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Market Renewal – Energy Project: Understanding Net Interchange Scheduling Limit (NISL) under MRP

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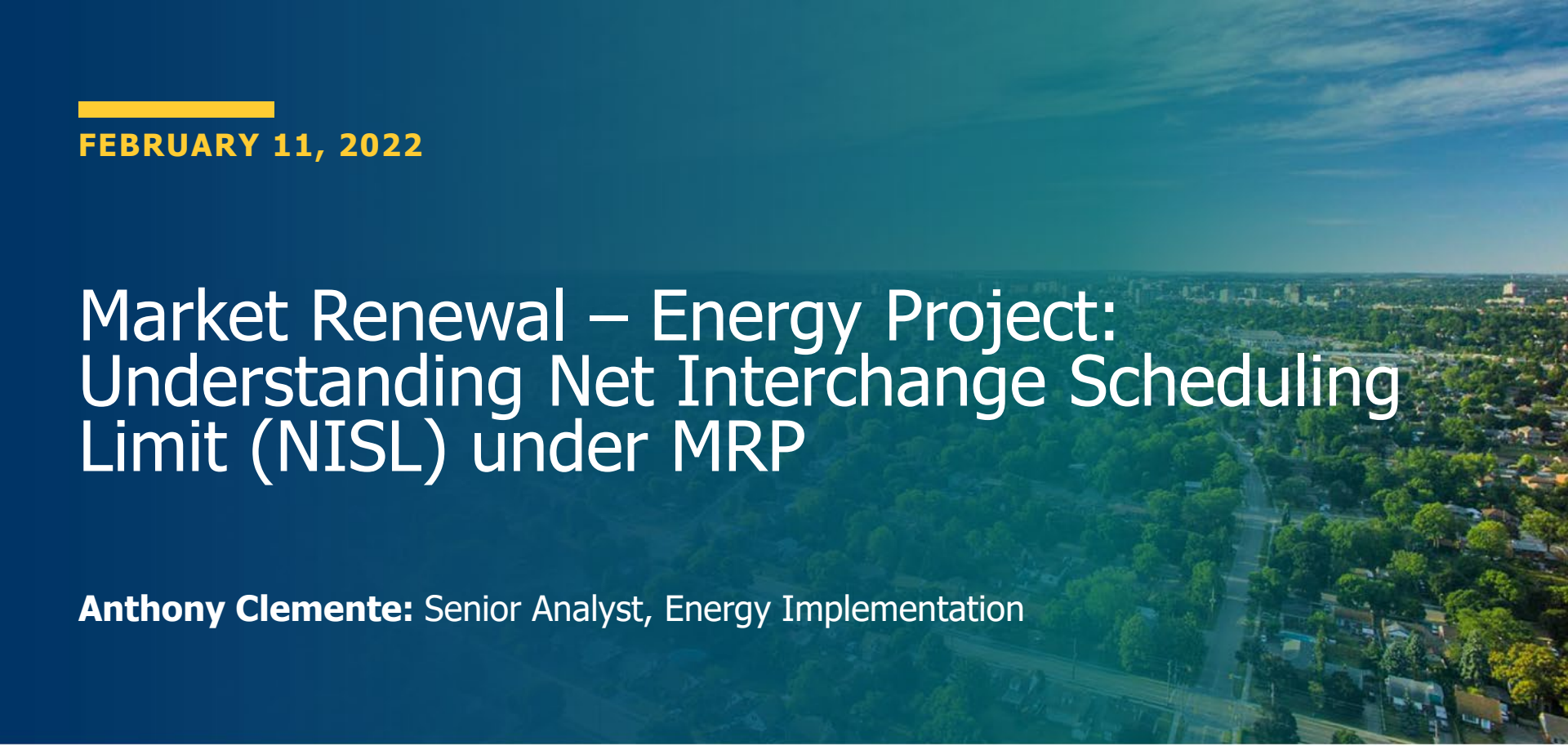

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Objective and Agenda

Objective: To provide an understanding of how the net interchange scheduling limit (NISL) works in today's market and the changes being made for the renewed market.

Agenda:

- Purpose of NISL and its design in today’s market
- Challenges with the current market design that does not include the NISL congestion cost in intertie pricing
- How NISL will work in the renewed market

Purpose of NISL

- NISL restricts the hour-to-hour change in net schedules across all interties to a defined threshold
- Ensures Ontario generators can satisfy hour-to-hour ramping requirements without adversely impacting the reliability of the IESO-controlled grid
- Normally set to 700 MW but may be increased under abnormal conditions (e.g. to alleviate shortfall or surplus conditions)
- For more information on how NISL works today, reference the *Net Interchange Scheduling Limit Quick Take* at: https://www.ieso.ca/-/media/Files/IESO/Document-Library/training/QT-Net-Interchange-Schedule-Limit.ashx

Example A: NISL Binding

- Assuming a NISL of 700 MW, there are binding NISL events in Hours 3 and 4

Hour Ending	**1**	**2**	**3**	**4**
Total Exports	100 MW	800 MW	0 MW	700 MW
Total Imports	700 MW	1,400 MW	1,300 MW	1,300 MW
Total Net Exports	-600 MW	-600 MW	-1,300 MW	-600 MW
Change From Previous Hour	-	**0 MW**	**-700 MW**	**+700 MW**

