Sources of Congestion Rent Shortfalls in the Day-Ahead Market

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October 15, 2014

OVERVIEW

It may be useful in considering how congestion rent shortfalls in the day-ahead market should be accounted for in the settlement system to have in mind an understanding of the varied factors that can give rise to such shortfalls.

There is more than one way of classifying sources of congestion rent shortfalls in the day-ahead market and some may find other classifications more intuitive. The groupings described below are those I find most useful for me.

OVERVIEW

Sources of congestion rent shortfalls in the day-ahead market can be put in three broad groups:

- Transmission system infeasibility– the transfer capability assumed in the auction or allocation of financial transmission rights is not available in the day-ahead market.
- Unpaid power flows -- the transfer capability assumed in the auction or allocation is available, but a portion of it is used by flows that are not charged for congestion.
- Unscheduled transfer capability -- the transfer capability assumed in the auction or allocation is available, but a portion of the transfer capability is not scheduled to transfer power in the day-ahead market.

Each of these broad categories has several subcategories.

TRANSMISSION SYSTEM INFEASIBILITY

- Transmission outages, network model differences.
- Transmission limit reductions.
- Constraints relaxed, not modeled, or not priced in the CRR auction
- Differences in load distribution factors for load zones between the CRR auction and the day-ahead market.
- CRRs not modeled in the auction.

TRANSMISSION SYSTEM INFEASIBILITY

- Transmission outages, network model differences.
  - These could be internal or external transmission system outages that reduce transfer capability. External transmission system outages could also be manifested in increased loopflows.
  - Transmission outages might not be modeled because they were not known at the time the auction was run or because their duration was judged too short to model in the auction. Even short outages can contribute to significant congestion rent shortfalls if they materially reduce transfer capability. In addition, outages that were expected to be short may take longer than expected.
  - Intentional or unintended differences in transmission system models between the CRR auction and the day-ahead market can reduce transfer capability in the day-ahead market by increasing flows on binding constraints in the day-ahead market.

TRANSMISSION SYSTEM INFEASIBILITY

- Transmission limit reductions.
  - These could include reductions in limits on the California ISO grid or reductions in entitlements to flows on external transmission systems.
- Constraints relaxed, not modeled, or not priced in the CRR auction.
  - Any constraint that is not enforced in the CRR auction can give rise to congestion rent shortfalls if it binds in the day-ahead market and the auction flows exceed the limit in the day-ahead market. This can include an external constraint that is enforced in the day-ahead market because of curtailments in real-time.
  - Shortfalls of this type could also arise from a constraint with a shadow price for flows in the day-ahead market and real-time (such as a market to market constraint) that is not accounted for in the CRR auction but enforced with a penalty price in the day-ahead market.

TRANSMISSION SYSTEM INFEASIBILITY

- Differences in load distribution factors for load zones.
  - If CRRs sinking in load zones are treated as perfect hedges with different load distribution factors in the day-ahead market than in the CRR auction, CRR flows may exceed transmission system limits based on day-ahead market load distribution factors.
  - If the differences are predictable, market participants could assemble portfolios of CRRs sinking at nodes and load zones that create no net flows on a key constraint in the auction but generate net flows, and CRR payments, in the day-ahead market.
- CRRs not modeled in the auction
  - If some CRRs are not modeled in the auction simultaneous feasibility test, the CRR flows settled in the day-ahead market can exceed transmission system limits in the day-ahead market.

UNPAID TRANSMISSION

- Increase in grandfathered rights flows that do not pay congestion charges between the CRR auction and the day-ahead market
- Increase in loopflows on binding constraint between the CRR auction model and the day-ahead market.
- Differences in PAR schedules between the auction and the day-ahead market that increase flows on constraints that are binding in the day-ahead market.
- Flows on binding constraints in day-ahead market that are not charged for congestion because of shift factor truncation.
- Increases in loss flows on binding constraints between the auction and the day-ahead market.

