

Tier 2 Synchronized Reserves Performance Educational Materials

May 29, 2013

Agenda

Education topics to be covered

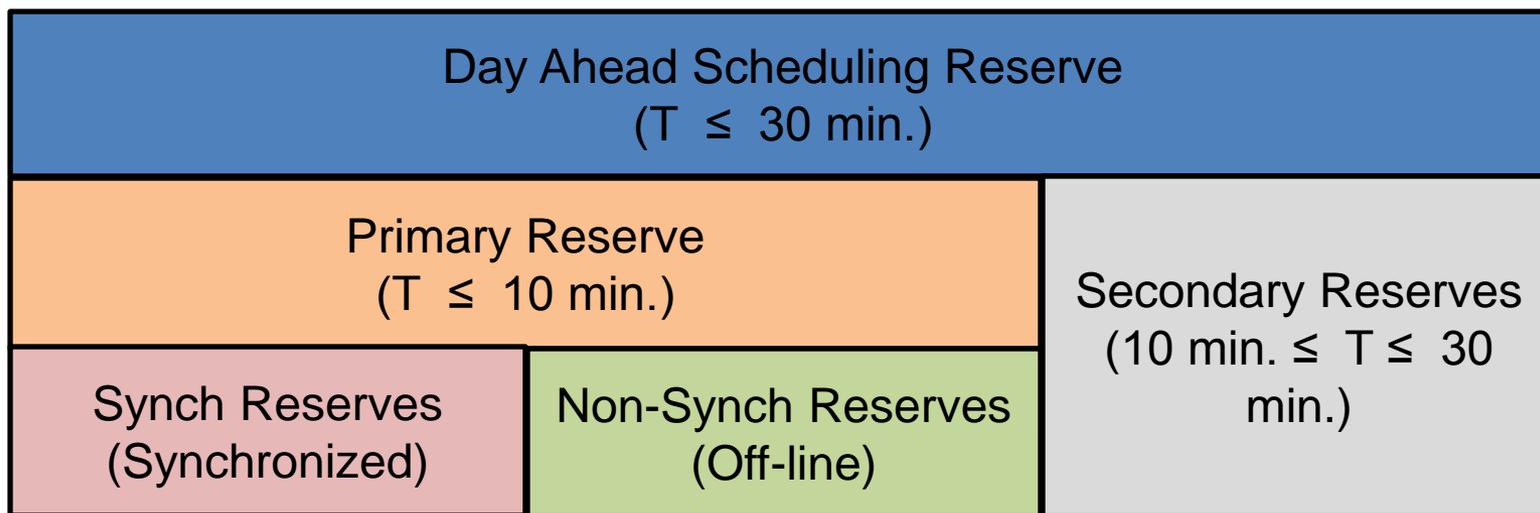
- Problem Statement summary
- Reserves Overview
- Tier 2 Synchronized Reserves Requirements/Qualification/Penalties
- Drivers that May Potentially Impact Reliability
- Penalty structure
- Experience from other RTOs

Problem Statement Summary

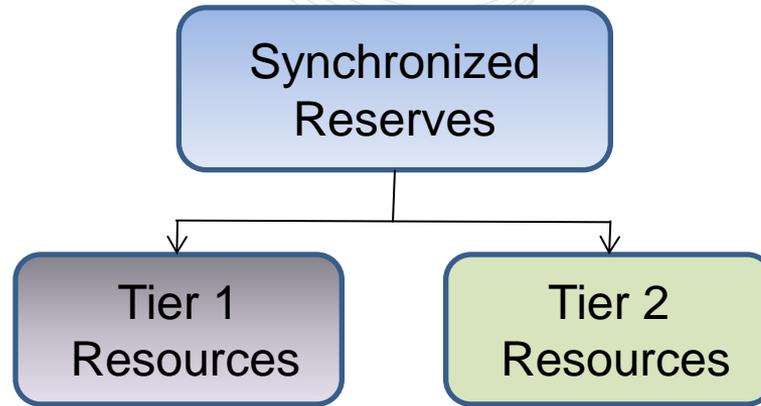
- Statement summary:
 - Tier 2 Synchronized Reserves (“SR”) receive a payment to be available to perform when PJM needs additional reserve to manage the grid. On average, PJM initiates a SR event, thereby calling on resources to fulfill their commitment and perform as required, 3 times per month. The penalty for non-performance of a Tier 2 resource is to take away revenue for the hour when the resource did not perform and also require the resource to provide Tier 2 reserves for 3 like days with no compensation. Further, Tier 2 resources do not go through a certification process to ensure the resource can respond within 10 minutes before they are permitted to participate in the market. With the approval of increased participation by Demand Response (DR) in the SR Market to 33%, coupled with some historical instances of performance issues from both generation and DR, PJM would like to explore different opportunities to ensure the resources that participate in the market have the capability to provide this reliability service initially and continuously.
- Issue source: PJM
- Key Work Activities:
 - Evaluate the current entry to the SR Market qualification process
 - Consider whether there is a need for additional ongoing processes to validate the performance capability of resources, and if so, develop those process improvements
 - Review the consequences for non-performance or substandard performance
 - Develop a requalification process, if required, for resources that repeatedly fail to perform
- Expected deliverables: Tariff and/or Manual changes
- Expected overall duration of work: Completed by Oct. 1 2013

