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POWER PRODUCERS
OF ONTARIO

Addressing Ramp Rate Issues in Ontario

Presentation to Market Pricing Working
Group

March 24, 2006

Background

- Adoption of the 12x generator ramp rate assumption was seen as a temporary measure to open the market
- The measure was taken to dampen the potential for volatility in the energy market
 - Volatility had been identified as a potential problem in the market trials

Problems with 12 x Ramp Rate

- Arbitrariness: the 12x is an arbitrary amount with no relation to anything other than the desire to reduce feared volatility
- Inefficiency: ramping is a valuable service, and the current solution does not reward it
- Overuse of ramping: because the current solution does not impose any costs for ramping on the IESO, while ramping does impose maintenance and emissions costs on generators, the IESO overuses it



CMSC is not Adequate

- CMSC pays as bid
 - The premise of the real-time market is that bids reflect marginal cost
 - That is the basis of pricing according to the last unit dispatched; it represents the marginal unit and its cost is the system marginal cost
 - If bids reflect marginal costs, they do not properly reflect the costs that can be imposed by ramping nor do they reflect other costs of market participation
- Paying infra-marginal bidders the system marginal cost will pay them for their fixed and other costs
 - Only bidders who know they are only scheduled when marginal can optimally reflect fixed and other costs in their bids
 - CMSC does not properly compensate the constrained-on generators for the costs that the constraint can impose
 - CMSC therefore does not properly recognize or allocate costs

MPWG Activity

- The MPWG has recognized the need for action with respect to the 12x ramp rate issue
- There is fairly general agreement that action is needed
 - The current system does not adequately compensate generators
 - The current system does not adequately incent the installation of generation with ramping capability
 - Having several generators with ramping capability is more important in a system like Ontario's, with high (and expected higher) proportions of nuclear capacity which cannot ramp
- The MPWG has discussed this issue since its inception



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Solutions Proposed to MPWG

- At its last meeting, the MPWG saw a presentation with four approaches:
 - The current 12x ramp rate
 - A lower ramp rate, down to 1x
 - A proposal from AMPCO that would pay the marginal cost only to those generators who ramp
 - The IESO's proposal to extend MIO to generation pricing, using an algorithm to be chosen from among several candidates



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IESO Choice Criteria

- IESO suggested choice criteria to the MPWG
 - Definitions here modified from IESO's
- Efficiency
 - Allocative efficiency: resources are put to their highest and best use; resources go to consumers and producers who value them most highly. Occurs when price = marginal cost.
 - Dynamic efficiency: optimal decisions over time; often refers to timely adoption of new technology
- Fairness: Market participants in the same circumstances receive the same treatment
- Reliability
 - Prices should provide incentives to participants to follow dispatch instructions
 - Total compensation should provide sufficient returns to ensure long term capacity adequacy
- Transparency: suitable and stable basis for forward contracting

APPRO Choice Criteria

- APPRO suggests adding some dimensions to the choice criteria and adding some criteria
- Efficiency
 - Productive efficiency: ensuring that the minimum resources required are used to achieve a given outcome
- Fairness: Market participants pay for the costs they impose on the system
- Implementation costs: Changes that have lower implementation costs are preferred
- Harmonization: Changes that improve trade between Ontario and neighboring jurisdictions are preferred

APPRO Options

- APPRO considered several options for addressing the ramping problem
- The preferred APPRO option remains the 1x ramp rate
- Failing that, APPRO considered several other options:
 - A load following ancillary service
 - Used in New Brunswick, suggested by market design experts
 - Payment for deviations from hour-ahead dispatch instructions from IESO
 - Requires that hour-ahead dispatch instructions carry some commitment from IESO
 - Payment for ramping: a payment to all generators who change their level of output in response to instructions from the IESO

APPRO Preferred Solution

- APPRO's position is that the most efficient long-term fix to 12x is to adopt the original 1x (myopic) design
 - From a market design perspective this is the correct thing to do and was the original design intent for this market
 - It is consistent with the principle of market design that price should be based on the system marginal cost
 - It signals consumers properly with the cost that they are imposing
 - It signals producers properly with the value of their contribution
 - It is the approach used in PJM, NYISO, New England and other successful markets
 - IESO has suggested that adopting 1x ramp rate would raise annual average HOEP by 10%
 - But this estimate assumes no change in either bidding strategies and generation availability in Ontario or in electricity trade
 - Also, in neighboring markets, prices do not appear to be consistently 10% above Ontario's

Apparent Price Impact of 1x?

