

Reserves Settlements

EPFSTF

January 17, 2019

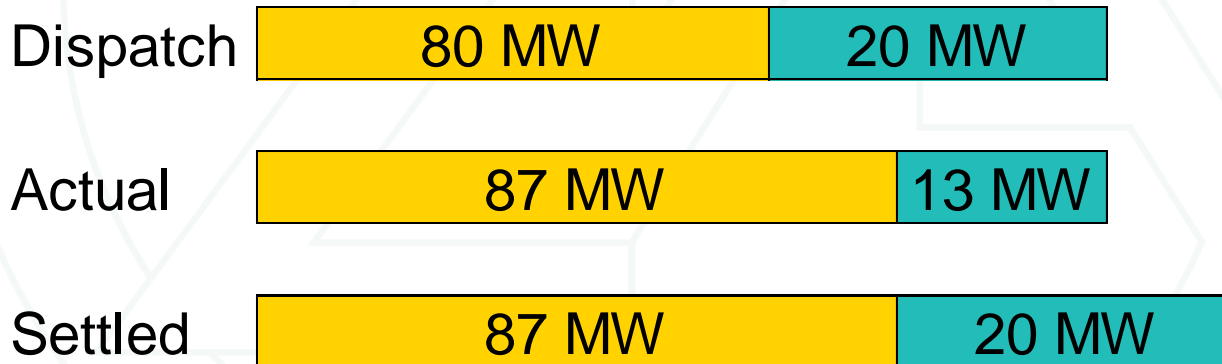
Joe Bowring
Catherine Tyler



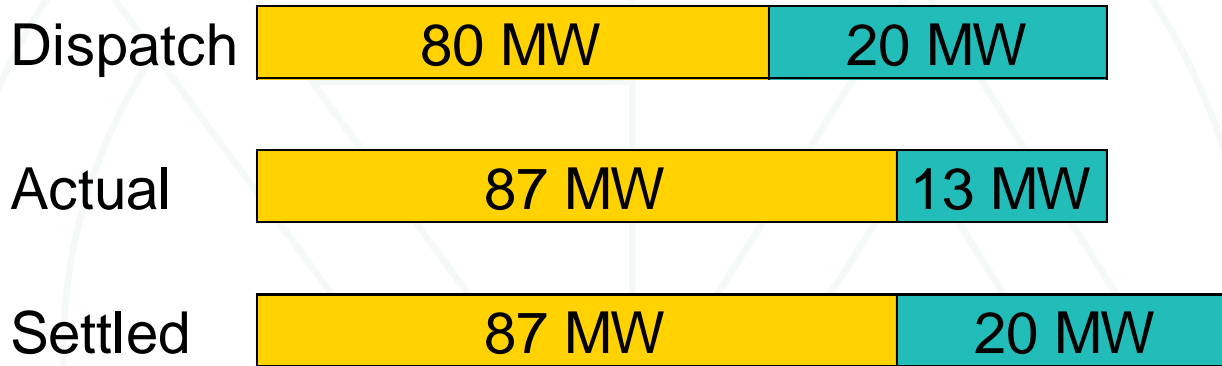
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Double Payment Issue

- 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.



