
MAY 21, 2020

TRANSMISSION RIGHTS MARKET REVIEW

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Business Lead

Meeting Participation

- Webcast participation (including audio):
 - <https://www.meetview.com/TRMarketReview/>
 - Click “Ask a Question” in the bottom right corner of the screen to ask a question
- Teleconference participation (audio only):
 - Local (+1) 416 764 8640; Toll Free (+1) 888 239 2037
 - Press *1 to alert the operator that you have a question;
 - Press *0 for any other operator assistance

Meeting Participation Continued

- When asking a question, state your name and who you represent
- This stakeholder engagement is guided by the IESO [Engagement Principles](#)

Purpose

- Present stakeholders with an overview of the Transmission Rights (TR) Market Review
- Propose a draft objective statement for the TR market
- Present data analysis on historical performance of the TR market
- Solicit feedback on the data analysis and proposed objective statement

Agenda

- Introduction
- Proposed TR Market Objective Statement
- TR Market Data Analysis



INTRODUCTION

Renewed Focus on MDAG

- During the April 2 webinar, MDAG members indicated they found it difficult to engage with the IESO and fellow members in an open discussion format that they had previously indicated was of most value to the membership and IESO
- Additionally, the IESO expects this engagement to be of interest to stakeholders who are not members of MDAG.
 - Questions were received from these stakeholders about whether they were to engage equally with MDAG members and the IESO on the content being discussed in the webinar

Renewed Focus on MDAG Continued

- To reconcile this feedback and ensure alignment with the initial purpose and intent of the MDAG as an advisory group, the TR Market Review initiative will be continued as a separate stakeholder engagement
- MDAG will continue with a renewed focus on advising the IESO on the future evolution of the Ontario electricity market

New TR Market Review Engagement Approach

- The TR Market Review will be launched as a separate stakeholder engagement with its own engagement web page, plan and schedule that aligns with what was previously discussed with the MDAG
- Materials related to this engagement will be posted on the TR Market Review engagement web page and engagement meetings/webinars will be conducted separate from MDAG meetings

TR Market Review Engagement Approach Continued

- The engagement plan and schedule has factored in updates at future MDAG meetings before major milestones and decision points are completed in order to ensure the MDAG has an opportunity to provide advice and guidance and to ensure alignment with the goals of the 2020 Work Plan
- This new approach will make clear that participation is open to all stakeholders and bring the MDAG into alignment with its original stated objectives outlined in the Terms of Reference
- Feedback on this engagement approach and the engagement plan can be provided to engagement@ieso.ca

TR Market Review - Drivers

Intertie trading enhances reliability and cost-effectiveness of the Ontario electricity system. It is important to understand how TRs promote efficient intertie trading in today's market

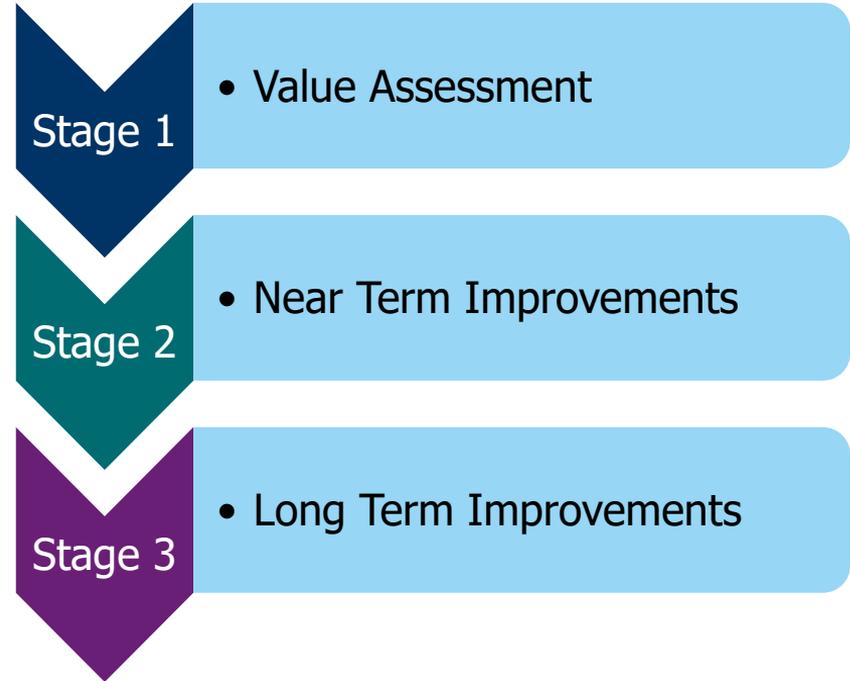
The IESO has received feedback regarding potential inefficiencies of the TR market observed by the Market Surveillance Panel (MSP), market participants and IESO business units

Changes to the energy market through the MRP will have implications on the TR market longer term



TR Market Review - Scope

- Assess the historical performance of the TR market, determine the objective for the TR market and whether the TR market is achieving its intended purpose
- Identify near-term changes that will improve the overall efficiency, value and function of the TR Market (Pre- MRP)
- Identify long-term changes to ensure alignment and compatibility of the TR market with the MRP (Post-MRP)



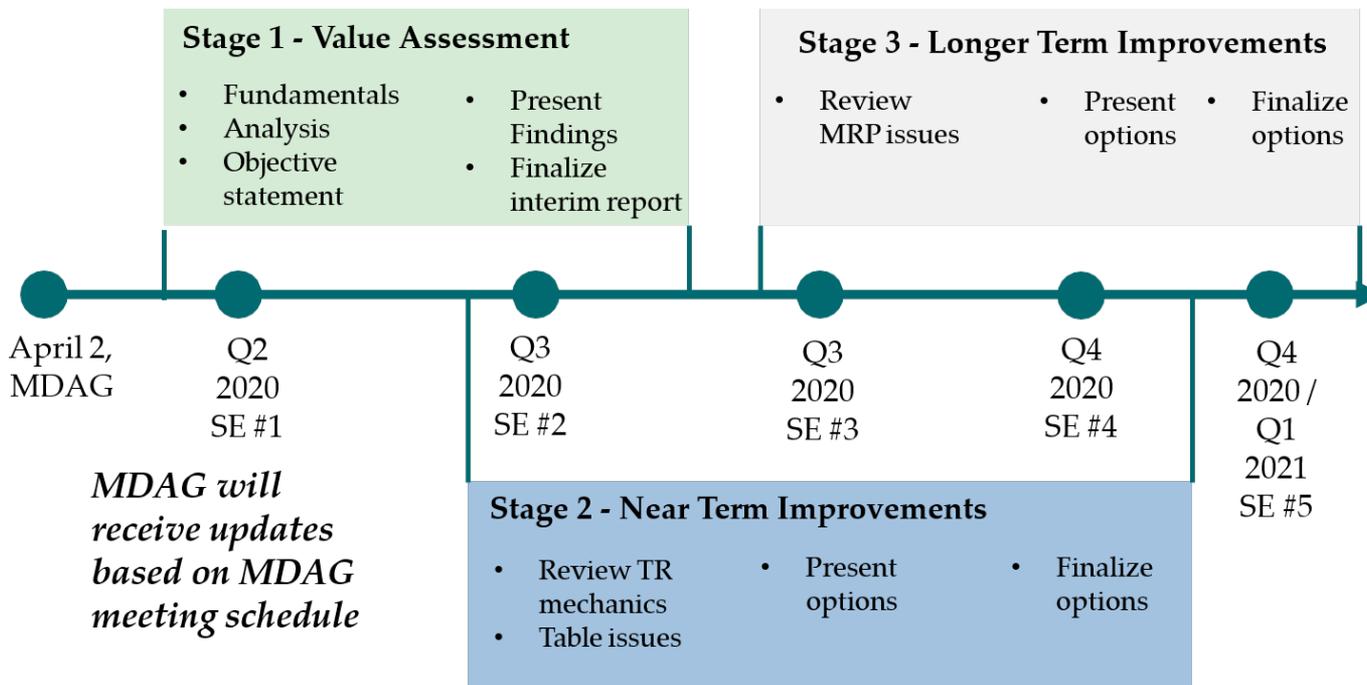
TR Market Review – Stage 1 Scope

Stage 1- Value Assessment

- Present fundamentals of the TR Market to stakeholders
- Evaluate historical data and solicit stakeholder feedback on how TRs are used in practice
- Assess the value the TR market provides under a range of system conditions
- Review the original design intent for the TR market and establish a comprehensive objective statement in the context of today's electricity market
- Determine the extent to which the TR market is achieving its objective

Deliverable: Assess the value of the TR market to Ontario and, in turn, determine the need for and scope of Stage 2 and Stage 3

TR Market Review - Proposed Timeline





PROPOSED OBJECTIVE STATEMENT

Original Design Intent of the TR Market¹

In 1999 the Market Design Committee (MDC) recommended the introduction of TRs in Ontario as a financial hedge against the congestion-related price differences across constrained interties. Here's the following quote by the MDC:

Original Design Intent of the TR Market¹ - Quote

"These rights are "financial," because they do not guarantee physical access to the intertie (which is allocated to the most competitive bidders in the IMO's scheduling and dispatch process) nor preclude those without rights from gaining access to the grid (hence, the rights cannot be hoarded as a means to exclude competitors from the grid). Instead, holders of these rights are entitled to be compensated by the IMO for the congestion-related difference in prices that arise across constrained interties, thus providing a financial hedge against such price differences."

Market Surveillance Panel's Recommendations

In its monitoring reports*, the Market Surveillance Panel (MSP) recommended:

- *The IESO should reassess the design of the Ontario TR market to determine whether it can play a more effective role in supporting efficient trade with neighbouring jurisdictions.*
- *The IESO should reassess the design of the Ontario transmission rights market to determine whether it is achieving its intended purpose.*

The Proposed Objective Statement

- The objective statement intends to clearly identify the purpose of the Ontario TR market and explain how the purpose can be achieved. It will be the guiding principle for the TR review and future evaluation and evolution of the Ontario TR market.
- The proposed objectives of the Ontario TR market are to:
 - Enhance the efficiency of intertie trades by providing a congestion hedge to physical intertie traders
 - Provide net benefits to Ontario ratepayers in the long term

Proposed Objective Statement - Rationale

- Enhance the efficiency of intertie trades by providing a congestion hedge to physical intertie traders
 - To provide a congestion hedge for traders is the primary function of TRs
 - It is consistent with the original design intent of the Ontario TR market and how TRs are used in the wholesale electricity markets in general
 - With the changing supply mix and load dynamics, Ontario is more reliant on efficient intertie trading than ever before and TRs can help maximize this potential

Proposed Objective Statement – Rationale Continued

- Provide net benefits to Ontario ratepayers in the long term
 - Benefits to Ontario ratepayers need to be greater than costs to maintain the TR market in the long term.
 - Benefits to other market participants are important but secondary to the value derived by Ontario ratepayers, who are responsible for paying for the transmission system via regulated rates under the present and future market design
 - An increased aggregate welfare for the entire market is an ideal result of the TR market



HISTORICAL PERFORMANCE AND DATA ANALYSIS

Outline of Data Analysis

- The IESO assessed individual components of the overall TR market from three different perspectives:
 - All interties
 - An individual intertie
 - An individual auction
- The following data will be presented in a format that first answers these three questions:
 - What did we look at?
 - Why did we assess it?
 - What are IESO's preliminary observations?
- At the end of this presentation is a large appendix containing supplementary information

[For additional background on the TR Market, please see the TRCA Backgrounder found here](#)

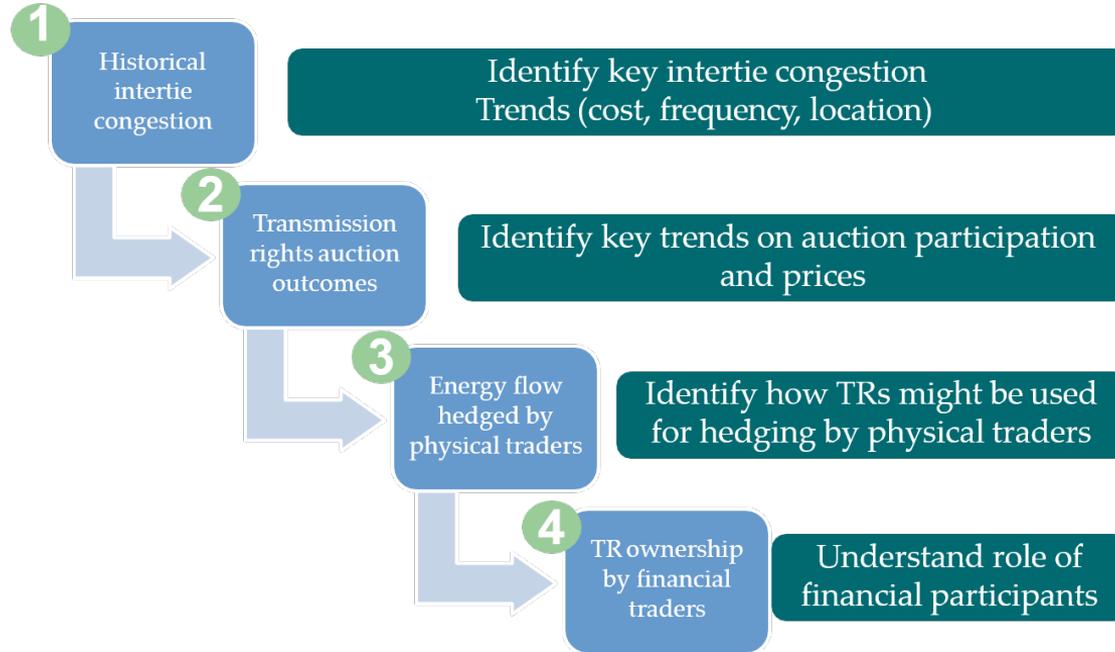
Intention of Data Analysis

- Data analysis is to identify broader trends and highlight key observations, instead of explaining each data point
- System conditions and market dynamics changed over the years, which had various impacts on the TR market
- Therefore, the IESO suggests that this data be viewed from a holistic perspective
- Context and explanation will be provided during the stakeholder engagement session to help stakeholders comprehend the data



