Reserve Market Settlements

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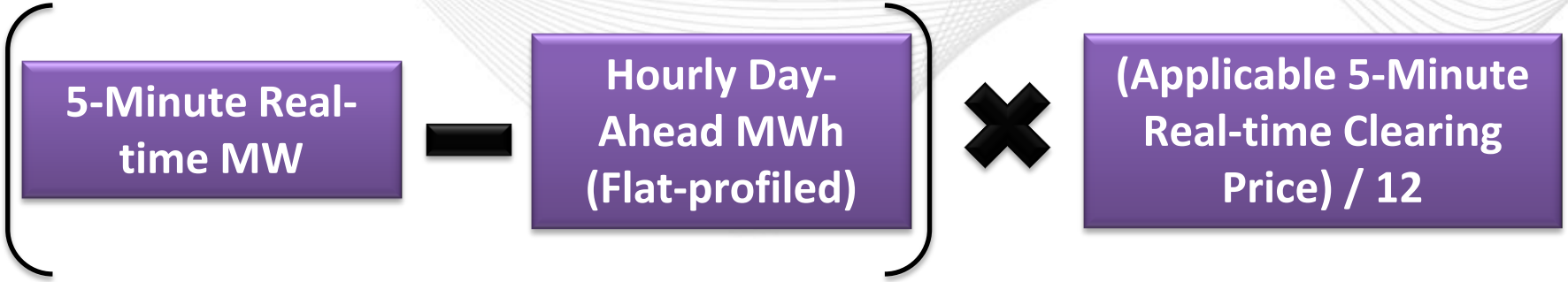
Energy Price Formation

- Energy Price Formation Senior Task Force established to address issues
- PJM Board of Managers established deadline for resolution
- Stakeholder process was unable to reach consensus
- PJM submitted a 206 filing to FERC in late March
- Proposed June 1, 2020 implementation date

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 Reserve MW – DA Secondary Reserve MW) * RT SECMCP

Credits for Energy and Reserve MWs

- Synchronized and Secondary Reserves
  - Balancing Reserve MW assignment is capped at the lesser of

    Reserve Assignment OR (Eco Max – RT Revenue Data for Settlements value)

    * Sync/Secondary Max is used if less than Economic Max

    * Sync Reserves - No capping occurs if there is a Synchronized Reserve Event
  - Eliminates payment for Energy and Reserves for the same MWs

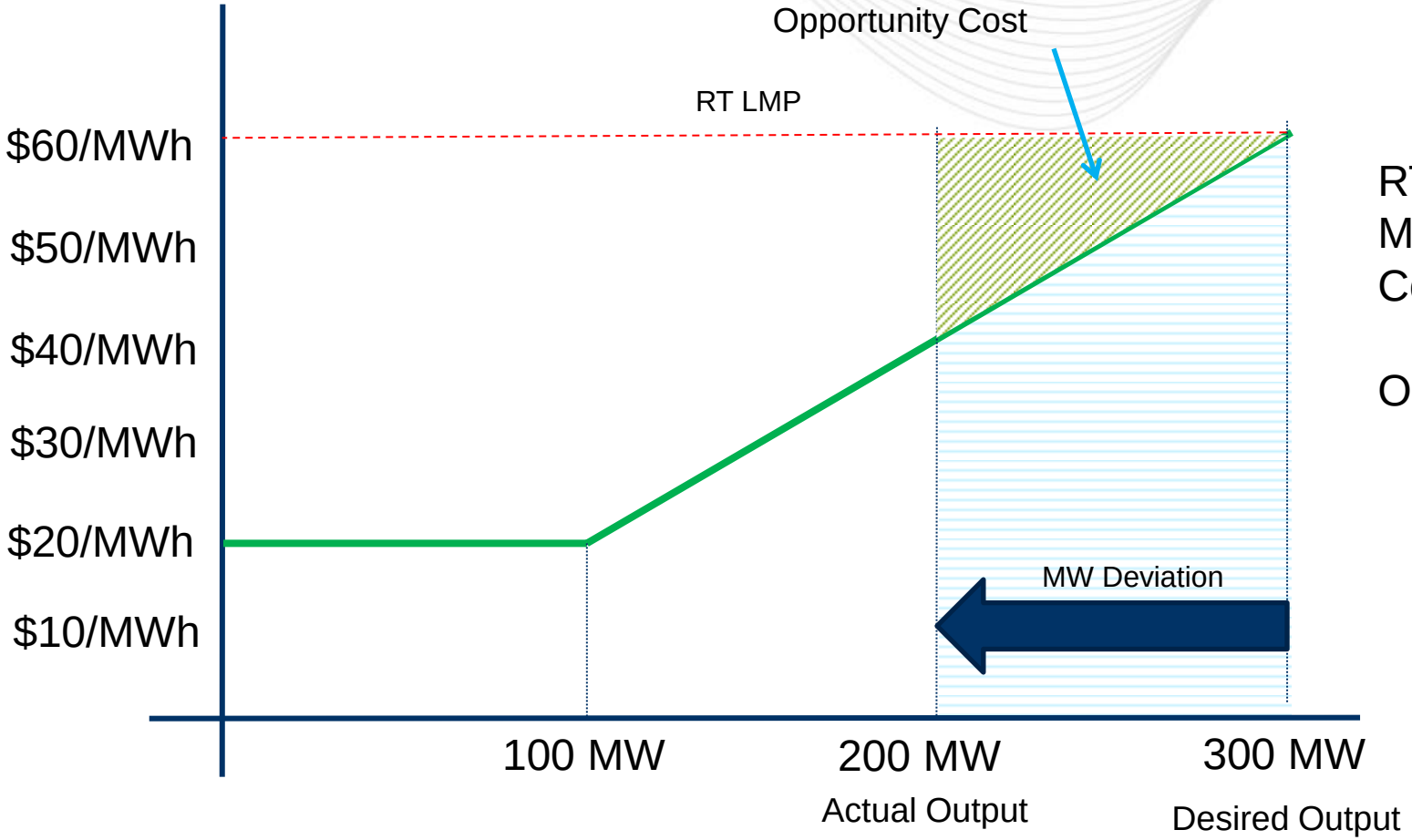
Opportunity Cost Calculation

- Day-ahead and Balancing Opportunity Cost calculated for each reserve market
- A Balancing Opportunity Cost only applies when the RT Reserve assignment is greater than the DA Reserve assignment

- Basic calculation

  (LMP * MW Deviation) – Integrated cost under the offer curve for the MW Deviation

Opportunity Cost Example



RT LMP = $60/MWh
MW Deviation = 100 MW
Cost = $5,000

Opp Cost = ($60/MWh * $100) - $5,000
= $1,000

Market Revenue Neutrality Offset

- Based on Day-ahead and Real-time market clearing, resource MWs can shift between reserve markets or between reserve and energy markets
  - When PJM directs a MW shift between markets, losses created by buying back the DA reserve position are offset by additional profits earned in the other markets
- A shift in MWs can introduce additional revenues above cost that need to be accounted for in the final Lost Opportunity Cost Credit calculation

Lost Opportunity Cost Credit Calculation

Reserve Market Lost Opportunity Cost Credit =

Day-ahead Opportunity Cost +

Balancing Opportunity Cost –

(Day-ahead MCP Credit + Balancing MCP Credit) –

Market Revenue Neutrality Offset Credit

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

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