Reserves Overview

- What are reserves?
 - Reserves are additional generation capacity above the expected load scheduled to protect the power system against the uncertain occurrence of future operating events, including the loss of generation or load forecasting errors



Reserves con't



<p>Tier 1 (Economic)</p>	<p>Online units that follow economic dispatch and only partially loaded and therefore are able to increase output within 10 minutes following PJM dispatcher request to an event</p>
<p>Tier 2 (Non-economic)</p>	<p>Resources that offered into the Synchronized Reserve Market and cleared</p> <ul style="list-style-type: none"> Condensers (CTs & hydro) transition to online Tier 2 condense mode Steam reduced to provide Tier 2 CTs online at min - operating at a point that deviates from economic dispatch Demand Response that can drop load

Current Structure

Two Reserve Zones

- Reliability First Corporation (RFC) Reserve Zone
 - Mid-Atlantic sub-zone, defined based on most limiting transfer interface
 - Analysis of most limiting transfer interface coincides with quarterly network model builds
- Southern Reserve Zone (SERC companies)
 - Comprised of Dominion zone

New Structure

One Reserve Zone

- RTO Reserve Zone
 - Mid-Atlantic Dominion (MAD) sub-zone due to potential deliverability issues
 - ❖ defined based on most limiting transfer interface
 - ❖ Resources with 3% or greater raise help distribution factor on the interface are included in MAD sub-zone
 - Merging the Mid-Atlantic plus Dominion zones recognizes their electrical similarity as being downstream of major interfaces
 - Reduces reserves that must be held overall and will reduce overall system costs of maintaining reserve during non-shortage conditions

Tier 2 Requirements

- Eligibility
 - “Generation Resources and Demand Resources must be able to provide 0.1 MW of Tier2 Synchronized Reserve Capability in order to participate in the Tier 2 Synchronized Reserve Market.” (Manual 11 – Section 4.2.1)
- Commitment
 - “Any resource that is committed for Tier 2 when a synchronized reserve event occurs is obligated to respond for their commitment at the start of the event within 10 minutes” (Manual 11 – Section 4.2.7)
 - “All resources must maintain an output level greater than or equal to that which was achieved as of 10 minutes after the event for the duration of the event or thirty minutes from the start of the event, whichever is shorter.” (Manual 11 – Section 4.2.12)

