Illustrative Examples of Alternative Local Market Power Mitigation

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This paper provides an illustrative example of the potential modification to the ISO's current Local Market Power Mitigation (LMPM) provisions that may allow LMPM procedures to be run with all bid-in supply and demand (physical and virtual), without undermining the potential effectiveness of LMPM. This potential modification was discussed along with other options for LMPM under convergence bidding in an October 2, 2009, whitepaper issued by the Department of Market Monitoring (DMM).[1] These illustrative examples are being provided as a supplement to this previous whitepaper in advance of a stakeholder meeting on the ISO's convergence bidding proposal scheduled for October 9, 2009, and an October 14, 2009, deadline for stakeholder comments on the ISO's final convergence bidding proposal.

Base Case Example

To first illustrate the rationale for this approach, Figures 1 through 6 provide a base case example that illustrates how use of virtual supply in existing LMPM procedures could undermine the effectiveness of LMPM.

- Figure 1 depicts the market bids and Default Energy Bids (DEBs) for supply within a load pocket constrained by competitive transmission constraints. Figure 2 shows the market bids and DEBs for supply in the remaining (unconstrained) areas of the system. All supply bids represent physical generation with DEBs except for one relatively high priced virtual supply bid within the local constrained area, as depicted in Figure 1.

- Figures 1 and 2 also show the supply bids that would clear in these areas in the Competitive Constraints (CC) run, in which none of the non-competitive constraints between these two parts of the system are enforced. Total system demand is met by a combination of supply from one resource in the constrained area ($Q1_{CC}$), and supply from multiple other resources in the unconstrained area ($Q2_{CC}$).

- Figures 3 and 4 show the supply bids that would clear in these two areas in the All Constraints (AC) run, in which the non-competitive constraints between these two parts of the system are enforced. To relieve congestion on these non-competitive constraints, the amount of supply dispatched within the constrained area must be increased from $Q1_{CC}$ to $Q1_{AC.}$ Due to the merit order of the market bids used in the AC run, the relatively high priced virtual supply is dispatched, rather than the remaining physical supply with higher market bids (but relatively low DEBs).

- Figures 5 and 6 show the supply bids that would clear in these two areas in the final Integrated Forward Market (IFM) run. Although the virtual supply bid is dispatched up in the AC run, the final market bid of this virtual supply is not mitigated. As shown in Figure

[1] See discussion of New Approach B, described in *Local Market Power Mitigation Options Under Convergence Bidding*, Department of Market Monitoring, October 2, 2009, http://www.caiso.com/243b/243bebe3228c0.pdf

5, this virtual supply bid ultimately "crowds out" supply with much lower DEBs within the constrained area during the mitigation process, and ends up setting the locational marginal price (LMP) in the constrained area in the IFM.

Potential LMPM Modification

Figures 7 through 12 illustrate a potential modification to LMPM procedures that could allow virtual demand and supply to be included in LMPM procedures without undermining the effectiveness of LMPM. Under this approach, all physical and virtual demand and supply bids would be included in both the CC and AC runs. However, in order to prevent higher priced virtual supply from "crowding out" physical supply that has a lower cost (but higher unmitigated market bid), this approach would consider mitigated bids from physical supply in clearing the AC run, as described below.

- As shown in Figures 7 and 8, this example starts with the same set of market bids and DEBs as the base case depicted in Figures 1 and 2. In this example, however, bids for each of the resources have been labeled (A through I) to help illustrate how this approach prevents the relatively high priced virtual supply bid (labeled B in Figure 7) from undermining the effectiveness of LMPM procedures.

- As shown in Figures 9, and 10, rather than basing the AC run on unmitigated market bids, bids for physical resources in the AC run are modified as follows:

    - Units not committed in the CC run would be bid into the AC run at their DEBs.

    - For units dispatched in the CC run, market bids for energy above the level at which units were scheduled in the CC run would be subject to mitigation in the same manner currently used to mitigate bids after the AC run.[2]

    - For units dispatched in the CC run, each unit's CC run schedule would be protected by a negatively priced bid (see Unit A in Figure 9 and Units F and G in Figure 10).

- The AC run would then be performed with all physical and virtual bids (supply and demand).

- Only physical units dispatched up in the AC run to meet uncompetitive constraints would be subject to mitigation in the IFM (see Unit C in Figures 9 and 11).

