Reserves Settlements

EPFSTF
January 23, 2019
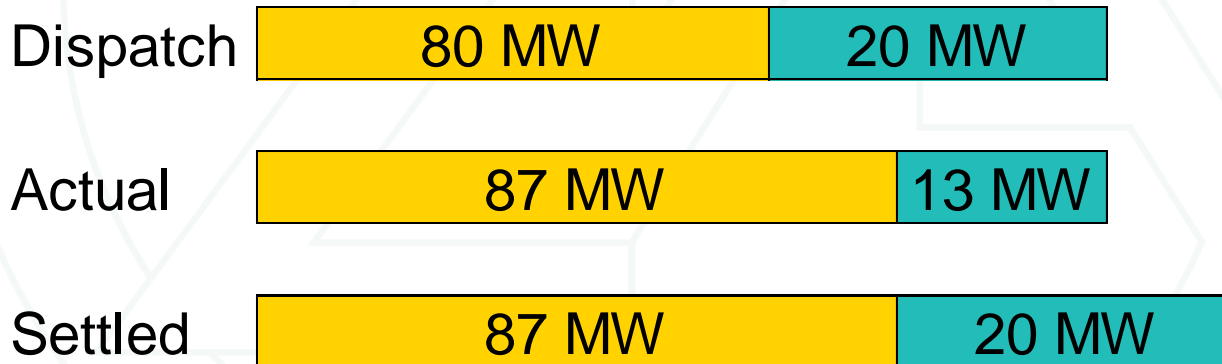
Joe Bowring
Catherine Tyler
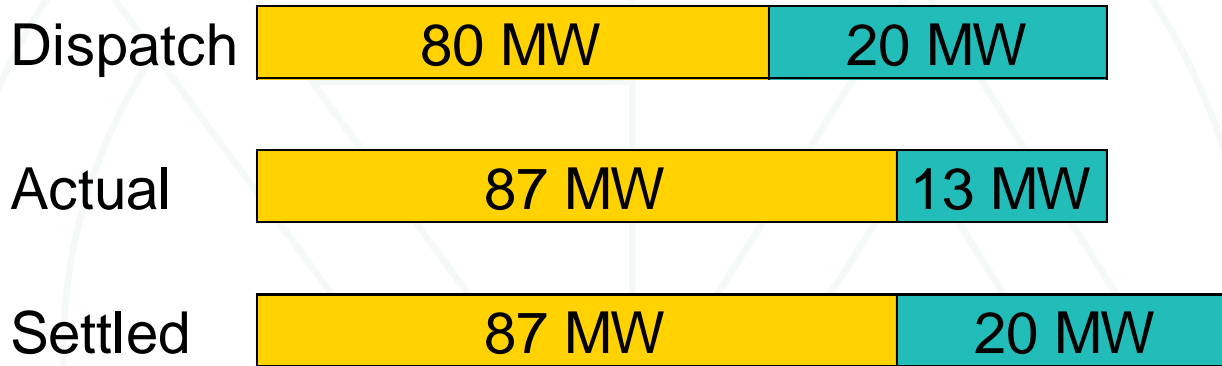
Double Payment Issue

- **Real-time energy is settled at the metered output.**

- **Reserves are settled at the dispatch output.**

- **A resource could receive compensation for energy and reserves beyond the resource's actual capability.**

Dispatch	80 MW	20 MW
Actual	87 MW	13 MW
Settled	87 MW	20 MW

Monitoring Analytics

Double Payment Issue

Dispatch	80 MW	20 MW
Actual	87 MW	13 MW
Settled	87 MW	20 MW

- **Resource receives payment for 107 MW when its capability is only 100 MW.**

- **Deviation is only 7 MW, or 7 / 80 = 8.75 percent, so PJM deems the resource to be following dispatch.**

