Transmission Rights Market Review Final Report

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Contents

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List of Abbreviations

Abbreviation	Description
ACP	Auction Clearing Price
DAM	Day-Ahead Market
DSO	Dispatch Scheduling and Optimization
HOEP	Hourly Average Energy Price
ICP	Intertie Congestion Price
IESO	Independent Electricity System Operator
LMP	Locational Marginal Price
MCP	Market Clearing Price
MRP	Market Renewal Program
IZP	Intertie Zonal Price

1. Executive Summary

In May 2020, the IESO launched the Transmission Rights Market Review (Review) to evaluate the historical performance of the transmission rights (TR) market, identify potential opportunities that will improve its reliability and efficiency benefits, and ensure that it is compatible with the changes that are currently being developed through the IESO's Market Renewal Program (MRP). The Review was initiated in response to prior recommendations from the Ontario Energy Board's Market Surveillance Panel, as well as observations and feedback from IESO internal business units and Market Participants.

Throughout the Review, the IESO and stakeholders worked together to develop a detailed and comprehensive analysis and assessment of Ontario's TR market. At the conclusion of this work[1], it was clear that TRs provide intertie traders with an important hedge against the financial risks associated with congestion at the interties and play a central role in facilitating efficient trade with Ontario's neighbouring electricity systems. By playing a critical role in enabling efficient trade, TRs are important to ensure Ontario is maximizing the value of its interties for the benefit of Ontario consumers, Market Participants and the IESO. The analysis indicated that the TR market provides direct benefits of $50-$135 million annually depending on market conditions as well as supporting much larger benefits associated with intertie trade generally.

However, the Review also highlighted the potential for improvements. Working with stakeholders, the IESO assessed a range of potential changes which were subsequently prioritized according to their ability to generate additional value. These high-value opportunities include introducing multiple bid laminations, on-peak and off-peak TR products, reconfiguration auctions, and publishing additional TR related information. These potential enhancements received general support from stakeholders and are consistent with the best practice in North American financial transmission rights (FTR) markets. If implemented, they could be expected to improve the overall efficiency of the TR auctions, and generate additional benefits associated with intertie trade.

The final stage of the Review developed a set of recommendations for long-term changes to the TR market, driven by a need to ensure alignment and compatibility with the Market Renewal Program. These changes focused on identifying what settlement processes, market rules and associated documentation would need to be updated to ensure compatibility with the introduction of a Day-Ahead Market. The Review recommended that these changes be incorporated into the scope of the Market Renewal Program to ensure they are in place at go-live and the IESO has subsequently adopted this recommendation.

[1] These findings are more fully documented in the "Transmission Rights Market Review Interim Report", IESO, October 6, 2020, https://www.ieso.ca/-/media/Files/IESO/Document-Library/engage/Transmission-Rights-Market/trm-20201006-transmission-rights-market-review-interim-report.ashx

As a final point, the IESO would like to acknowledge and thank the many stakeholders that have provided valuable and timely comments throughout the TR Market Review. As users of TRs, your participation and perspectives have greatly enhanced the IESO's understanding of this market and helped us come to the right conclusions on the value that TRs and intertie trade bring to Ontario. It is through working together that we have identified the high-value opportunities, proposed long-term changes and outstanding issues as presented in this final report.

2. Background and Overview

2.1 Background and Purpose of the Final Report

The Independent Electricity System Operator (IESO) is the interface between many different components of Ontario's power system. The IESO delivers key services across the electricity sector, including operating the power system, planning for the province's future energy needs, enabling conservation, and designing a more efficient electricity marketplace to support the evolution of the sector. One of the lesser known yet still critically important responsibilities of the IESO is to administer an ongoing financial transmission rights (TR) market.

In Ontario, TRs are financial instruments that are intended to support efficient intertie trading with neighbouring jurisdictions by providing a mechanism for Market Participants to hedge against congestion costs at the interties. Efficient intertie trading creates commercial opportunities for Ontario Market Participants and generates benefits to Ontario consumers as well as neighbouring markets. The IESO facilitates regular auctions to sell these rights, which are purchased by Market Participants to hedge their trading activities.

In May 2020, the Transmission Rights Market Review was launched by the IESO to: 1) evaluate the historical performance of the TR market and determine whether it is achieving its intended purpose; 2) identify potential opportunities that will improve reliability and efficiency benefits; and 3) ensure that the TR market design is compatible with the changes that are currently being developed through the IESO's Market Renewal Program (MRP). The overall review process was conducted over a 12-month timeframe with regular touchpoints with stakeholders who provided input and feedback on IESO analysis and potential enhancements.