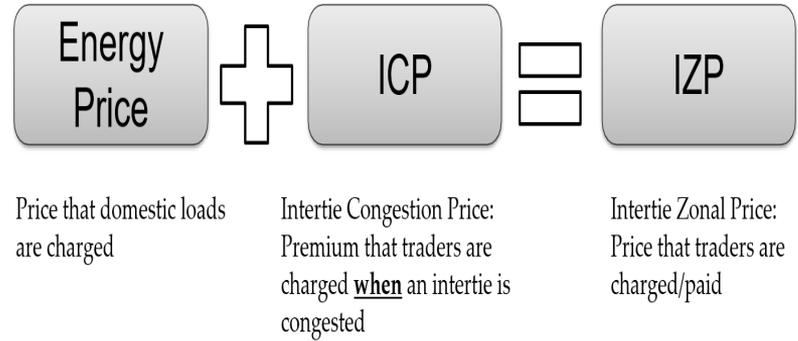
ALL INTERTIES

ALL INTERTIES AT ONCE: 4 COMPONENTS



Intertie Congestion

- Ontario trades energy across interties with 5 different jurisdictions, Quebec (PQ), Manitoba (MBSI), New York (NYSI), Minnesota (MSNI), and Michigan (MISI)
- When there is more demand from traders than available intertie capacity, the prices for imports and exports diverge compared to prices in Ontario



Summary (Data Slides 30-32)

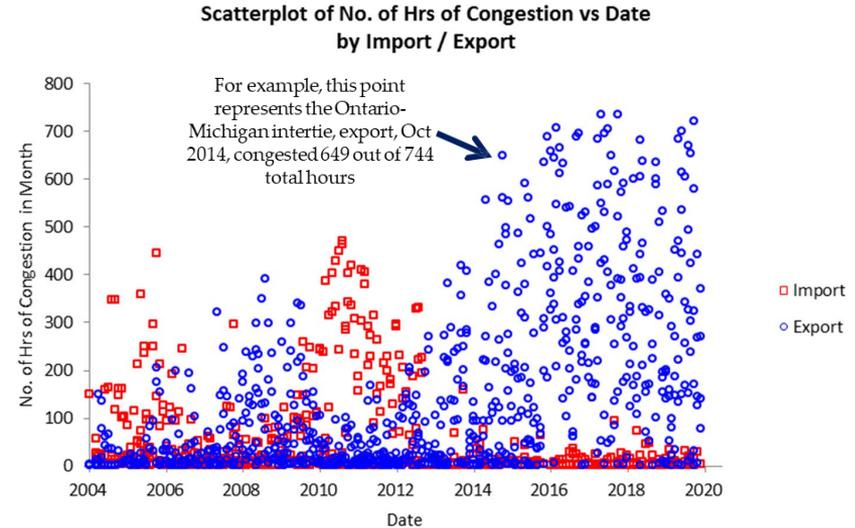
- What did we look at?
 - The frequency (no. of hours) and cost (the sum of ICP charged to each MW over all hours in a month, or \$/MW-Month) of congestion over all the interties in the last 16 years by month
- Why did we assess it?
 - TRs were intended to hedge intertie congestion. This assessment helps us understand the frequency, cost, and location of congestion faced by intertie traders

Summary (Data Slides 30-32) Continued

- IESO observations:
 - The frequency and cost of congestion in the export direction has significantly increased in recent years, but has decreased in the import direction
 - The frequency and cost can be quite variable and hard to predict, both month-to-month on each intertie and over long timescales

Slide 30-Hours of Congestion vs. Date by Import/Export

- A scatterplot graph showing the number of hours of congestion in a month versus date by import or export for years 2004 to 2020.
- The number of hours of congestion in a month ranges from 0 to 800
- An emphasis is made on the Ontario-Michigan intertie export which congested 649 out of 744 hours in October 2014



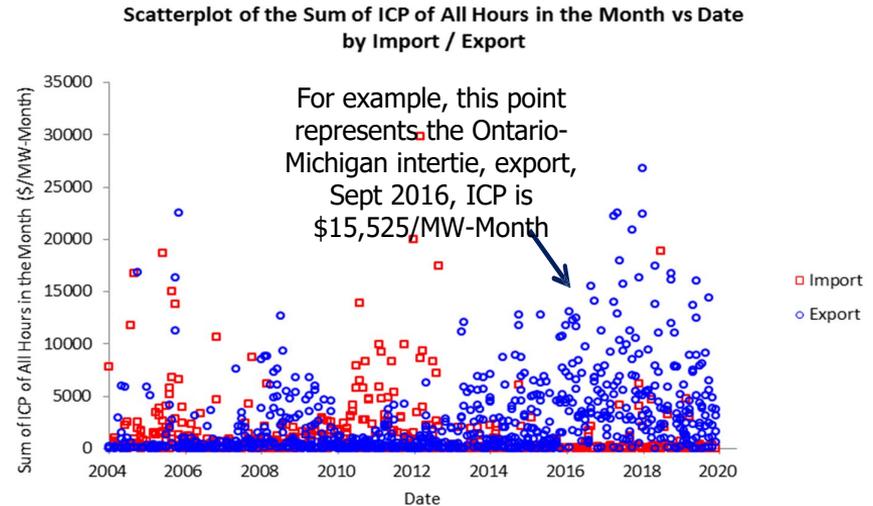
By Jurisdiction

Import Only

Export Only

Slide 31-Sum of ICP of All Hours vs. Date by Import/Export

- A scatterplot graph showing the sum of ICP of all hours of in a month versus date by import or export for years 2004 to 2020.
- The sum of ICP of all hours in the month ranges from 0 to 35,000
- An emphasis is made on the Ontario-Michigan intertie export with an ICP of \$15,525 in September 2016.



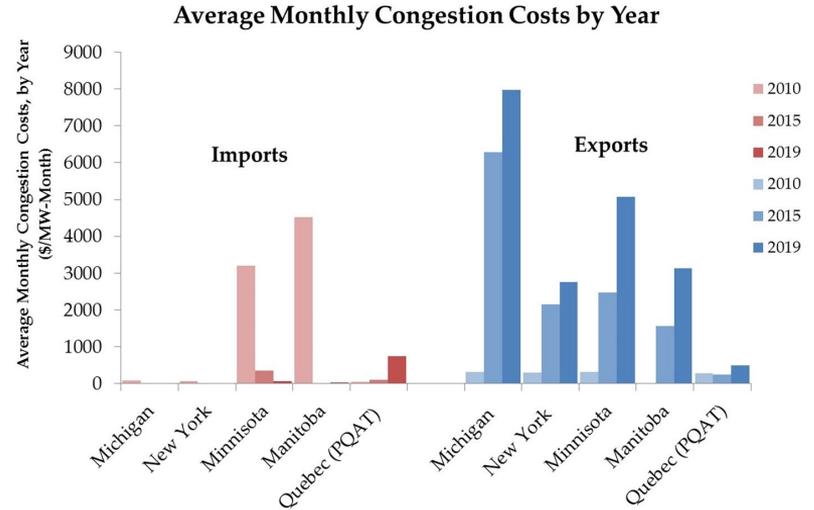
[By Jurisdiction](#)

[Import Only](#)

[Export Only](#)

Slide 32-Average Monthly Congestion Costs by Year

- The bar chart on the right shows the average monthly congestions by year for imports and exports through years 2010 to 2019.
- The average monthly congestion costs by year ranges from 0 to 9000
- Michigan had the highest congestion cost for exports in 2019 with \$8,000 and Quebec the lowest with less than \$1,000



Transmission Rights Auction Outcomes

- Transmission Rights (TRs) are financial instruments auctioned by the IESO to hedge (or speculate) against the ICP that occurs when interties are congested
 - TRs entitle holders to a payment of the price difference between an intertie zone and Ontario for a defined period of time
 - TRs do not guarantee physical transmission service or impact the scheduling of transactions

Transmission Rights Auction Outcomes Continued

- Transmission Rights are offered on short-term (ST, monthly) and long-term (LT, annual) durations through TR auctions
- There are 17 TR action paths in total, including 10 import paths and 7 export paths

Summary (Data Slides 37-40)

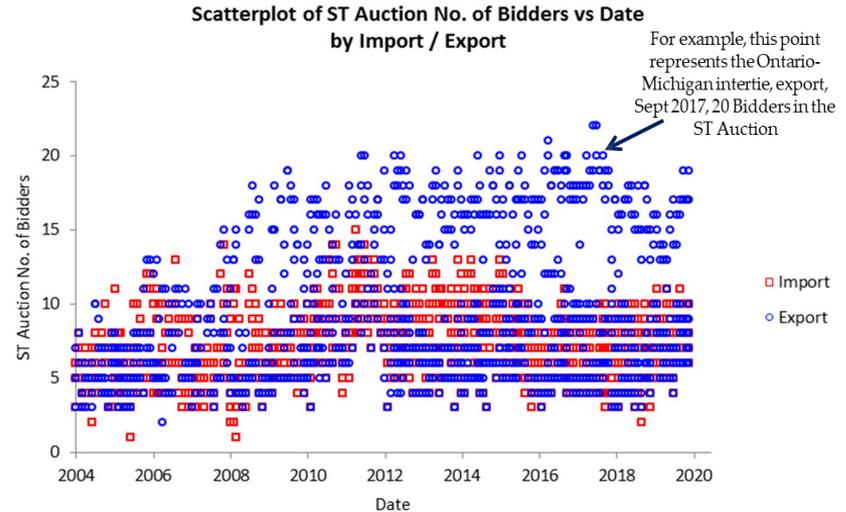
- What did we look at?
 - Number of bidders, number of TRs sold and clearing price of ST TR auctions by month and import/export over 16 years
- Why did we assess it?
 - To better understand trends in participation and clearing prices in the ST TR auctions

Summary (Data Slides 37-40) Continued

- IESO observations:
 - Average number of bidders across all ST auctions is 7.7 (6.6 in the import direction, 9.4 in the export direction)
 - Number of bidders can vary widely across the interties (ranging from 1 to 24)
 - Large variations in the numbers of ST TRs sold, with some similarities on the import and export directions
 - Auction clearing prices follow large scale trends in congestion, underlining system conditions.

Slide 37-ST Auction Number of Bidders vs. Date by Import/Export

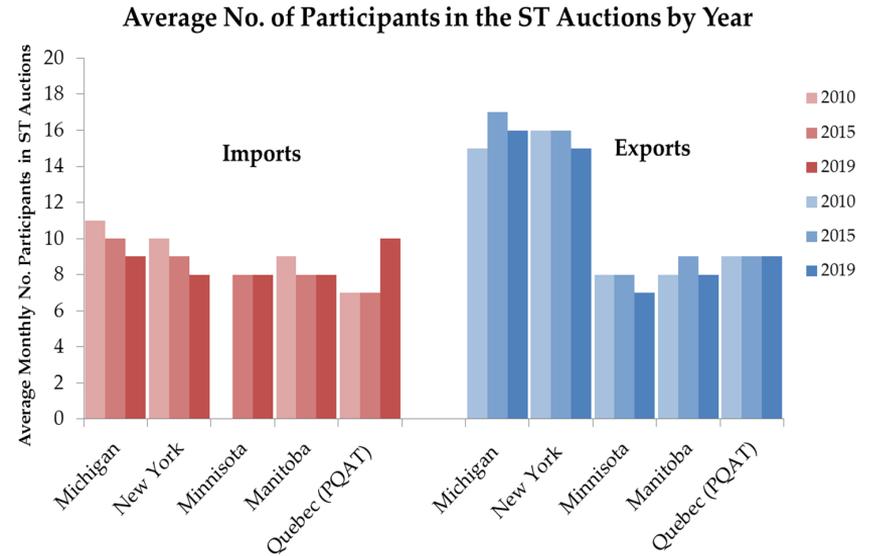
- A scatterplot graph showing the ST Auction number of bidders versus date by import or export for years 2004 to 2020.
- The number of bidders range from 0 to 25.
- An emphasis is made on the Ontario-Michigan intertie export with 20 bidders in the ST auction for September 2017.



