

Issue 13 : Control Action Operating Reserve (CAOR)

MPWG # 51 - Aug 19, 2008



- To provide MPWG with a review and update on Control Action Operating Reserve (CAOR) use.
- To identify issues with respect to current CAOR procedures and pricing.
- To initiate discussion on identified issues and gather MPWG feedback.

- Background on CAOR
- Frequency of CAOR usage
- Issues identified
- Scope of study
- MPWG feedback
- Supplemental information

HISTORY:

- Prior to CAOR introduction in the market, the IESO manually reduced the OR requirements when a shortage of reserve (insufficient OR market offers) in the real time constrained schedule was identified.
- The reduction in the OR requirement allowed market to clear with available OR offers.
- The lowered OR requirement was used for calculating prices (MCP) in the unconstrained schedule.
- Often shortages that exist in the constrained schedule will not exist in the unconstrained schedule.
- These out-of-market actions had following implications:
 - Counter-intuitive price effect: A decrease in market clearing price at times of shortage.
 - RT vs. PD Divergence: Increased difference between Pre-dispatch and Real time prices since manual OR reductions were typically employed in Real-time.

CAOR is the implementation of standing offers in IESO reserve markets for certain out-of-market control actions available to IESO.

- In July 2003, 400 MW of out-of-market control actions were introduced at an offer price of \$30 for 30R and \$30.10 for 10N.
- The prices applied were chosen so that CAOR would be scheduled at roughly same frequency (around 7%) in which out-of-market control actions were scheduled previously.
- The objective behind the pricing structure was to ensure CAOR was typically used first as 30R before being scheduled as 10N.
- CAOR implementation had following effects on the market:
 - Reduced frequency of shortfalls in OR market.
 - Less instances of manual reductions in OR requirements.
 - Reduced non-intuitive pricing outcomes.
- After introduction of CAOR, there were number of concerns raised related to its implementation such as pricing of CAOR and scheduling CAOR in pre-dispatch.
- In November 2005, IESO Board approved additional 400 MW of standing offers for CAOR.

	Prior to November 23, 2005	Since November 23, 2005
Amount	400 MW	Additional 400 MW
Price	10N @ 30.1/MWh 30R @ 30.00/MWh	200MW @ \$75/MWh for 10N 200MW @ \$100/MWh for 10N
Timeframe	Pre-dispatch and real-time	Real -time
All CAOR offers have an associated energy offer price of 2,000/MWh		

- Rationale for additional 400 MW of CAOR:
 - To further reduce instances of counter-intuitive pricing.
 - Offered only in real-time to reduce likelihood of planning for reliance on Emergency Control Actions.
- Also, eliminated the IESO practice of reducing operating reserve (OR) requirement when a shortage was expected.

CAOR pricing structure

Resource	Total Quantity (MW)	30 min OR Price (\$/MW/Hr)	10 min Non Sync OR Price (\$/MW/Hr)	Resource OR Scheduling Ramp Rate (MW/Min)	Energy Bid (\$/MWh)	Resource Energy Ramp Rate (MW/Min)
RICHVIEW -230.G_3VR	400 PD & RT	30.00	30.10	999	2000.00	4 up, 999 down
RICHVIEW -230.G_5VR	200 RT	N/A	75.00	999	2000.00	4 up, 999 down
RICHVIEW -230.G_5VR	200 RT	N/A	100.00	999	2000.00	4 up, 999 down

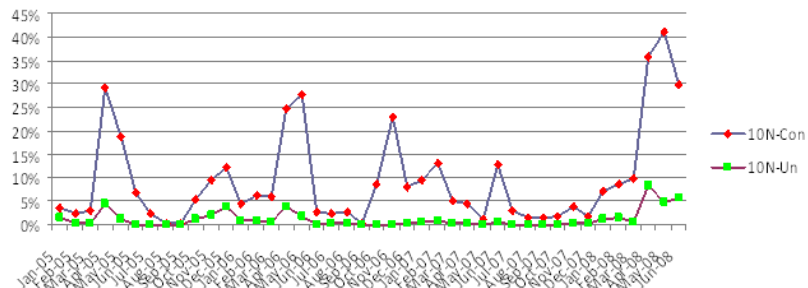
Current Development

- At present, the IESO has recommended removing CAOR from pre-dispatch for operational reasons (Refer to 'Proposal to remove CAOR from pre-dispatch').