In October 2020, the IESO published the Transmission Rights Market Review Interim Report[2], which focused on the historical performance and value of the TR market to Ontario. Following publication of the Interim Report, the IESO continued to engage with stakeholders to identify the high-value opportunities, long-term changes and outstanding issues needed to improve the TR market. This Final Report summarizes the results of this work and includes a series of recommendations and outstanding issues for further considerations. This report also provides a recap of the key findings from the Interim Report, but readers are encouraged to review the Interim Report for a more detailed discussion on the performance and value assessment of the TR market.

2.2 Transmission Rights Market in Ontario

[2] "Transmission Rights Market Review Interim Report", IESO, October 6, 2020, https://www.ieso.ca/-/media/Files/IESO/Document-Library/engage/Transmission-Rights-Market/trm-20201006-transmission-rights-market-review-interim-report.ashx

The electricity supply and demand are constantly changing both within Ontario and in neighbouring jurisdictions. Therefore, it can be difficult to predict when intertie congestion will occur and how large those congestion costs may be. Since 2002, the transmission rights market has been established in Ontario to ensure that Market Participants have the opportunity to purchase TRs to hedge against congestion cost risks on key intertie paths.

Congestion costs can be significant for traders. On the Ontario to Michigan intertie between 2016 to 2019, the average export congestion price was about $18/MWh. If an exporter flowed each hour over the course of a month the congestion costs per MW would add up to more than $10,000

Currently in Ontario, the costs of internal congestion are combined with system reliability costs and charged to loads and exporters on an hourly basis as Congestion Management Settlement Credits (CMSCs). Therefore, TRs are not needed to hedge internal congestion costs[3]. In contrast, congestion on Ontario's interties is priced separately as the difference between the intertie zonal price (IZP) and the uniform market clearing price (MCP), and is called the intertie congestion price (ICP). When there is congestion on the interties, the MCP and the IZP diverge. TRs allow traders to hedge the difference between the IZP that they get settled on and Ontario's uniform MCP.

Since market opening, the TR market has gone through several changes to address issues and to incrementally enhance the efficiency of the TR market. These changes have impacted the number of TRs sold on intertie paths, but have left the bulk of the original TR market design in terms of the types of products sold and the auction dynamics largely intact. A more thorough history of these changes and their impact on historical auction prices, market participation and TRs sold has been outlined in the Interim Report.

[3] Through the MRP, the IESO has determined that internal congestion rents and loss residuals will be returned to Ontario consumers each month according to their share of consumption in that month. Internal TRs will not be offered post-MRP.
Day-Ahead Market High-Level Design, Page 52 https://www.ieso.ca/-/media/Files/IESO/Document-Library/engage/dam/DAM-High-Level-Design-Aug2019.ashx
Market Settlement Detailed Design Document, Page 216, section 3.7.14 https://www.ieso.ca/-/media/Files/IESO/Document-Library/market-renewal/MRP_Market-Settlement_Chapter_V2_Working_V2.ashx

3. Recap of TR Market Review Interim Report - Stage 1

3.1 Overview

In its January 2013 Monitoring Report[4] , the Ontario Energy Board's Market Surveillance Panel (MSP) issued a recommendation that the IESO should reassess the design of the Ontario transmission rights market to determine whether it is achieving its intended purpose. To address the MSP's recommendation, the IESO worked with stakeholders during Stage 1 of the TR Market Review to establish a revised objective statement for the Ontario TR market and to assess the historical performance of the TR market.

To support Stage 1 of the Review the IESO produced a wide-ranging and comprehensive assessment of historical TR market data in order to better understand intertie congestion trends, TR utilization, competition and financial performance of TR auctions including auction clearing prices, auction revenues, payouts and congestion rent collected. This data was used in the determination of the value of today's TR market.

This chapter recaps the key findings from Stage 1, and additional details are documented in the Interim Report[5].

3.1 Evolved Objectives of the TR Market

In order to assess whether the TR market was achieving its intended purpose, the IESO determined that it was important to review and explicitly define the objectives of the TR market. When the Ontario electricity market opened in 2002, the intent of establishing a parallel financial TR market in Ontario was to allocate congestion rent collected to Market Participants in a way to support a financial hedging system. The IESO supplemented the original objective with a requirement that the TR market should deliver benefits to Ontario that are greater than the costs to maintain the TR market in the long-term. These two requirements were codified in a revised set of objectives for the Ontario TR market, as follows:

1. Enhance the efficiency of intertie trades by providing a congestion hedge to physical intertie traders.
2. Maximize the gains from electricity trade and provide net benefits for Ontario consumers in the long run.