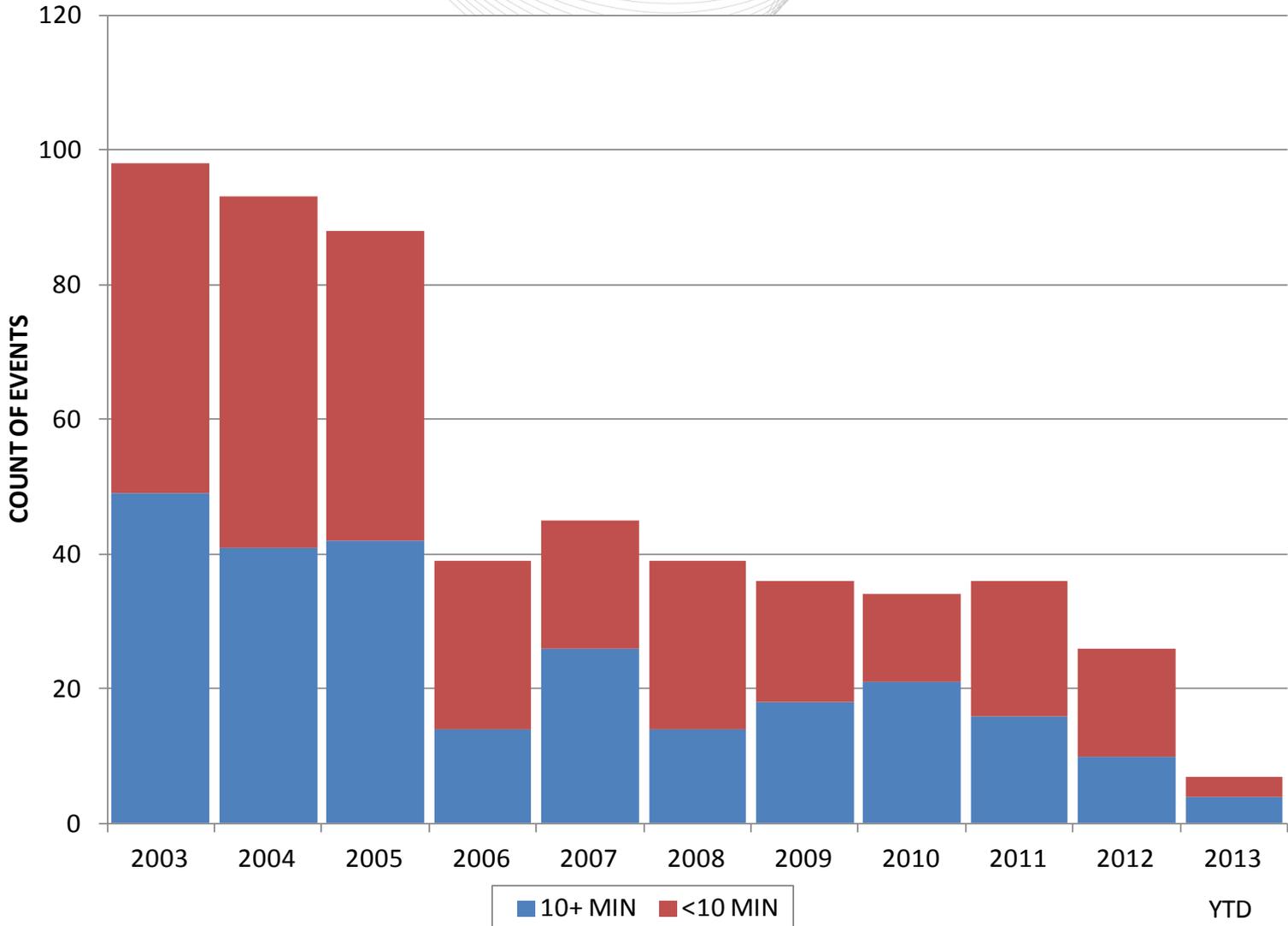
Current Manual Language – Qualification & Penalties

- Manual 11 – Section 4.2.1
 - “There is no qualification process for Tier 2 resources”
- Manual 11 – Section 4.2.13
 - “Since Tier 2 resources are credited with a capacity payment any time they are expected to be ready to respond to a synchronized reserve event, failure to provide that response results in an obligation to “repay” that credit following instances of non-performance.”
 - “The resource is credited for Tier 2 synchronized reserve capacity in the amount that actually responded for the contiguous hours the resource was assigned Tier 2 synchronized reserve during which the event occurred”
 - “The owner of the resource incurs a synchronized reserve obligation in the amount of the shortfall for the three consecutive, same-peak days occurring at least three business days following the event.”