The use of negative bids to protect CC schedules prevents resources dispatched in the CC run based on their market bids from being replaced by generation from units that have lower DEBs (but a higher market bid). For example, as shown in Figure 10, although Unit I has a lower DEB than Units F and G, Unit I is not dispatched up in the AC run and therefore does not have its bid mitigated prior to the IFM.

[2] Specifically, the unit's highest accepted bid price in the CC run would be applied as a "floor" to the unit's DEB, so that the remaining segments of the unit's bid curve would be equal to the higher of (i) the unit's highest accepted bid in the CC run or (ii) it's DEB.

Meanwhile, the use of negatively priced bids to protect each unit's CC schedule also ensures that units are dispatched up in the AC run only to the extent they are needed to resolve congestion on the non-competitive constraints added in the AC run. Unlike current LMPM procedures, this approach ensures that physical units are dispatched up to meet non-competitive constraints in the AC run based on the merit order of their DEBs (as they would appear in the IFM under this scenario), rather than market bids. This ensures that physical units with DEBs that are lower than the bid price of virtual supply are used to relieve congestion on non-competitive constraints in the AC run and thereby have mitigated bids passed on to the IFM (e.g., see Unit C in Figures 9 and 11). This more accurately represents the bid structure of resources used to relieve non-competitive constraints and ultimately improves overall market efficiency. This approach would also introduce bid-in demand into the LMPM process (as ordered by FERC) and would be effective in mitigating how relatively high priced virtual demand could undermine LMPM procedures if virtual supply and demand bids were utilized in the CC and AC runs.[3]

DMM believes this approach may change the specific mix of units subject to mitigation, but would not significantly increase the total amount of generation subject to mitigation. This is because use of negatively priced bids to protect each unit's CC schedule would ensure that units are dispatched up in the AC run only to the extent they are needed to resolve congestion on the non-competitive constraints added in the AC run and not based on changes in relative merit order resulting from bid mitigation after the CC run. Thus, it appears that the only situation in which the total amount of generation subject to mitigation could be increased over the current approach (of mitigating physical supply against the demand forecast) would be when total demand clearing the AC run within uncompetitive constrained areas was greater than the forecast of physical demand within that area. Meanwhile, to the extent that virtual supply bids are submitted within non-competitive constrained areas at a competitive price (at or below the DEBs of physical supply), these virtual supply bids would get dispatched up in the AC run, would reduce the amount of physical supply subject to mitigation, and could ultimately get accepted in place of physical generation in the IFM.

[3] For example of how virtual demand could undermine LMPM procedures, see Example 1 in *Convergence Bidding: DMM Recommendations, Attachment A: Examples of Convergence Bidding and Local Market Power Mitigation*, November 2007.

Fig. 1: Local Constrained Area

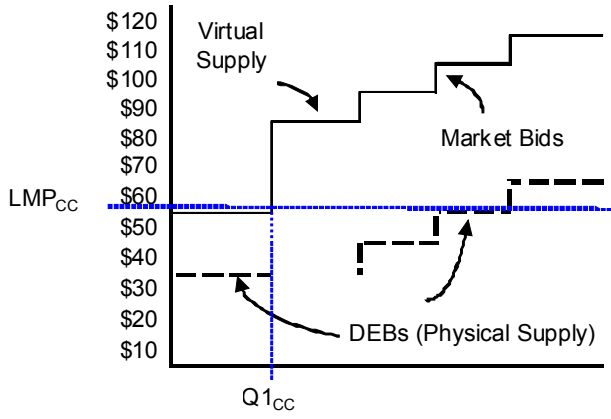

Fig. 2: Rest of System (Unconstrained)