[4] Market Surveillance Panel Monitoring Report on the IESO-Administered Electricity Markets for the period from November 2011 – April 2012, Page 151 https://www.oeb.ca/oeb/_Documents/MSP/MSP_Report_Nov2011-Apr2012_20130114.pdf

[5] "Transmission Rights Market Review Interim Report", IESO, October 6, 2020, https://www.ieso.ca/-/media/Files/IESO/Document-Library/engage/Transmission-Rights-Market/trm-20201006-transmission-rights-market-review-interim-report.ashx

The revised objective statements are intended to clearly identify the purpose of the Ontario TR market and be a yardstick against which future enhancements could be judged. The recommendations in Stage 2 and 3 of the TR Review are consistent with these objectives.

3.2 Key Findings from Stage 1 of TR Market Review

The IESO worked closely with stakeholders through Stage 1 to conduct the value assessment of the TR Market and understand the opportunities and implications that could result from potential enhancements to the market. The culmination of this work to date was documented in the Interim Report. The key findings are summarized below:

TRs are necessary for efficient trade at Ontario's interties

The IESO's analysis and stakeholder consultations confirmed that intertie congestion is volatile and unpredictable, and TRs play a critical role in facilitating intertie trades by providing a valuable price hedge to traders.

At a high level, TRs have been used by physical traders to hedge congestion risks for a proportion of intertie transactions. Trader participation in the TR market and hedged flow have been consistently higher on export ties that have higher levels of congestion, which aligns with their primary use as a hedging instrument. The TR auctions displayed a range of outcomes in terms of competition, auction revenues, TR payouts and impacts to the Transmission Rights Clearing Account (TRCA).

Overall, TRs have provided significant value to traders and Ontario consumers, with reliability, market efficiency and consumer benefits as outlined below.

Reliability Benefits

To understand the potential reliability impacts of TRs on intertie transactions, the IESO tabulated export failure rates by volume for intertie transactions that were backed by TRs and compared it to export transactions that were not backed by TRs. The results showed that export failure rates for export transactions that are backed by TRs are consistently lower than for export transactions that are not backed by TRs. Directionally, this lowers the number of out-of-market actions that the IESO has to undertake to make-up for failed transactions, and helps maintain price integrity and reduce uplift costs.

Market Efficiency and Consumer Benefits

In this context, market efficiency measures the direct benefit from reducing the overall generation costs to meet demand in Ontario and adjacent markets, and consumer benefits measures direct savings to Ontario consumers. The conclusion that the IESO drew from its assessment was that without the TR market, losses to Ontario consumers, primarily from reduced export volumes, would

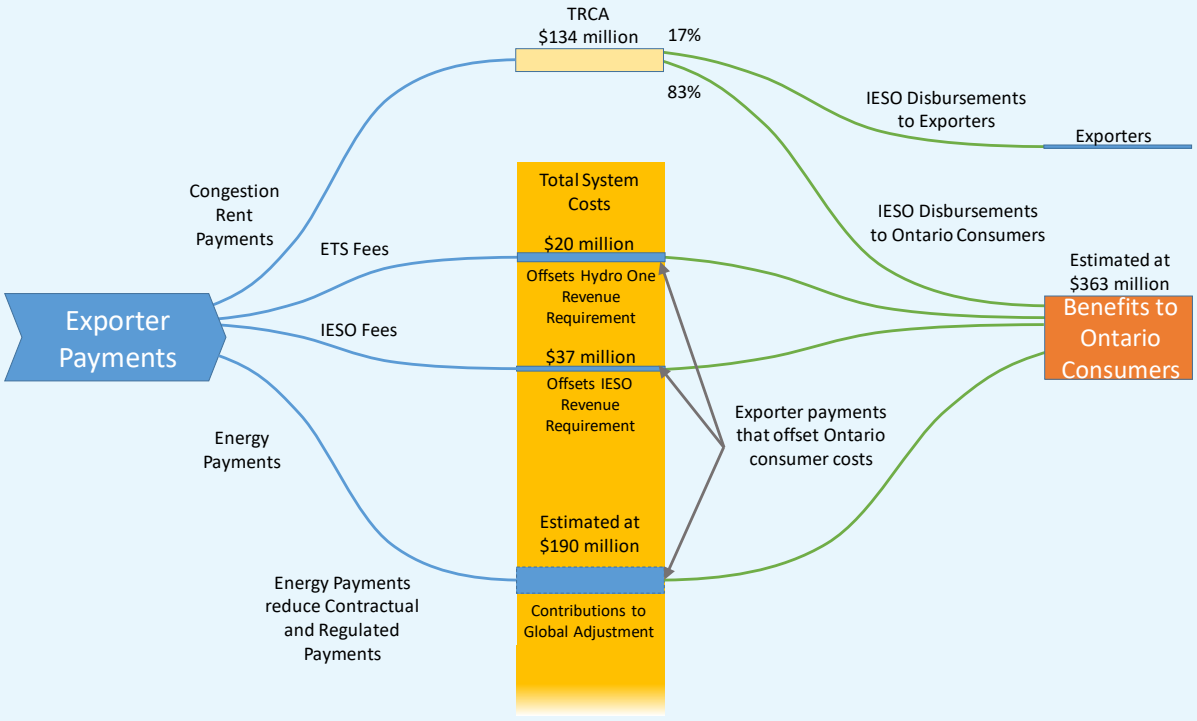
be in the range of $50-135 million per year (excluding market efficiency losses by Ontario and adjacent markets)[6].

