

# Scarcity Pricing Mechanism: Tier 2 Synchronized Reserve Market Structure

SPWG

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## Issues for discussion

- **Structure of the Tier 2 Market: Hour ahead scheduling vs. “full 5 minute optimization”**
  - **Cycling of unit assignments**
  - **Location specific opportunity costs**
  - **Participation of DR**
  - **Effects on generation participation and incentives**

# Concerns with PJM's Approach

- **System control issues with PJM's proposal**
  - **PJM proposes to largely eliminate hour ahead scheduling of Tier 2 Synchronized Reserve (S.R.)**
  - **PJM proposal, as presented, will reduce reserves and sources of reserves**
    - **Cycling within hour assignments**
    - **Participation of DR**
    - **Affects on generation participation and incentives**
  - **May affect frequency of events**

# Sync Reserve Optimization: PJM Proposal

- **PJM proposes to effectively eliminate hour ahead Tier 2 S.R. Market**
  - **Hour ahead assignment based on unit limitations (need to start, etc) on within hour assignment**
- **PJM's objective is to maximize the resources being optimized within the 5 minute dispatch**
- **PJM argues 5 minute optimization will improve overall efficiency and improve transparency of system conditions**

# Sync Reserve Optimization: PJM proposal

- **Efficiency and Reliability improvement via “full” 5 minute optimization depends on a number of unproven assumptions:**
  - **PJM assumes there are issues w/ current method**
  - **Resources will be capable of changing status between reserves and energy on a 5 minute basis**
  - **Resources will be willing to follow dispatch on a 5 minute basis**
  - **“Cycling” of assignment for a 10 minute product makes sense on a 5 minute basis**
  - **PJM presumes *required* “cycling” will not occur**
  - **There will be the same amount of reserve capacity available under 5 minute optimization as under hour ahead scheduling mechanism**

# Synchronized Reserve Optimization: MA concerns with PJM proposal

- **Concerns about “full” 5 minute optimization (and elimination of hour ahead Tier 2 S.R. market):**
  - **No reason to believe 5 minute “cycling” of Tier 2 S.R. assignments will not occur (constraints and multiple marginal units)**
    - **Could reduce available S.R. reserves “offers”**
    - **How does DR track S.R. status?**
    - **Preventing cycling cannot be consistent with 5 minute optimization**
      - Restricting cycling will reduce “optimization”
      - Taking assignments as given from interval to interval

# Synchronized Reserve Optimization: MA concerns with PJM proposal

- **Concerns about “full” 5 minute optimization (and elimination of hour ahead tier 2 market):**
  - **Fewer reserves could be made available if hour ahead scheduling is lost:**
    - **DR may need hour ahead notification to participate**
      - Significant source of Tier 2 S.R. under current structure
    - **Generation may have less reserves available on “5 minute” basis**
      - 10 minute ramp vs. 5 minute assignment
      - May have more available from predetermined set points (from hour ahead assignment)
      - Incentives under hourly integrated prices
      - Questionable transparency improvement with hourly integrated prices

# Cycling within hour assignments

Area A Generation			
Gen	MC	Max Gen	Reserves
B	\$60	850	50
C	Q + \$100	400	50

  