| Average Market Prices (Cdn\$) | | | |
|--------------------------------------|---------------------|-------|------------------|
| 2005 | MISO* (IESOZone) | ONT | NYISO (ZoneO) |
| January | | 47.26 | 53.82 |
| February | | 40.02 | 44.52 |
| March | | 49.28 | 52.09 |
| April | 41.46 | 50.20 | 53.06 |
| May | 31.47 | 42.23 | 47.49 |
| June | 49.48 | 53.17 | 56.17 |
| July | 57.82 | 62.28 | 65.00 |
| August | 62.59 | 73.17 | 74.75 |
| September | 60.24 | 79.56 | 87.35 |
| October | 53.23 | 64.44 | 86.08 |
| November | 44.83 | 49.34 | 60.91 |
| December | 64.91 | 81.02 | 80.58 |
| 2005 Average | 51.78 | 57.66 | 63.49 |

APPRO Position on Approach

- APPRO recognizes that, given the information currently available, other stakeholders have strong reservations about the consequences of adopting 1x (myopic)
 - The IESO has said that it would produce a 10% increase in average price. APPRO notes that the increase may well be lower.
 - Price volatility will increase, though experience suggests that it is unlikely to increase as much as was first feared
 - Further, under current government policy, consumers are protected from high and volatile market prices through the high fraction of generation with prices set by regulation or contract
 - Despite these arguments, APPRO recognizes that the conditions to win acceptance of 1x (myopic) ramp rate may not be present
 - APPRO has therefore considered other possible approaches in a spirit of cooperation with other market participants
 - The approach presented and evaluated here would provide a payment for ramping to every generator which changes its output level in response to IESO instructions



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Ramping Payment

- The mechanism would compensate every generator that provides ramping service to the IESO
 - Would compensate any directed change in output
 - Payment would be a fixed amount per MW of change instructed by the IESO regardless of its direction (up or down)
- The size of the payment would be set after quantitative analyses to determine an appropriate amount
 - The premium should be high enough to
 - Adequately compensate generation owners for additional maintenance costs on equipment which changes output levels
 - Adequately incent installation of generation equipment with ramping capability
 - Give the IESO incentives to use AGC and ramping together in a more effective manner



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Ramping Payment Impacts

- The ramping payment may affect market prices
 - It probably will not change generator offers, at least at first
 - But it might change dispatch as the IESO seeks to rationalize ramping and reduce payments
 - That could change prices, as could eventual reactions in generator availability
- Its cost should be carried in the hourly uplift, since it arises from the hourly operation of the electricity system
- Implementation costs will be minimal if this does not require a change in the IESO's dispatch algorithm



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Ramping Payment Costs

- Cost of the measure can be set after cost analysis
- A rough analysis shows that the cost can be relatively small
 - For 2005, APPrO estimates the total of upward and downward movements in the level of demand in Ontario at ~4.3 million MW, measuring only hourly net increases
 - The IESO issues dispatch instructions for much more ramping than that
 - This total does not account for demand changes within an hour, which have to be met
 - By one APPrO estimate, ramping would be about 2.5x the total changes in demand
 - Using the ratio of 2.5 times, a price of \$10 per MW would produce revenues of \$108 million
 - This would not be large amount compared to the wholesale power market of over \$10 billion last year



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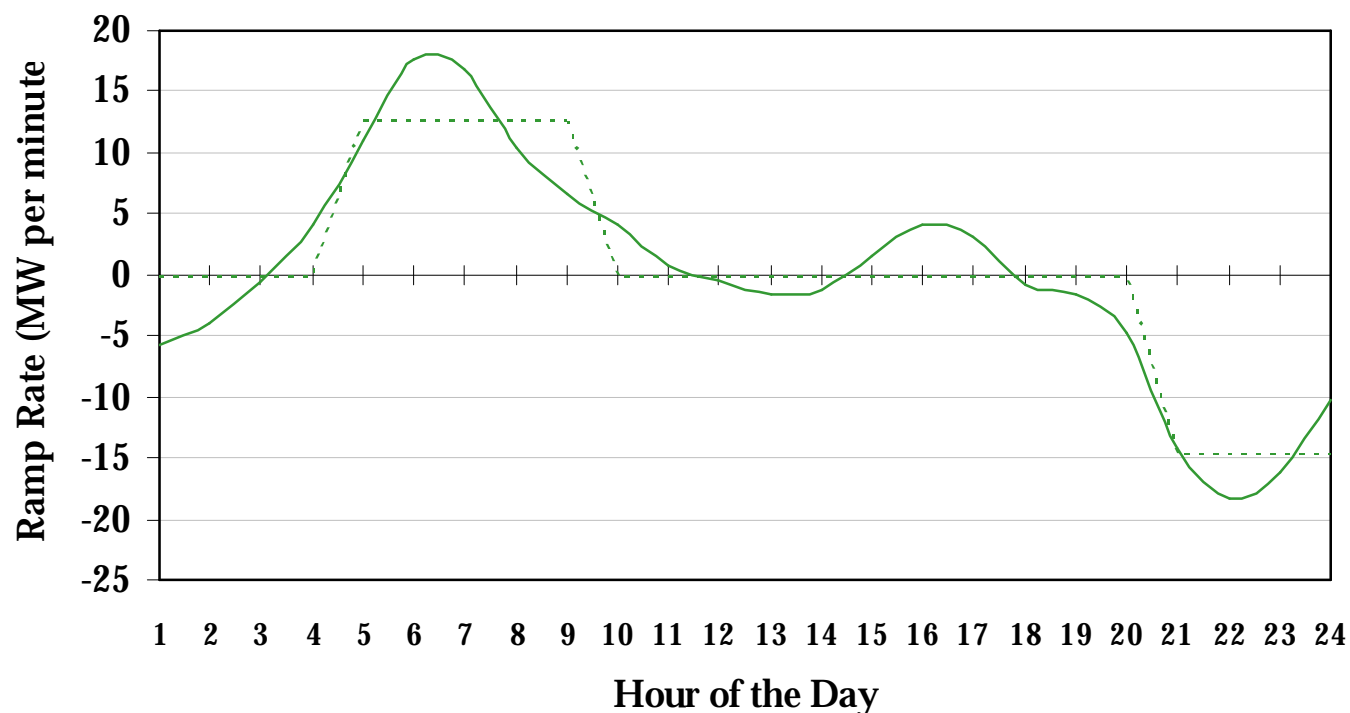
Ramping Required