In addition to the direct benefits, TRs also facilitate broader intertie trading and generate additional benefits to Ontario.

The figure in Box 1 highlights how exporter payments can benefit Ontario consumers through a mixture of congestion rent, IESO fees and energy payments. These payments, in effect, offset some of the GA costs that would otherwise have been paid for by Ontario consumers.

Box 1: Value of Intertie Trade to Ontario Consumers

The IESO recognizes that intertie trade provides significant economic benefit to Ontario consumers. For example, IESO analysis indicates that in 2019, benefits to Ontario consumers from exports were estimated to be at least $363 million. These benefits were calculated by running a simulation where all exports were removed, not just the TR backed exports. The figure below shows the results of this work, providing a breakdown of the total economic benefits of exports in 2019.



Notes: TRCA is the Transmission Rights Clearing Account. Estimates do not include exporter contributions to all uplift costs which would further increase benefits to consumers, likely similar in size to the ETS fee

[6] "Transmission Rights Market Review Interim Report", IESO, October 6, 2020, Page 48 https://www.ieso.ca/-/media/Files/IESO/Document-Library/engage/Transmission-Rights-Market/trm-20201006-transmission-rights-market-review-interim-report.ashx

The value of the TR market is not maximized today

Although TRs are useful today as a price hedge, the current inflexible auction design and the simplistic types of TRs offered may limit the value of TRs to Market Participants directly and Ontario consumers indirectly through less efficient intertie trade. In this way, it is very probable that the value of TRs is not maximized.

Based on stakeholder feedback, the current TR products, which cover all the hours in a month in the case of short term (ST) TRs or all the hours in a year for the case of long term (LT) TRs, are not considered by traders to be a good match for many of the different trading strategies that they may want to pursue. For example, if a trader only wanted to flow energy during peak hours, they would have to buy at a minimum a block of TRs that is valid over all hours of the month.

The IESO also heard from Market Participants that the ability to only submit one price quantity pair (one bid lamination) in TR auctions severely limits traders' ability to pursue different strategies with different numbers of TRs valued at different prices.

Stakeholders further mentioned that TRs incent and provide greatest value to longer term trades but there is limited value to shorter term trades that provide important operational benefits to the IESO / system. TRs are currently offered on a "one size fits all" basis that can make them expensive to purchase and present barriers to smaller traders. These types of issues combined with the challenge of forecasting congestion accurately make TRs risky and expensive, and traders factor these costs and risks into their TR bids.

Inefficiencies in the TR market design may prevent traders from purchasing TRs that would further enhance efficient trade and benefit Ontario.

FTRs are used extensively in the U.S. jurisdictions. The common features found and proven to be efficient in most U.S. FTR markets include multiple bid laminations, on-peak/off-peak FTR products and reconfiguration auctions.

There are material opportunities to increase the value of the TR market

Based on IESO observations, Market Participant consultations and proposals, there are real and substantial opportunities that could be explored to increase the value of TRs to the IESO, Market Participants and Ontario consumers. These opportunities included allowing for multiple bid laminations, an expanded suite of TR products, allowing TR holders to resell TRs, and making more detailed information to traders prior to auctions. These items were explored further during Stage 2 and Stage 3 of the Review.

4. Summary of TR Market Review Stage 2 – Near-Term Improvements

4.1 Overview

The purpose of Stage 2 of the TR Market Review was to identify a set of high-value opportunities that are consistent with the TR market objectives and will improve the overall efficiency, value and function of the TR Market. A report was not published for Stage 2, however engagement materials can be found on the IESO website[7].

Although the opportunities identified during Stage 2 were categorized as near-term improvements, the implementation of these identified opportunities is outside the scope of the TR Market Review. All potential projects resulting from the Review and their associated costs and benefits will need to be evaluated and prioritized by the IESO against other competing projects before being considered for implementation. Separate engagements may be required during the implementation process.

