Balancing Reserve Settlements

EPFSTF

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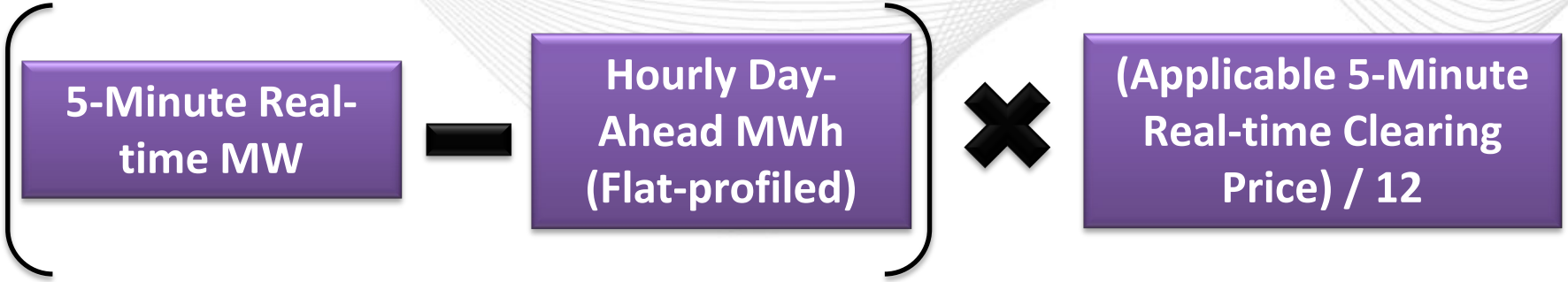
Day-ahead Settlements

- Credit Calculations
  - DA Energy = Energy MWh * Total DA LMP
  - DA Sync Reserve = Cleared Sync MWh * DA SRMCP
  - DA Non-Sync Reserve = Cleared Non-Sync MWh * DA NSRMCP
  - DA Secondary Reserve = Cleared Secondary MWh * DA SECMCP

Balancing Settlements



- Credit Calculations
  - Bal Energy = (RT MW – DA MW) * Total RT LMP
  - Bal Sync Reserve = (RT Sync MW – DA Sync MW) * RT SRMCP
  - Bal Non-Sync Reserve = (RT Non-Sync MW – DA Non-Sync MW) * RT NSRMCP
  - Bal Secondary Reserve = (RT Secondary MW – DA Secondary Reserve MW) * RT SECMCP

Reserve Market Settlement Billing Line Items

- New Credit and Charge Billing Line Items
  - Day-ahead and Balancing Credits
    - Synchronized Reserve
    - Non-Synchronized Reserve
    - Secondary Reserve
  - Charges
    - Synchronized Reserve
    - Non-Synchronized Reserve
    - Secondary Reserve

Day-ahead Settlement

	Day-ahead
Offer ($/MWh)	25
GenMW (MWh)	300
LMP ($/MWh)	40
SynchReserveMW (MWh)	50
SynchReservePrice ($/MWh)	15
NonSynchReserveMW (MWh)	0
NonSynchReservePrice ($/MWh)	10
SecondaryReserveMW (MWh)	0
SecondaryReservePrice ($/MWh)	5

	Day-ahead Revenues ($)
Energy	12,000
SynchReserve	750
NonSynchReserve	0
SecondaryReserve	0

Information

- 350 MW resource
- Ramps at 5 MW/min

- Resource committed for energy and SynchReserve
- No NonSynch award
- No SecondaryReserve award

Adding Real-time and Balancing Out…

	Day-ahead	Real-time
Energy (MWh)	300	325
LMP ($/MWh)	40	50
SynchReserveMW (MWh)	50	25
SynchReservePrice ($/MWh)	15	25
NonSynchReserveMW (MWh)	0	0
NonSynchReservePrice ($/MWh)	10	9
SecondaryReserveMW (MWh)	0	0
SecondaryReservePrice ($/MWh)	5	6

Information

- $25/MWh Offer Price
- Dispatched up 25 MW for energy
- Reduced SynchReserve commitment

In real-time the unit is

- A net seller of energy (25 MWh)
- A net buyer of SynchReserves (25 MWh)

