Draft Evaluation of Pricing Options Against IESO Decision Criteria

Criteria	12X	AMPCO	1X - Myopic	MIO
Efficiency				
The right amount of energy in the lowest cost to those most willing to pay i.e. comparing the cost of producing an extra MW with the benefit gained from consuming that MW. (within the hour) i.e. efficient dispatch, appropriate price signals for non dispatchable participants.	The clearing price understates the cost of the incremental MW relative to the actual cost of dispatch. This can lead to inefficient outcomes. E.g. NDL (Non Dispatchable Load) values energy at $80, but consumes energy with a dispatch cost of $100 due to depressed 12X price.	Same as 12X	The clearing price overstates the cost of the incremental MW relative to the actual cost of dispatch. There are lower cost MWs available from the temporal optimized constrained solution for known demand changes. This can lead to inefficient outcomes. e.g. NDL values energy at $80, 1X myopic price is $100, NDL does not consume but MIO dispatch cost of energy is only $75.	The clearing price most accurately reflects the cost of the incremental MW relative to the actual cost of dispatch. Should lead to the most efficient outcome.
Drive participants short term behaviour to benefit market efficiency (i.e. induces participants to bid/offer at their true cost/value (this includes imports and exports) allowing algorithm to achieve the most efficient outcome.	12X price does not accurately reflect the physical dispatch and so can induce inefficient behaviour and lead to inefficient transactions. Examples 1. No incentive to offer full ramp capability because CMSC calculated based on offer and 12X ramp rate. 2. Exports may adjust bids	Essentially the same as 12X. However, payment for ramp may induce participants to make more ramp available.	Price is sometimes higher than the cost of the physical dispatch. This may provide an incentive for inefficient behaviour. Examples 1. A generator who anticipates an elevated real-time price starts a unit earlier than they would have with MIO dispatch price. 2. There may be	Price matches the physical dispatch, reflects system conditions and signals efficient behaviour. No constrained off CMSC for ramp limited facilities – There is incentive for marginal units to maximize ramp to maximize production/revenue.

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	to overstate value of energy, knowing real-time price is damped by 12X methodology.		situations where participants may have incentive to withhold ramp capability. Since price impacts are more sensitive to ramp capability in a 1X price methodology. A marginal unit with market power can see increased impact to withholding ramp, leading to a higher market price.	
Compensation should provide incentives for efficient technology choice and timely and efficient capacity investment.	The 12x price dampens ramp impacts and as a result, may under signal the need for investment in technologies to improve ramp capability for both loads and generators.	Marginal improvement over status quo. 12X price does not accurately reflect the physical dispatch and so may not signal appropriate investment, however some incentive for investment in marginal units to maximize their ramping capability.	Does not accurately reflect the physical dispatch – overstates the cost of ramp for known demand changes. Signals are skewed towards fast ramp/peak units.	Most accurately reflects physical dispatch. Should provide most accurate signals for technology type.

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Fairness				
Prices should result in transfers of wealth between stakeholders that are no more or no less than needed to induce the efficient outcomes. Identify cash flow changes relative to the status quo.	Option which leads to lowest price paid by loads. Option which leads to lowest revenues earned by generators. CMSC to keep generators whole means minimum cost to loads for the efficient outcome	Relative to 12x option loads likely to pay a marginally higher amount due to the additional uplift paid to ramping generators. Ramping generators will be paid a marginally higher revenue. All other generators will receive the same revenue, Analysis based on previous simulations indicates the additional payments to ramping units will result in an average increase cost to loads of about 0.1% if MIO is used to calculate the 1x ramp. This increases to about 0.3% if a 1x Myopic is used.	Option which leads to highest price paid by loads. Option which leads to highest revenues earned by generators including ramping generators and other base-load generators. Past simulation results show an average increase to MCP of about 10%.	Depending on how minimum generation blocks are dealt with is either slightly more or less costly than AMPCO. Early dispatch of relatively slow moving, lower cost incremental generators, minimizes the cost of responding to known demand changes while still reflecting the cost of unforeseen changes. Past simulation results show the average change in MCP will be -1.0% (incremental), 0% (modified incremental) and +1.0% (HSP). If the unit minimums are not enforced, the above results are changed by +1%.

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Reliability				
Incentives to participants to follow dispatch instructions i.e. is a participant able to generate more profit by operating at some other point?	The use of CMSC provides incentive to follow dispatch instructions. With CMSC, total profit is maximized at dispatch.	Same as 12X	Desire to maximize revenue by maximizing output should lead to participants following dispatch.	Depending on MIO price choice, may require a production cost guarantee to keep early movers whole to their offer prices. Without the guarantee, early movers would be better off not following dispatch.
Incentives to participants to address immediate reliability concerns e.g. demand response, increased supply from sources such as self scheduling generators and imports (similar to efficiency, but not focused on efficient response, just response).	Reduction of size and frequency of shortage pricing reduces signals for demand response and self scheduling generators to come to market. E.g. As with earlier situations, may lead to consumption when the value of the energy is lower than the actual cost of production.	Similar to 12X. Payment to ramping units may induce more ramp availability to alleviate reliability issues from ramp limitations.	Shortage pricing during temporary lack of supply should call participants to the market and signal reduction in demand.	Unforeseen changes in supply/demand will produce scarcity pricing with the accompanying incentive for demand response and supply to come to the market.
Compensation should provide incentives to ensure long term capacity (gross capacity in MW from any generation or demand response).	Questionable that 12X will induce long term capacity adequacy. Current forecast of supply shortage has required intervention by OPA.	Similar to 12X Ramping revenue may help construction of incremental units (non incremental units are not paid ramp payments).	Ramp induced shortage prices which result in higher average price may help induce capital investment in capacity.	Average compensation is not significantly higher than the current 12X price. There will be no significant improvement over the current signals for long term capacity.

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Transparency				
Price methodology should be simple and clear.	Price calculation is most simple and transparent of options. Supply is simply the capacity available in the current hour without ramp limitations. With joint optimization, all are complicated.	Price calculation is the same as 12X however the calculation of the ramping payment is not transparent to participants.	Slightly less simple than 12X pricing as ramp limitations affect price rather than the simple gross MW available.	MIO prices are generally more complicated than 12X or 1X prices and, depending on the method chosen, can be very complicated.
Produce prices which are predictable.	Removing the impact of unexpected changes and ramp limitations in the supply-demand mix may improve the ability to make forecasts for future prices.	Same as 12X.	Price becomes more volatile and is more influenced by unforeseen events such as weather shifts, change in demand/supply.	More difficult to predict price for a particular set of system conditions at a particular time. Temporal optimization means prices for any given set of conditions are more difficult to predict, however produces less price volatility.
Produce prices which reflect system conditions.	Participants may not be able to infer all conditions from the price. 12X will mask the impact of changes in supply and demand.	Same as 12X.	Reflects temporary shortages, however overstates predictable ramp induced shortage as the constrained MIO solution is more efficient.	Depending on the MIO price choice, predicted changes in system conditions can lead to counter-intuitive prices such a price dip just prior to the change in the hour.