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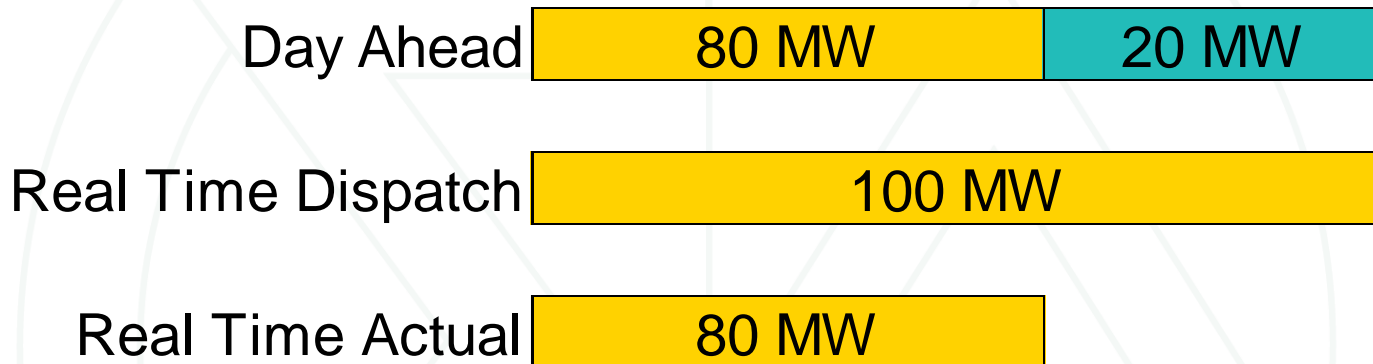
Rule Preventing Double Payment

- **The IMM proposes a new settlement rule that a resource cannot receive payment for reserve MW in excess of its applicable economic maximum output limit for the dispatch interval.**

- **PJM would pay the full value for metered energy produced, but would cap the settlement of reserve MW so that payment does not exceed the resource's stated capability.**

$$Metered\ Energy\ MW + Reserve\ MW \leq Eco.Max.$$

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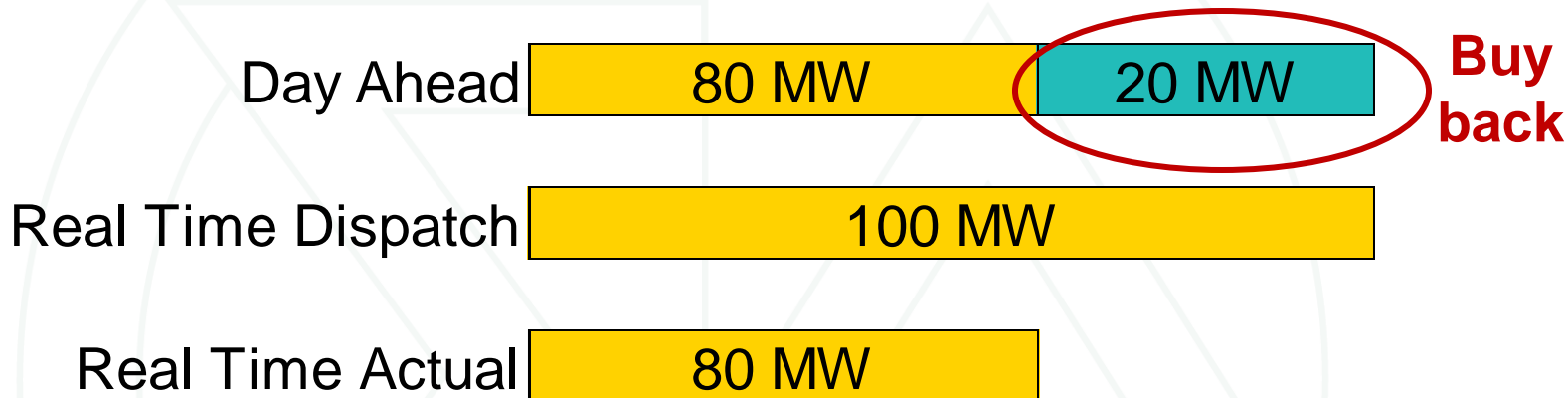
Balancing Reserve Uplift Payment

- **PJM claims that market incentives for dispatch following require uplift for negative balancing reserve payments for each reserve product for every five minute interval.**

- **Market incentives do not require such payment.**

- **Reserves are compensated based on dispatch, not performance.**

- **PJM takes back the reserve position based on dispatch instructions whether or not the resource follows dispatch.**

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Balancing Reserve Uplift Payment