4.2 Options and Approach

A theme emerged during Stage 1 of the Review in that the value of TRs is limited by both the inflexible auction design and the simplistic TR products offered. To better understand these limitations, the IESO assessed the current TR auction tool, processes and products. The IESO also conducted a jurisdictional scan on major North American financial transmission rights (FTR) markets and identified a set of FTR market features that have been proven to be effective and viable and are considered industry best practices.

Guided by the TR market objectives, industry best practices and its assessments, the IESO proposed a list of options to explore potential improvements in three aspects of the TR market: the TR auction tool, auction processes and TR products:

- Enable multiple bid laminations (tool)
- Improve the methodology that the IESO applies to determine the number of TRs to auction; make more and better information available to TR holders; and review TR auction timeline (process)
- Offer more granular TR products; introduce mechanisms to allow TR holders to reconfigure their TRs (products)

These options have been proven to be effective and viable features in major North American FTR markets. They would potentially increase the value of TRs by providing flexibility, transparency and certainty to help Market Participants manage risks associated with purchasing TRs, thereby increasing

[7] https://ieso.ca/en/Sector-Participants/Engagement-Initiatives/Engagements/Transmission-Rights-Market-Review

competition and efficiency in TR auctions. Furthermore, improved TR products and enhanced auction mechanisms can be expected to generate greater auction revenues and reduce any difference between auction revenues and payouts, which in turn would benefit Ontario consumers.

Stakeholders expressed interest in participating in more in-depth conversations to explore potential options for improvements. To facilitate the discussions, the IESO conducted focused meetings with interested stakeholders via individual conference calls. Six stakeholders from the trading community voluntarily participated in the Stage 2 focused meetings where they provided their perspectives on how the different options could enhance the efficiency of the TR market, as well as the benefits and costs of trading in general.

The meetings resulted in open and productive discussions between the IESO and stakeholders. While stakeholders had consensus on some options, they also expressed diverse views on other options. This collaborative process enabled the IESO to receive various stakeholder perspectives and helped provide important information that was considered when deciding on the highest-value opportunities.

4.4 High Value Opportunities

Following the focused meetings, the IESO evaluated all the options considering a number of aspects: the overall objectives of the TR Market, the principles that fall within the IESO's broader mandate (efficiency, competition, implementability, certainty and transparency), compatibility and alignment with the MRP changes, best practices in North American FTR markets, stakeholder feedback gathered through focused meetings, and legal considerations.

"Multiple bid laminations" was consistently the highest priority change requested among stakeholders, given that it is a common feature in the North American FTR markets and consistent with the Ontario energy and operating reserve market.

On balance, the IESO proposed a suite of high-value opportunities, all of which were aligned with industry best practices, supported by stakeholders, compatible with MRP changes and consistent with the TR Market evolved objectives. If implemented, these opportunities could be expected to result in more flexibility, transparency and certainty to help Market Participants manage risks associated with purchasing TRs, thereby increasing competition, reducing costs and improving the efficiency of TR auctions. Improved TR products and an enhanced auction mechanism can also be expected to generate greater auction revenues and promote more efficient intertie trades, which in turn benefit the IESO and Ontario consumers.

Table 1: Summary of Stage 2 High Value Opportunities

High-Value Opportunities	**IESO's Key Considerations**
Multiple Bid Laminations	Multiple bid laminations would provide the required flexibility for Market Participants to manage risks with purchasing TRs and encourage more active participation and competitive bidding in TR auctions. This option is provided in all major North American FTR markets, and received unanimous stakeholder support.

High-Value Opportunities	IESO's Key Considerations
New On-Peak/Off–Peak TR Products	Introducing more diverse TR products could also enable more opportunities for traders to acquire TRs based on specific hedging needs and to support various trading strategies. More optionality in the TR products could also encourage more participation in the TR auctions and potentially increase the auction revenue. These options are common FTR products offered in all major North American FTR markets.
Reconfiguration auctions	Reconfiguration auctions could increase TR liquidity by providing Market Participants with flexibility to re-position their TR portfolios, thereby enhance the value of the TR products and potentially increase TR auction revenue. This option is available and has been proven to be a valuable feature in other North American FTR markets.
Publishing additional information on outages	Providing additional information could help Market Participants with more timely and transparent information and better assist them in assessing and forming TR auction bidding strategies. The IESO aims to strike a balance between providing sufficient information to Market Participants and keeping the TR Pre-Auction Report concise and manageable. Therefore, the IESO may consider adding outage IDs to the TR Pre-Auction Report, so that Market Participants can cross reference with the public Outage Reports.

