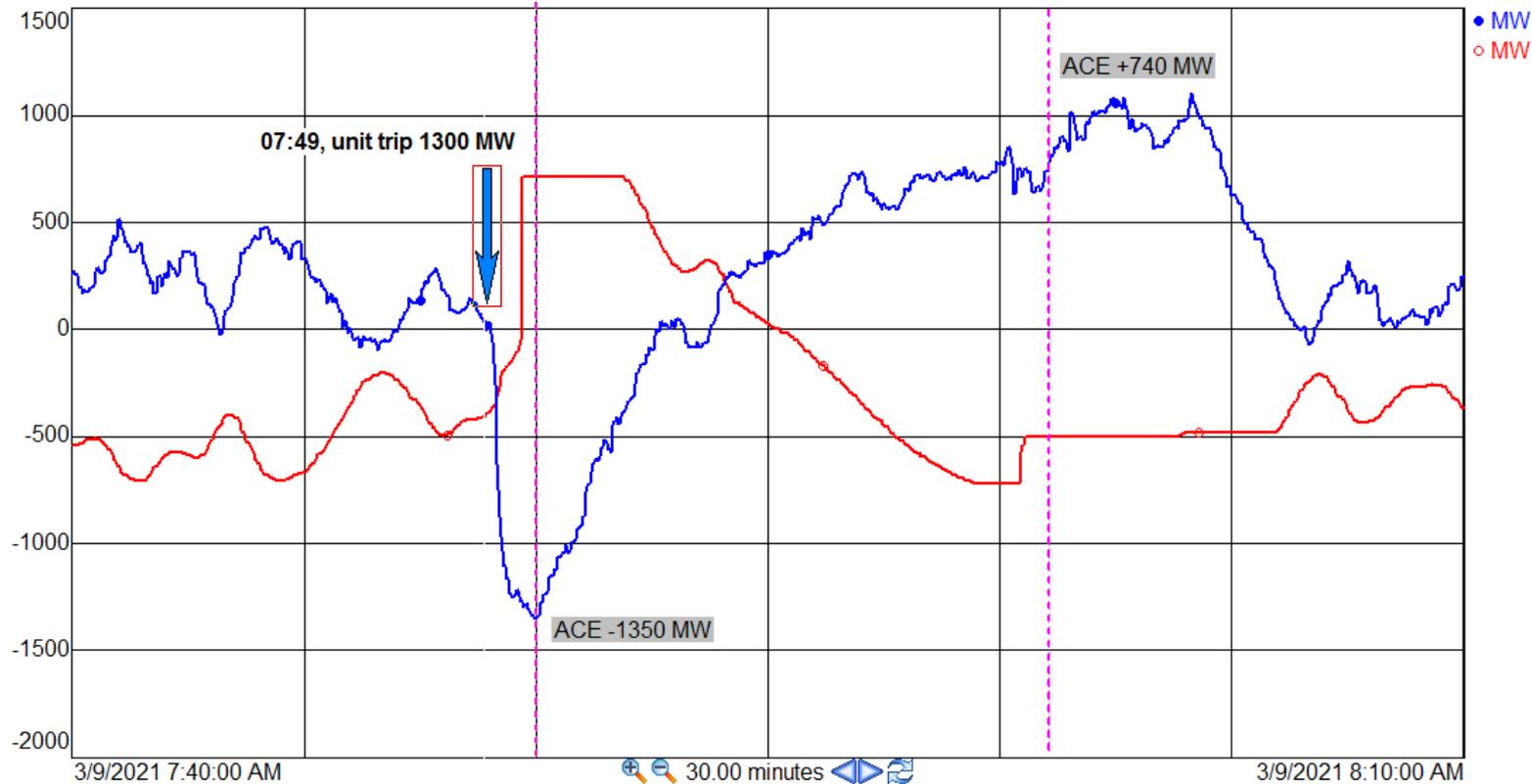
- **No reserve shortages in any of the SCED solutions, even after unit loss is modeled.**
- **The first available SCED case showing the unit trip was not approved.**
- **Dispatchers used load bias both before and after the unit trip.**
- **Multiple SCED solutions were approved from the same SCED case using different levels of load bias.**