Import Only
Export Only

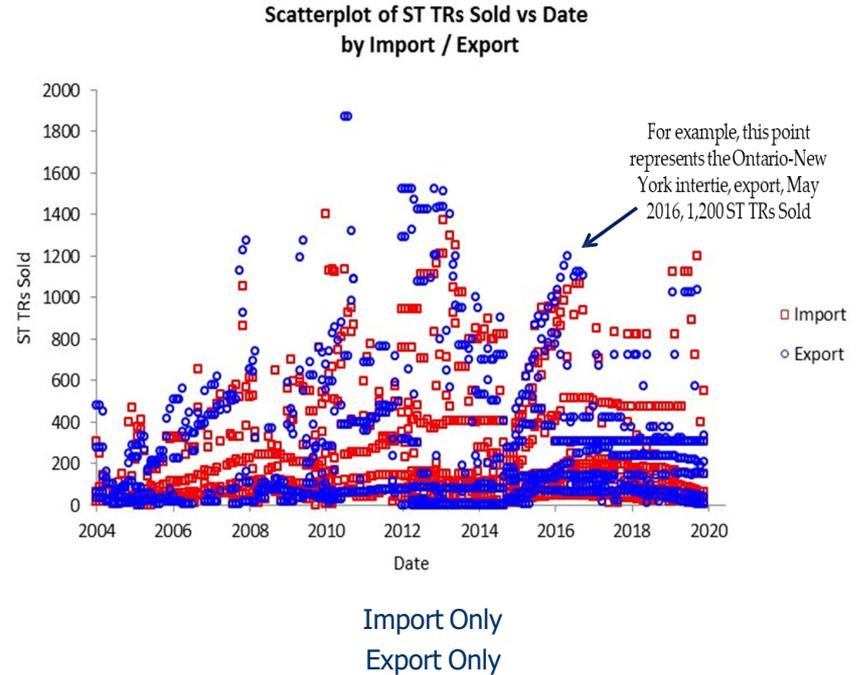
Slide 38-Average Number of Participants in the ST Auctions by Year

- The bar chart on the right shows the average number of participants in the ST auctions by year for imports and exports through years 2010 to 2019.
- The average number of participants in ST auctions ranges from 0 to 20.
- Michigan had the highest monthly participants; 17 in the ST auctions for 2015 by exports



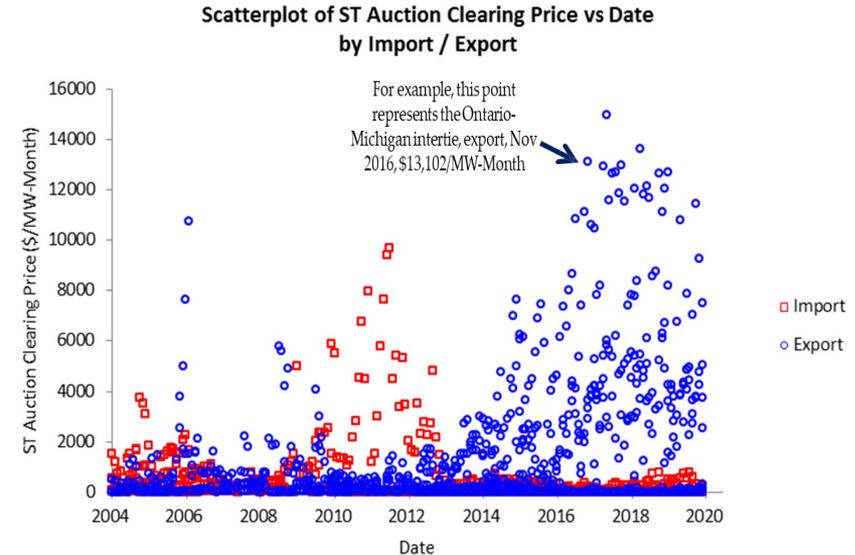
Slide 39-ST TRs Sold vs. Date by Import/Export

- A scatterplot graph showing the ST TRs sold versus date by import or export for years 2004 to 2020.
- The number of ST TRs sold range from 0 to 2000.
- An emphasis is made on the Ontario-New York intertie export of May 2016 where 1,200 ST TRs were sold.



Slide 40-ST Auction Clearing Price vs. Date by Import/Export

- A scatterplot graph showing the ST auction clearing price versus date by import or export for years 2004 to 2020.
- The ST Auction clearing price per month ranges from 0 to 16,000
- An emphasis is made on the Ontario-Michigan intertie export with an auction clearing price of \$13,102 in November 2016



By Intertie

Import Only

Export Only

Summary (Data Slides 43-46)

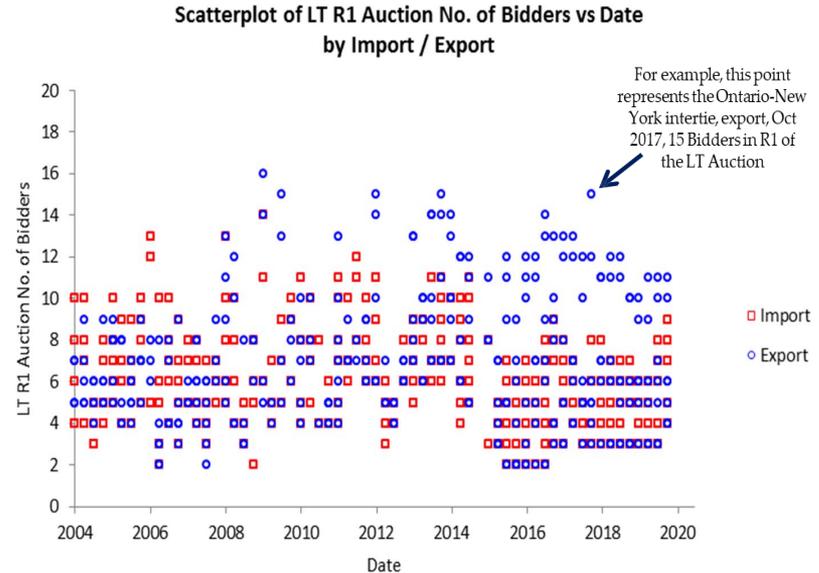
- What did we look at?
 - Number of bidders, number of TRs sold and clearing price of LT TR auctions by quarter and import/export over 16 years
- Why did we assess it?
 - To better understand trends in participation and clearing prices in the LT TR auctions

Summary (Data Slides 43-46) Continued

- IESO observations:
 - Average number of bidders across all LT auctions is 6.2 (5.6 in the import direction, 6.6 in the export direction)
 - Large variations in the numbers of LT TRs sold, with some similarities on the import and export directions
 - Auction clearing prices follow large scale trends in congestion

Slide 43-LT R1 Auction Number of Bidders vs. Date by Import/Export

- A scatterplot graph showing the LT R1 auction number of bidders versus date by import or export for years 2004 to 2020
- The LT R1 Auction bidders ranges from 0 to 20
- An emphasis is made on the Ontario-New York intertie export with 15 auction bidders in October 2017

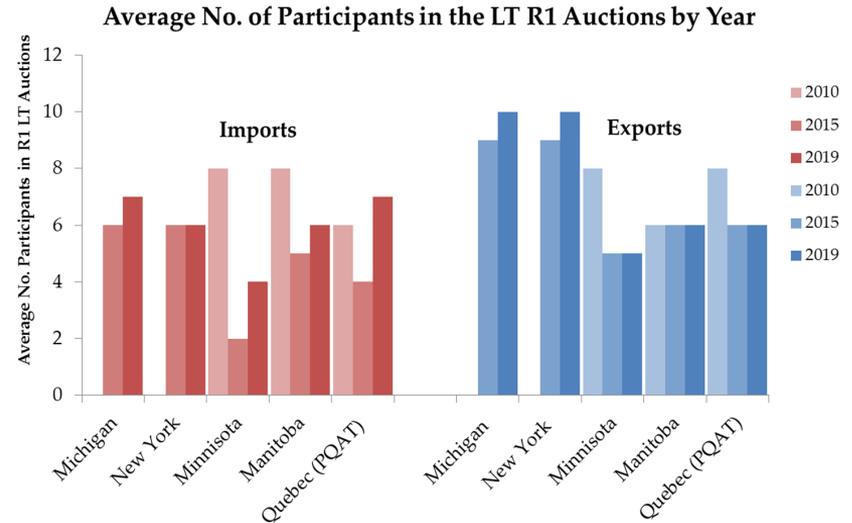


By Intertie

Import Only
Export Only

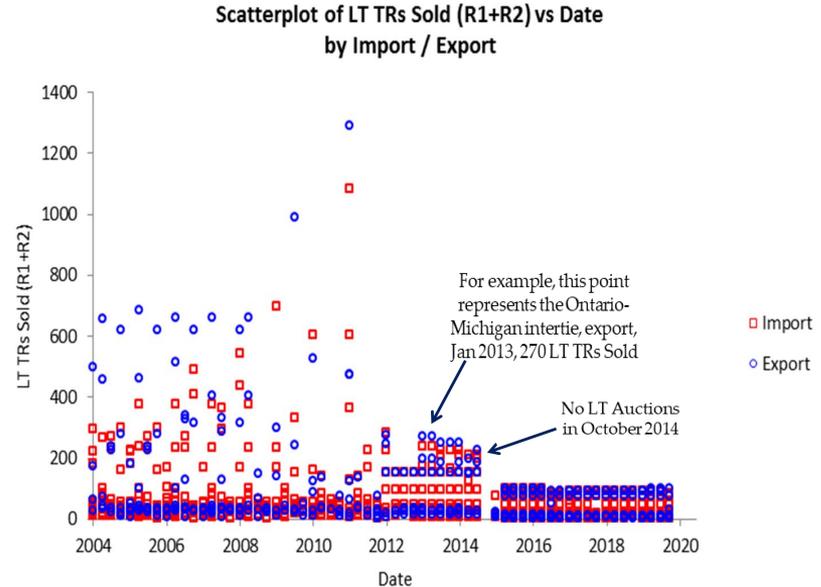
Slide 44-Average Number of Participants in the LT R1 Auctions by Year

- The bar chart on the right shows the average number of participants in the LT R1 auctions by year for imports and exports through years 2010 to 2019
- The average number of participants in LT auctions ranges from 0 to 12
- Michigan and New York had the highest monthly participants for 2019 exports, while Michigan and Quebec had the highest number of participants for imports in 2019



Slide 45-LT TRs Sold vs. Date by Import/Export

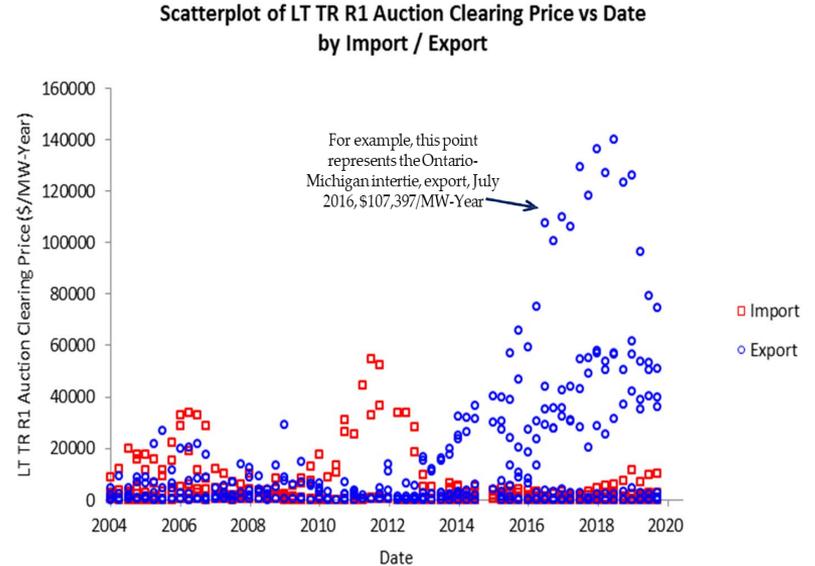
- A scatterplot graph showing the LT TRs sold versus date by import or export for years 2004 to 2020.
- The LT TRs sold ranges from 0 to 1400
- An emphasis is made on the Ontario-Michigan intertie export with 270 LT TRs sold in January 2013
- There were no LT auctions in October 2014 as shown on the graph



Import Only
Export Only

Slide 46-LT TR R1 Auction Clearing Price vs. Date by Import/Export

- A scatterplot graph showing the LT TR R1 auction clearing price versus date by import or export for years 2004 to 2020.
- The auction clearing price per year ranges from 0 to 160,000
- An emphasis is made on the Ontario-Michigan intertie export with an auction clearing price of \$107,397 in July 2016



By Intertie

Summary (Table on Slide 49)

- What did we look at?
 - Each physical trader's energy flow across the interties and whether physical traders also owned TRs on the same intertie in the same direction when they flowed energy, from 2016-2019
- Why did we assess it?
 - We wanted to understand the extent to which TRs were potentially being used for hedging purposes

Summary (Table on Slide 49) Continued

- IESO observations:
 - About 30-40% of energy flow was associated with TR ownership
 - IESO welcomes stakeholder input on particularly how TRs are used in practice
 - Why is this percentage not higher?
 - Are TRs inherently risky financial products or is there inflexibility in the TR auction?
 - Do physical traders want TRs but are unable to clear the auction?

Slide 49-Energy Flow With and Without TR Ownership by Physical Traders (2016-2019)

Year	Total Energy Flowed (TWh)	Total Energy Flow Without TR Ownership (TWh)	Total Energy Flow With TR Ownership (TWh)	Percentage of Energy Flow With TR Ownership (%)	Total TRs Owned (TWh Equivalent)
2016	29.9	17.3	12.5	42%	44.3
2017	25.7	16.5	9.2	36%	33.0
2018	27.0	17.1	9.9	37%	31.3
2019	26.4	16.9	9.4	36%	29.8

- In these calculations, a "Physical Trader "refers to an organization that completes a physical trade on at least one of the Ontario interties within a given year.

Summary (Table on Slide 52)

- What did we look at?
 - We looked at the proportion of TR ownership by financial traders
- Why did we assess it?
 - We want to better understand financial trader participation in the TR market

Summary (Table on Slide 52) Continued

- IESO observations:
 - In the last 4 years, about a third of TRs are owned by financial traders
 - IESO welcomes stakeholder input on:
 - What purpose do TRs serve to financial traders?
 - Are these being purchased solely for speculative purposes or for other purposes?