Double Payment Issue



- **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.**

Rule Preventing Double Payment

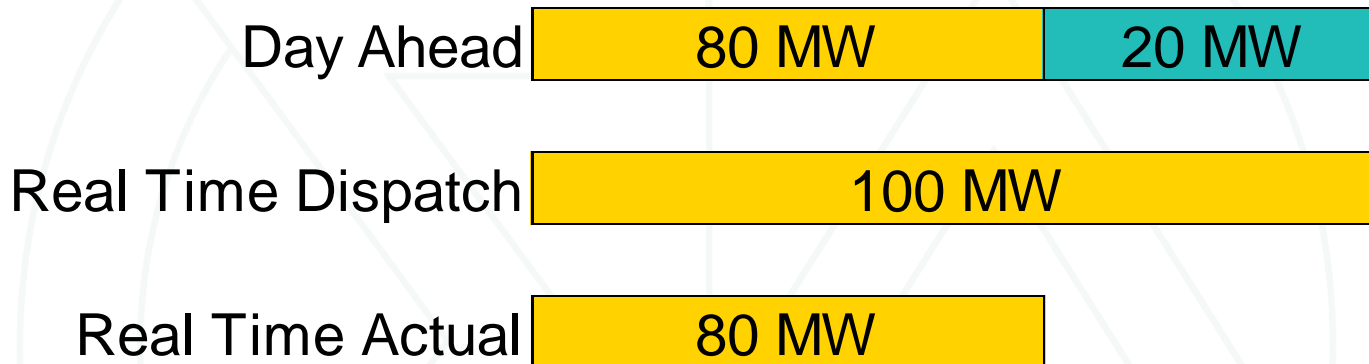
- **The IMM proposes a new settlement rule that a resource cannot receive payment for reserve MW in excess of its applicable economic maximum output limit for the dispatch interval.**
- **PJM would pay the full value for metered energy produced, but would cap the settlement of reserve MW so that payment does not exceed the resource's stated capability.**

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

Balancing Reserve Uplift Payment

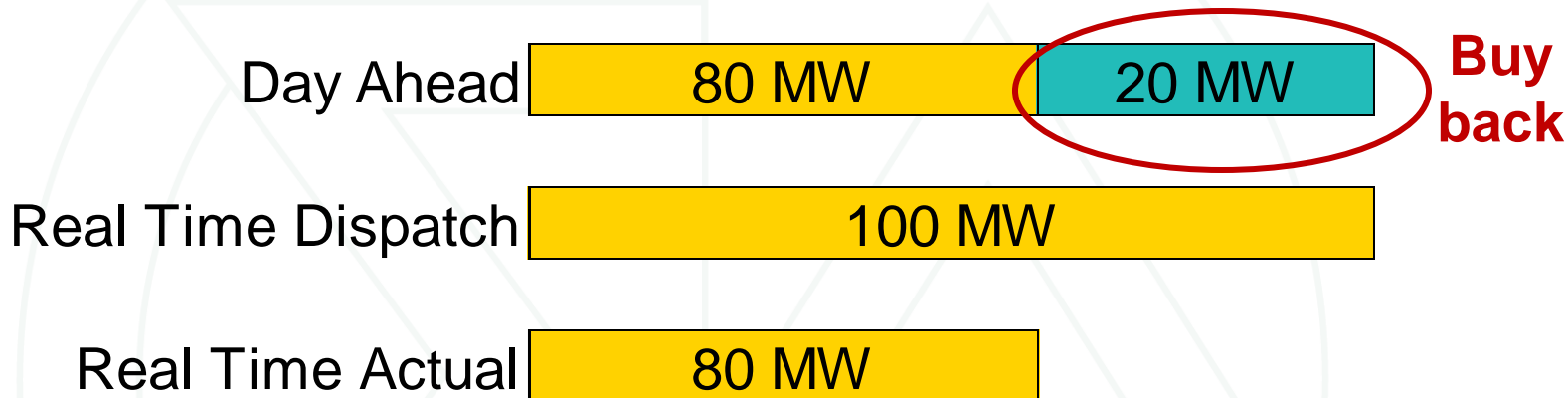
- **PJM claims that market incentives for dispatch following require uplift for negative balancing reserve payments for each reserve product for every five minute interval.**
- **Market incentives do not require such payment.**
- **Reserves are compensated based on dispatch, not performance.**
- **PJM takes back the reserve position based on dispatch instructions whether or not the resource follows dispatch.**