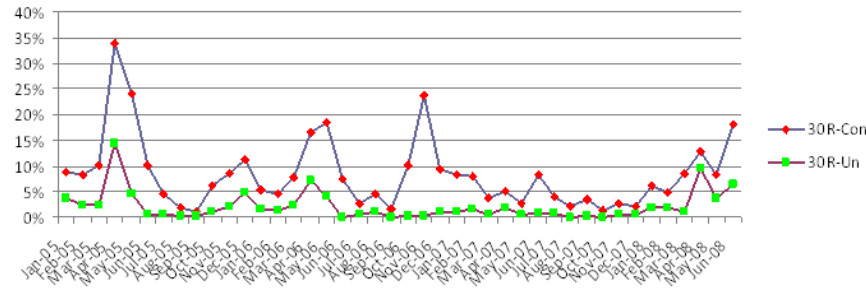
Prior to implementation of CAOR, the IESO used out-of-market sources of reserve in roughly 7 % (constrained) of 5 min intervals. For the period between Jan. 2005 – Jun. 2008, CAOR has been scheduled:

- 9.5% in real-time constrained sequence
- 1.94% in real-time unconstrained sequence
- 10.3% in Pre-dispatch constrained sequence
- 2.7% in Pre-dispatch unconstrained sequence

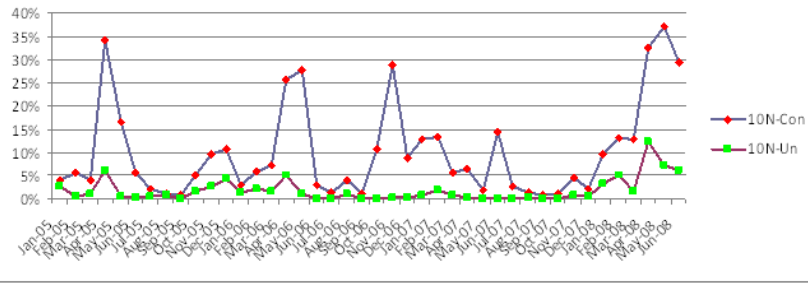
RT Constrained Vs UnConstrained 10N



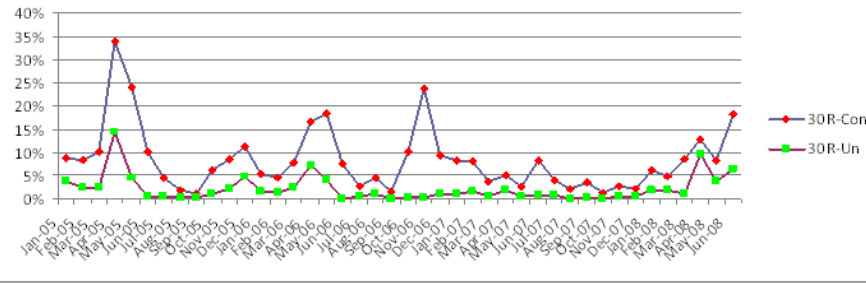
RT Constrained Vs UnConstrained 30R



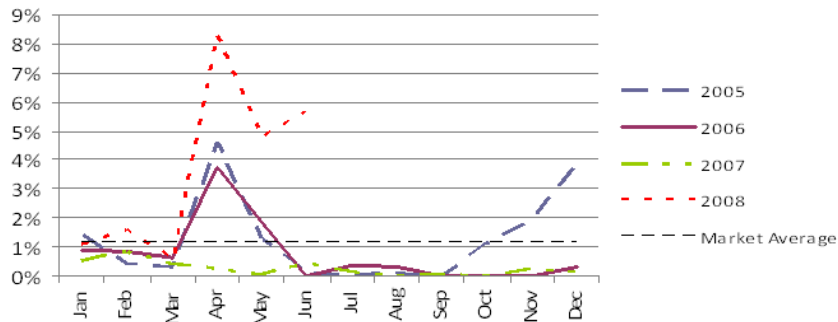
PD Constrained Vs Unconstrained 10N



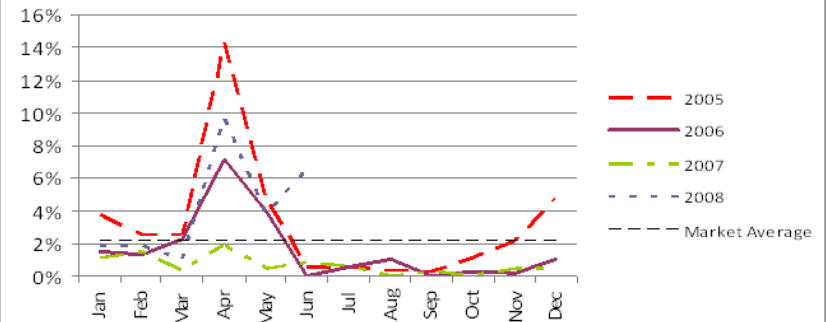
PD Constrained Vs UnConstrained 30R



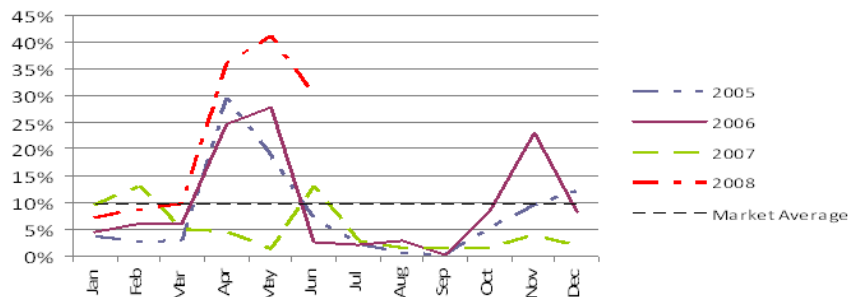
RT Unconstrained 10N



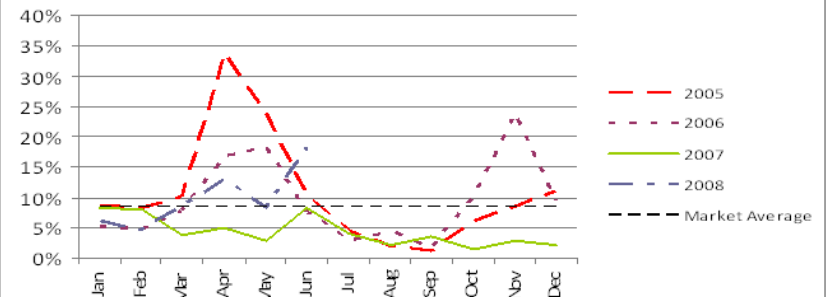
RT Unconstrained 30R



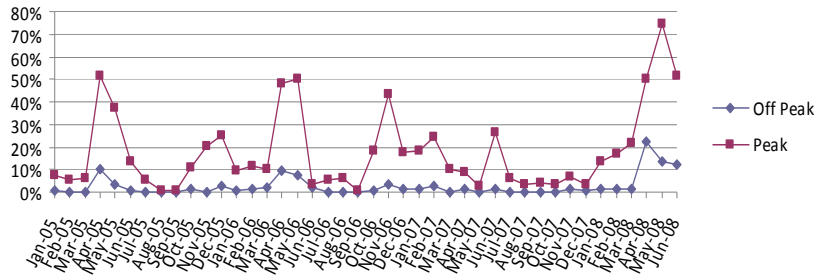
RT Constrained 10N



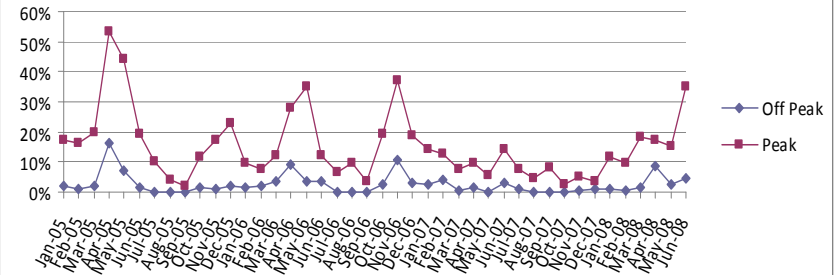
RT Constrained 30R



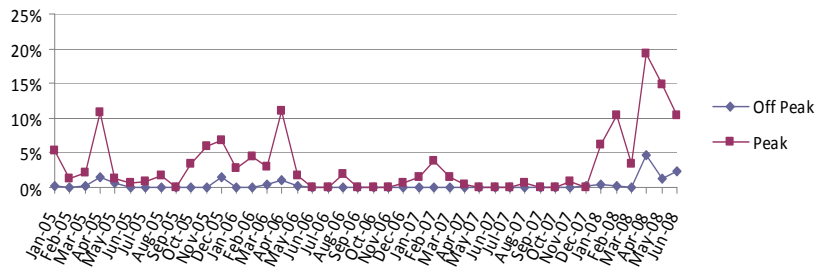
RT Constrained Peak Vs Off Peak 10N



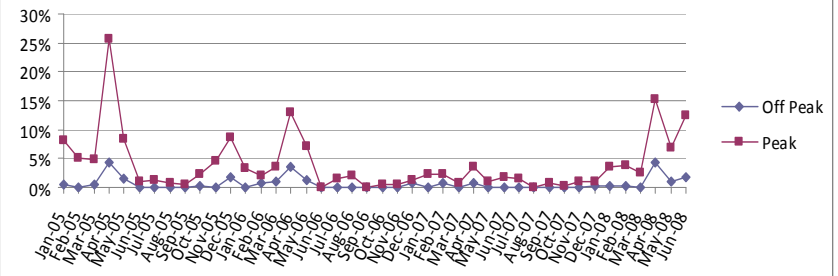
RT Constrained Peak Vs Off Peak 30R



RT Unconstrained Peak Vs Off Peak 10N



RT Unconstrained Peak Vs Off Peak 30R



1. Current Price structure: Do we have the correct price structure of CAOR? Is CAOR displacing potential market OR resources? Is it resulting in inefficient price signals?