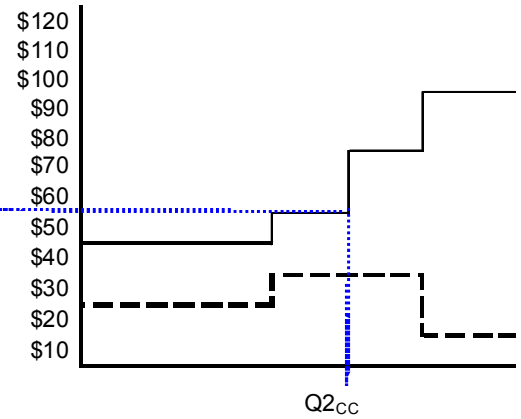

Fig. 3: Local Constrained Area

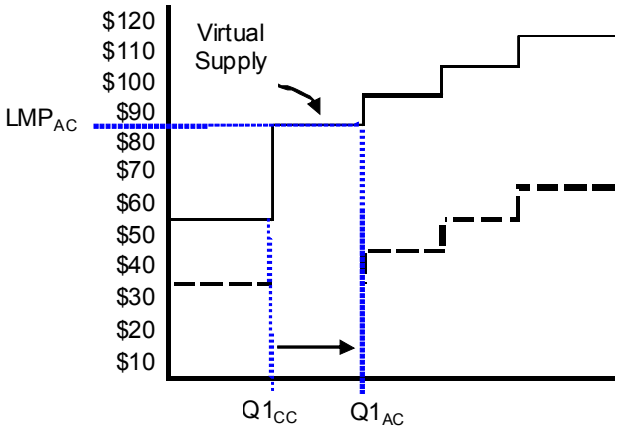

Fig. 4: Rest of System (Unconstrained)

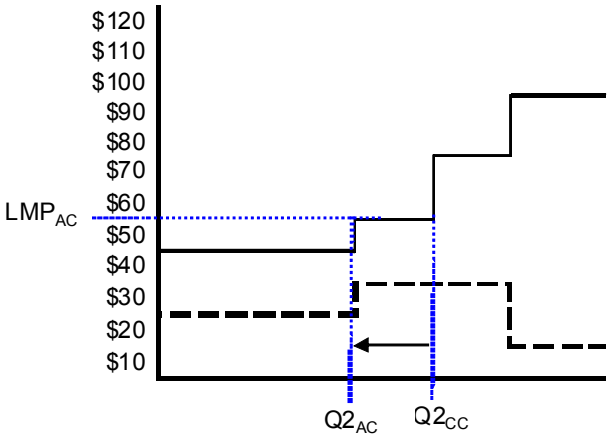

Fig. 5: Local Constrained Area

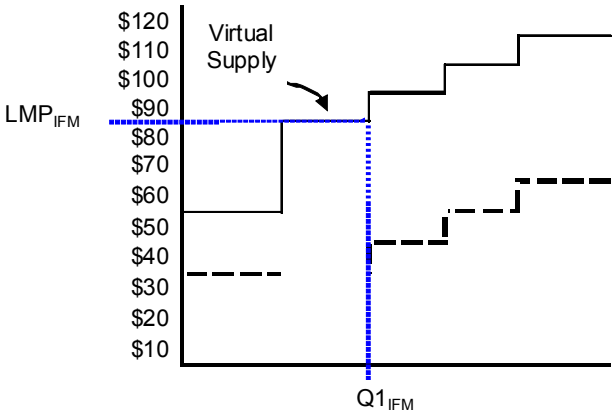

Fig. 6: Rest of System (Unconstrained)