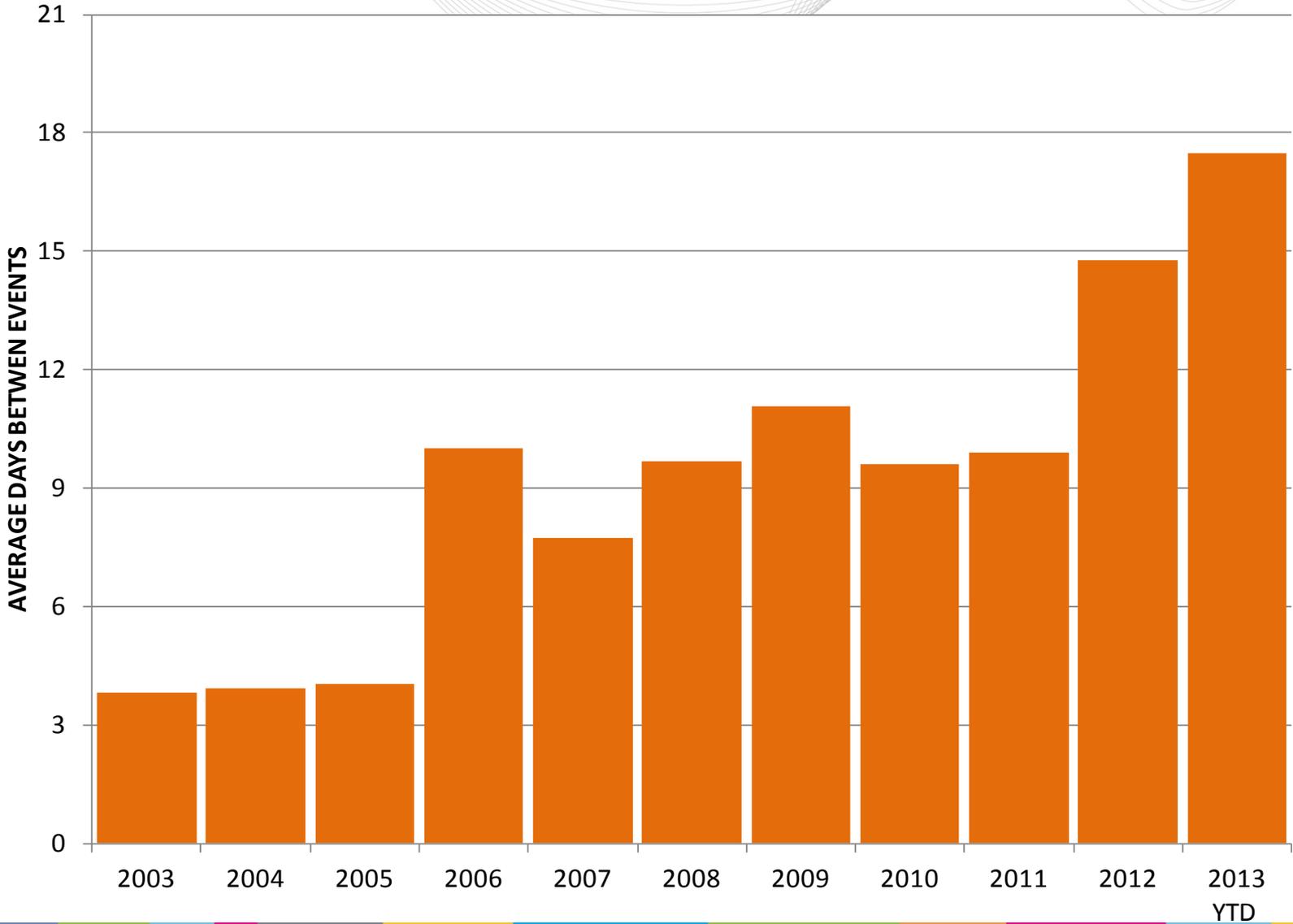
Drivers that May Potentially Impact Reliability

- Change in the mix of gen and DR (now 33%) – we want to make sure we don't drop below 75% average performance. Ultimately we'd like to strive for performance in the 90% range
- Because there is no qualification test requirement to enter the SR market, we have no verification that units can meet the requirements to perform
- Also, based on the weak penalty there may be little incentive for units to continue to perform as requested, after entering the market

