# Bid Cost Recovery

B.F. Hobbs

The Johns Hopkins University

CAISO MSC

MSC Meeting, March 18, 2011

# Economic Justification for BCR

- To provide incentive for least-cost producers to participate in market
- Specifically, to provide "supporting prices" for resource schedules
  - Definition: Supporting prices provide no incentive to deviate from schedule (or to leave market)
    - I.e., schedule is profit-maximizing

# Some Economic Theory

- O'Neill et al. define supporting prices for unit commitment-like problems
  - Look like simple BCR for simple start-up cost or min-run cost cases
  - R.P. O'Neill, P.M. Sotkiewicz, B.F. Hobbs, M.H. Rothkopf, W.R. Stewart, Jr., "Efficient Market-Clearing Prices in Markets with Nonconvexities," European Journal of Operational Research, 2005, vol. 164, pp. 269–285

- Difficulty: supporting prices not unique

- Ring, Hogan, Pope, Gribik propose selecting "uplift minimizing" supporting prices
  - W.W. Hogan and B.R. Ring, "On Minimum-Uplift Pricing for Electricity Markets," March 19, 2003, (available at http://ksghome.harvard.edu/~WHogan/minuplift_031903.pdf )
  - P.R. Gribik, W.W. Hogan, S.L. Pope, Market-Clearing Electricity Prices and Energy Uplift, HEPG,December 31, 2007

# An Implication of Theory

- If resource's operating decisions in two periods are separable (one doesn't affect costs of other), then:
  - BCR should be applied separately to the two periods
  - If applied to both together, then there may be incentive for efficient generator (with nonconvex costs) to exit the unprofitable market
- For instance
  - IFM dispatches a turbine for afternoon peak, but not morning ramp
    - Then turbine needed for morning ramp in RT.
  - Separate BCR for each hour if a fast ramp plant has no unit commitment constraints except high min run level & high no-load costs
    - But for high start-up cost, slow ramping units, use entire day for BCR
    - Different BCR rules for different resources required?!

# Another Implication

- But if resource's decision to enter one market necessarily means it participates in a second market, then combining for BCR purposes reasonable:
  - Can't leave one market without leaving the other market
- For instance:
  - RUC and RT market
  - Future possible combined IFM/RUC
  - Operating reserves and energy in joint optimization (if must submit bids for both)

# Limitations

- Theory assumes price-taking behavior
  - Doesn't consider possibility of non-cost based bidding
  - E.g., raising bids to recover costs (shouldn't be possible in competitive market)
- O'Neill et al. theory assumes energy prices = marginal cost
  - What if pricing run or model discrepancies mean that energy bids accepted that exceed P?
    - E.g., CAISO export market?
  - Would it be better to try to correct market price calculations instead?
- Theory assumes that recovery of uplift is nondistorting
  - Who pays, and does it change their behavior?

# Conclusions

- Moving to separate IFM and RT BCR seems reasonable, given ability to enter one market and not the other

- RUC ambiguous, but not of large consequence

- Alternative is to calculate supporting prices using O'Neill et al./Ring et al.-type methods
  - Being explored at MISO