- The next three slides give some indication of the amount of ramping capacity that is needed in Ontario
- These charts only account for changes between hours; changes within hours are not included
- These are therefore undercalculations of the amount of ramping actually needed
- The charts show that the peak ramp rates in the summer are about 25 MW/min up and 25 MW/min down
 - These estimates are consistent with estimates from other jurisdictions, such as maximum thermal ramping used in PJM of 54 MW/min up and 61 MW/min down
 - This study showed that the thermal ramping capacity was over three times the maximum amount of thermal ramping used

Ramping Capacity Needed in Ontario: Average Day



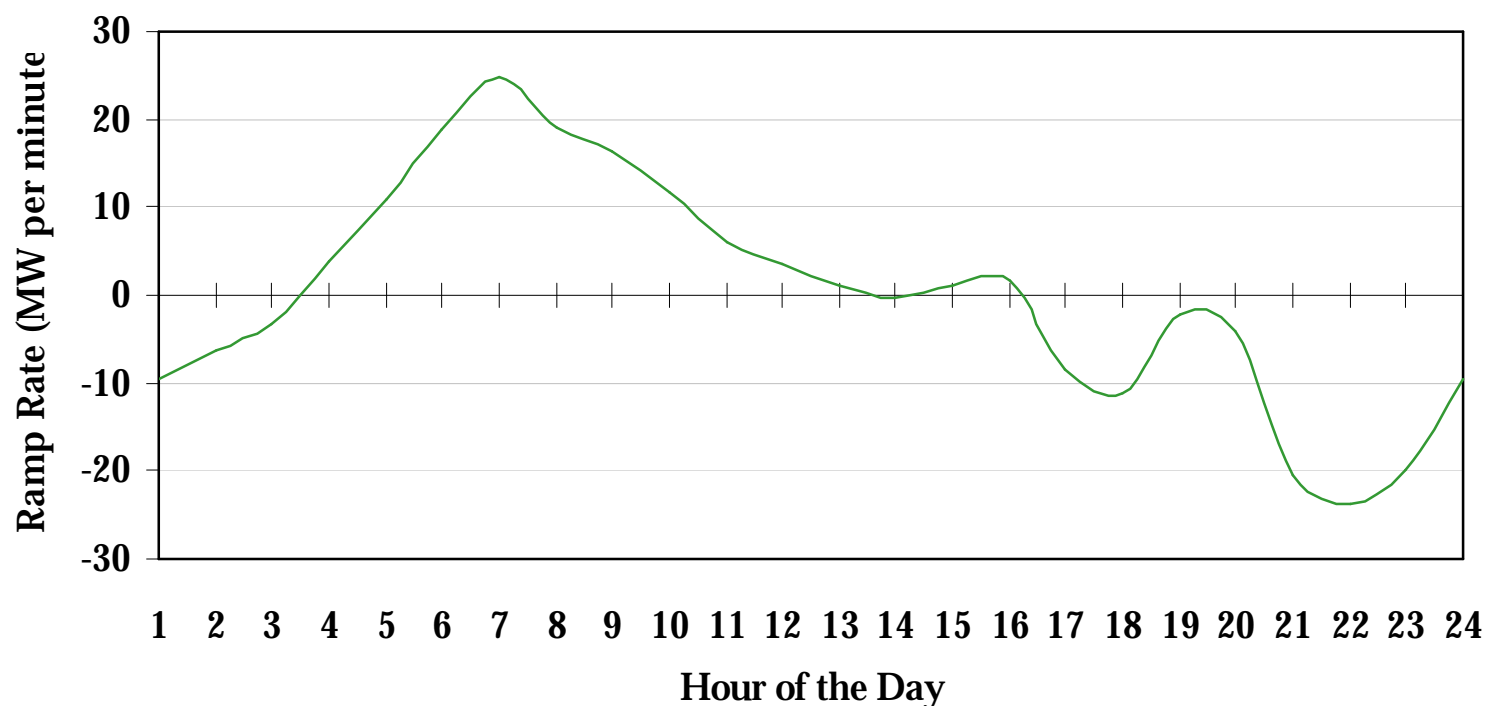
Hourly Ramp Rate – Average Day (based on average of all days since market opening)