Day Ahead	80 MW	20 MW

Real Time Dispatch	100 MW

Real Time Actual	80 MW

- **When the resource follows its day ahead dispatch it must buy back its DA reserve position and receives no balancing energy compensation.**

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Balancing Reserve Uplift Payment

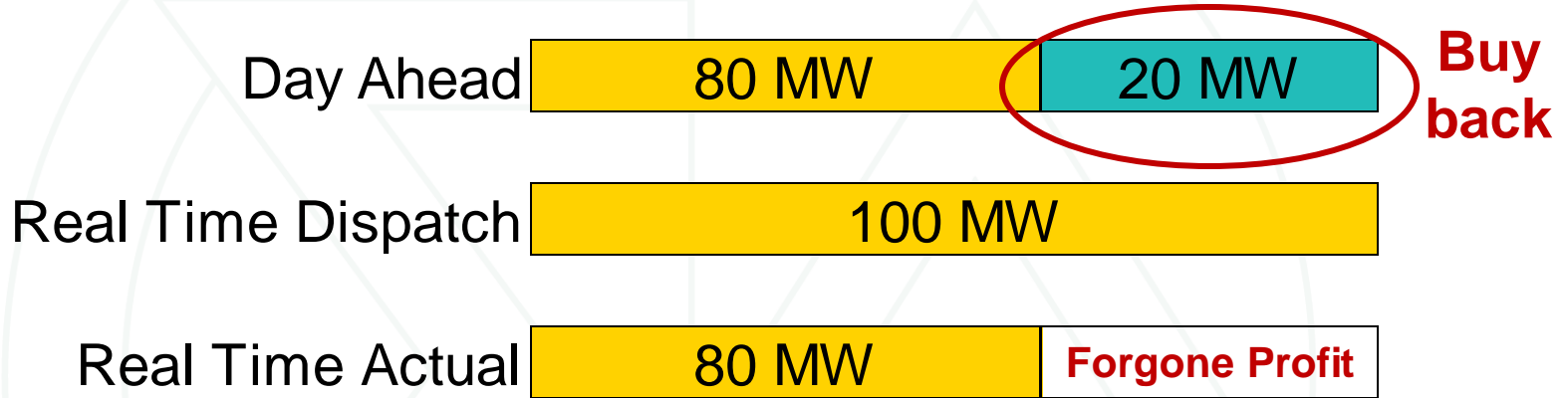| Day Ahead | 80 MW | 20 MW | **Buy back** |
| Real Time Dispatch | 100 MW |
| Real Time Actual | 80 MW |

- **When the resource follows its day ahead dispatch it must buy back its DA reserve position and receives no balancing energy compensation.**

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Balancing Reserve Uplift Payment

Day Ahead
| 80 MW | 20 MW |

Buy back

Real Time Dispatch
| 100 MW |

Real Time Actual
| 80 MW | **Forgone Profit** |

- **When the resource follows its day ahead dispatch it must buy back its DA reserve position and receives no balancing energy compensation.**
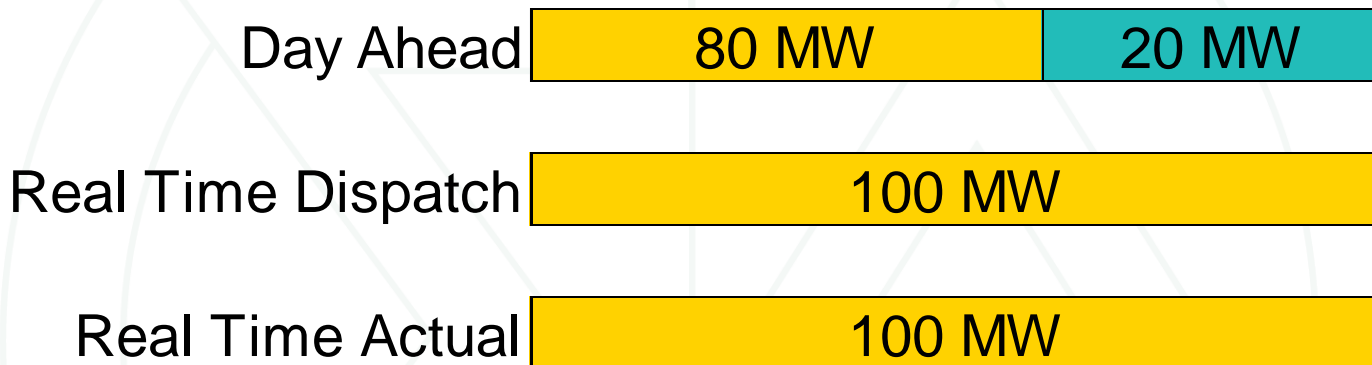
Monitoring Analytics