Balancing Settlement	Real-Time (MWh)	Day-ahead (MWh)	Balancing (MWh)	RT Price ($/MWh)	Balancing Position ($)
Energy	325	300	25	50	1,250
SynchReserve	25	50	-25	25	-625
NonSynchReserve	0	0	0	9	0
SecondaryReserve	0	0	0	6	0
TOTAL					**625**

Day-ahead Settlement with Two Products

	Day-ahead
GenMW (MWh)	200
LMP ($/MWh)	40
SynchReserveMW (MWh)	50
SynchReservePrice ($/MWh)	30
NonSynchReserveMW (MWh)	0
NonSynchReservePrice ($/MWh)	25
SecondaryReserveMW (MWh)	100
SecondaryReservePrice ($/MWh)	20

	Day-ahead Revenues ($)
Energy	8,000
SynchReserve	1,500
NonSynchReserve	0
SecondaryReserve	2,000
TOTAL	11,500

Information

- Same unit ($25/MWh offer)
- 200 MW eco min
- **Ramps at 10 MW/min**

- Resource committed for energy and SynchReserve
- No NonSynch award
- **100 MWh SecondaryReserve award (10-30 minute)**

Balancing Out Energy, Synch and Thirty Minute…

	Day-ahead	Real-time
Energy (MWh)	200	350
LMP ($/MWh)	40	90
SynchReserveMW (MWh)	50	0
SynchReservePrice ($/MWh)	30	40
NonSynchReserveMW (MWh)	0	0
NonSynchReservePrice ($/MWh)	25	35
SecondaryReserveMW (MWh)	100	0
SecondaryReservePrice ($/MWh)	20	30

Information

- Dispatched up 150 MW for energy
- Reduced Synch Reserve commitment
- Reduced Secondary Reserve commitment

In real-time the unit is

- A net seller of energy (150 MWh)
- A net buyer of Synch Reserve (50 MWh)
- A net buyer of Secondary Reserve (100MWh)

Balancing Settlement	Real-Time (MWh)	Day-ahead (MWh)	Balancing (MWh)	RT Price ($/MWh)	Balancing Position ($)
Energy	350	200	150	90	13,500
SynchReserve	0	50	-50	40	-2,000
NonSynchReserve	0	0	0	35	0
SecondaryReserve	0	100	-100	30	-3,000
TOTAL					**8,500**

Balancing Settlements for Reserves

- Negative buyback on an interval basis included in the existing Opportunity Cost Credit calculation
- For each Reserve Market on an interval basis:
- If Cost exceeds Day-Ahead plus Balancing Revenue

  Opp Cost Credit = Cost – (DA MCP Credit + Bal MCP Credit)

  where Cost = Offer plus LOC
- Any Day-Ahead plus Balancing Revenue above cost is factored into Balancing Operating Reserve calculation

Example

- Generator A
  - Day-ahead MCP Credit = $10
  - Does not cover its position in real-time due to a PJM-instructed deviation
  - Cost to buy out of the real-time position is $1,000

Balancing Reserve Market Settlement Example

- Assume a $0 cost and a full buyback

	Gen Credits	Load Charges
Day-Ahead MCP Credit	$10	$10
Balancing MCP Credit	($1000)	($1000)
MCP Credit Total	($990)	($990)
Opp Cost Credit	$990	$990
Total Charge/Credit	$0	$0

Eligibility Rules

Resource is ineligible to recover the balancing buy back if:

1. Self-scheduled for another service
2. Reduced flexibility in real-time
3. Unit trip
4. Not following dispatch per Operating Reserve deviation rules
5. Offline unit not responding within 30 minutes when requested
6. Failure of a Synch Reserve resource to respond to a Synch Reserve event

Balancing Reserve Market Settlement Example

- Assume a $0 cost and unit is ineligible

	Gen Credits	Load Charges
Day-Ahead MCP Credit	$10	$10
Balancing MCP Credit	($1000)	($1000)
MCP Credit Total	($990)	($990)
Opp Cost Credit	$0	$0
Total Charge/Credit	($990)	($990)

Allocation of Reserve Markets Credits

- Credits allocated as charges to real-time load consistent with current reserve market allocation

- Keeps reserve balancing settlement within the reserve market structure