2. If CAOR is removed from pre-dispatch as proposed, what will be the market and pricing impacts? Would it cause increased divergence between RT and PD pricing sequences?

- Neighbouring OR markets (Preliminary information on NY & PJM markets included).
- Research papers based on Pricing of Operating Reserve - William Hogan.
- Examination of Ontario OR curve – analyse the non-strategic market offers being displaced by CAOR.
- Reliability impacts
- Market efficiency impacts – Market efficiency and price impacts due to possible changes in current CAOR pricing structure and/or procedure.

Neighbouring OR Markets

NYISO OR Market:

The key elements of NY OR markets can be summarized as follows:

- Co-optimization of operating reserve with energy and regulation in both the day-ahead and real-time markets.
- Use of OR demand curves in price determination of operating reserves to reflect the value of OR and energy in shortage conditions.
- Operating reserve prices are based on the marginal cost of providing the service to the system, which equals the sum of the marginal OR provider's:
 - (i) Availability offer price, and
 - (ii) Opportunity cost of not providing another product, such as energy
- In real-time, all dispatchable on-line generators are at a \$0/MWh availability offer.
- A two-settlement system for OR, whereby day-ahead schedules must either be provided in real-time or purchased back from the RT market at RT clearing prices.

Under OR shortage conditions, the real-time market uses demand curves to limit the costs of procuring OR and allows market to clear with 'rational prices'. The demand curve values are set high enough to capture all available market with certainty.

The current market design consists of nine demand curves, one for each category and location of reserve.

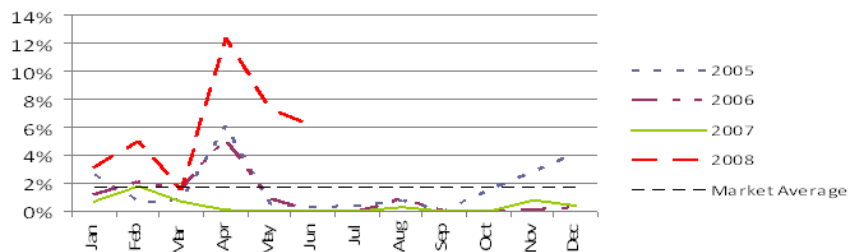
PJM OR Market:

PJM operates a 2 tiered reserve market. Their reserve market exists in both the real time and day-ahead timeframes. Tier 1 OR is excess capacity of online generators, and is priced higher than \$0.00 only in the case of reserve pickup. Tier 2 resources offer in to the OR market with an offer cap of \$7.50 over their cost, and are only scheduled into the OR market if the reserve requirement is not satisfied by the Tier 1 OR. This price cap remains active unless scarcity pricing is called into effect. During scarcity conditions Price goes to the highest offer of a unit running for PJM within the zone.

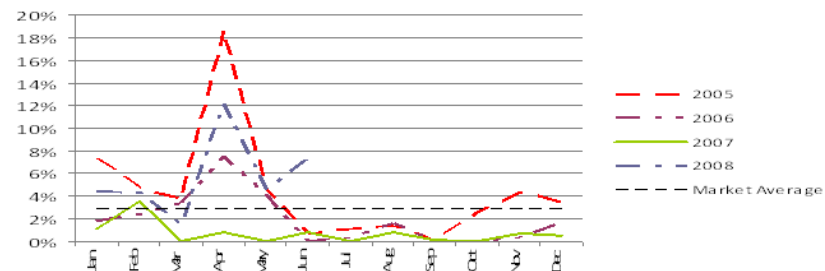
- Solicit MPWG Feedback on issue with written comments on discussion paper, issues and scope by September 9, 2008.
- Develop a work plan.
- Present work plan, Stakeholder engagement (SE-72) plan and proposal analysis to MPWG on Oct. 29, 2008 meeting.