Quantity of Synchronous Reserve Events in Decline



Average Days Between SR Events Increasing



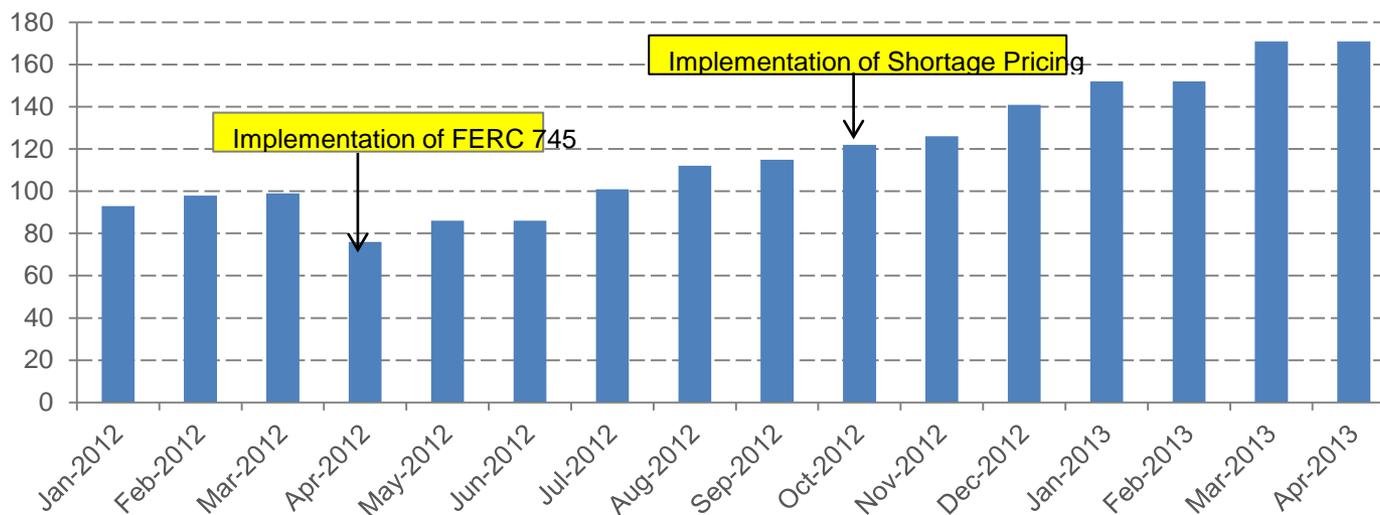
Current Performance, 10+ Min Events

10+ Min. Events By Year	T2 MET 100%+ Resp of Assign		T2SHORT										T2 ZERO 0% and Less Response		Total	
	Resp	Asgn	81-99%		61-80%		41-60%		21-40%		1-20%		Resp	Asgn	Resp	Asgn
2007	664	550	287	308	101	139	4	9	12	31	4	86	-	207	1,071	1,329
	41%		23%		10%		1%		2%		6%		16%		81%	
2008	463	353	205	222	60	91	37	70	18	58	6	76	-	136	789	1,007
	35%		22%		9%		7%		6%		8%		13%		78%	
2009	469	365	295	320	76	103	44	85	31	98	3	141	-	472	918	1,584
	23%		20%		7%		5%		6%		9%		30%		58%	
2010	1,006	756	463	494	190	270	35	69	30	90	8	165	-	472	1,732	2,317
	33%		21%		12%		3%		4%		7%		20%		75%	
2011	1,085	858	498	531	118	158	41	82	43	147	13	413	-	286	1,799	2,474
	35%		21%		6%		3%		6%		17%		12%		73%	
2012	117	74	64	71	23	30	1	3	3	10	1	24	-	28	208	240
	31%		29%		13%		1%		4%		10%		11%		87%	
2013	77	62	47	50	62	88	23	47	25	89	1	32	-	34	235	402
YTD	15%		13%		22%		12%		22%		8%		8%		59%	

Participation in SR Market

- New participation by traditional generation has remained relatively constant
- Number of new Demand Response participants is increasing

Number of Unique Participating Locations per Month



Penalty Structure

- Current penalty calculation:
 - Day of penalty
 - Shortfall reduces Tier 2 Credits for all contiguous hours
 - Obligation for 3 consecutive like peak days
 - (shortfall (MW)) (duration of the event (min))/60 min

YEAR	PENALTY OBLIGATION (MWh)	PENALTY CHARGES	PENALTY CHARGE RATE (\$/MW)
2008	8764.488	\$58,352.31	\$6.66
2009	47820.816	\$197,922.52	\$4.14
2010	55661.184	\$215,014.83	\$3.86
2011	46043.378	\$227,676.65	\$4.94
2012	4038.192	\$4,387.94	\$1.09
2013	12471.408	\$11,219.73	\$0.90

Experience from Other RTOs - NYISO

- NYISO
 - To become a Reserve Qualified Resource, a pre-qualification test must be passed
 - If the participant fails the test, all reserve bidding privileges are removed
 - Participant must submit an explanation describing the cause of the failure
 - A retest must be scheduled
 - The NYISO may conduct a performance audit of an individual Generator at any time and without prior notification
 - 3 Audit reasons
 - To ascertain the emergency response rate as a test of ability to provide Operating Reserves
 - To assess the response to an order for a reserve pick-up to ascertain ability to provide Operating Reserves
 - To ascertain ability to reach and operate at Normal Upper Operating Limit

Experience from Other RTOs - CAISO

- CAISO
 - An Ancillary Service Provider wishing to provide Spinning Reserve must pass a qualification test to demonstrate the overall ability to meet the performance requirements:
 - Confirmation of control communication path performance for Dispatch instructions
 - Confirmation of primary and secondary voice circuits for receipt of Dispatch instructions
 - Confirmation of performance
 - Testing of the resource's governor or other control system
 - CAISO conducts random compliance and performance tests. If a resource fails:
 - A warning notice is given
 - Warning stays in effect until a test is passed. Performing during the next event does not void the warning
 - If fail a second audit while the warning is in effect, the resource is disqualified from providing services

Experience from PJM

- PJM
 - To become a Tier 2 Synchronized Reserve provider, there is no qualification test required
 - Units do not have to verify their capability to perform
 - There is no mechanism to restrict units from entering this market
 - PJM does not conduct random compliance and performance tests
 - Units do not have to verify that they have maintained the capability to respond
 - There is no mechanism to disqualify units
 - PJM does have a weak penalty
 - Little deterrent to repeated failure to perform