Slide 52-Energy Flow With and Without TR Ownership by Physical Traders (2016-2019)

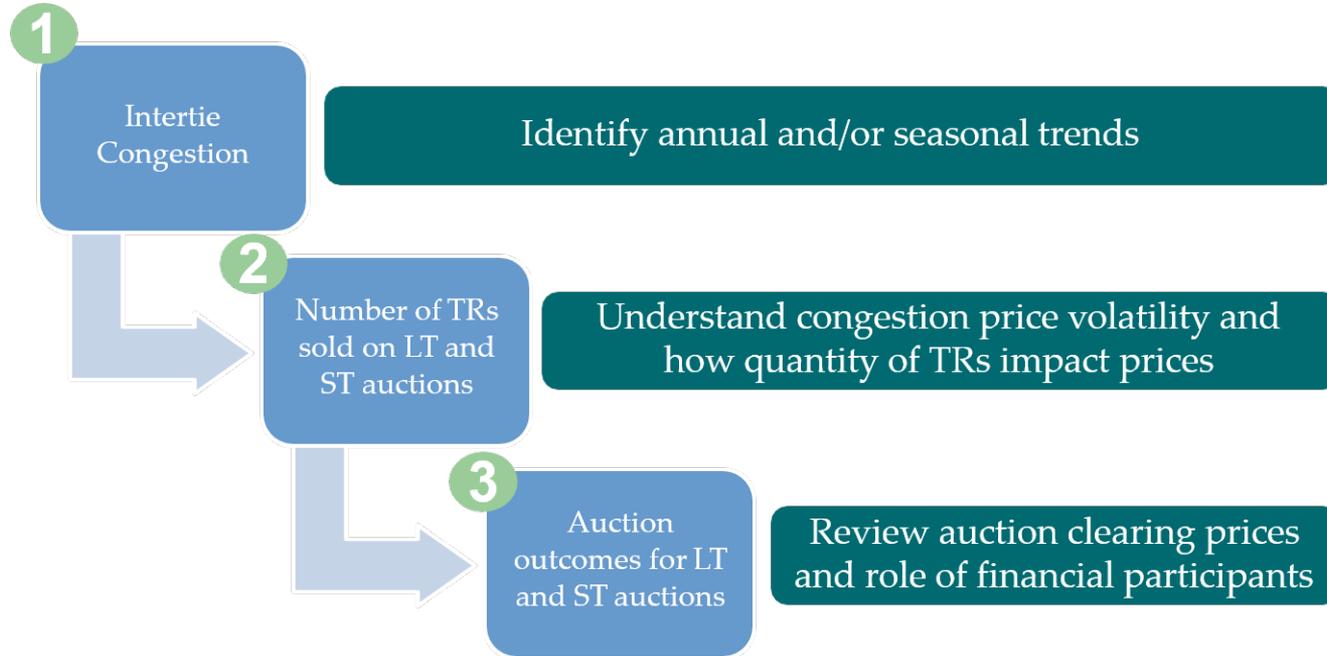
Year	Total TRs Owned By All Market Participants (TWh Equivalent)	Total TRs Owned by “Financial Traders” (TWh Equivalent)	Percent Ownership by “Financial Traders” (%)
2016	63.9	19.6	31%
2017	49.5	16.5	33%
2018	46.7	15.5	33%
2019	47.7	17.9	38%

- In these calculations, a “Financial Trader” refers to an organization that buys transmissions rights but does not complete a physical trade on at least one of the Ontario interties within a given year.



AN INDIVIDUAL INTERTIE

AN INDIVIDUAL INTERTIE: 3 COMPONENTS



A Focus on Ontario to Michigan Exports

- The ON-MISI tie was chosen as a case study
 - It had the largest transaction volume in 2019
 - It had the highest percentage of congested hours in 2016-2019
 - Due to these factors, we anticipated high participation in the TR market and also use of TRs on this intertie
- In the future, the IESO plans to complete similar assessments of less competitive interties for comparison

Percentage of Hours with Transmission Congestion

		2016	2017	2018	2019	Transaction Volumes (MWh) - 2019
Export	Manitoba	36%	20%	33%	28%	739,373
	Michigan	82%	85%	67%	70%	9,566,455
	Minnesota	45%	52%	30%	43%	520,472
	New York	40%	48%	38%	36%	6,319,055
	PQAT	0%	0%	2%	4%	2,522,512
	PQDA					678
	PQHZ	0%			0%	112,127
Import	Manitoba	0%	0%	0%	0%	514,242
	Michigan					83,921
	Minnesota	1%	0%	0%	0%	63,894
	New York					21,006
	PQAT	2%	3%	3%	2%	4,871,220
	PQBE	0%	0%	0%	0%	758,591
	PQDA			0%		275
	PQDZ		0%	0%	0%	80,807
	PQPC		0%	0%		220,884
	PQXY		0%	0%		840

- Michigan is highlighted in the table because it has the highest percentage of hours with 9,566,455 total transaction volumes in export for 2019

Summary (Table on Slide 59-62)

- What did we look at?
 - We looked at heat maps of congestion prices, TRs sold, and auction clearing prices on the ON-MISI intertie by year and month over 16 years
- Why did we assess it?
 - We wanted to observe year-to-year or seasonal variation in congestion and TR auctions outcomes over the ON-MISI intertie
 - The purpose of the heatmap is demonstrate a trend, not to analyze specific data points

Summary (Table on Slide 59-62) Continued

- IESO observations:
 - Over a longer historical time period, the frequency and magnitude of congestion over the ON-MISI tie has significantly increased
 - There have been broad trends but there remains significant month-to-month variation
 - Large changes in the number of TRs sold
 - Clear seasonal patterns are not obvious

Slide 59-ON-MISI Congestion – Monthly Cost

Congestion Cost (Monthly ICP/MW) – ON – MISI Export

Month	Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
1		0	0	0	0	3825	35	670	931	254	80	7057	2025	11772	7895	26794	5140
2		0	2	7	480	354	2	418	436	610	91	911	3711	13060	6025	5313	1390
3		58	145	15	0	1457	4652	275	130	866	1600	355	6491	12249	9244	9447	2418
4		0	1	739	425	3137	6778	0	0	971	2924	2899	5158	12468	22225	5001	8876
5		933	0	9	680	4841	403	151	3755	3123	5852	8674	12796	8437	22539	17480	13661
6		0	0	0	369	4942	2353	950	1415	1076	5391	6035	6854	7197	17928	11084	15992
7		4	178	0	73	3399	2638	849	4104	1854	3671	2630	6399	9716	15704	3796	7946
8		0	0	59	415	2498	674	387	489	663	2548	4010	5225	4517	9898	3708	8131
9		0	0	0	56	435	335	187	67	434	5537	8942	1003	15525	11220	5897	9102
10		0	0	0	54	53	132	15	64	1583	2806	12772	4528	14085	20879	16778	14346
11		0	0	0	0	758	3481	0	113	2778	5687	8660	10598	7711	10544	11084	4897
12		0	0	0	7	2879	341	0	786	118	425	7217	10718	11258	16332	7802	3744

Highest Values 

Lowest Values 

Slide 60-ON-MISI Congestion – Number of Hours

Month	No. of Hours of Congestion – ON – MISI Export															
	Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
1	0	0	0	0	175	6	53	60	28	17	105	197	659	459	490	358
2	0	1	2	12	23	1	44	19	105	14	55	202	644	495	322	159
3	1	7	1	0	90	205	36	13	99	137	34	486	707	500	600	291
4	0	2	28	20	127	298	0	0	150	227	223	423	665	684	392	451
5	18	0	2	40	244	47	15	77	206	383	557	591	633	736	682	685
6	0	0	0	11	153	217	98	55	94	290	384	560	539	696	637	700
7	1	5	0	5	129	226	41	138	147	239	333	518	543	706	321	604
8	0	0	5	14	131	81	19	26	63	246	402	442	408	649	326	670
9	0	0	0	3	31	52	17	9	48	419	463	99	689	616	390	653
10	0	0	0	1	13	26	1	6	196	249	649	445	695	735	636	722
11	0	0	0	0	40	156	0	12	270	408	485	636	525	572	509	443
12	0	0	0	1	54	48	0	86	19	68	555	688	530	591	534	370



Slide 61-Heat Maps of TRs Sold – ON-MISI

- Data shows the quantity of TRs sold in each auction and the start date of the TR ownership period. LT TRs are valid for 12 months, so the valid number of LT TRs is greater than shown, e.g. the valid number of LT TRs for Q1 2019 is 376, the sum of LT TRs sold for Q2-Q4 2018 and Q1 2019

ST TR Ownership Period Month

Year

ST TRs Sold – ON to MISI – Export

Month	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
1	478	233	224	576	656	590	555	690	1524	1440	533	333	776	474	374	374
2	478	230	224	576	694	368	743	690	1524	1440	533	362	822	724	724	1024
3	454	294	224	620	740	343	826	690	1524	840	533	392	724	674	724	724
4	135	265	352	455	0	0	859	0	1524	570	603	529	424	424	324	324
5	0	162	326	0	0	1191	59	0	1474	1160	503	561	674	424	574	324
6	43	195	359	525	0	1275	879	480	1424	960	503	519	424	424	724	1024
7	50	195	259	531	372	320	1870	480	1424	773	503	723	424	424	374	1024
8	43	195	259	531	372	690	1870	480	1424	773	903	612	1124	724	374	1024
9	86	227	446	0	129	388	1320	0	1424	773	403	797	1124	424	324	574
10	86	227	411	131	129	285	1087	315	1094	750	176	742	424	424	324	1038
11	200	330	391	927	0	0	0	590	1524	800	176	783	424	374	374	188
12	233	73	56	163	0	600	0	0	1434	550	176	826	424	724	324	338

Start of LT TR Ownership Period

Year

LT TRs Sold (R1+R2) – ON to MISI Export

Quarter	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Q1	498	180	0	0	315	141	0	1290	276	270	187	0	94	94	94	94
Q2	658	687	659	661	661	0	0	0	0	270	200	94	94	94	94	94
Q3	240	240	340	334	0	991	0	0	0	187	187	94	94	94	94	94
Q4	280	280	315	0	0	0	0	0	0	23	0	94	94	94	94	30

Highest Values 

Lowest Values 

Slide 62-Heat Maps of Auction Clearing Prices – ON-MISI

- Clearing prices reflect expected congestion in the applicable ownership period, 1 month for ST auctions, 12 months for LT auctions

STTR Ownership

ST Auction Clearing Prices (\$/MW-Month) – ON to MISI - Export

Period	Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Month	1	10	50	41	41	8	362	198	305	650	1362	2894	6245	4621	10475	7821	12685
	2	9	1	14	14	390	367	244	578	77	356	2620	6176	6145	7855	12036	4065
	3	0	5	17	89	744	295	209	337	104	743	2801	3678	7373	8201	8411	3775
	4	2	72	18	18	0	0	151	0	410	1232	1455	4221	6586	12960	13615	6746
	5	0	25	21	0	0	201	321	0	930	2662	4494	8005	14962	11822	10788	
	6	6	1	51	230	0	92	330	382	1504	1498	3799	5575	8656	11570	12161	2794
	7	374	17	121	322	5781	1741	375	1250	1719	2738	4787	6897	10848	12649	11664	7901
	8	379	14	144	781	5600	1845	387	1438	1691	2887	2526	7462	5394	12689	8555	4956
	9	152	24	225	0	1203	1598	108	0	1034	2002	2913	5947	7395	11887	8752	7063
	10	18	1	19	276	800	513	98	258	243	2265	4486	2701	11108	12983	12671	11450
	11	15	7	8	79	0	0	0	310	488	2265	7020	4009	13102	11543	11111	9254
	12	10	40	61	231	0	341	0	0	1074	3000	7626	4494	10601	7415	12055	7522

Start of LTTR

LT R1 Auction Clearing Prices (\$/MW-Year) – ON to MISI - Export

Ownership Period	Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Quarter	Q1	101	876	0	0	1702	8497	0	3125	11236	16375	25028	0	59270	110000	136218	126039
	Q2	104	502	104	712	3012	0	0	0	0	11102	32128	39879	75000	106084	127020	96625
	Q3	269	460	485	1080	0	6804	0	0	0	15339	36778	57009	107398	129210	140160	79056
	Q4	260	490	844	0	0	0	0	0	0	19710	0	65880	100740	118388	123250	74664

Highest Values



Lowest Values



Summary (Graph on Slide 65)

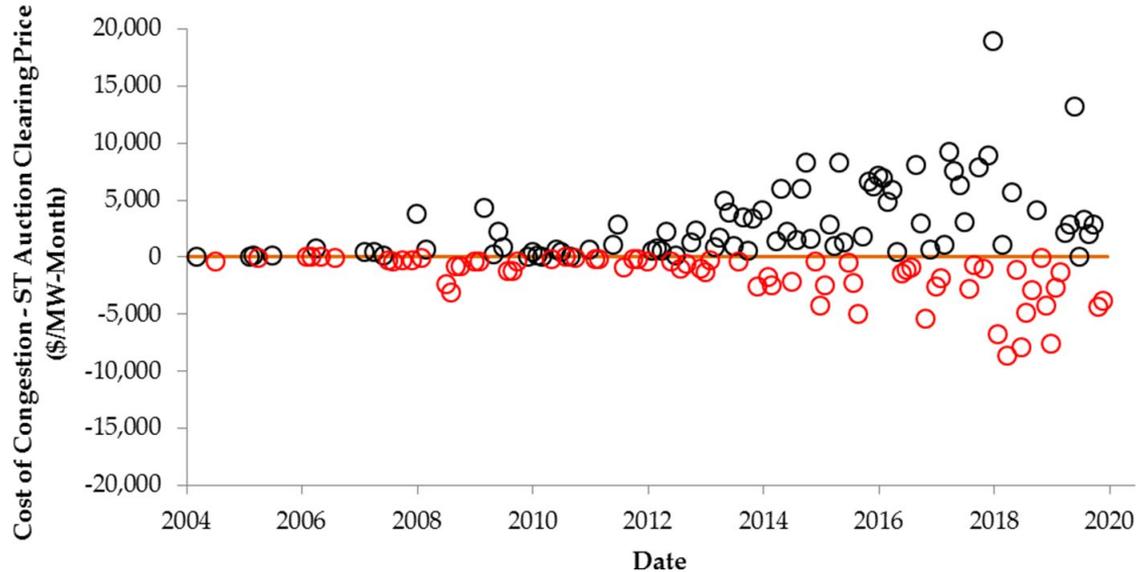
- What did we look at?
 - We looked at TR payouts (the cost of congestion) minus the cost of purchasing TRs (the ST auction clearing price) over time, by month, on the ON-MISI tie
- Why did we assess it?
 - We wanted to see how closely market participants were able to predict the cost of congestion

Summary (Graph on Slide 65) Continued

- IESO observations:
 - The data suggests that predicting month-to-month changes in the cost of congestion is challenging
 - As congestion costs increase, differences between TR payouts and the cost of purchasing TRs can become amplified

Slide 65-Cost of Congestion-ST Auction Clearing Price by Date

TR Payout (Cost of Congestion) - Cost of TRs (ST Auction Clearing Price), by Date



Summary (Chart on Slide 68-69)

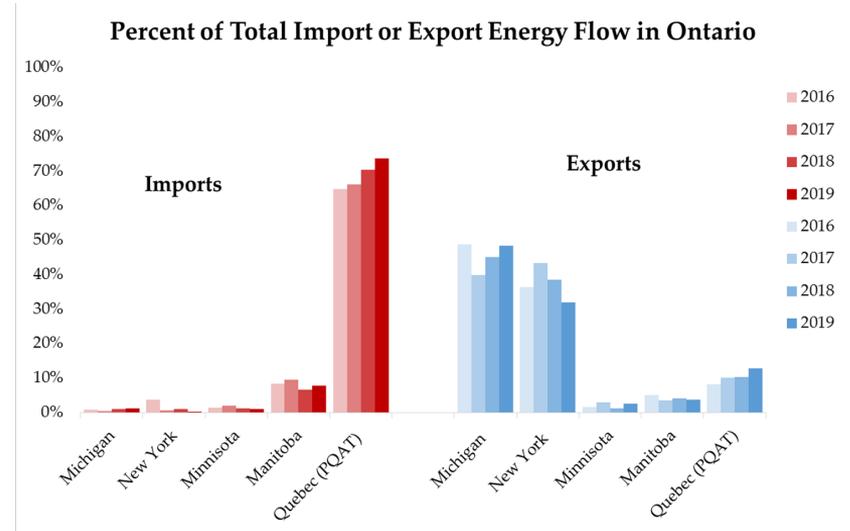
- What did we look at?
 - ST auction clearing prices, the standard deviation of bids, and the percentage of participants that flowed who also cleared the auction, on the ON-MISI tie in 2019 by month
- Why did we assess it?
 - We wanted to observe (1) the month to month variation of auction clearing prices and bids, (2) if bidders who did not clear the auction still flow, and (3) the percentage of non-flowing participants that clear

Summary (Chart on Slide 68-69) Continued

- IESO observations:
 - High month-to-month volatility in clearing prices and bids, and many participants flowed despite not clearing the auctions
 - Often participants cleared but did not flow, which may provide an indication of the value financial traders play in establishing an efficient clearing price for congestion
 - IESO welcomes stakeholder input on how to interpret the data
 - Why are physical traders not always able to secure transmission rights in the auction?