Area B Generation			
Gen	MC	Max Gen	Reserves
D	\$600	100	50

Reserve Requirement = 100 MW



# Cycling within hour assignment

	1	2	3	4	5	6	7	8	9	10	Energy area A							Energy Area B					Unit D			
Row	Total Greater System Demand	Greater System Demand (Area A)	Transmission from Area A to B	Local Demand for area B	Net Demand for area B	Reserves	Area A LMP	Reserve Area Price	MU Area A	MU Area B	B Energy	B Reserves	MC	"Local" Opportunity Cost	C Energy	C Reserves	MC	"Local" Opportunity Cost	Area B LMP	D Energy	D Reserves	MC	"Local" Opportunity Cost	Margin on energy	Margin on Reserves	Row
1	450	400	50	50	0	150	\$ 60	0	B	B	450	50	\$ 60		0	50	\$ -		\$ 60	0	50	\$ -				1
2	550	500	50	50	0	150	\$ 60	0	B	B	550	50	\$ 60	\$ -	0	50	\$ -		\$ 60	0	50	\$ -				2
3	750	700	50	50	0	150	\$ 60	0	B	B	750	50	\$ 60	\$ -	0	50	\$ -		\$ 60	0	50	\$ -				3
4	800	750	50	50	0	150	\$ 60	0	B	B	800	50	\$ 60	\$ -	0	50	\$ -		\$ 60	0	50	\$ -				4
5	850	800	50	50	0	100	\$ 60	0	B	B	850	0	\$ 60	\$ -	0	50	\$ -		\$ 60	0	50	\$ -				5
6	950	850	50	100	50	100	\$ 150	\$ 90	C	D	850	0	\$ 60	\$ 90	50	50	\$150.00	\$ -	\$ 600	50	50	\$ 600	\$ -	\$ -		6
7	1020	900	50	120	70	100	\$ 220	\$ 160	C	D	830	20	\$ 60	\$ 160	120	50	\$220.00	\$ -	\$ 600	70	30	\$ 600	\$ -	\$ -		7
8	1080	950	50	130	80	100	\$ 250	\$ 190	C	D	820	30	\$ 60	\$ 190	150	50	\$250.00	\$ -	\$ 600	80	20	\$ 600	\$ -	\$ -		8
9	1130	1000	50	130	80	100	\$ 330	\$ 270	C	D	820	30	\$ 60	\$ 270	230	50	\$330.00	\$ -	\$ 600	80	20	\$ 600	\$ -	\$ -		9
10	1190	1050	50	140	90	100	\$ 390	\$ 330	C	D	810	40	\$ 60	\$ 330	290	50	\$390.00	\$ -	\$ 600	90	10	\$ 600	\$ -	\$ -		10
11	1240	1100	50	140	90	100	\$ 440	\$ 380	C	D	810	40	\$ 60	\$ 380	340	50	\$440.00	\$ -	\$ 600	90	10	\$ 600	\$ -	\$ -		11
12	1250	1110	50	140	90	100	\$ 450	\$ 390	C	D	810	40	\$ 60	\$ 390	350	50	\$450.00	\$ -	\$ 600	90	10	\$ 600	\$ -	\$ -		12
13	1270	1130	50	140	90	80	\$ 910	\$ 850	B	D	830	20	\$ 60	\$ 850	350	50	\$450.00	\$ 460.00	\$1,450	90	10	\$ 600	\$850	\$ 850	\$ 850	13
14	1290	1150	50	140	90	60	\$ 910	\$ 850	B	D	850	0	\$ 60	\$ 850	350	50	\$450.00	\$ 460.00	\$1,450	90	10	\$ 600	\$850	\$ 850	\$ 850	14
15	1320	1180	50	140	90	30	\$1,330	\$ 850	C	D	850	0	\$ 60	\$1,270	380	20	\$480.00	\$ 850.00	\$1,450	90	10	\$ 600	\$850	\$ 850	\$ 850	15