Balancing Reserve Uplift Payment



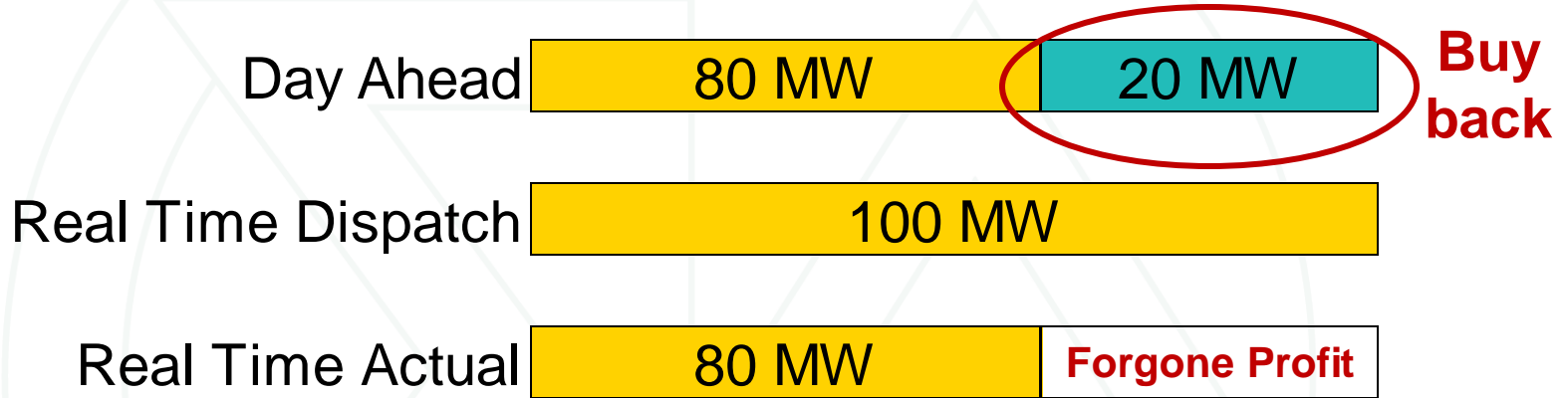
- **When the resource follows its day ahead dispatch it must buy back its DA reserve position and receives no balancing energy compensation.**

Balancing Reserve Uplift Payment



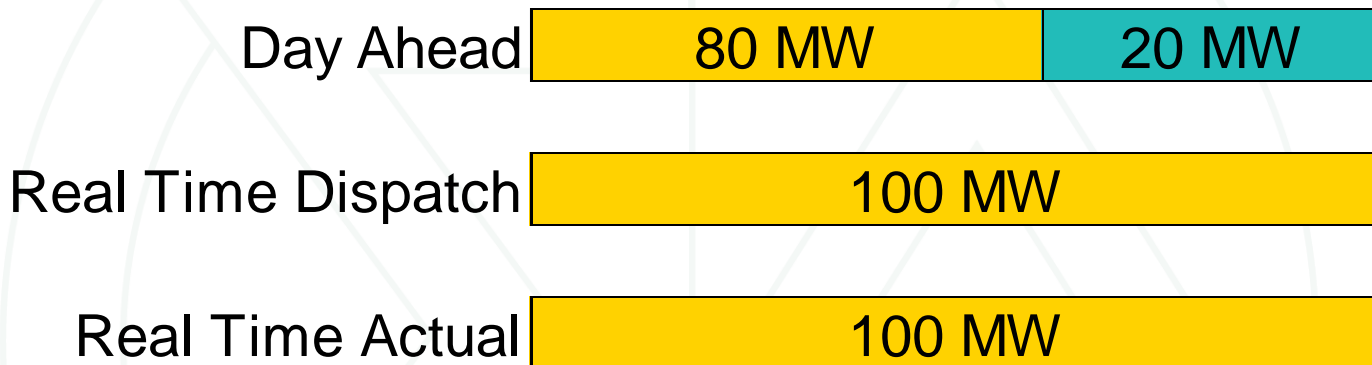
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Balancing Reserve Uplift Payment