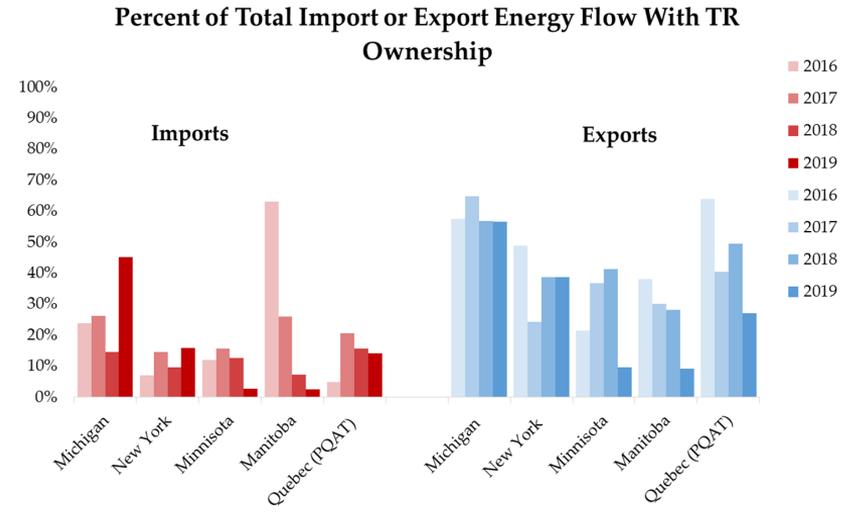
Slide 68-Percent of Total Import/Export Energy Flow in Ontario

- Percent of Imports for Quebec were higher than 70% in 2019 and the highest
- Percent of Exports in general were lower than 50% from 2016 to 2019



Slide 69-Percent of Total Import/Export Energy Flow with TR Ownership

- Exports in 2019 were less than 60 percent with Michigan being the highest
- Imports in 2019 were less than 50 percent with Michigan being the highest



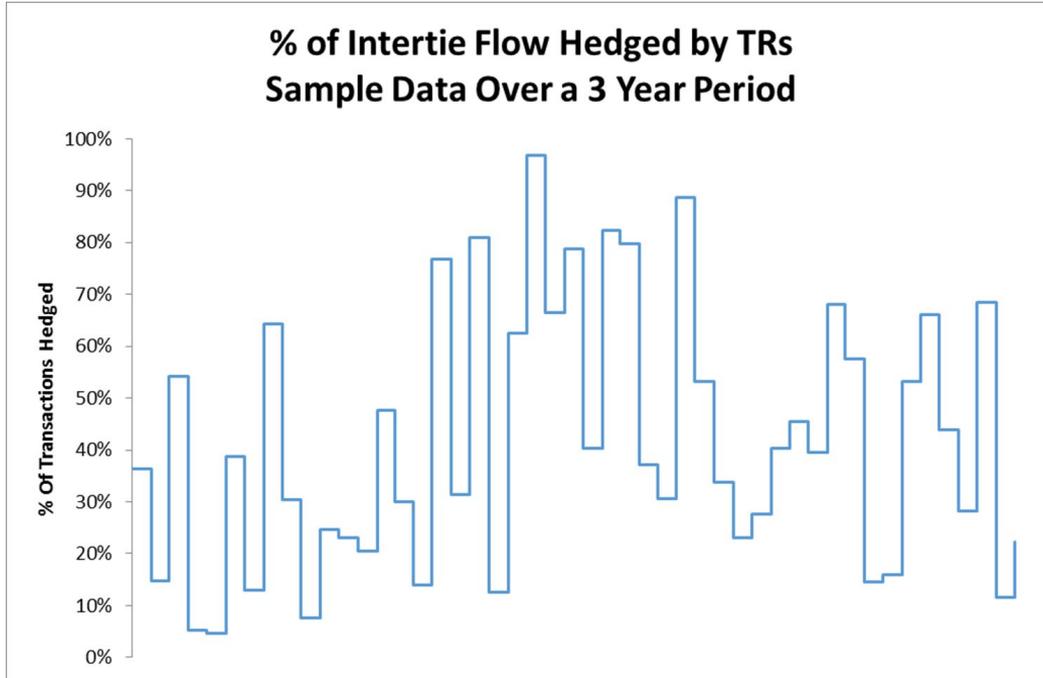
Summary (Chart on Slide 72)

- What did we look at?
 - The percentage of intertie flow hedged by TRs by month for a sample 3 year period
- Why did we assess it?
 - To see if there was relatively low or high variability in month-to-month percentage hedged transactions during a period in which the intertie was typically congested

Summary (Chart on Slide 72) Continued

- IESO observations:
 - There was high month-to-month volatility in the percentage of hedged transactions
 - Some transactions were always hedged due to the ownership of LT TRs

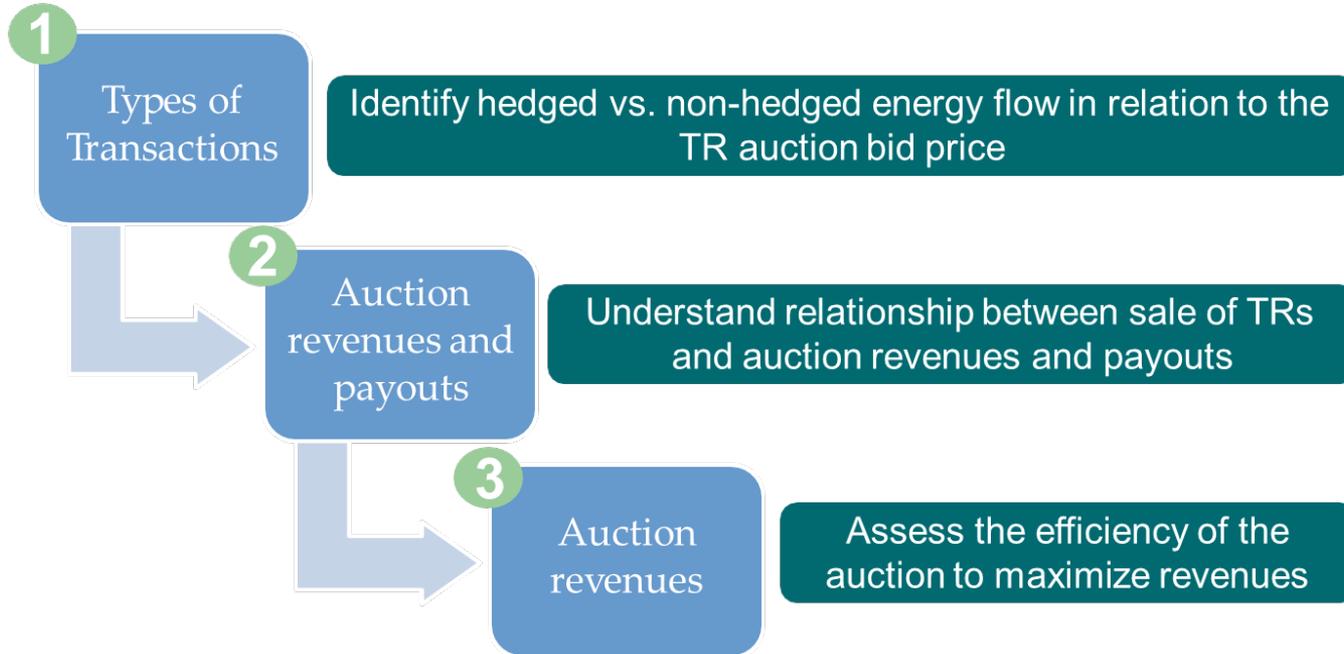
Slide 72 -Percentage of Intertie Flow Hedged by TRs





AN INDIVIDUAL AUCTION

AN INDIVIDUAL AUCTION: 3 COMPONENTS



Summary (Graph Slides 78-80)

- What did we look at?
 - We looked at the bid curves and compared auction revenue and TR payouts for a number of ST auctions on an intertie
- Why did we assess it?
 - We wanted to observe (1) hedged vs. non-hedged energy flow in relation to the TR auction bid price, (2) TR auction revenue and payout vs. TRs sold, and (3) whether TR auction revenue was maximized in particular auctions

Summary (Graph Slides 78-80) Continued

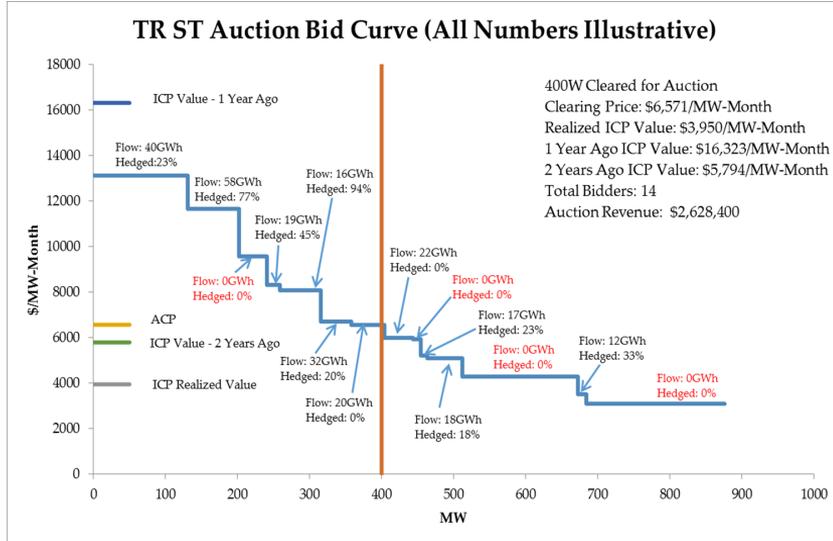
- **Important Note**

- The IESO is only showing illustrative data and not actual data for slides 78-80. Illustrative data was constructed by taking actual data and adding randomization elements to its individual components. Bid prices and quantities, flow and % hedged quantities, ICP values, and MW sold are all representative only and are not real data

Continued Summary (Graph Slides 78-80)

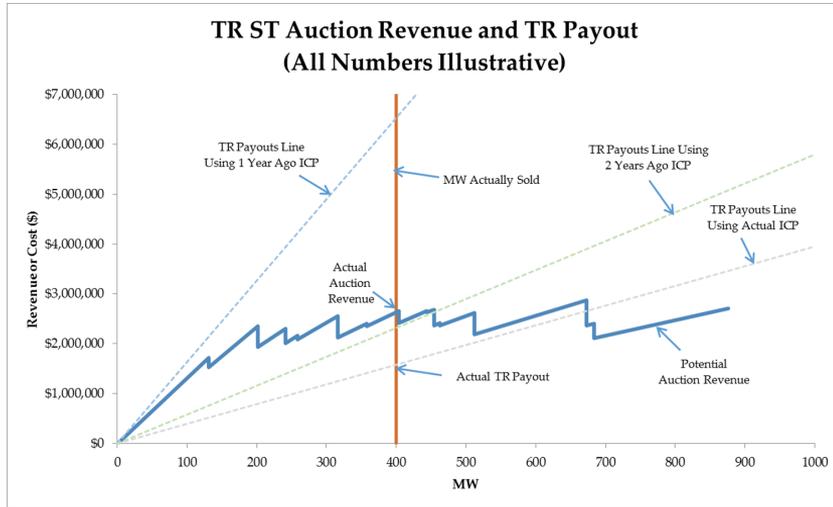
- IESO observations:
 - TR auction revenue depends strongly both on TRs sold and participants bids
 - TR payouts depends on the ICP, which appears to be volatile and hard to predict.
 - TRs appear risky for traders, considering the highly uncertain nature of ICP:
- If so, the value of TRs to market participants and Ontario ratepayers might not be being maximized
- The IESO would need to complete a much larger assessment to understand the extent that this is representative of the TR market as a whole

Slide 78-TR ST Auction Bid Curve (All Numbers Illustrative)