UNPAID TRANSMISSION

- Increase in grandfathered rights flows that do not pay congestion charges between the CRR auction and the day-ahead market
- Increase in loopflows on binding constraint between the CRR auction model and the day-ahead market.
  - Loopflows are just the difference between actual and modeled flows. They could be due to transaction schedules on external systems, or could be due to inaccurate modeling by the California ISO of transmission flows due to either internal generation and load or interchange transactions.
- Differences in PAR schedules between the auction and the day-ahead market that increase flows on constraints that are binding in the day-ahead market.
  - This is usually not a factor for internal PARs that are optimized in the day-ahead market unless they are out of service or have operating problems that limit their range in the day-ahead market.

UNPAID TRANSMISSION

- Flows on binding constraint in day-ahead market that are not charged for congestion because of shift factor truncation.
  - Shift factor truncation could in theory contribute either to shortfalls or surpluses.
  - The settlement of load at LAPs may result in large amounts of load having small shift factor relative to the distributed load bus that could happen to produce shortfalls.
  - If shift factors are truncated in the day-ahead market but not in the auction or vice versa, there is also a potential for CRR holders to construct bundles of CRRs that take advantage of shift factor truncation to consistently generate shortfalls.

UNPAID TRANSMISSION

- Increases in loss flows on binding constraint between the auction and the day-ahead market.
  - Hard to assess in theory, could result in overall shortfalls or could shift congestion rents into loss residual.
  - Could test impact by rerunning DAM on day with significant unexplained shortfalls and shifting reference bus, examine impact of the change on congestion rent shortfalls and loss residual.
  - Could also test by running cases with reduced load to examine the impact on congestion rent shortfalls and loss residual.

UNSCHEDULED TRANSFER CAPABILITY

- Power flows on binding constraint in day-ahead market are less than the limit.
  - This outcome could be due to iteration limits or MIP gap in day-ahead market solution.
  - If flows are less than the limit, not enough congestion rents will be collected.
  - The impact of these factors should normally be small.
- Powerflows on transmission system element in day-ahead market are less than limit because the transmission constraint is not actually binding, but the constraint is treated as binding in calculating day-ahead market prices.

SHORTFALL IMPACTS

In some circumstances, the factors contributing to congestion rent shortfalls will be anticipated and reflected in auction prices, so that increased congestion rent shortfalls are offset by increased auction revenues.

- This will not be the case to the extent that the CRRs impacting the constraint were allocated, rather than auctioned.
- This will also not be the case if the constraint that binds in the day-ahead market does not bind in the CRR auction because it is not modeled or not enforced, or because of modeling differences, shift factor truncation, changes in load factor distribution factors, etc.

ISO CRR/FTR SHORTFALL POLICIES

PJM: Sum of day-ahead market and real-time congestion revenue compared to target allocation for each hour. Payments prorated in proportion to share of target allocation. Prorated payments may be made up by surpluses in other hours. See PJM Manual 6 Financial Transmission Rights, October 10, 2013 section 8.4

New York ISO: TCC holders are paid their target allocation. Transmission Owners are charged for the energy market cost of transmission outages and derates in the day-ahead market. Net congestion rents, positive or negative, are allocated to the transmission owners based on formulas related to auction revenues. Net congestion rents consist of congestion rents collected in the day-ahead market, plus payments for the cost of outages and deratings, less payments to TCC holders. See New York ISO Manual 14, Accounting and Billing Manual, sections 9 and 10 or New York ISO, Market Services Tariff, Section 17.5.

ISO CRR/FTR SHORTFALL POLICIES

MISO: Day-ahead market congestion revenue (including Joint Operating Agreement revenues and payments) are compared to target FTR allocation for each hour. Hourly payments are prorated based on target allocation. Prorated payments may be made up by surpluses in other hours. See Midwest ISO Business Practices Manual, Market Settlements, Manual 5, section 2.93 June 12, 2013

ISO New England: Sum of day-ahead market and real-time congestion revenue compared to target allocation. Payments to FTR holders are prorated in proportion to their share of the positive target allocation. ISO New England, Manual for Financial Transmission Rights, M-06 October 1, 2012 section 5.2

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