The other options were ruled out with the aforementioned key considerations:

Table 2: Summary of Stage 2 Options Ruled Out

Ruled Out Options	IESO's Key Considerations
Seasonal and weekly TRs, delaying the TR auction timeline and reducing credit requirements for TR participants	These options are not common features adopted by major North American FTR markets and did not receive sufficient stakeholder support. They will also add a greater level of complexity to the administration of the TR market without a sufficiently compelling benefit.
A secondary market	This option was ruled out, given that an alternative process[8] already exists.
Other additional information requested by stakeholders	Some stakeholders requested that the IESO publish information on bid data, TR participants who cleared each TR

[8] As authorized by Chapter 8, s.4.9 of the Market Rules, the TR ownership transfer process is outlined in Market Manual 4.4 (FORM-84 and FORM-85)

Ruled Out Options	IESO's Key Considerations
	auction, and the number of financial and physical traders who participated in each TR auction by intertie path. This information is made available in some North American FTR markets, but after a legal review it was decided that[9] the requested information cannot be published by the IESO at this time due to confidentiality issues.

The IESO received stakeholder feedback which indicated general agreement with these high-value opportunities identified during Stage 2 of the TR Market Review.

4.5 Item to Be Addressed

During Stage 2 of the TR Market Review, the IESO identified a number of intertie paths where congestion is very infrequent and the value of selling TRs is questionable and may not meet the objectives as defined at the outset of the Review. The IESO intends to continue to look into this issue and will engage with stakeholders in the future on any proposed changes.

[9] Refer to Market Manual 2.14 - Information Confidentiality Catalogue

5. Summary of TR Market Review Stage 3 – Long-Term Changes

5.1 Overview

The Market Renewal Program is developing fundamental changes to the energy market which will have a significant impact on the financial TR market. It is important that the TR market effectively integrates these changes into its design.

The objective of Stage 3 of the TR Market Review was to propose long-term changes to the TR market to ensure alignment and compatibility with the future renewed energy market. A report was not published for Stage 3, however engagement materials can be found on the IESO website[10].

As part of Stage 3 of the TR Market Review, the IESO identified two key linkages between the MRP and the TR market, including changes to the intertie settlement price and the TR settlement timeframe. As a newly added component to the intertie settlement price, the Net Interchange Scheduling Limit (NISL) component generated significant stakeholder interest, particularly on the question of whether TRs should hedge the NISL congestion risk post-MRP.

Therefore, Stage 3 of the Review focused on two areas: the key linkages between the MRP and the TR market, and the assessment on NISL. Subsequently, the outcomes of Stage 3 include the IESO's proposal for default changes required to bring the TR market in alignment with the MRP, and the IESO's decision on whether TRs should hedge NISL congestion risk post-MRP.

A focused assessment on NISL was conducted during Stage 3 stakeholder engagement. Section 5.3 of this report is dedicated to providing more details on what NISL is, its potential impact on the TR market and whether TRs should hedge NISL post-MRP.

5.2 Key Linkages Between MRP and TR Market

Two MRP changes that will impact the TR market are related to Intertie Settlement Price and TR Settlement Timeframe, and are explained in more detail below.

MRP Changes to Intertie Settlement Price

Currently, the Intertie Zonal Price (IZP) is the intertie settlement price. The Intertie Congestion Price (ICP) is the difference between the IZP and the uniform Ontario Market Clearing Price (MCP). The ICP is calculated in the pre-dispatch sequence and carried over to real time. The congestion cost

[10] https://ieso.ca/en/Sector-Participants/Engagement-Initiatives/Engagements/Transmission-Rights-Market-Review

resulting from a NISL constraint is omitted from the intertie settlement price. (See Box 3 for more information on NISL).

In the future renewed energy market, the Locational Marginal Price (LMP) at the intertie proxy location will replace the IZP to be the intertie settlement price. The NISL component will be added to the intertie LMP. The newly added NISL component generated significant stakeholder interest and required the IESO to take a focused assessment on NISL and its impact, which was summarized in Section 5.3.

Box 2 provides details on intertie price formulas and variables used in the current market design and for the future market design with MRP.

Box 2: Intertie Price Formulas and Variables

Current Market Design
The IZP is calculated as follows:
IZP=MCP + ICP

MRP
The future LMP at the intertie proxy will be calculated as follows:
Intertie LMP= $Ref_{LMP} + Loss_{LMP} + Int\_Cong_{LMP} + Ext_{Cong_{LMP}} + NISL_{Cong_{LMP}}$

The future ICP will be calculated as:
Future ICP= $Ext_{Cong_{LMP}} + NISL_{Cong_{LMP}}$

Variable Descriptions

$\boldsymbol{Ref_{LMP}}$	Energy Reference Price
$\boldsymbol{Loss_{LMP}}$	Loss component
$\boldsymbol{Int\_Cong_{LMP}}$	Internal congestion component
$\boldsymbol{Ext\_Cong_{LMP}}$	External congestion component
$\boldsymbol{NISL\_Cong_{LMP}}$	Net Interchange Scheduling Limit component

Source: "Day-Ahead Market Calculation Engine" Detailed Design Document, Page 175-176 https://www.ieso.ca/-/media/Files/IESO/Document-Library/market-renewal/MRP_DAM_Calculation-Engine_V2.ashx

MRP Changes to TR Settlement Timeframe

Under the current market design, TRs are settled at the real time ICP to provide a hedge for intertie congestion costs that occur in real time.