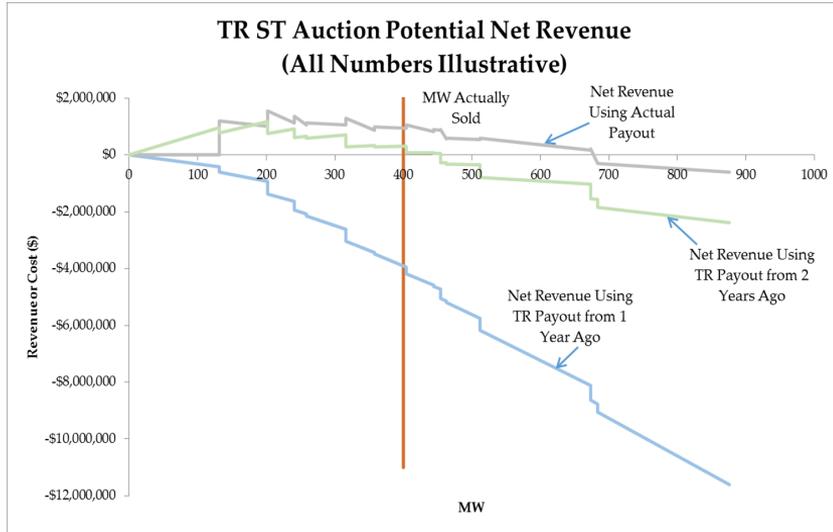
- Flow is calculated for this intertie and month only, does not indicate status as physical or financial trader. Hedged % was calculated based on both LT and ST TRs
- Price of MW per month ranges from \$0 to \$18,000
- Number of MW ranges from 0 to 1000

Slide 79-TR ST Auction Revenue and TR Payout (All Numbers Illustrative)



- Revenue cost ranges from \$0 to \$7,000,000
- Number of MW ranges from 0 to 1000
- For example, actual auction revenue at 400 MW equals \$2,500,000 on the graph
- For example, actual TR payout at 400 MW equals \$1,500,000 on the graph

Slide 79-TR ST Auction Potential Net Revenue (All Numbers Illustrative)



- Revenue cost ranges from $-\$12,000,000$ to $\$2,000,000$
- Number of MW ranges from 0 to 1000
- Net Auction Revenue = Auction Revenue – TR Payout
- For example, net revenue using TR payout from 1 year ago equals $-\$4,000,000$ at 400 MW on the graph
- For example, net revenue using actual TR payout at 400 MW equals $\$1,000,000$ on the graph

Overall Summary – Market Mechanism

- The TR auction is able to price intertie congestion risk and provides participants an opportunity to hedge this risk
- Data indicates there is increased demand and willingness to pay for TRs as imports/exports increase
- Data indicates that TRs are being used in some capacity as a complimentary product to physical flow

Overall Summary – Market Mechanism Continued

- However, it is not obvious to the IESO whether TRs are actually used for hedging purposes and the extent that they enable efficient intertie trade
- Stakeholder feedback is welcome to help us understand how TRs are used in practice

Overall Summary – Market Design

- Intertie congestion is hard to predict, which makes it challenging for participants to price their bids accurately
- Potential inefficiencies in the current design may limit the value of TRs to market participants directly and Ontario consumers indirectly through less efficient intertie trade
- Data suggests that financial participants can play an important role in providing liquidity and competition to generate efficient TR clearing prices and maximise auction revenues for the benefit of Ontario ratepayers

Overall Summary – Market Design Continued

- How an efficient TR market translates into a net benefit for Ontario is still to be determined
- Stakeholder input is crucial to help IESO understand various perspectives before drawing any firm conclusions

Key Questions for Stakeholders

Stakeholder feedback will be critical in enabling the IESO in making a holistic assessment of TRs in the Ontario market and particularly to Ontario ratepayers

- How are TRs used in practice by stakeholders? Do TRs provide an appropriate or optimal hedge against congestion?
- How do stakeholders manage the risk associated with TRs?

Key Questions for Stakeholders Continued

- What improvements to the current design would you suggest to help maximize the value of TRs and encourage greater participation in the TR market?
- To support the TR review, are there lessons learned from other jurisdictions that you could provide from your experience in trading elsewhere?

Next Steps

- Written feedback can be provided to engagement@ieso.ca using the feedback form on the engagement web page by June 11
- Based on stakeholder feedback, the IESO will summarize findings for Stage 1 – Value Assessment and report to stakeholders in the subsequent stakeholder engagement session expected to take place in Q3 2020

Questions?

Appendix Slides

- The following is a relatively large appendix that contains supplementary data slides that are hyperlinked to previous slides in the presentation
- They are intended to provide additional information and to allow participants to explore various aspects of the data further if needed

Origins of Transmission Rights

- Transmission Rights (TRs) were introduced in the U.S. to help wholesale electricity consumers and load serving entities (LSEs) manage the price risk (due to congestion) of flowing power across different price zones
- There are many factors that can cause congestion to occur, exposing LSEs and their customers to a high degree of financial risk without a natural hedge against it. This creates difficulty for consumers and LSEs to fulfill their obligation to serve loads and support the cost of operating the transmission network through regulated rates

Origins of Transmission Rights Continued

- Allocating TRs to consumers and LSEs is expected to provide insurance against congestion, significantly reducing this price risk
- Creating a market for TRs allows consumers and LSEs the opportunity to sell TRs they don't think they need and allows financial traders the opportunity to purchase TRs, thereby maximizing the value of TRs to consumers

Ontario TR Market

- The Ontario TR market was established at market opening and has been operating largely based on its original design.
 - With the uniform market price in Ontario, TRs are not needed to hedge internal congestion costs, but offered solely on the interties to provide a hedge against intertie congestion costs (price difference between an intertie zone and Ontario).
- The value of the TR market is significant and generates on average \$150 million in auction revenue each year from up to 30 TR market participants, including physical and financial traders.

Ontario TR Market Continued

- TRs are offered on long-term (annual) and short-term (monthly) durations through quarterly and monthly TR auctions.
- TRs are financial instruments and do not guarantee physical transmission service or impact the scheduling of transactions.

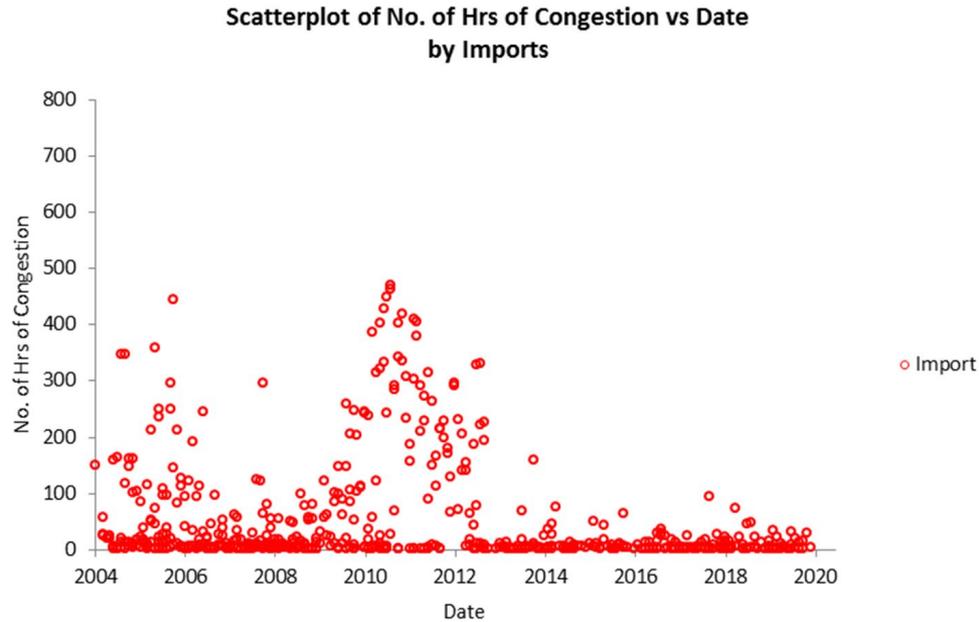
Transmission Rights Auctions

- Ontario exports to 5 different jurisdictions, Quebec (PQ), New York (NYSI), Minnesota (MSNI), Michigan (MISI), Manitoba (MBSI)
- There are 17 TR action paths in total, including ten import paths and seven export paths.
 - The ten import paths for which TRs are sold are: MICH-ON (Michigan), NY-ON (New York), QOUTA-ON (Quebec HVDC), MAN-ON (Manitoba), QBEAU-ON (Quebec), QP33C-ON (Quebec), QD5A-ON (Quebec), MIN-ON (Minnesota), QD4Z-ON (Quebec) and QX2Y-ON (Quebec)

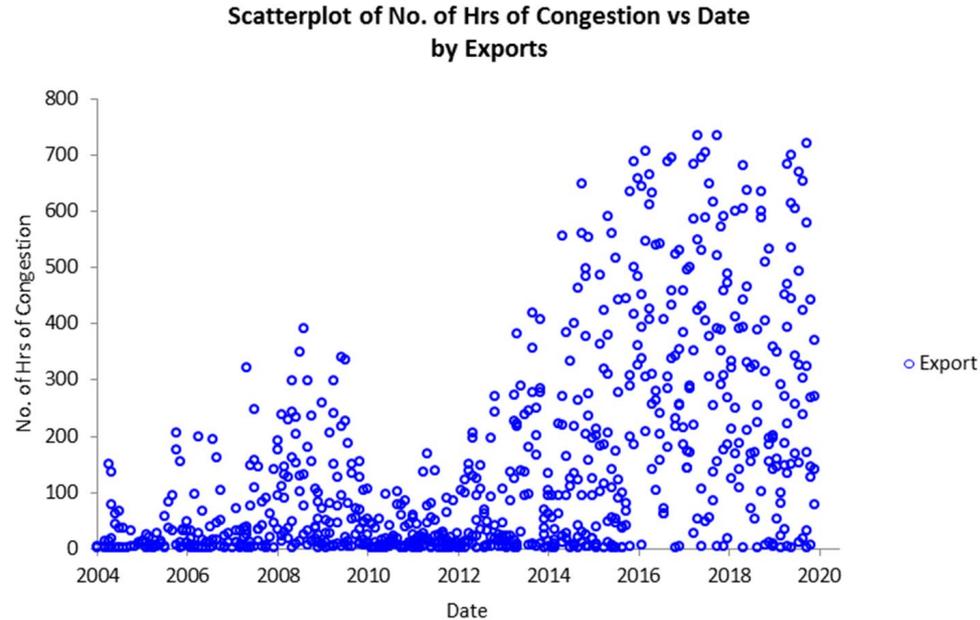
Transmission Rights Auctions Continued

- The seven export paths for which TRs are sold are: ON-MICH (Michigan), ON-NY (New York), ON-QOUTA (Quebec HVDC), ON-MAN (Manitoba), ON-QD5A (Quebec), ON-MIN (Minnesota), ON-QH4Z (Quebec)
- Transmission Rights are offered on long-term (annual) and short-term (monthly) durations through TR auctions

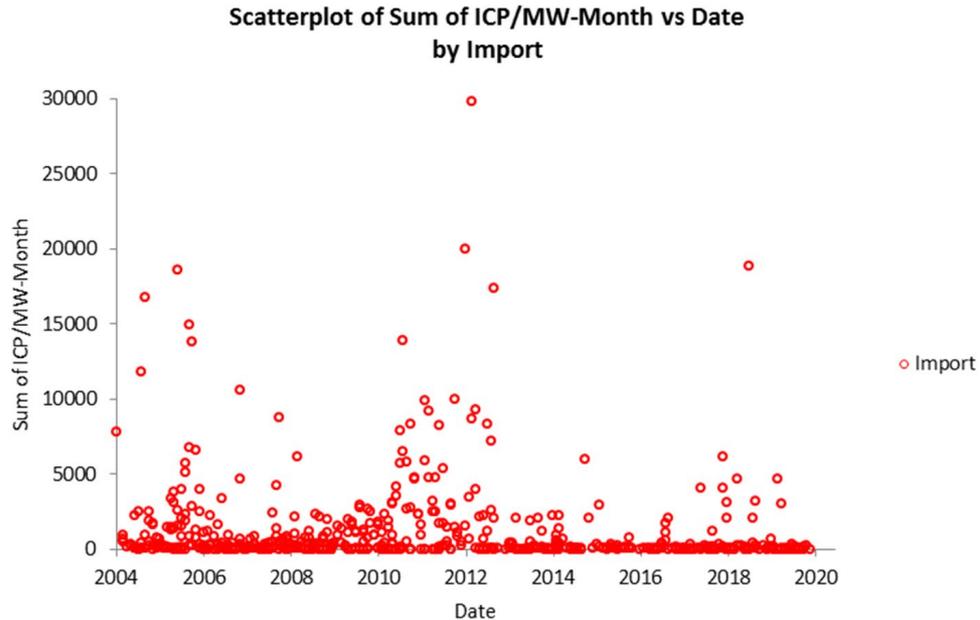
Appendix A – Scatterplot Graph of Number of Hours of Congestion vs. Date by Imports



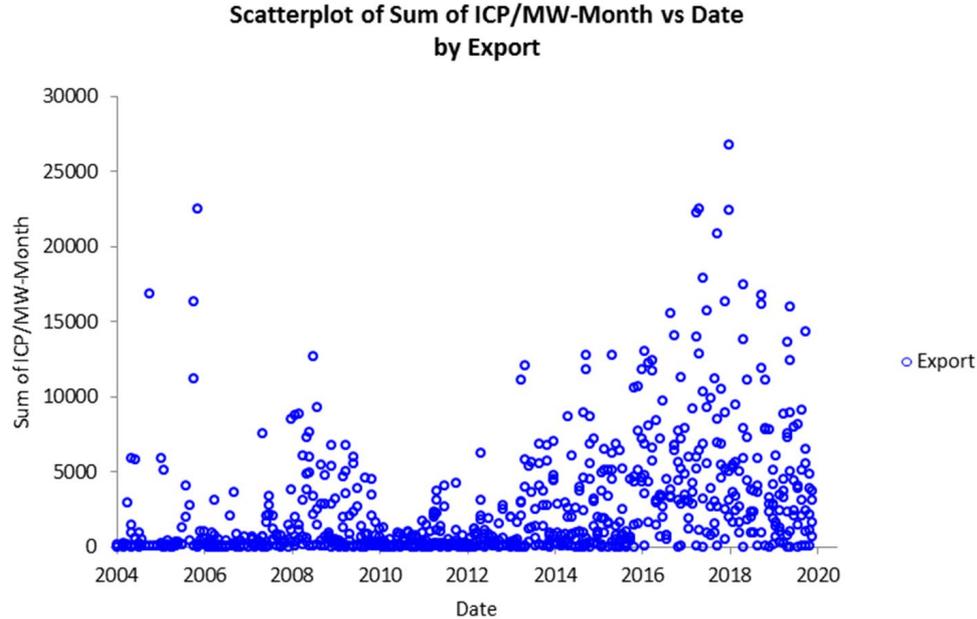
Appendix B – Scatterplot Graph of Number of Hours of Congestion vs. Date by Exports



