Fast Start Reserve Pricing Issue

MIC

IMM

August 11, 2021

FERC Background

- FERC required PJM to implement fast start pricing for LMP by relaxing the eco min constraint for fast start units.
- Integer relaxation relaxes both the eco min and eco max constraint for fast start units.
- PJM proposed
  - Integer relaxation (accepted)
  - Fast start pricing for reserves (denied)
- PJM filings do not state that integer relaxation applies fast start pricing to reserve prices.

PJM Implementation

- **The implementation in place for September 1, 2021, includes application of fast start prices to reserve prices in some circumstances.**
- **This change to reserve prices was not included in PJM's filings.**
- **The result is due to the use of integer relaxation.**

Manual 11

- **Manual 11 Section 4.29 (page 106) correctly describes PJM's September 1 planned implementation of synchronized reserve prices.**
- **Stakeholder approval of the manual language is approval of PJM's planned implementation.**
- **Manual 11 and the planned implementation are not consistent with the filings and FERC approved OA.**
- **Stakeholders should not endorse the current planned implementation of fast start pricing.**

Integer Relaxation Mechanics

- **The commitment variable relaxes both the eco min and eco max for a fast start unit.**

$$Commit * EcoMin \leq Energy\ MW + Reserve\ MW \leq Commit * EcoMax$$

- $0 \leq Commit \leq 1$

- **The commitment variable is determined by the optimization in the pricing run, along with the energy MW and reserve MW.**

Integer Relaxation Mechanics

- **In the pricing run solution, for a marginal unit needed to increase MW, the commitment variable equals the share of eco max cleared for energy and reserves for the fast start unit.**

$$Commit = \frac{Energy\ MW + Reserve\ MW}{EcoMax}$$

- **To increase energy or reserve MW, the commitment variable must be increased.**
- **The commitment variable is multiplied by the commitment cost in the calculation of system production cost.**

Integer Relaxation Mechanics

- **When the commitment variable is between zero and one for a fast start unit that is marginal in the energy market, the commitment cost divided by the eco max (amortized start up and no load) is added to the LMP.**

$$LMP = \frac{Commitment\ Cost}{EcoMax} + Incremental\ Energy\ Cost$$

- **This is the result intended by FERC’s order.**

Integer Relaxation Mechanics

- **When the commitment variable is between zero and one for a fast start unit that is marginal in the reserve market, the commitment cost divided by the eco max (amortized start up and no load) is added to the synchronized reserve market clearing price (SRMCP).**

$$SRMCP = \frac{Commitment\ Cost}{EcoMax} + Reserve\ Offer + LOC$$

- **This result was not intended by FERC's order.**
- **This result was not included in PJM's compliance filings.**

Fast Start Pricing in Reserves

- **Result of concern:**
  - **The commitment cost of the marginal unit for reserves is included in the reserve clearing price when there is no fast start unit marginal for energy and no LOC.**
    - Typically, this is a tier 1 deselected unit (LOC is zero) that is clearing tier 2 reserves.
    - With consolidation of tier 1 and tier 2 coming with the extended ORDC in 2022, the result will occur more often.

Not Cooptimization

- **The result of concern is not due to the cooptimization of energy and reserves.**
- **The amortized start up and no load of a fast start marginal unit for energy only enters the reserve price through the LOC component.**
- **The commitment cost of the marginal unit for energy is expected in the reserve price as part of the LOC, when the marginal unit for reserves has an opportunity cost.**
- **The result of concern only occurs when LOC is zero for the marginal unit for reserves.**

Possible SRMCP Outcomes Under Fast Start

- For the marginal unit for reserves,
  - When unit is fully used between energy and reserves (Commit = 1.0), SRMCP is equal to LMP minus incremental energy offer (LOC) plus reserve offer.
  - When unit is not fully used between energy and reserves (Commit < 1.0), SRMCP is equal to amortized no load and start cost plus reserve offer.
- The same result could occur for the nonsynchronized reserve price (NSRMCP) and the regulation prices.

Fully Used Unit

- Eco Min = 50 MW
- Eco Max = 100 MW
- Commitment Factor: 1.0
- Inc Offer: $20/MWh
- No Load Cost: $500/hour
- Start Cost: $5,000/start
- Fast start clearing:
  - Energy: 70 MW   Reserves: 30 MW   LMP: $50/MWh
- SRMCP = LMP – Incremental Cost
- SRMCP = ($50 - $20) = $30/MWh

Partially Used Unit

- Eco Min = 50 MW
- Eco Max = 100 MW
- Commitment Factor: 0.9
- Inc Offer @ 80 MW: $20/MWh, @ 100 MW: $200/MWh
- No Load Cost: $500/hour
- Start Cost: $5,000/start
- Fast start clearing:
  - Energy: 80 MW   Reserves: 10 MW   LMP: $75/MWh
- SRMCP = (LMP – Incremental Cost) + (Amortized NL + ST)
- SRMCP = 0 + ($500/100 + $5,000/100) = $55/MWh

Monitoring Analytics, LLC

2621 Van Buren Avenue

Suite 160

Eagleville, PA

19403

(610) 271-8050

MA@monitoringanalytics.com

www.MonitoringAnalytics.com