Balancing Reserve Uplift Payment

Day Ahead	80 MW	20 MW

Real Time Dispatch	100 MW

Real Time Actual	100 MW

- **When the resource follows its real time dispatch, it must buy back its DA reserve position, which is offset by balancing energy revenues.**

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Balancing Reserve Uplift Payment

Day Ahead | 80 MW | 20 MW | **Buy back**

Real Time Dispatch | 100 MW

Real Time Actual | 100 MW | **Higher Energy Revenues**
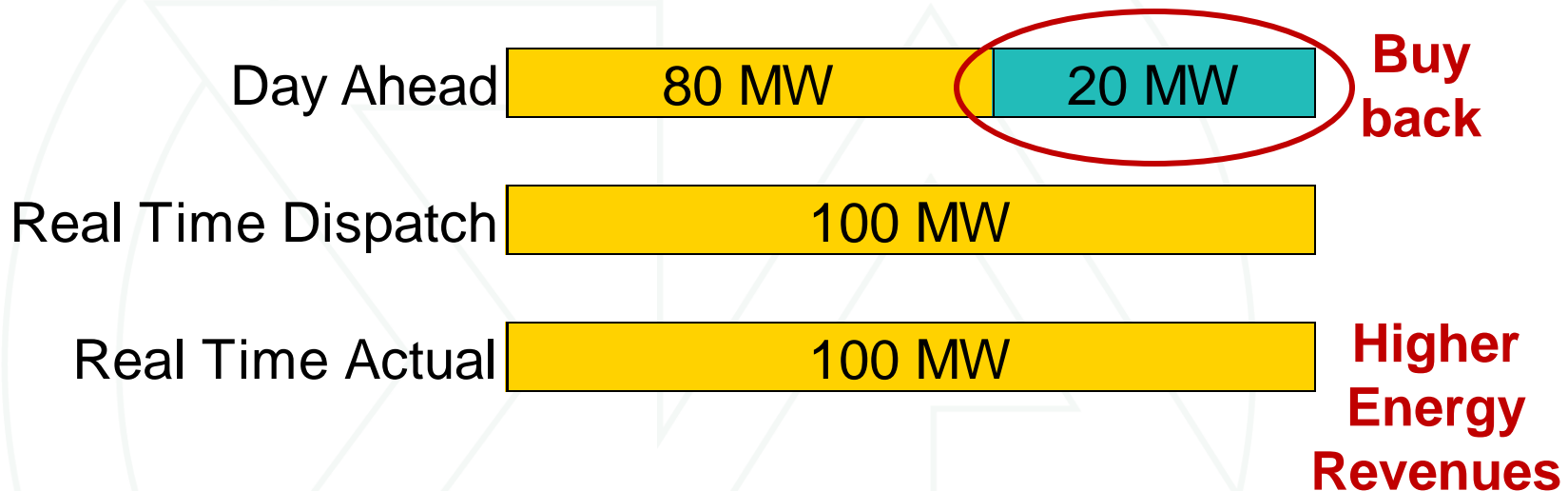
- **When the resource follows its real time dispatch, it must buy back its DA reserve position, which is offset by balancing energy revenues.**

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Reserve Uplift Calculation

- **Current Reserve LOC Uplift:**
  - **LOC Uplift = MW x (RT LMP – Offer) – Reserves MW x MCP**

- **PJM Proposed Reserve LOC Uplift**
  - **LOC Uplift = MW x (RT LMP – Offer) – (DA Reserves MW x DA MCP + Balancing Reserves MW x RT MCP)**

- **Unlike status quo, converting reserves to energy results in negative balancing reserve position.**