March 9, 2021: ACE

March 9, 2021 Spin Event

Spin Start 07:50

Spin End 08:01



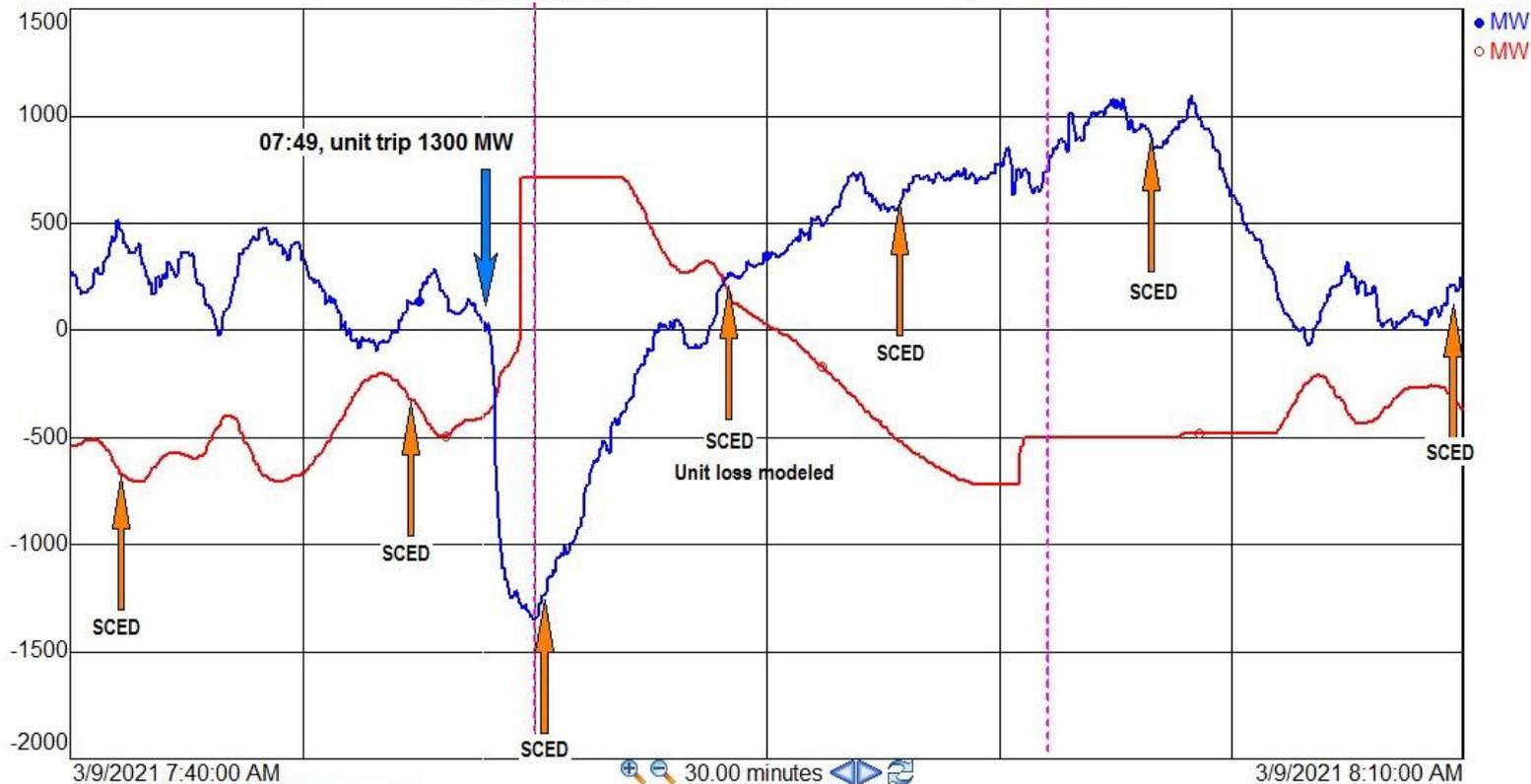
• RTO ACE ◦ RTO REG SIGNAL

March 9, 2021: SCED Approvals

March 9, 2021 Spin Event

Spin Start 07:50

Spin End 08:01



● RTO ACE ○ RTO REG SIGNAL

March 9, 2021: ACE

SCED Case	1	2	3	4	5	6	7	8	9	10	11
SE Data Time	7:25:00	7:30:00	7:35:00	7:39:00	7:44:00	7:50:00	7:53:00	7:55:00	8:00:00	8:05:00	8:10:00
Execution Time	7:26:01	7:31:01	7:36:01	7:41:00	7:46:00	7:51:00	7:53:36	7:56:01	8:01:01	8:06:01	8:11:01
Solution Time	7:27:20	7:32:00	7:37:00	7:42:03	7:47:02	7:51:58	7:54:36	7:57:01	8:02:01	8:07:04	8:12:04
Target Time	7:40:00	7:45:00	7:50:00	7:55:00	7:59:00	8:05:00	8:05:00	8:10:00	8:15:00	8:20:00	8:25:00
Tripped Unit Status	Online	Online	Online	Online	Online	Offline	Offline	Offline	Offline	Offline	Offline
Low Bias (MW)	-750	-750	-750	-750	-750	0	-500	-500	-500	-500	-500
Approved Time		7:33:11	7:41:04	7:47:20		7:54:07					
Med Bias (MW)	-250	-250	-250	-250	-250	500	0	0	0	0	0
Approved Time									8:03:16	8:09:44	8:16:20
High Bias (MW)	250	250	250	250	250	1000	500	500	500	500	500
Approved Time					7:50:08			7:57:49			