• Additional Graphs

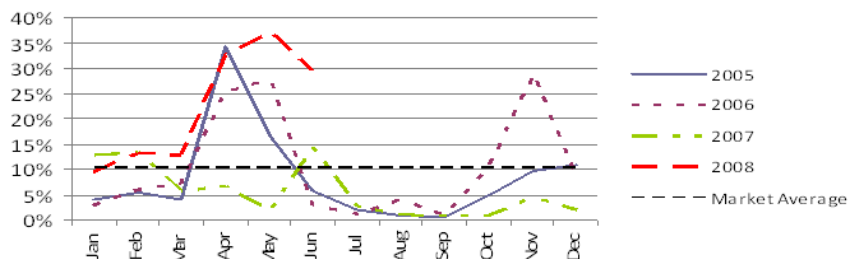
PD Unconstrained 10N



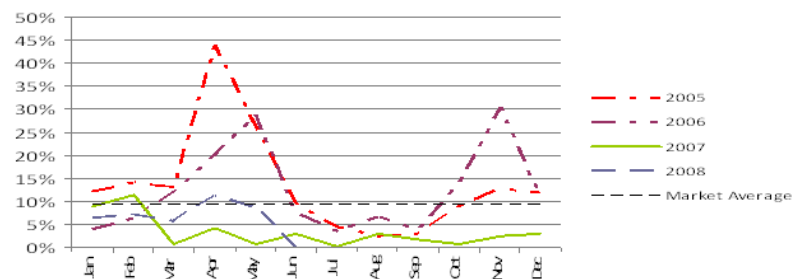
PD Unconstrained 30R



PD Constrained 10N

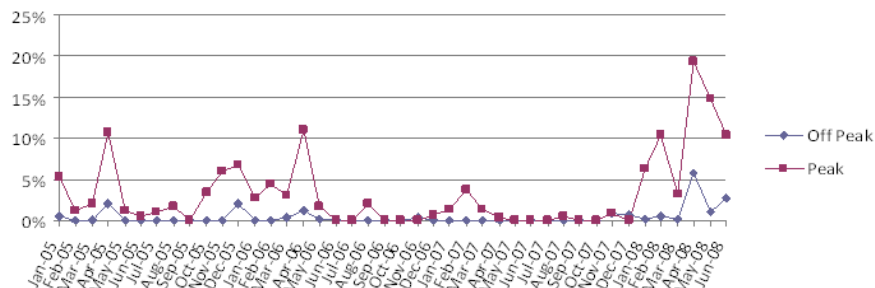


PD Constrained 30R

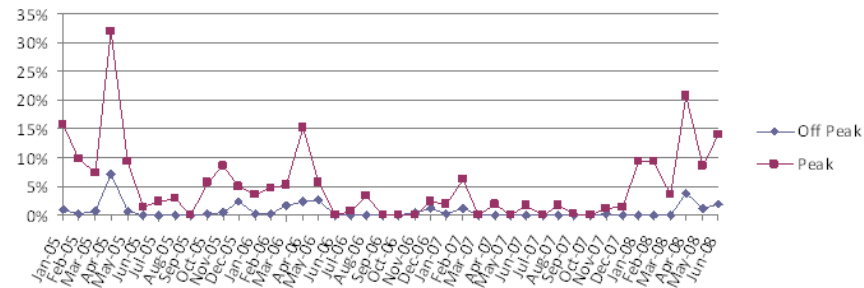


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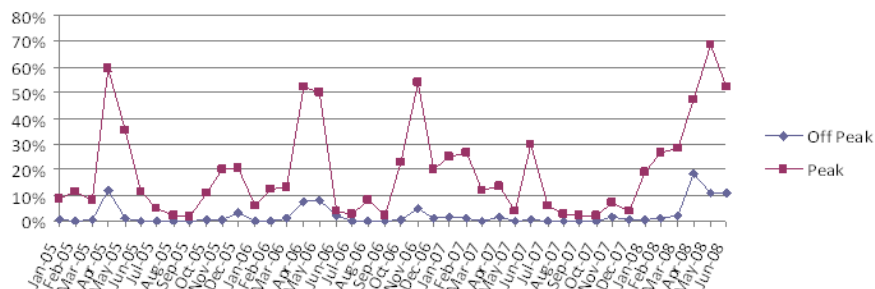
PD Unconstrained Peak Vs Off Peak 10N



PD Unconstrained Peak Vs Off Peak 30R



PD Constrained Peak Vs Off Peak 10N



PD Constrained Peak Vs Off Peak 30R