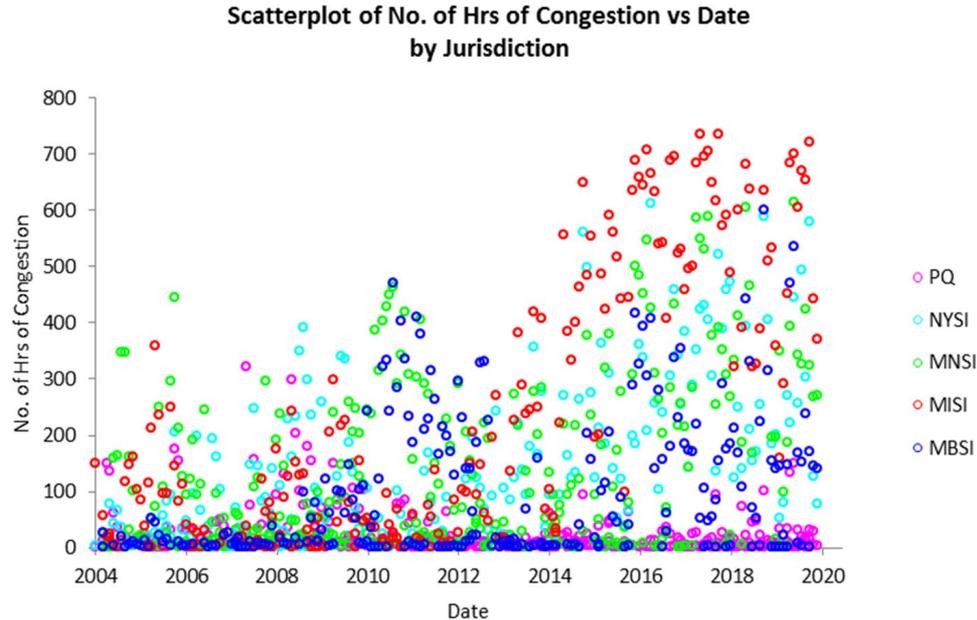
Appendix C – Scatterplot Graph of Sum of ICP/MW per Month vs. Date by Import



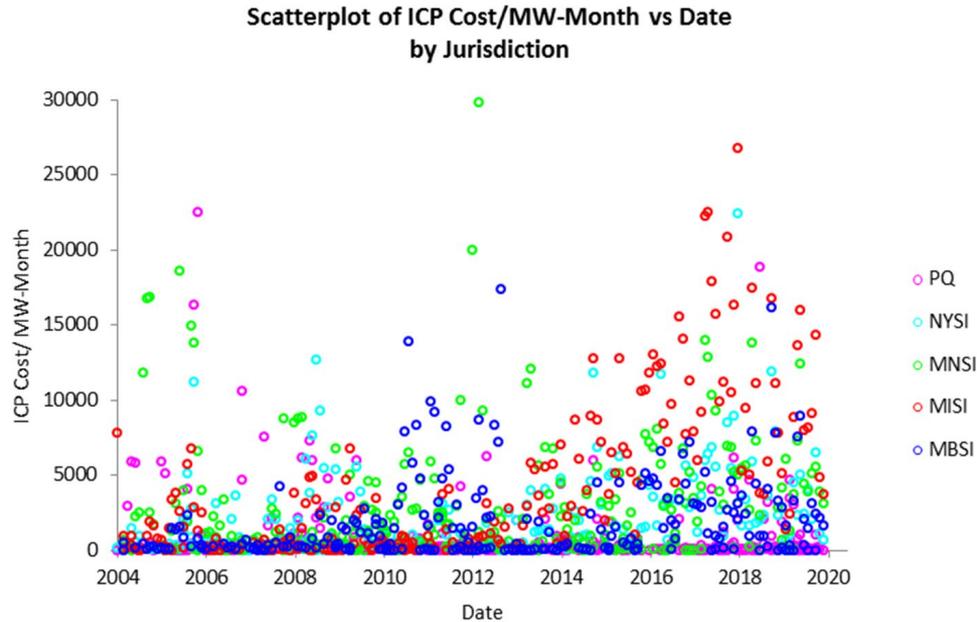
Appendix D – Scatterplot Graph of Sum of ICP/MW per Month vs. Date by Export



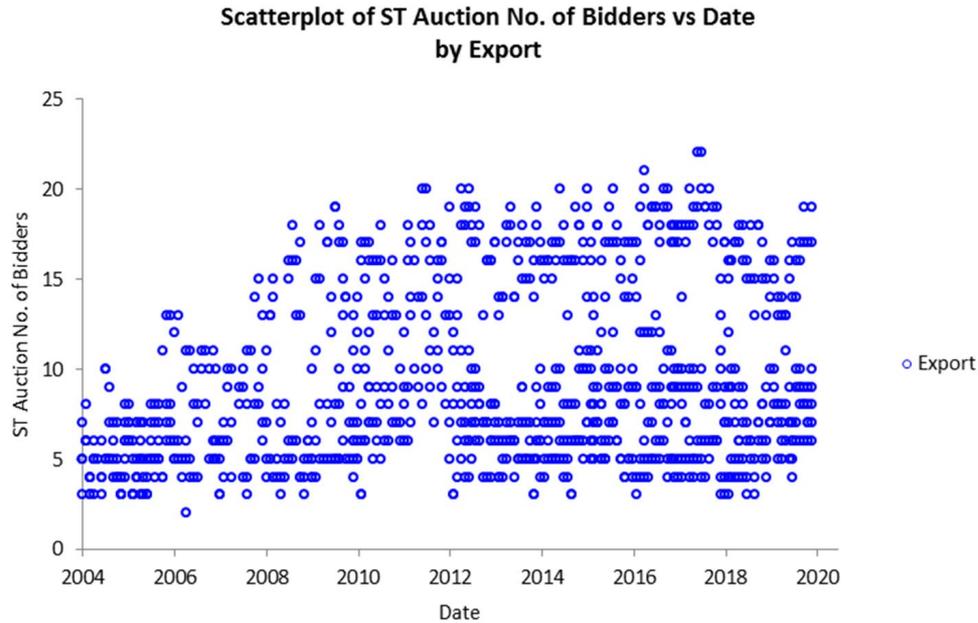
Appendix E – Scatterplot Graph of Number of Hours of Congestion vs. Date by Jurisdiction



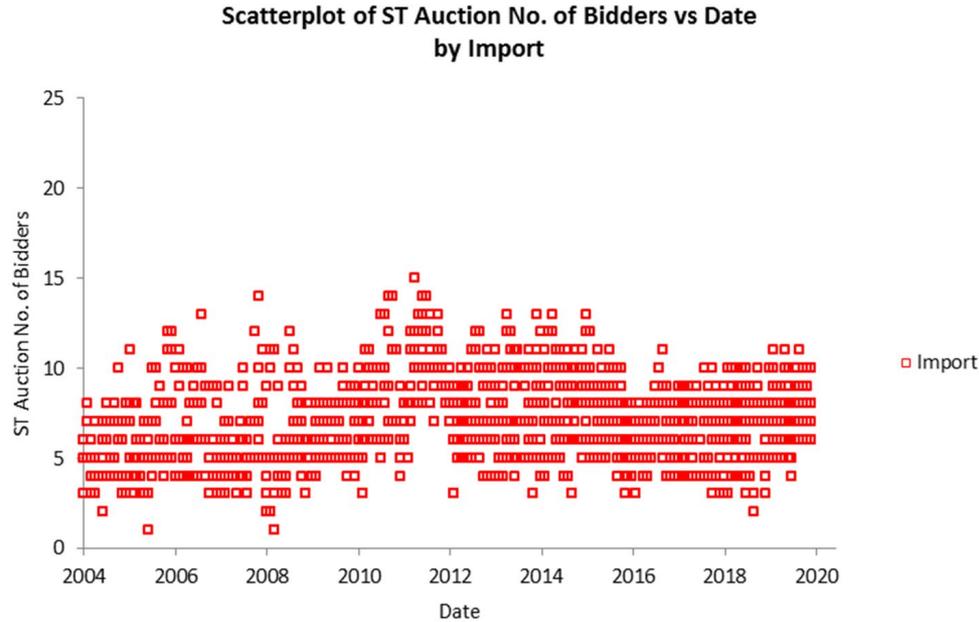
Appendix G – Scatterplot Graph of Sum of ICP/MW per Month vs. Date by Jurisdiction



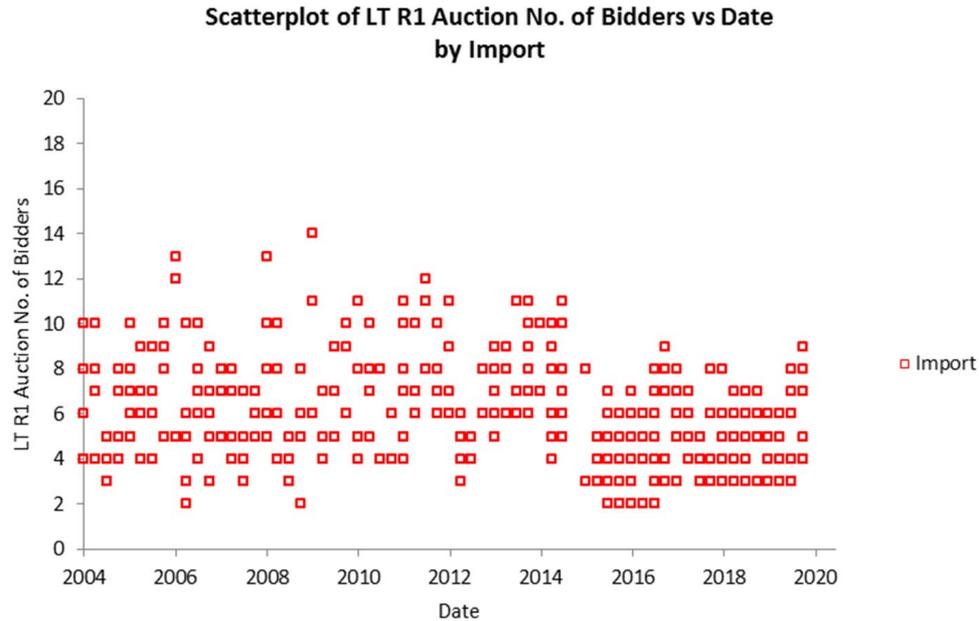
Appendix H – Scatterplot Graph of ST Auction Number of Bidders vs. Date by Export



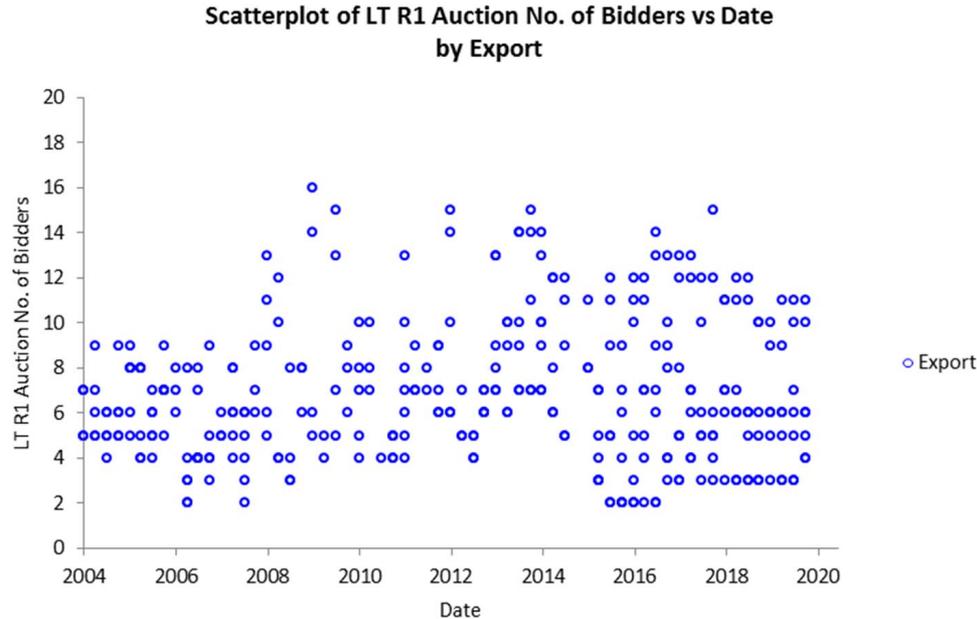
Appendix I – Scatterplot Graph of ST Auction Number of Bidders vs. Date by Import



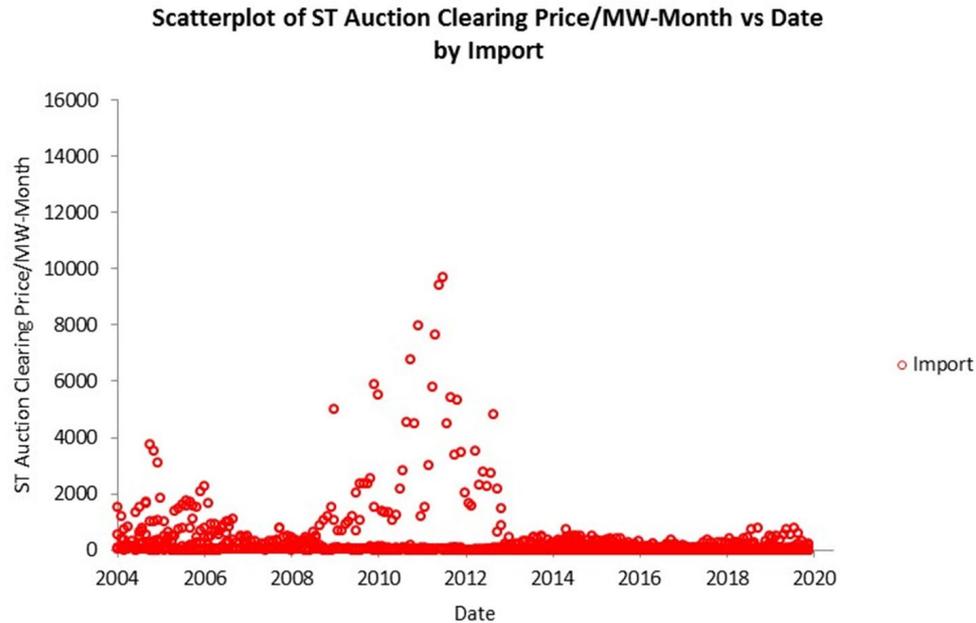
Appendix J – Scatterplot Graph of LT R1 Auction Number of Bidders vs. Date by Import