- SCED solution with unit loss modeled was available 2.5 minutes after spin event began (Case 6).**

March 9, 2021 SCED Timeline

SCED Case	1	2	3	4	5	6	7	8	9	10	11
SE Data Time	7:25:00	7:30:00	7:35:00	7:39:00	7:44:00	7:50:00	7:53:00	7:55:00	8:00:00	8:05:00	8:10:00
Execution Time	7:26:01	7:31:01	7:36:01	7:41:00	7:46:00	7:51:00	7:53:36	7:56:01	8:01:01	8:06:01	8:11:01
Solution Time	7:27:20	7:32:00	7:37:00	7:42:03	7:47:02	7:51:58	7:54:36	7:57:01	8:02:01	8:07:04	8:12:04
Target Time	7:40:00	7:45:00	7:50:00	7:55:00	7:59:00	8:05:00	8:05:00	8:10:00	8:15:00	8:20:00	8:25:00
Tripped Unit Status	Online	Online	Online	Online	Online	Offline	Offline	Offline	Offline	Offline	Offline
Sync Reserve Req (MW)	1,860	1,859	1,858	1,856	1,842	1,794	1,776	1,757	1,743	1,737	1,740
Low Bias (MW)	-750	-750	-750	-750	-750	0	-500	-500	-500	-500	-500
Approved Time		7:33:11	7:41:04	7:47:20		7:54:07					
SR MW in excess of Req	0	0	0	0	0	0	0	0	0	0	0
Sync Reserve MCP	\$7.5	\$7.5	\$7.5	\$7.5	\$7.5	\$34.4	\$5.6	\$6.8	\$7.5	\$7.5	\$7.5
Med Bias (MW)	-250	-250	-250	-250	-250	500	0	0	0	0	0
Approved Time									8:03:16	8:09:44	8:16:20
SR MW in excess of Req	0	0	0	0	0	-304	0	0	0	0	0
Sync Reserve MCP	\$8.7	\$8.4	\$8.0	\$8.5	\$8.9	\$850.0	\$7.5	\$7.5	\$7.5	\$7.5	\$7.5
High Bias (MW)	250	250	250	250	250	1000	500	500	500	500	500
Approved Time					7:50:08			7:57:49			
SR MW in excess of Req	0	0	1	0	0	-190	0	0	0	0	0
Sync Reserve MCP	\$11.7	\$10.5	\$8.4	\$11.7	\$12.0	\$681.0	\$9.3	\$8.4	\$16.6	\$8.0	\$23.2

Reserve Dispatch and Prices on March 9, 2021

- **The reserve requirement fell with the output of the unit that was largest contingency.**
- **Two solutions (Mid and High bias) from the first case solved with unit loss were short of SR requirement.**
 - **Cases not approved.**
 - **ACE recovered to zero in four minutes after spin event began.**



SCED During Spin Events

- **It appears there is a 2.5 to 3 minute period after a spin event begins, before a new SCED solution with the unit loss modeled is available to be approved.**
- **SCED solutions are approved at expected frequency during spin events.**
- **SCED dispatch instructions are not relevant because all call asks all resources to increase output.**
- **Replace all call with dispatch/commitment tool that generates dispatch signals faster than RTSCED.**
- **Update settlement rules to ensure following these dispatch signals is rewarded and/or penalized.**

Pricing During Spin Events

- **Pricing during spin events should be consistent with supply and demand.**
- **Current shortage pricing rules:**
 - **PJM has 15 minutes to recover ACE.**
 - **If reserves deployed during the spin event are replaced, no shortage pricing.**
 - **If RT SCED calculates a reserve shortage according to the standard process, shortage pricing results.**

ORDCs

- **Currently, the demand curve goes to zero at minimum reserve requirement (MRR) plus 190 MW.**
- **If the available reserves meet MRR plus 190 MW, the prices are close to zero.**
- **Under the reserve market changes to be implemented in May 2022, the ORDC is downward sloping, well beyond the MRR plus 190 MW.**
- **Any reduction in supply, even well beyond the MRR, will result in price increases.**

Other Reserve Market Changes

- **With Tier 1 and Tier 2 consolidation, all reserves will be paid the synchronized reserve MCP.**
- **ORDC will result in higher prices and likely larger cleared reserve MW.**
- **All synchronized reserves subject to penalties for nonperformance.**
- **The current overresponse to all call expected to be amplified under the new reserve market rules.**

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