Single Schedule Market: Written Comments of APPrO

July 27 and August 14 Sessions

Design Element Number	Design Element	Identified Options	Overview of Options	Common Practice	Other Consideration	Interdependent Elements	Preliminary Decision	Decision with Reasons	APPrO Comments
SSM1	Energy Price - Congestion Component	1) Include Congestion in Pricing	• A foundational choice for moving to SSM.	Option 1		N/A	1) Include Congestion in Pricing	Including the cost of congestion in the energy price is a foundational element of a SSM	Agree that including the cost of congestion in pricing as is done in other ISOs is appropriate, subject to satisfactory stakeholder enagement.
SSM2	Energy Reference Price	1) Continue to use Richview (Status Quo) 2) Use another Location	• LMP Price does not depend on the choice of the reference location • Richview was chosen as the reference location because it is well connected to most parts of the province and because of its proximity to Ontario's major load centre	N/A		N/A			APPrO agrees that continuing to use Richview as the reference location is sensible.
SSM3	Energy Price - Loss Component	1) Include cost of marginal losses in the dispatch but exclude from prices (Status Quo) 2) Exclude the cost of marginal losses from the dispatch 3) Include the cost of marginal losses in both the dispatch and prices	• Option 1 is complicated & will require maintaining a 2 schedule system and CMSC • Option 2 will increase the cost of meeting load and require changes in the design & implementation of the constrained software schedule • Option 3 will minimize cost of meeting load without need for CMSC, improve efficiency of market price signal and reduce uplift. It would also be consistent with the IESO's current constrained schedule	Option 3	•Consideration whether to continue to use static loss factors or move to dynamic				APPrO agrees that Option 3 is the best and most efficient outcome. Moving to dynamic losses if done effectively is a preferred approach and consistent with other ISOs.
SSM4	Ex Post vs. Ex Ante Pricing	1) Ex Post Pricing 2) Ex Ante Pricing	• IESO currently uses a form of Ex Post (Option 1) in the unconstrained • Option 1 is complex to implement in a way to ensure it does not lead to pricing anomalies; past implementations have sent inefficient price signals during reserve shortages or ramp constrained periods • Option 2 is consistent with the IESO's current constrained schedule and avoids sending inefficient price signals during reserve short or ramp constrained periods	Option 2					At a high level APPrO considers that Ex Ante pricing (Option 2) is preferred. Current shadow prices are derived ex ante. However, APPrO reserves its position until more and better information is available on interdependencies with MFIS and intertie congestion pricing, are available.
SSM5	Intertie Congestion Pricing	1) Charge intertie transactions based on congestion charge in the constrained pre-dispatch and the price at the intertie in the real-time constrained schedule 2) Charge intertie transactions based on: • The real-time schedule price if there is no congestion • When export constrained -the higher of the nodal price in real-time or pre-dispatch • When import constrained -the lower of the nodal price in real-time or pre-dispatch	• Option 1 is similar to the status quo • Option 2 is similar to what has recently been used in the New York ISO	Approach varies among ISOs	• There may be further changes required when the IESO investigates more frequent intertie scheduling or future coordinated transaction scheduling with neighbouring jurisdictions.				Preference is for Option 1, subject to better understanding of interdependencies of more frequent intertie scheduling.
SSM6	Supplier Pricing	1) Zonal Prices 2) Nodal Prices	• Zonal pricing would mean retaining a certain amount of constrained on and off payments • Other ISOs that previously had zonal have moved to nodal pricing for suppliers. • Nodal pricing for Suppliers is used in all other SSM ISOs • Would improve market efficiency, reduce uplift and enable improvements such as a day-ahead market	Option 2					Assuming congestion is included in pricing, nodal pricing (Option 2) is preferred. This will have to be carefully managed in terms of contract amendments to maintain supplier economics, and potentially disadvantageous locational pricing for existing suppliers (and loads), so some form of grandfathering will need to be considered. Given this, how to manage after contracts expire is also a consideration
SSM7	Operating Reserve Reference Price	1) Co-optimize energy and operating reserve	• Only one viable option which is also the status quo				1) Co-optimize energy and operating reserve	The IESO's current design is best practice for SSM markets.	APPrO agrees that current design (co-optimization) is best practice for SSM markets. APPrO would like to submit that whether in discussion on this particualr design element or another, we should consider tri-optimization with Frequency Regulation. Furthermore, we should also consider optimizing a new flexibility product (if market renewal goes down this path). Tri-Optimizatin is more efficient for system operators as well it would allow additional market participants to participate in the regulation market, adding to the IESO's depth of resources.
SSM8	Operating Reserve Price -Congestion Component	1) Include Congestion in Pricing	• Only viable option for SSM	Option 1	• This will provide a more efficient price signal for investments that would allow demand-side and storage resources to provide reserves in higher-priced regions.		1) Include Congestion in Pricing	Including the cost of congestion in pricing is a foundational element of a SSM	APPrO agrees that including the cost of congestion in pricing is a foundational element of a SSM

