Market Strategy& Resource Planning

# Intertie Congestion Pricing

**Jeffrey Nelson**

**March 2010**

# Issue: Process to Price Intertie Congestion can Produce Anomalous Results

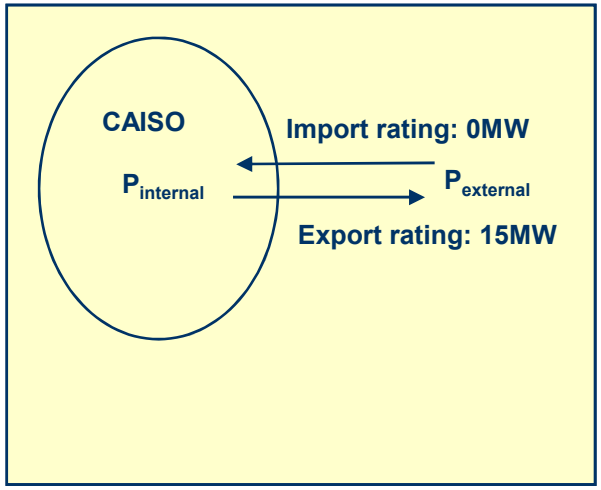
- CAISO rules eliminate bids if an intertie has a 0MW rating in both directions
  - Intertie is deemed "open"
  - We support this rule
- However, if the line has a non-zero rating in one direction (e.g. export) but a 0MW rating in the other direction (e.g. import), the CAISO accepts and utilizes bids in both directions
- The end result is that bids are allowed to set prices, even though the bids, in some cases, may never clear the market
  - Can result in anomalous results
  - Bigger problem if the line is not competitive
- Current process may result in inflated congestion prices, inflated CRR revenues, and CRR revenue insufficiency

# Pricing Policy Questions

- Question 1: How do you price "disconnected nodes"?
  - Already addressed at FERC– CAISO looks at the price of "closest electrically connected node" and uses that price
  - Evidently not implemented yet in software
  - We support this rule and think is should apply to an "open intertie"
- Question 2: How is the congestion component of the LMP priced if the Shadow price on a line is $0? (Specifically on a radial line.)
  - Already addressed in MRTU: If shadow is $0, congestion component is $0
- Question 3: If an inter-tie has a 0MW rating in one direction (e.g. import), and a positive rating in the other direction (e.g. 15MW export), should it be treated as an "open tie"?
  - Currently rule is "no", because exports allows imports even though the line is rated at 0MW
  - However without exports, imports are infeasible
    - Suggests the tie should be treated as "open" in the import direction once off-setting exports are exhausted
      - When the line is "open", tie should be priced as a disconnected node (use closest connected price)
      - Suggests the congestion component should be the shadow price in the export direction ($0 if net exports <15MW)
    - Import bids should never be used to determine the congestion component of the price

# Example: Current Intertie Pricing Practice

Example:




**Consider a single intertie.**

**The tie has 0MW import capability**

**And 15MW export capability**

## Price formation under current processes

- Case 1: Only export bids < 15MW
  - Since exports are below the limit, there is no congestion and $\mathbf{P_{internal} = P_{external}}$
  - Any export bid >= $P_{internal}$ will clear the market
- Case 2: Only 1MW of import bids (no export bids)
  - $\mathbf{P_{external}}$ = **Import bid price** (anywhere from -$30 to +$500)
  - CAISO prices the line based on the first bid that cannot be accepted
    - Note that no import bids ever clear the market, but they were still allowed to set prices
- Case 3: 1MW of export bids, 2MW of import bids
  - Even though the import limit is 0MW, if the export bid clears the market, the 1MW import bid now has the ability to clear the market (it effectively nets to reduce the amount exported)
  - Assume the export bids to purchase power at $40/MWh an the 2MW import bids to sell power at $5/MWh
  - Here $\mathbf{P_{external}}$ = **$5/MWh**, even though the line is not congested in the export direction
    - Shadow price in the export direction is $0, but the line still has a congestion component if $P_{internal}$ >$5

# Observations with Current Methodology

- The import can set $\mathbf{P_{external}}$ even when its bid is ineligible to clear the market (case 2)
- As long as the import is willing to clear more quantity than the export, it can set $\mathbf{P_{external}}$ at any value it wants
  - This has significant implications if the import bidder also holds CRRs
  - Virtual bids have a claw-back rule; that rule is not currently in place for physical bids
- The problem seems to stem from a pricing methodology that allows the first bid that *cannot flow* to set prices rather than treating the tie as a disconnected node when bids become infeasible

# Possible Solutions

- Option 1: Instead of pricing the path based on the first bid that *cannot flow*, the constraint should be treated as a disconnected node with the total LMP equal to the nearest connected node (Pinternal) and the congestion component based on the shadow price of the rated (export) direction
  - In case 1 since there is no congestion (even though the import is rated at 0MW), the congestion price should be $0
    - Power can be exported (without the need for an import bid) without creating any congestion, the shadow price in the export direction is $0, so the congestion component on the tie should be $0
    - $P_{internal} = P_{external}$ based on disconnected node pricing
  - In case 2 when no bids flow, the congestion price should be $0
    - Power can be exported (without the need for an import bid) without creating any congestion, the shadow price in the export direction is $0, so the congestion component on the tie should be $0
    - $P_{internal} = P_{external}$ based on disconnected node pricing .
  - In case 3, since no additional import bids can flow, and since the export direction is not congested, the congestion price should be $0
    - Power can be exported (without the need for an import bid) without creating any congestion, the shadow price in the export direction is $0, so the congestion component on the tie should be $0
    - $P_{internal} = P_{external}$ based on disconnected node pricing .
  - In general, the line would only post a congestion price if net exports reach the line limit
    - Congestion prices would be set by the export bids/shadow on the constraint
- Option 2: Apply special bidding rules for low-rated or non-competitive ties
  - Possible examples:
    - Bids on 0WM or small ties can only be submitted if a source and a path (i.e. a tag) is provided in advance
    - Implement the CRR clawback rule for all bids on small/non-competitive ties
- Option 3: CRRs are only impacted by the congestion component, simply ensure the congestion component is set to $0 in these cases irrespective of how the total LMP is calculated
- Other?