Hourly ramps only; does not include changes within hours

Ramping Needed in Ontario: Average Summer Peak Day

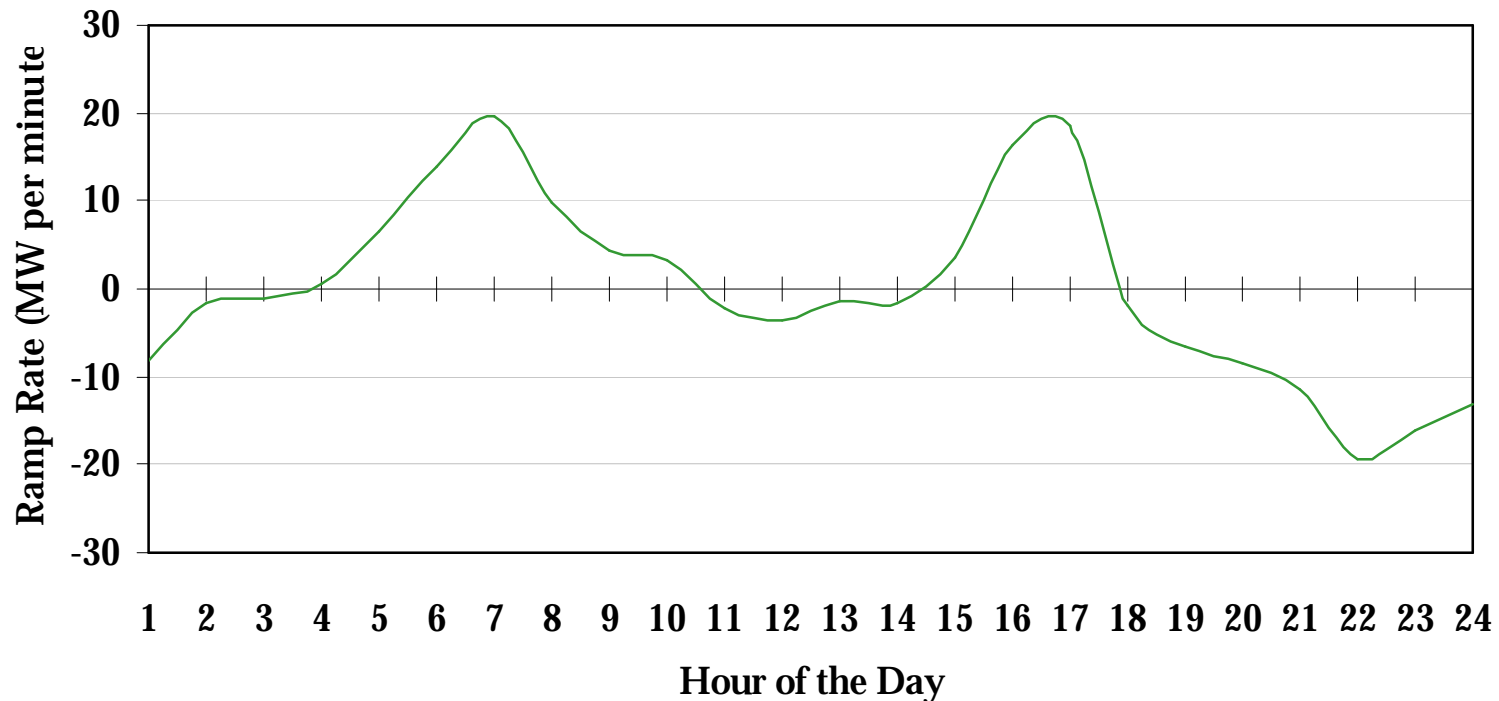
Hourly Ramp Rate – Average Day (during the peak week in the summer of 2002)



Hourly ramps only; does not include changes within hours

Ramping Needed in Ontario: Average Winter Peak Day

Hourly Ramp Rate – Average Day (during the peak week in the winter of 2002)



Hourly ramps only; does not include changes within hours