# Cycling within hour assignment

	1	2	3	4	5	6	7	8	9	10	Energy area A						Energy Area B						Unit D		25	
Row	Total Greater System Demand	Greater System Demand (Area A)	Transmission from A to B	Local Demand for area B	Net Demand for area B	Reserves	Area A LMP	Reserve Area Price	MU Area A	MU Area B	B Energy	B Reserves	MC	"Local" Opportunity Cost	C Energy	C Reserves	MC	"Local" Opportunity Cost	Area B LMP	D Energy	D Reserves	MC	"Local" Opportunity Cost	Margin on energy	Margin on Reserves	Row
1	450	400	50	50	0	150	\$ 60	0	B	B	450	50	\$ 60		0	50	\$ -		\$ 60	0	50	\$ -				1
2	550	500	50	50	0	150	\$ 60	0	B	B	550	50	\$ 60	\$ -	0	50	\$ -		\$ 60	0	50	\$ -				2
3	750	700	50	50	0	150	\$ 60	0	B	B	750	50	\$ 60	\$ -	0	50	\$ -		\$ 60	0	50	\$ -				3
4	800	750	50	50	0	150	\$ 60	0	B	B	800	50	\$ 60	\$ -	0	50	\$ -		\$ 60	0	50	\$ -				4
5	850	800	50	50	0	100	\$ 60	0	B	B	850	0	\$ 60	\$ -	0	50	\$ -		\$ 60	0	50	\$ -				5
6	950	850	50	100	50	100	\$ 150	\$ 90	C	D	850	0	\$ 60	\$ 90	50	50	\$150.00	\$ -	\$ 600	50	50	\$ 600	\$ -	\$ -	\$ -	6
7	1020	900	50	120	70	100	\$ 220	\$ 160	C	D	830	20	\$ 60	\$ 160	120	50	\$220.00	\$ -	\$ 600	70	30	\$ 600	\$ -	\$ -	\$ -	7
8	1080	950	50	130	80	100	\$ 250	\$ 190	C	D	820	30	\$ 60	\$ 190	150	50	\$250.00	\$ -	\$ 600	80	20	\$ 600	\$ -	\$ -	\$ -	8
9	1130	1000	50	130	80	100	\$ 330	\$ 270	C	D	820	30	\$ 60	\$ 270	230	50	\$330.00	\$ -	\$ 600	80	20	\$ 600	\$ -	\$ -	\$ -	9
10	1190	1050	50	140	90	100	\$ 390	\$ 330	C	D	810	40	\$ 60	\$ 330	290	50	\$390.00	\$ -	\$ 600	90	10	\$ 600	\$ -	\$ -	\$ -	10
11	1240	1100	50	140	90	100	\$ 440	\$ 380	C	D	810	40	\$ 60	\$ 380	340	50	\$440.00	\$ -	\$ 600	90	10	\$ 600	\$ -	\$ -	\$ -	11
12	1250	1110	50	140	90	100	\$ 450	\$ 390	C	D	810	40	\$ 60	\$ 390	350	50	\$450.00	\$ -	\$ 600	90	10	\$ 600	\$ -	\$ -	\$ -	12
13	1270	1130	50	140	90	80	\$1,000	\$ 940	B	D	830	20	\$ 60	\$ 940	350	50	\$450.00	\$ 550.00	\$1,000	90	10	\$ 600	\$400	\$ 400	\$ 400	13
14	1290	1150	50	140	90	60	\$1,000	\$ 550	B	D	850	0	\$ 60	\$ 940	350	50	\$450.00	\$ 550.00	\$1,000	90	10	\$ 600	\$400	\$ 400	\$ 400	14
15	1320	1180	50	140	90	30	\$1,000	\$ 520	C	D	850	0	\$ 60	\$ 940	380	20	\$480.00	\$ 520.00	\$1,000	90	10	\$ 600	\$400	\$ 400	\$ 400	15

# MA S.R. Proposal: Enhance Current Market Structure

- **MA proposes that PJM keep hour ahead Tier 2 Sync Market, market definitions and associated assignments**
  - **Tier 2 S.R. hour ahead assignments should be based on expectations of next hour system conditions and prices**
  - **Hour ahead Tier 2 S.R. assignments should continue to be taken as a “given” going into within hour optimization**
  - **As today, within hour adjustments (additions) to Tier 2 S.R. made in real time**
    - **Enhance within hour adjustments (additions) via use of reserves modeled as a constraint**

# MA Synchronized Reserve Proposal: Advantages

- **Consistent with current market structures**
  - “Known” methodology and still improves within hour dispatch
  - Better at dealing with resource limitations that may otherwise limit reserve availability
  - More consistent with reserve requirements (90 minutes to rebuild)
- **Will avoid issues of 5 minute “cycling”**
  - **Should provide for and encourage availability of more reserve resources**
    - Allows continued participation by less flexible units
    - Allows continued participation by DR
  - **May allow a means to properly recognize scarcity and avoid false positives (morning ramp)**