- NISL was binding in ~8% of all hours between 2018 and 2020

How NISL Works Today

- To respect NISL today, the day-ahead commitment process (DACP) and pre-dispatch (PD) calculation engines may reduce or increase imports and exports that would have otherwise been economically scheduled
- The DACP and PD calculation engines consider the cost, or shadow price, of the NISL congestion component in scheduling but does not reflect this cost in determining intertie prices

Example B: How NISL is Respected Today

- Assuming an hour 1 net import schedule of 500 MW and the following import offers and export bids for hour 2:

Transaction	Hour 2 Offers and Bids
Import A	1,300 MW@ $30
Import B	300 MW @ $35
Export C	100 MW @ $50
Export D	300 MW @ $34

- At an hour 2 intertie price of $38, transactions A,B,C are economic and D is uneconomic, resulting in a potential net import schedule of 1500 MW
- However, the net import schedule must be limited to 1200 MW to respect a NISL limit of 700 MW

Example B: How NISL is Respected Today (cont'd)

- To produce a net import schedule of 1200 MW in hour 2, DACP and PD would evaluate the lowest cost from the following options:

Option	Economic Schedule	Schedule to Respect NISL	Offer/Bid Price	Cost [(Intertie Price – Offer/Bid Price) x Schedule Change to Respect NISL
Do not schedule Import B	300 MW	0 MW	$35	($38 - $35) x 300 MWh = $900
Schedule Export D	0 MW	300 MW	$34	($38 - $34) x 300 MWh = $1200

- Import B will not be scheduled as it maximizes gains from trade while respecting NISL
- The cost associated with reducing import B from its economic schedule is recovered through a make-whole payment

Challenges With Current NISL Design

By not including the NISL congestion component in intertie prices today, we have seen two main market impacts:

1. Incorrect intertie price signals
2. Unnecessary make-whole payments

Impact 1: Incorrect Intertie Price Signals

- Excluding the NISL congestion component from intertie prices can result in intertie prices that are counter-intuitive to the schedules produced to respect NISL because the marginally scheduled transaction is precluded from setting price
- Recall from example B, import B was not scheduled at an offer of $35 despite an intertie price of $38
- Not incorporating the NISL congestion component prevented the intertie price from being reduced to a level that should attract more exports and less imports

Impact 2: Unnecessary Make-Whole Payments

- Excluding the NISL congestion component from intertie prices can result in unnecessary make whole payments for transactions that are uneconomically scheduled relative to the intertie price
- From example B, import B would receive a make whole payment of $900 [($38 - $35) x 300 MW] for not being scheduled at an intertie price of $38
- The import B make-whole payment is unnecessary because it would not have been required if the intertie price was reflective of NISL

Intertie Prices in the Renewed Market

- The renewed market design intends to minimize these impacts by including the NISL component in the intertie prices as follows:

$$\text{Intertie Border Price (IBP)}_{LMP} + \text{Ext\_Cong}_{LMP} + \mathbf{NISL\_Cong_{LMP}}$$

Where,

IBP*$_{LMP}$ = reference component + loss component + internal congestion component

Ext_Cong$_{LMP}$ = congestion component associated with intertie import/export limits

NISL_Cong$_{LMP}$ = congestion component associated with NISL limit

*Today's IBP = Market Clearing Price

- Future IBP and Ext_Cong components can be different for each intertie price, whereas the NISL_Cong component is equal for all intertie prices

How Scheduling Respects NISL in the Future

- From example B, recall the hour 1 net import schedule of 500 MW and the same import offers and export bids for hour 2:

Transaction	Hour 2 Offers and Bids
Import A	1,300 MW@ $30
Import B	300 MW @ $35
Export C	100 MW @ $50
Export D	300 MW @ $34

- Assuming an intertie border price (IBP) of $38, the future day-ahead market (DAM) and PD engines will, similar to today, evaluate whether not scheduling import B or scheduling export D is the optimal solution to respect NISL
- Import B will not be scheduled as it maximizes gains from trade

How NISL Congestion Component is Determined

- To calculate the NISL congestion component for the intertie price, the DAM and PD engines need to determine the savings of increasing NISL by 1 MW

Transaction	Hour 2 Offers and Bids	Hour 2 Schedule to Satisfy 700 MW NISL	Eligible to satisfy next MW (701 MW NISL)?	Savings (Difference Between IBP and Eligible Offer/Bid)
Import A	1,300 MW@ $30	1,300 MW	No	N/A
Import B	300 MW @ $35	0 MW	Yes	$3 ($38 - $35)
Export C	100 MW @ $50	100 MW	Yes	-$12 ($38 - $50)
Export D	300 MW @ $34	0 MW	No	N/A

- The DAM and PD engines would increase import B rather than reduce export C as it results in a higher savings

Intertie Price with NISL & Make Whole Payment Impact

- The intertie price for hour 2 would be:

$$IBP_{LMP} + Ext\_Cong_{LMP} + NISL\_Cong_{LMP} = \$38 + \$0 + (-\$3) = \$35$$

- A $35 intertie price that includes NISL incentivizes more exports and less imports relative to a $38 intertie price that does not include NISL
- No make whole payments are required as no transactions are uneconomically scheduled relative to the intertie price

Summary

- Future intertie prices will include the NISL congestion component when NISL is binding
- Including this component results in intertie prices that better align with the schedules produced to respect NISL and minimize unnecessary make whole payments

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