SSM9	Constraint Violations	1) Apply current penalty prices in the constrained schedule, but relax violated constraints and determine settlement prices based on incremental energy and/or operating reserve offer prices (status quo) 2) Use the same set of penalty prices for both dispatch and pricing a) Use current penalty prices b) Create a hierarchy of new penalty prices c) Create a demand curve for penalty prices 3) Apply current penalty prices in dispatch, but use a different set of penalty prices for settlement a) Create a hierarchy of new penalty prices b) Create a demand curve for penalty prices	Under all of the options, OR and Energy prices would continue to be capped at $2,000/MWh. • ISOs operating single schedule markets have evolved away from using arbitrarily large penalty prices and towards choosing penalty values that are consistent with the cost ("reliability value") of actions the ISO would take to resolve those conditions	• Most ISOs have moved toward using transmission and operating reserve demand curves in real-time dispatch	• A key driver is to ensure that operators don't have to manually make these decisions; the prices need to be set correctly to ensure the software makes the right commitment decisions. • ISOs moving toward penalty values that more closely reflect the cost or 'reliability value' of control actions.				APPrO prefers Option 2c. Preference is to use demand curves as opposed to an arbitrary system of hierarchical costs which would also reduce the need for operator action.
SSM10	Out-of-market Operator Actions	1) Control actions are priced at maximum market price ($2,000) or some other level for one or more of the following: a) Voltage reductions b) Curtailment of exports for adequacy c) Scheduling of emergency imports 2) Control actions are not priced	Option 1 a,b&c • Would provide a stronger price for generation and load resources to respond • Would require some changes in constrained schedule or implementation of a 'pricing pass' • Would be most consistent with the current practice used by the IESO Option 2 • Would not provide additional signal for generation and load to respond • Would not require any changes in constrained schedule or introduction of a 'pricing pass' • These actions are rarely used, but the value of load reductions for the additional price signal may be very high	Varies		Outcomes of the options in design element 9 - Constraint Violation pricing - may affect the choices made when pricing out-of-market operator actions			As APPrO prefers 2c with respect to SSM9 (above), the preference would be to have all these prices along the price curve. Option 2 is not viable Furthermore, APPrO notes that while reviewing this design element, we should revaluate the current prices associated with CAOR, so that it is relied on less frequently than it is today.
SSM11	Multi-Interval Optimization	1) Use MIO to determine schedules but use single interval optimization for prices (similar to status quo) 2) Use MIO to determine schedules and prices	Option 1 • Similar to current design but SSM would take actual ramp rates, transmission congestion and minimum load blocks into account when calculating prices • Potential for inconsistencies between dispatch and prices. Option 2 • Reduced potential for inconsistencies between dispatch and prices.	Varies (not all jurisdictions have implemented MIO)					Option 2 is preferred.
SSM12	Price-Setting Eligibility/Operating Restrictions	1) Do not allow any resources' restricted MW's (e.g. minimum loading point) to set or impact prices (status quo in the constrained schedule). 2) Allow fast start online resources' restricted MW's to set or impact price.	Option 1 • Would not require changes in prices determined by the constrained schedule. • Could at times set prices that would be inconsistent with the dispatch of fast starting resources with MLPs (Ontario currently has few such resources) Option 2 • Would produce marginal prices more in line with actual dispatch of fast-starting resources with MLPs in real-time • Would require changes in how prices are determined by the constrained schedule when units with operating restrictions are marginal	NYISO allows fast-start gas turbines to set price, so long as they are marginal and not simply online because of minimum run-time considerations					APPrO prefers Option 2. "Moving" resources should set price. Interdependent with SSM 18.
SSM13	Mitigation process	1) Pivotal Supplier Test (offer/bid is subject to mitigation if it is part of supplier capacity that is pivotal in resolving a binding constraint - measure of amount of competition) 2) Conduct and Impact Test (offer/bid is subject to mitigation if it exceeds competitive reference level, and has a market impact by raising the clearing prices).	Method in which to apply mitigation: Option 1 • Depends on complicated approximations in order to identify pivotal supply associated with a constraint • May not capture all of the binding constraints ex-ante - potential for under mitigation Option2 • Captures comparatively more of the potential market power scenarios • If market impact is identified, then mitigation is applied to all those whose offers exceeded the conduct threshold • Mitigation process requires significant processing time (needs to resolve the dispatch up to three times)	Varies Option 1 - PJM, CAISO Option 2 - NYSIO, ISONE, MISO, SPP	• A further consideration associated with the Pivotal Supplier Test is whether to test for one, two or three pivotal suppliers.				APPrO prefers Option 2 (cost and impact test) however this is a complex subject which will require further discussion. Whatever the choice it should, among other considerations, not lead either to over investigation, or under investigation