- **Resources will be charged (buy back) when not fulfilling their DA reserve position.**

Reserve Uplift Calculation

- **When RT Reserves MW < DA Reserves MW**
  - **And RT MCP < DA MCP, revenues increase.**
  - **And RT MCP > DA MCP, revenues decrease.**
- **PJM is concerned about net losses when RT Reserves MW < DA Reserves MW and RT MCP > DA MCP.**
- **In order to correctly determine net losses, PJM must include the net revenues of the reserves that were converted to energy produced.**

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Reserve Uplift Calculation

- **Under status quo, PJM makes resources whole every five minutes for reserve market lost opportunity costs.**
  - Resources keep the profits, get made whole for losses.
  - Should apply only to inflexible resources committed in the hourly ASO process.
- **PJM's proposal exacerbates the current overcompensation and expands it to all resources with day ahead positions.**

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Example

Interval	DA Energy MW	DA Reserves MW	RT Energy MW	RT Reserves MW	Bal Energy MW	Bal Reserves MW
1	80	20	80	20	0	0
2	80	20	80	20	0	0
3	80	20	80	20	0	0
4	80	20	80	20	0	0
5	80	20	100	0	20	-20
6	80	20	100	0	20	-20
7	80	20	100	0	20	-20
8	80	20	100	0	20	-20
9	80	20	80	20	0	0
10	80	20	80	20	0	0
11	80	20	80	20	0	0
12	80	20	80	20	0	0

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Example

Interval	Offer $/MWh	DA LMP $/MWh	DA RMCP $/MW	RT LMP $/MWh	RT RMCP $/MW
1	$100	$100	$10	$100	$10
2	$100	$100	$10	$100	$10
3	$100	$100	$10	$100	$10
4	$100	$100	$10	$100	$10
5	$100	$100	$10	$120	$80
6	$100	$100	$10	$120	$80
7	$100	$100	$10	$120	$80
8	$100	$100	$10	$120	$80
9	$100	$100	$10	$100	$10
10	$100	$100	$10	$100	$10
11	$100	$100	$10	$100	$10
12	$100	$100	$10	$100	$10

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Example

Interval	DA Energy Value $	DA Reserves Value $	Bal Energy $	Bal Reserves $	RT Cost $	Net Profit $	Reserve Cost $	Reserve Uplift (Interval) $	Reserve Uplift (Hourly) $
1	$667	$17	$0	$0	$667	$17	$0	$0	($17)
2	$667	$17	$0	$0	$667	$17	$0	$0	($17)
3	$667	$17	$0	$0	$667	$17	$0	$0	($17)
4	$667	$17	$0	$0	$667	$17	$0	$0	($17)
5	$667	$17	$200	($133)	$833	($83)	$0	$117	$117
6	$667	$17	$200	($133)	$833	($83)	$0	$117	$117
7	$667	$17	$200	($133)	$833	($83)	$0	$117	$117
8	$667	$17	$200	($133)	$833	($83)	$0	$117	$117
9	$667	$17	$0	$0	$667	$17	$0	$0	($17)
10	$667	$17	$0	$0	$667	$17	$0	$0	($17)
11	$667	$17	$0	$0	$667	$17	$0	$0	($17)
12	$667	$17	$0	$0	$667	$17	$0	$0	($17)
Total	$8,000	$200	$800	($533)	$8,667	($200)	$0	$467	$333

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Example

Line Items	Interval Uplift	Hourly Uplift	All Inclusive Uplift (Energy+Reserves)
DA Energy	$8,000	$8,000	$8,000
DA Reserves	$200	$200	$200
Balancing Energy	$800	$800	$800
Balancing Reserves	($533)	($533)	($533)
Reserves Uplift	$467	$333	NA
Energy Uplift	$0	$0	$200
Offer	($8,667)	($8,667)	($8,667)
Net Profit	$267	$133	$0

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One Energy and Reserves Uplift Payment

- **PJM should create one uplift calculation that prevents resources that follow dispatch from operating at a loss without creating overcompensation.**

- **The calculation should include costs and revenues in all short term markets (energy, regulation, reserves).**

- **Incorporating reserves in the existing Balancing Operating Reserve Credit accomplishes this.**

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