Convergence Bidding Information Release and Market Performance

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Outline of Presentation

- Market efficiency benefits of convergence bidding
  - Reduce total cost of meeting load
- False benefits of convergence bidding
  - Price convergence alone
- Why information release will increase likelihood of realizing benefits of convergence bidding
  - Can be used to reduce total cost of meeting load
- Information release is the norm in financial markets
  - Evidence on role of information release in financial markets
- How ISO proposal can improve market efficiency

Benefits of Convergence Bidding

- Reduce total cost of serving load

- Suppose that before implementation of convergence bidding, a long-start unit that lowers the total daily cost of meeting demand is not dispatched
    - Day-ahead price is $40/MWh, but real-time price is $50/MWh because more expensive short-start units must be used to meet real-time demand
    - Suppose load purchases 1,000 MWh in day-ahead market and 200 MWh in real-time market
        - Total wholesale cost to meet load is $50,000 = $40 x 1000 + $50 x 200

- Suppose convergence bidders increase demand in day-ahead market by 100 MWh and this causes the long-start unit to be dispatched at a day-ahead price of $41/MWh
    - Real-time price is lower because only 100 MWh of additional generation is dispatched in real-time at a price of $42/MWh because of price-taking virtual supply of 100 MWh in real-time market
    - Suppose load continues to purchase 1,000 MWh in day-ahead market and 200 MWh in real-time market
    - Total wholesale cost to meet load is now $49,400 = $41 x 1000 + 42 x 200

- Conclusion—If convergence bidding changes day-ahead dispatch then even if load does not change purchasing behavior it can benefit from convergence bidding

Benefits of Convergence Bidding

- Market efficiency benefits from convergence bidding specific to California market
  - Demand bid in at Load Aggregation Point (LAP) level aggregation is allocated to nodal level using load-distribution-factors (LDFs) set by CAISO
  - With nodal convergence bidding, if a market participant believes that LDFs are inaccurate then it can submit a nodal demand convergence bid to ensure that sufficient generation is dispatched to meet real-time demand at that location
  - How aggregate demand is allocated to nodes now depends on assessment of all market participants, not just ISO operators
  - Similar result holds for day-ahead network model
    - Convergence bidders can reduce or increase transfer capacity of a transmission link or reduce or relax other operating constraints in day-ahead market

Benefits of Convergence Bidding

- Increases elasticity of residual demand curve that a supplier faces in day-ahead market
- Residual demand curve Supplier A faces equals aggregate market demand curve less aggregate willingness-to-supply curve of all other market participants besides Supplier A
  - DR(p) = residual demand curve facing supplier A in day-ahead market
  - D(p) = market demand curve in day-ahead market, including convergence bids
  - SO(p) = willingness-to-supply curve of all other market participants besides Supplier A in day-ahead market, including convergence bids
  - Slope of DR(p) equals DR'(p) = D'(p) – SO'(p)
  - Both D'(p) and SO'(p) are larger in absolute value if convergence bids are included in each curve
    - Larger sales loss to Supplier A from a given increase in market price
  - Elasticity of Residual demand curve = DR'(p)*[p/DR(p)]
  - Conclusion--For same values of DR(p) and p, curve is more elastic when convergence bids are included
- Conclusion--A supplier facing a distribution of residual demand curves that is more elastic has less ability to exercise unilateral market power in day-ahead market
  - Will submit offer curve closer to its variable cost curve

False Benefit of Convergence Bids

- Price convergence--Average value of day-ahead price, p(DA), is approximately equal to average value of real-time price, p(RT)

- Extent of deviation between these two average prices depends on cost of entry into convergence bidding market and costs to participate in market

    – If it costs $1/MWh to clear a convergence bid, then

$$|E(p(DA)) - E(p(RT))| < \$1$$

is the best that can be expected

    – Convergence bids will not be submitted unless bidder expects to cover $1/MWh cost to participate

- Conclusion--Price convergence can occur with convergence bidding having no impact on market efficiency, improving market efficiency, or reducing market efficiency

False Benefit of Convergence Bids

- If dispatch of system does not change, then revenue earned by CBers formerly went to loads or generation unit owners

- Suppose that in earlier example, convergence bidding did not cause long-start unit to be dispatched

  - Suppose that it is still the case that P(DA) = $40/MWh and P(RT) = $50/MWh

  - Convergence bidders earns $1000 = ($50-$40)*100 that previously when to generation unit owners

  - 1100 MWh of generation scheduled in day-ahead market

    - 1000 MWh by loads and 100 MWh by convergence bidders

  - 100 MWh of generation scheduled in real-time market

    - 200 MWh purchased by loads, 100 MWh of which is price-taking virtual supply sold in real-time by convergence bidders

Information Release and Benefits of CB

- With information release, market participants can more easily determine whether CBs increased or decreased market efficiency
  - If market participants can reconstruct market outcomes with and without CBs, they determine if actual costs of meeting load increased or decreased as a result of convergence bids
  - With CB information release market, participants can more easily measure the success of their own convergence bidding efforts
    - What was their cost of meeting load lower because of their CB submissions?
  - Participants can learn which CB strategies are successful and which are unsuccessful and under what system conditions
  - Participants can learn which CB strategies reduce wholesale price volatility

Information Release and Financial Markets

- Financial markets typically release trade specific information to all market participants
  - Price and quantity for each transaction immediately released following sale to market participants
  - Some markets release information on bid and offer stack depth and associated bid and offer price levels to all market participants in advance
  - Experimental economics evidence suggests that information release reduces bid/ask spreads and increases trading volume in financial markets
  - CB market is a purely financial and no electricity is actually delivered or consumed in real-time
    - Difficult to see how information release does not enhance efficiency of energy market
  - Conclusion--Information should be released unless it can be demonstrated to be harmful to market efficiency

Information Release and Financial Markets

- In general, in financial markets participants profit from superior knowledge about value of asset traded
  - If market participant has superior information about nodal net positions or form of virtual bidding offer and bid stacks it can profit from this, if this information is not released to all participants
  - Withholding this information from market participants only benefits those participants able to gather this information at the expense of those that cannot
  - If ISO releases this information, this limits ability of market participants to profit from their knowledge of this information
  - Convergence bidders must profit from their superior knowledge of real-time system conditions at each node in network, which increases likelihood that convergence bidding reduces total cost of serving load

ISO Proposal Can Improve Performance

- Knowledge market-wide knowledge nodal net positions at all nodes in day-ahead market can improve ability of market participants to gauge success of convergence bidding

  - On system-wide basis

  - For individual market participants

- This increases ability of market participants to submit CBs that are privately profitable and reduce total cost of serving system load

Concluding Comments

- Convergence bidding must improve efficiency of dispatch to provide market efficiency benefits

- Greater information release can allow market participants to achieve more efficient commitment and operation of units

- Hard to argue information release can reduce market efficiency given experience from financial markets

  - Standard should be information release unless it can be demonstrated to harm market efficiency

Questions/Comments?