The MRP Day-Ahead Market (DAM) High-Level Design has made a decision that "intertie FTRs will be settled at DAM prices to provide Market Participants with the ability to hedge DAM congestion. Settling FTRs at DAM prices will also drive greater import and export participation in the DAM since it is a Market Participant's only opportunity to hedge congestion"[11].

As a result of this MRP High-Level Design decision, by default, TRs will continue to be settled at the Ext_Cong_{LMP} only in the day-ahead timeframe to provide a hedge for import/export congestion costs based on day-ahead schedules. Any congestion costs that occur in real time will not be hedged by TRs.

In the future market, the real time schedule may differ from the day-ahead schedule resulting in incremental congestion costs or savings for import/export congestion and NISL congestion in real time. The disposition of congestion costs or savings derived from real time import/export and NISL congestion remains unresolved and is included in Section 5.5 as an item that will need to be addressed.

Box 3: Net Interchange Scheduling Limit (NISL)

NISL is an administrative constraint imposed to the cross-hour change of the net interchange schedule over all interties. The IESO limits the net interchange from hour-to-hour to 700 MW. The NISL may be expanded due to reliability concerns. The purpose of this limit is to restrict large changes on the net interchange schedule that can have an adverse impact on the reliability of the IESO-controlled grid.

Today, NISL is implemented in both the day-ahead and the real time pre-dispatch scheduling processes. The NISL congestion price is generated and published by the Dispatch Scheduling and Optimization (DSO) tool for both the constrained and unconstrained runs. However, the NISL congestion price is currently omitted from intertie settlement prices. As a result of this misalignment between intertie settlement prices and economic schedules in today's market, there are instances when NISL congestion causes otherwise uneconomic intertie transactions to be scheduled.

5.3 Net Interchange Scheduling Limit

As noted in Section 5.2, in the new market the NISL component will be added to the intertie LMP, potentially resulting in NISL congestion costs or savings in both day-ahead and real time. When NISL congestion occurs, the NISL congestion component of the intertie LMP will be the same across all interties. The NISL congestion component can be positive or negative, resulting in an increase or a decrease to the intertie LMP. The rationale for including NISL in the intertie LMP is that it provides

[11] Day-Ahead Market High-Level Design, Page 53 https://www.ieso.ca/-/media/Files/IESO/Document-Library/engage/dam/DAM-High-Level-Design-Aug2019.ashx

transparency of the NISL impact in comparison to today's market design and aligns the intertie schedule with the settlement price.

Additionally, with MRP multi-hour optimization, the NISL congestion frequency and magnitude are expected to be reduced. The penalty price for the NISL constraint will be set based on the 99th percentile of the historic NISL shadow price[12]. The NISL shadow price in the constrained pre-dispatch sequence has historically corresponded to approximately $500[13]. Therefore, the magnitude of NISL impact is expected to be capped at $500 post-MRP.

Hedging NISL with TRs

The NISL component in the future intertie LMP generated significant stakeholder interest, particularly on the question of whether TRs should hedge the NISL congestion risk in the day-ahead timeframe. Stakeholders indicated that hedging NISL with TRs would allow traders to offer into the Day-Ahead Market without trying to estimate NISL congestion risks.

In response to the stakeholder feedback, the IESO conducted an assessment on the option to hedge NISL with TRs post-MRP. As detailed in Table 3, the assessment shows that in the current market a congestion rent shortfall is not an issue during NISL binding hours, based on the data from 2018 to 2020. The same cannot be said for the post-MRP assessment results, however.

For this assessment, the IESO used data from the same time period and looked at the outcome if NISL was hedged by TRs post-MRP. The result shows that the estimated congestion rent would be

> A congestion rent shortfall will occur if congestion rent minus TR payouts is less than zero. Persistent congestion rent shortfalls could potentially lead to significant reductions in the Transmission Rights Clearing Account (TRCA) balance, which would need to be funded mainly by Ontario consumers with no commensurate benefit. Furthermore, the IESO would have to reduce the number of TRs to auction in the future in order to balance the congestion rent shortfalls, resulting in reduced hedging opportunities for traders and potentially higher TR auction clearing prices.