SSM14	Timing of Application	1) Ex-Ante (before the fact) market power mitigation	• Because the exercise of market power in a SSM can affect market prices, mitigation needs to be done before market prices are determined. • After the fact mitigation and the subsequent resettling of market prices would be complicated and disruptive	Ex-Ante	• While incremental bid/offers are subject to ex-ante mitigation, mitigation of start-up costs, minimum load costs, and/or restrictive operating parameters could potentially be performed ex-post (impacts are limited to uplift which can be dealt with after-the-fact)		1) Ex-Ante (before the fact) market power mitigation	• Because the exercise of market power in a SSM can affect market prices, mitigation needs to be done before market prices are determined	Ex-ante seems the only possible choice.
SSM15	Reference levels	1) Apply principles used in today's mitigation, in order to develop reference prices. Option 2 - Develop new principles that develop reference prices used for mitigation.	Mitigation process needs reference offer prices that are an estimation of resource costs (including opportunity costs). More complicated for ex-ante mitigation, as these need to be calculated before all costs are known.						This seems to be an opportunity to re-examine reference pricing, therefore Option 2 appears to be a better choice. APPrO requests that the IESO provide a list of the current principles and how it is this done today?
SSM16	Pricing for loads	1) All loads pay the nodal price at their location. Prices include the marginal cost of losses and congestion. 2) All loads pay the zonal price, at the zone associated with their location. Prices include the marginal cost of losses and congestion. 3) All loads pay the province wide uniform price. Prices include the marginal cost of losses and congestion. 4) Dispatchable loads pay the nodal price, while non-dispatchable loads pay the zonal price. Prices include the marginal cost of losses and congestion. 5) Dispatchable loads pay the nodal price, while non-dispatchable loads pay the uniform price. Prices include the marginal cost of losses and congestion. 6) Dispatchable loads pay the zonal price, while non-dispatchable loads pay the uniform price. Prices include the marginal cost of losses and congestion. 7) All loads pay the province wide uniform price. Prices include the average cost of losses and congestion.	Load pricing options are based on three fundamental questions: 1.) Does the load price include the marginal or average cost of congestion and losses? • will decide if congestion and loss surpluses which can be used to fund FTRs or a uplift disbursement 2.) Will dispatchable and non-dispatchable loads be settled at the same level of granularity? (nodal, zonal, uniform)? • if different, may require a incentive mechanism to maintain amount of DL 3.) What is the applicable pricing granularity to the price (nodal, zonal or uniform)?	Variants of Option 4 seem to be the most common.					As the IESO notes, variants of Option 4 appear most common.
SSM17	Financial transmission rights	Option 1 - Full FTR Allocation: FTRs allocated to all loads to address incentive issue of dispatchable load (potentially paying a higher price) and to offset the impact of non-uniform pricing for all load. Option 2 - Alternative (non-FTR) Mechanism: Payments and charges to loads so that the sum of the payment and their energy price is approximately uniform Option 3 - No FTRs: No FTRs or other payment mechanism to address incentive or cost impact of change to non-uniform pricing Option 4 - FTRs allocated to dispatchable loads (and possibly to price responsive loads) in locations with average LMPs higher than average zonal price paid by non-dispatchable load Option 5 - FTRs allocated to all dispatchable load (and possibly to all price responsive loads) Option 6 - Payments to dispatchable loads (and possibly to price responsive loads) in locations with average LMPs higher than zonal price (links to load pricing Options 4, 5 and 6)	Options are introduced to address incentive or efficiency issues as a result of a particular load pricing option. The issues include: 1) Incentive issue - dispatchable load choosing to become non-dispatchable in order to pay a lower zonal price (than its nodal price) 2) Efficiency issue - dispatchable load paying a zonal or uniform price may incur actual or opportunity costs while following dispatch instructions 3) Incentive issue - for all loads in moving away from uniform pricing	Non-traditional application of FTRs (typical application is to provide node to node congestion hedge)	• Choice needs to be an approximation that is independent of actual consumption in order to preserve the marginal incentives at the location/zone.	• Choices are dependant on which load pricing option is chosen (will vary the incentive or efficiency issues that need to be addressed)			APPrO considers that FTRs are not required at this time.

SSM18	Make whole payments	1) Provide make whole payments for constrained up/down scenarios 2) Provide make whole payments only for constrained up scenarios	Options address compensation that may be required when a resources' dispatch is not in line with the prices at its location. A resource may be constrained up to provide ramp in a later interval (potentially incurring an operating loss) OR Constrained down to allow, for example, a fast starting gas-fired unit to come online (need to respect the minimum load of the gas unit) - potentially incurring an opportunity loss	Option 1					Option 1 is preferred, however this must be examined in the context of INRs to ensure that suppliers are not economically disdavanted compared to their contracts.
SSM19	Uplift recovery	1) Distribution of congestion rents and marginal loss surplus will be based on the per MWh of actual withdrawals by internal loads 2) Distribution of congestion rents and marginal loss surplus will be based on the per MWh of actual withdrawals by internal loads and exports	New types of payments (associated with congestion rents and losses) will need to be distributed to (or recovered from) market participants.	Varies					Option 2 is preferred (similar to the current TR clearing account, and new mechnism should be consistent).