Convergence Bidding on the Interties

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Design Principles

- We must have feasible intertie schedules
  - NERC and WECC standards require this
  - Operators need feasible schedules to run the grid reliably

- Virtual and Physical bids must clear against each other to set one price per pricing node
  - Just as is the case for internal transactions, virtual bids on the interties must be able to offset physical bids in order to be meaningful
Two constraints will be enforced in the scheduling run
  - Constraint [1] is that $PI + PE \leq \text{limit}$
  - Constraint [2] is that $(PI + VI) + (PE + VE) \leq \text{limit}$.

In the pricing run, only constraint [2] will be enforced
  - This will yield prices that reflect the interaction of physical and virtual
  - Physical results from the scheduling run will act as un-priced constraints in the pricing run

Constraint [1], which exists in the market software today
  - Ensures feasible intertie schedules
  - Ensures compliance with applicable WECC and NERC standards

A tagging requirement may be necessary
General example

- Line/scheduling limit is 100 MW, imports prevail
- Scheduling run enforces
  - $PI + PE \leq 100$
  - $(PI+VI) + (PE+VE) \leq 100$
- Scheduling run yields $PI = 200$, and $PE = 100$
- Pricing run enforces
  - $(PI+VI) + (PE+VE) \leq 100$
  - $200 - \varepsilon \leq PI < 200 + \varepsilon$
  - $100 - \varepsilon \leq PE < 100 + \varepsilon$
How does this play out?

- Four possible cases with respect to these constraints binding in the scheduling run
  - **Case A**: Neither [1] nor [2] is binding
  - **Case B**: Both [1] and [2] are binding
  - **Case C**: [2] is binding, but [1] is not
  - **Case D**: [1] is binding, but [2] is not

- The following slides show how each of these scheduling run scenarios plays out in the pricing run

- Feasible physical schedules from the scheduling run are preserved and passed to the pricing run as additional, un-priced constraints in the pricing run.

- The prices from the pricing run reflect no congestion costs as the shadow values of [2] is 0 because it is not binding.
Case B: Both [1] and [2] are binding

- The physically feasible intertie schedules from the scheduling run will be passed to the pricing run as constraints.
- In this case, we have a redundant constraint. Both constraints binding implies mathematically that $VI = VE$.
- Thus, the shadow value for [1] will equal the shadow value for [2], and will determine the congestion component of prices in the pricing run.
Case C: [2] is binding, but [1] is not

- There is no congestion created by the physical bids, but the virtuals do create congestion.

- The reliability constraint is not violated in the scheduling run, but the prices that come out of the pricing run reflect the congestion created by the virtual transactions.

- Note that we would not expect this situation to occur often or to persist.
Case D: [1] is binding, but [2] is not

- Constraint [1] is binding thus there is physical congestion at the intertie
- The feasible physical schedules are passed to the pricing run and combined with the virtuals
- The physical schedules + the virtual bids are subject to constraint [2]. Since counter-flows created by virtuals have done away with congestion, the pricing run will reflect a shadow value of 0
- This is good. Virtuals are supposed to be able to mitigate congestion and prices should reflect that.
Tagging Requirement

- The ISO is considering a tagging requirement for physical intertie schedules

- There could still be incentive to engage in implicit virtual bidding when virtual bidding is available

- The tagging requirement will be considered as part of a subsequent stakeholder process as discussed at the July 9th, 2009 stakeholder meeting
Next Steps…

- *Draft* Final proposal will be posted on Friday, Sept 11 for discussion at Sept 18 MSC Meeting

- A decision by the CAISO Board will be sought in October

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