$29.5M for the same time period, and would not be enough to cover an estimated TR payout of $71.1M. There could be a potential $41.6M congestion rent shortfall.

[12] MRP Detailed Design "Offers, Bids and Data Inputs" Chapter, Page 80 https://www.ieso.ca/-/media/Files/IESO/Document-Library/market-renewal/MRP_Offers-Bids-and-Data-Inputs_Chapter_V2.ashx

[13] Stakeholder Engagement Pre-Reading" Constraint Violation Pricing – November 25, 2019" Page 16

Table 3: Actual & Estimated Congestion Rent Shortfalls in NISL Binding Hours (2018-2020)

Data refers to NISL binding hours only	**Today's Market (Actual)**		**Post-MRP (If NISL were hedged by TRs)**	
	Congestion Rent	TR Payout	Estimated Congestion Rent	Estimated TR Payout
2018	$12.3 million	$10.2 million	$15.0 million	$36.1 million
2019	$8.5 million	$7.6 million	$8.2 million	$23.2 million
2020	$5.5 million	$4.9 million	$6.2 million	$11.8 million
Total	$26.3 million	$22.6 million	$29.5 million	$71.1 million

The congestion rent shortfall risk is estimated to be high because the NISL congestion price applies to all interties, including those interties without any physical flows. Therefore, TR payouts would be made on all intertie paths even if no congestion rent is collected.

Based on this assessment, hedging NISL congestion costs with TRs would create a significant congestion rent shortfall risk that would be difficult and costly to manage. It may also increase the manipulation risk and cause price distortions in the TR auctions. Therefore, on balance, the IESO has concluded that TRs are not the appropriate product to hedge NISL congestion costs post-MRP.

5.4 IESO's Proposal on Stage 3 Changes

The IESO, with support from stakeholders, has proposed changes that are required to bring the TR market in alignment with the MRP.

In the future renewed energy market, TRs will hedge the import/export congestion portion of the ICP (Ext_Cong_{LMP}) only in the day-ahead timeframe. TR settlement processes and tools need to be updated with day-ahead prices and intertie limits. All relevant market rules, market manuals, internal and external documents, procedures and tools need to be updated accordingly.

Furthermore, the IESO has made the decision that TRs will not hedge NISL congestion costs post-MRP. That said, considering that stakeholders are interested in learning more about NISL, the IESO intends to conduct an education session on NISL with stakeholders after the TR Market Review is completed. This will be an opportunity to have a more in-depth discussion on NISL to better understand congestion due to NISL and its impact on prices. All stakeholders who participated in the TR Market Review engagement will be notified when the education session will be scheduled.

5.5 Item to be Addressed

In the future renewed market, the costs/savings as a result of NISL congestion and the real time import/export congestion will be collected and need to be disbursed. After the TR Market Review is completed, the IESO will incorporate this outstanding item into the MRP scope.

6. Conclusion

The TR Market Review has reaffirmed that the TR market is achieving its intended purpose of providing traders with an opportunity to hedge against congestion cost risks. It creates value for Ontario consumers, Market Participants, and the IESO, but further work is needed to capture and maximize the potential value that the TR market could provide.

The Review identified high-value opportunities that will improve the overall efficiency, value and function of the TR market if implemented, and proposed long-term changes that will align the TR market with the future renewed energy market.

As part of the Review, some outstanding items were identified and will need to be resolved after the conclusion of the Review. Table 4 summarizes the TR Market Review outcomes and next steps.

Table 4: Summary of TR Market Review Outcomes and Next Steps

Opportunities, Changes and Issues to be Addressed	**Next Steps**
• Multiple bid laminations • On/off-peak TRs • Reconfiguration Auctions • Publishing additional information	These opportunities will go through the IESO project prioritization process to be reviewed against competing projects before approval and implementation.
The manner in which TRs are sold on paths with infrequent congestion	Further internal IESO review is needed. IESO will aim to provide stakeholders with an update by Q3 2021
TR settlement processes and tools need to be updated with DAM price and intertie limits	Implementation details, including engagement with stakeholders on draft market rule and manual changes to facilitate these changes will be communicated through the MRP engagement
Education on NISL to understand congestion and impact on prices	All stakeholders who participated in the TR Market Review engagement will be notified when this education is available
NISL congestion and RT import/export congestion will be collected and disbursed	Implementation details, including engagement with stakeholders on draft market rule and manual changes to facilitate these changes will be communicated through the MRP engagement

The IESO appreciates stakeholders' support and acknowledges that the TR Market Review would not have been possible without their active participation and valuable input. Following the conclusion of

the TR Market Review, stakeholders who participated in this engagement will receive updates on the next steps.

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