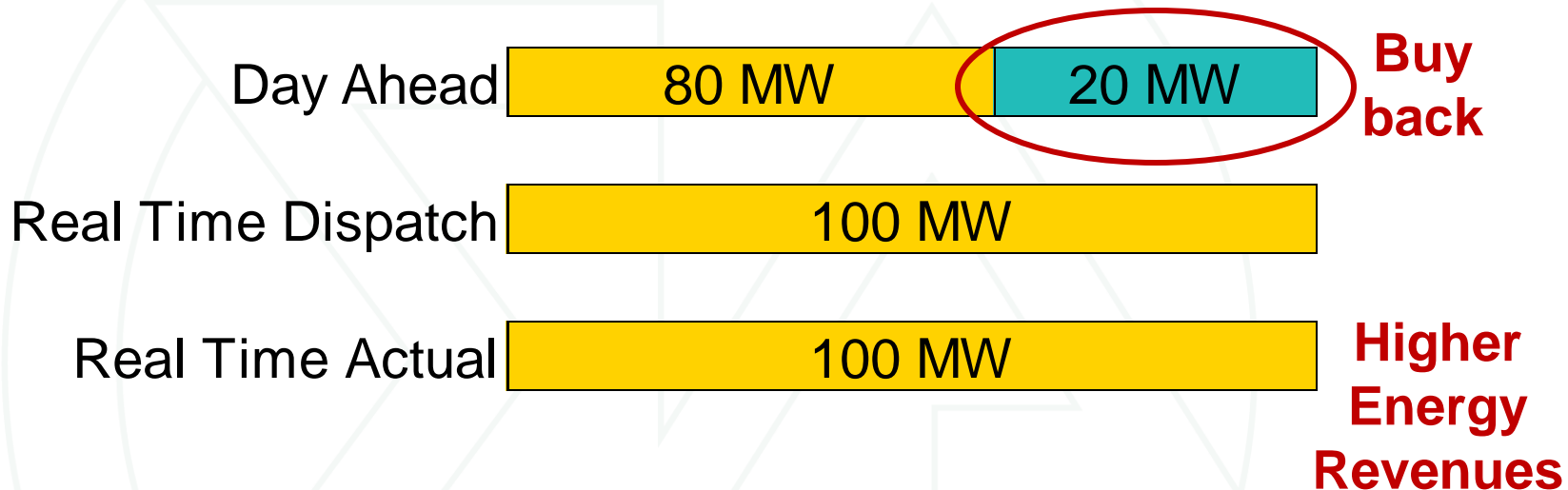
- **When the resource follows its day ahead dispatch it must buy back its DA reserve position and receives no balancing energy compensation.**

Balancing Reserve Uplift Payment



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

Balancing Reserve Uplift Payment



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

Reserve Uplift Calculation

- **Current Reserve LOC Uplift:**
 - $\text{LOC Uplift} = \text{MW} \times (\text{RT LMP} - \text{Offer}) - \text{Reserves MW} \times \text{MCP}$
- **PJM Proposed Reserve LOC Uplift**
 - $\text{LOC Uplift} = \text{MW} \times (\text{RT LMP} - \text{Offer}) - (\text{DA Reserves MW} \times \text{DA MCP} + \text{Balancing Reserves MW} \times \text{RT MCP})$
- **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.**

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.**

Example

Interval	DA Energy MW	DA Reseves 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

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



Example

Interval	DA Energy \$	DA Reserves \$	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)	\$20	\$137	\$137
6	\$667	\$17	\$200	(\$133)	\$833	(\$83)	\$20	\$137	\$137
7	\$667	\$17	\$200	(\$133)	\$833	(\$83)	\$20	\$137	\$137
8	\$667	\$17	\$200	(\$133)	\$833	(\$83)	\$20	\$137	\$137
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)	\$80	\$547	\$413

Example

Line Items	Interval Uplift	Hourly Uplift	All Inclusive Uplift
DA Energy	\$8,000	\$8,000	\$8,000
DA Reserves	\$200	\$200	\$200
RT Energy	\$800	\$800	\$800
RT Reserves	(\$533)	(\$533)	(\$533)
Reserves Uplift	\$547	\$413	NA
Energy Uplift	\$0	\$0	\$200
Offer	(\$8,667)	(\$8,667)	(\$8,667)
Net Profit	\$347	\$213	\$0

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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