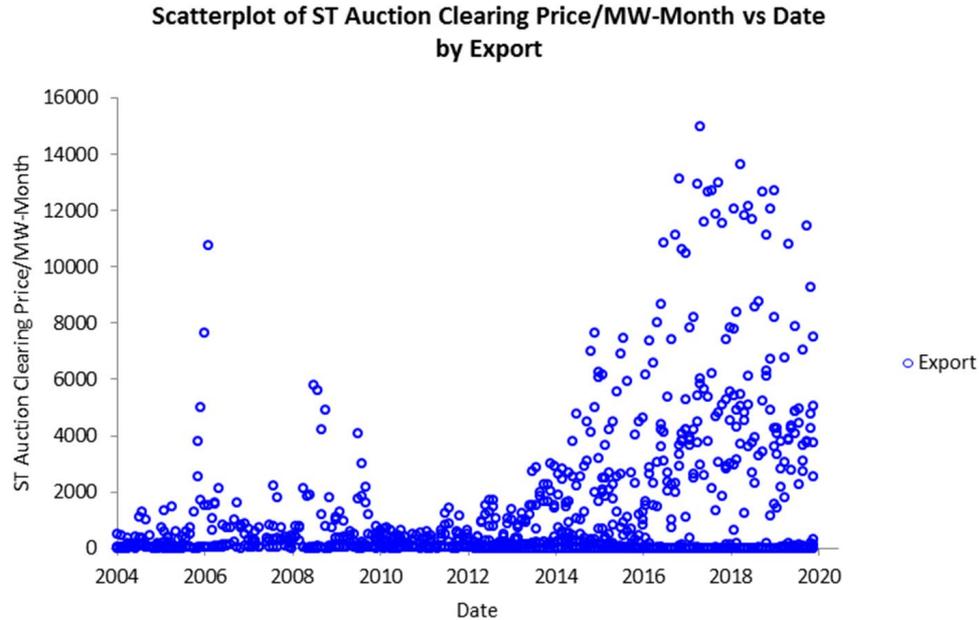
Appendix K – Scatterplot Graph of LT R1 Auction Number of Bidders vs. Date by Export



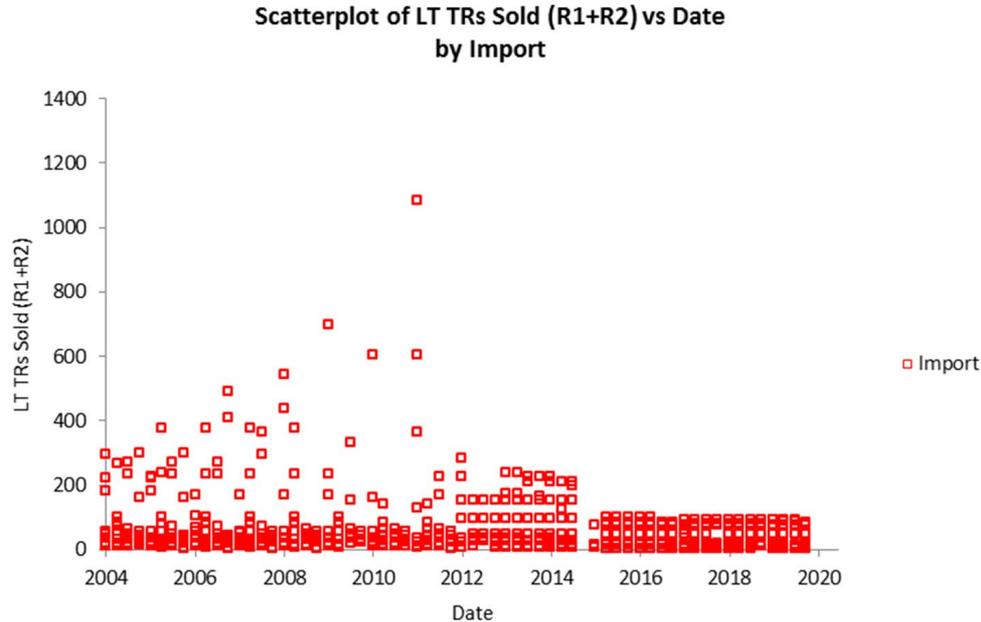
Appendix L – Scatterplot Graph of ST Auction Clearing Price per Month vs. Date by Import



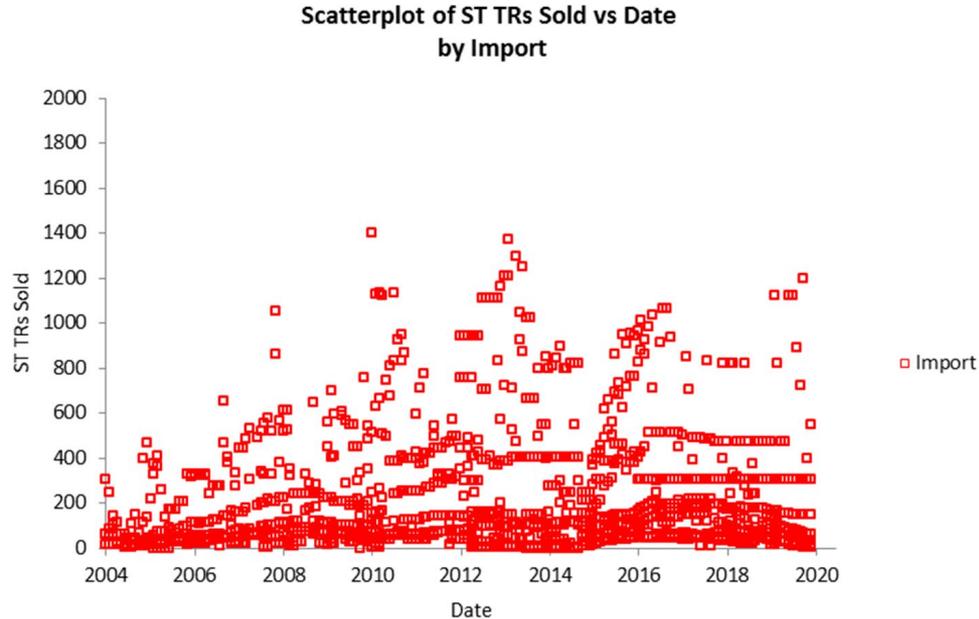
Appendix M – Scatterplot Graph of ST Auction Clearing Price per Month vs. Date by Export



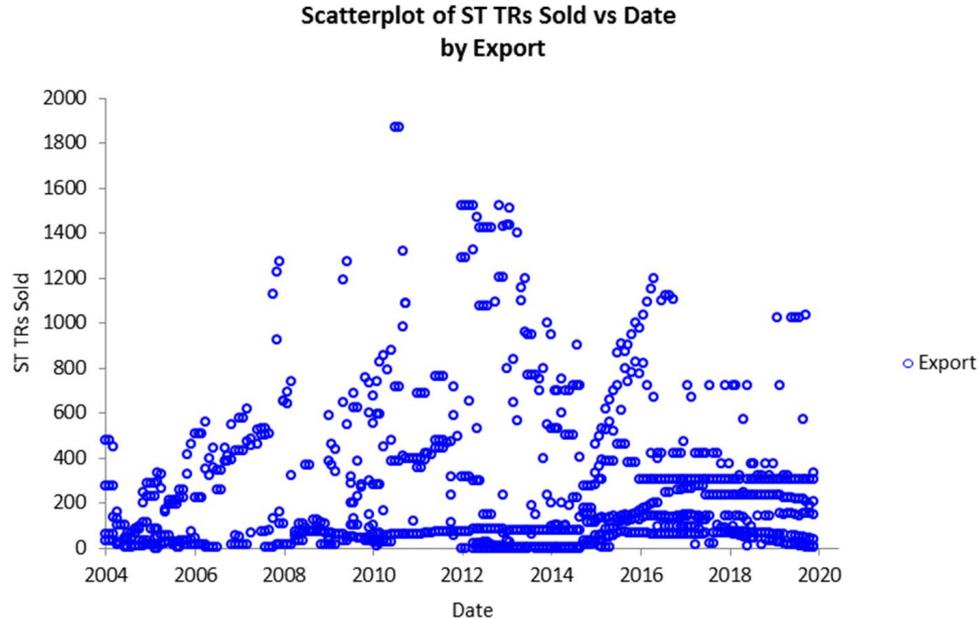
Appendix N – Scatterplot Graph of LT TRs Sold vs. Date by Import



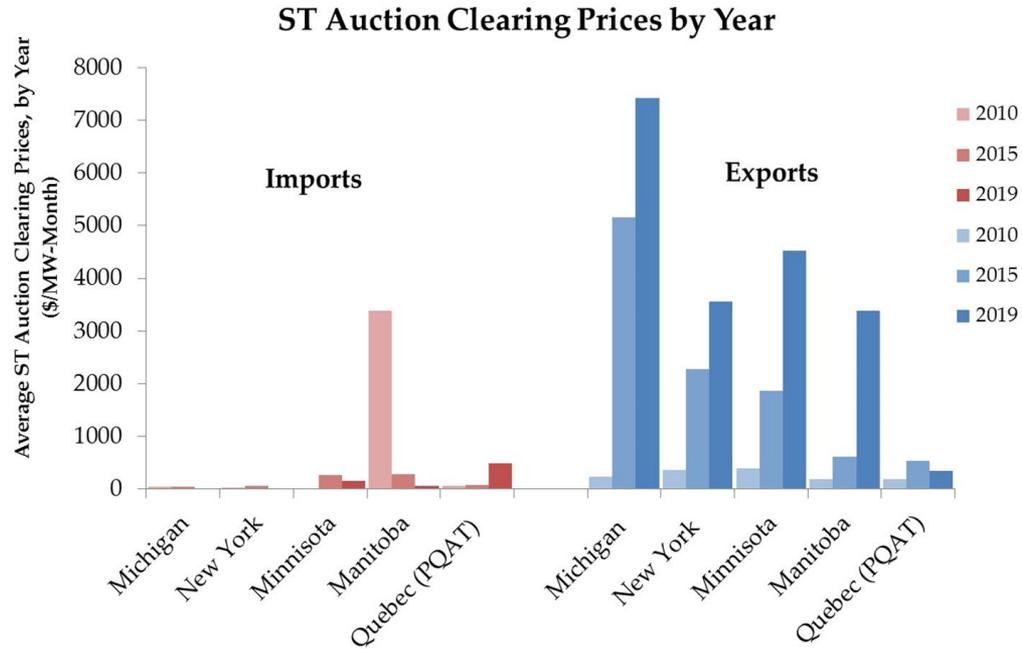
Appendix P – Scatterplot Graph of ST TRs Sold vs. Date by Import



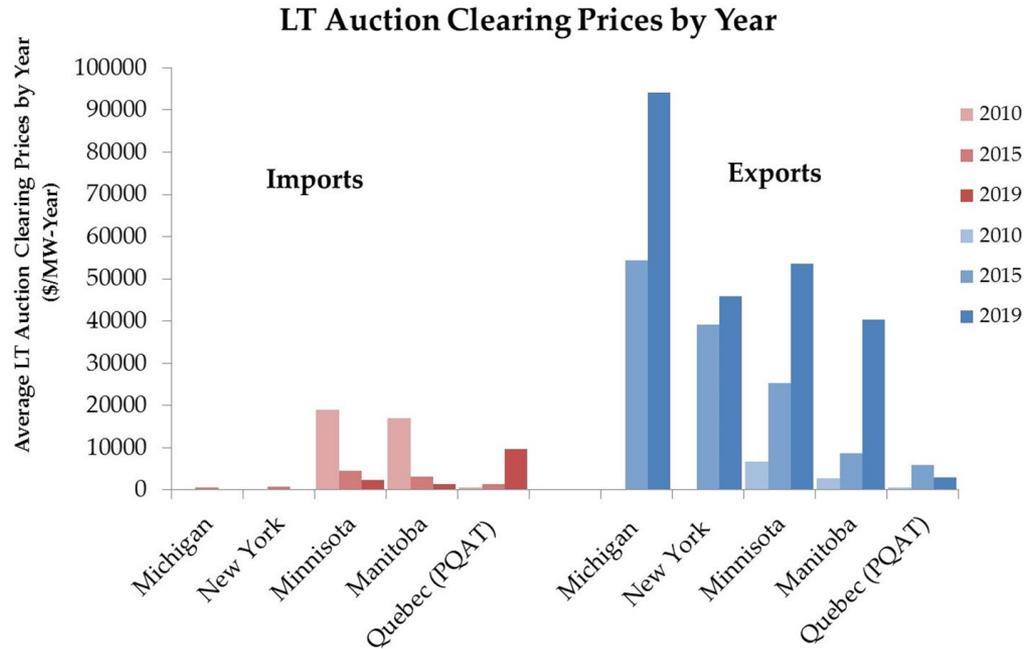
Appendix Q – Scatterplot Graph of ST TRs Sold vs. Date by Export



Appendix R – Bar Chart of ST Auction Clearing Prices by Year



Appendix S – Bar Chart of LT Auction Clearing Prices by Year



Thank You

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