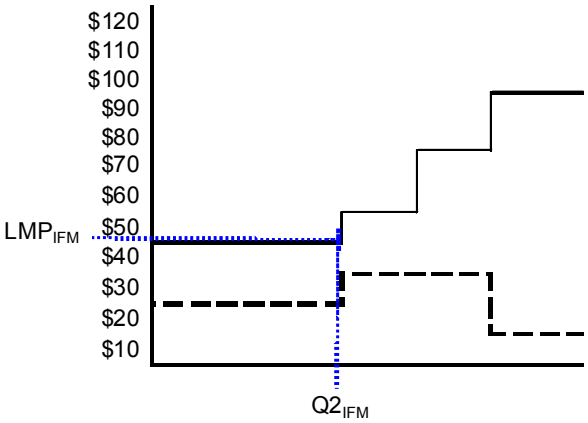

Fig. 7: Local Constrained Area

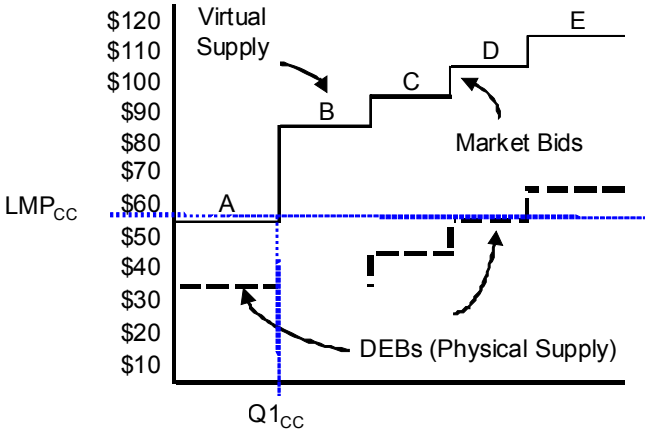

Fig. 8: Rest of System (Unconstrained)

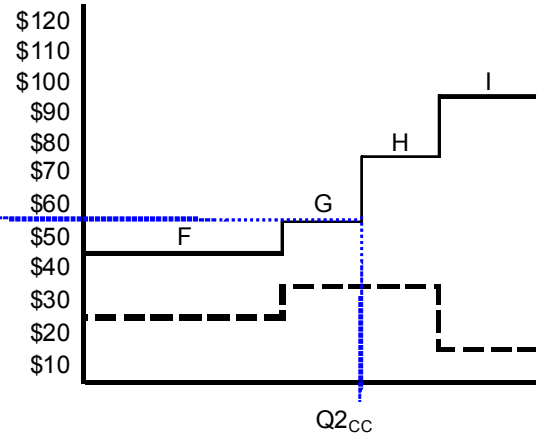

Fig. 9: Local Constrained Area

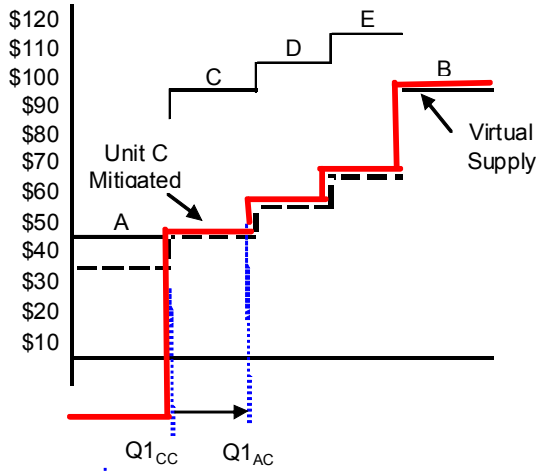

Fig. 10: Rest of System (Unconstrained)

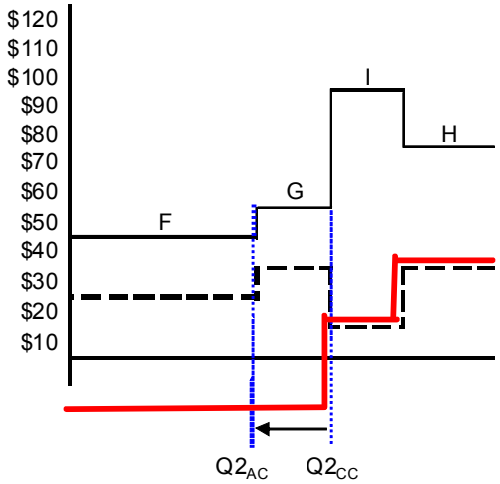

Fig. 11: Local Constrained Area

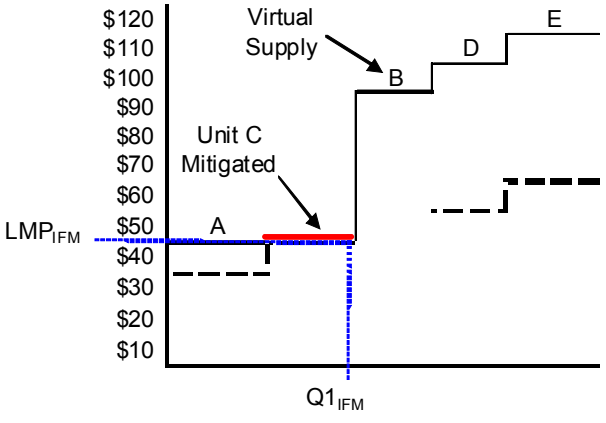

Fig. 12: Rest of System (Unconstrained)