

Generic Uniform Transmission Rate Issues Proceeding Export Transmission Service Rate

EB-2021-0243
Presentation Day Materials

August 4, 2022

CRA Charles River
Associates

Agenda

- Scope of Work
- Summary of Findings
- Study Methodology
- Export Rate Determination
- IR Topics Discussion
- Appendix 1 – Study Findings by Jurisdiction
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Scope of Work

- CRA was retained in 2012 to prepare a study (“2012 Jurisdictional Review”) for the IESO in response to OEB’s decision in proceeding EB-2010-0002. The 2012 Jurisdictional Review:
 - Identified a range of ETS tariffs in the US and Canada, their advantages/disadvantages and applicable rates
 - Was used to inform the proposed rates/rate design structure for the Ontario ETS rates
- In the most recent transmission rate application (EB-2019-0082) Hydro One was ordered by the OEB to provide an update to the 2012 Jurisdictional Review
 - CRA was retained in 2020 by Hydro One to update the 2012 Jurisdictional Review and report current export transmission service rates in other jurisdictions and, the rationale behind those rates where exists
- The results of this update were provided in the 2021 Jurisdictional Review of Export Transmission Service (ETS) Rates Study
- *This presentation provides an overview of the 2021 Jurisdictional Review of Export Transmission Service (ETS) Rates Study (“CRA 2021 Report”)*

Findings Summary

- Table 1 of the CRA 2021 Report summarizes the 2020 ETS rates
- ETS rate levels in general have increased since 2012 and display no changes in rate design.
- The rate level change is generally attributable to inflation and transmission expansion since last study (2012)
- The regulatory rationale for rate design differs across markets studied
 - For certain US jurisdictions ETS rates were developed from principles affirmed by the FERC Order No. 888/888-A.
 - ETS design was adopted from the former power pools in place before the formation of ISO/RTOs.
 - Other jurisdictions – mostly in Canada – rely on a variation of the US approach.
 - rates generally designed to recover total annual transmission revenue requirement (ATRR), rate design in US generally ATRR/capacity (More details on ATRR in later slide).
 - no specific cost allocation methodology identified.
 - No transmission applied congestion charges identified.

Table 1 Summary of 2020 Rates for Export Transmission Service (CAD)

		Annual Service \$/kW-year	Monthly Service \$/kW-month	Weekly Service \$/kW-week	Daily On-Peak Service \$/kW-day	Daily off-Peak Service \$/kW-day	Hourly On-Peak Charge \$/MWh	Hourly Off-Peak Charge \$/MWh
MISO	Firm	52.4801	4.3733	1.0092	0.2019	0.1438		
	Non-Firm		4.3733	1.0092	0.2019	0.1438	12.6154	5.9909
PJM	Firm	23.9089	1.9924	0.4597	0.0919	0.0657		
	Non-Firm		1.9924	0.4597	0.0919	0.0657	5.7468	2.7342
NYISO³		The energy-based rate for the Firm PTP service is different for each transmission company at the seam of NYISO, and it ranges between \$4.11 per MWh (Hydro-Québec) to \$7.75 per MWh (PJM).						
ISO-NE¹		163.6226						
SPP⁵	Firm	8.6951	0.7246	0.1672	0.0334	0.0239		
	Non-Firm		0.7246	0.1672	0.0334	0.0239	2.0899	0.9924
CAISO⁴								15.8482
Trans-Énergie²	Firm	78.06	6.51	1.50	0.30			
	Non-Firm		6.51	1.50	0.21		8.91	
Alberta⁴							8.28	
Ontario⁴							1.85	

1. ISO-NE does not distinguish between Firm and Non-Firm transactions and does not offer monthly, weekly, or daily transmission services. It offers hourly transmission service, and this is noted in Table 1 of Section 3 of this report.
2. TransÉnergie offers the same daily transmission service irrespective of time of day.
3. Non-firm service not offered.
4. Firm service not offered.
5. Schedules 7 and 8 rates also apply on a zonal basis for Point-to-Point transactions, in a range of \$16.8/kW-year to \$71.8/kW-year for annual firm service, and \$1.92/MWh to \$8.19/MWh non-firm.
6. Not clearly defined as either firm or non-firm, although rate is specific on energy basis and line capacity cannot be reserved for extended periods, therefore implied non-firm.

Source: CRA 2021 Report, Assumes FX \$.79 CD to \$USD @ January 20, 2021

Study Methodology

CRA's research methodology was to:

- Identify the applicable tariffed service and rate for generation export service in each jurisdiction;
- Obtain the applicable posted Open Access Transmission Tariff (OATT) from each market operator's website;
- Review the relevant tariff and confirm applicable rates and services for exports; and
- Conduct telephonic discussions with market operator staff where needed to confirm applicable tariff services and rates for exports

Export Rate Determination Overview

- Current ETS rate design was adopted from the former power pools that were in place in those regions prior to ISO/RTO implementation.
- These rates are generally designed to recover the total annual transmission revenue requirement (ATRR) over the forecasted annual billing units (12 Coincident Peak (CP) or zonal peak demand, or MWh basis). In these cases, the rates for export service are designed to recover total ATRR and there is no specific rate design or cost allocation approach applied to encourage a particular export market result.
- The ATRR is the amount of revenue a company must recover annually for costs associated with its transmission system.
- Approach is generally applied in all US jurisdictions with exception of CAISO, NYISO, and AESO that uses MWh as denominator. See Appendix

Costs typically included in the ATRR

- Investment Return and Associated Income Taxes;
- Transmission Depreciation and Amortization Expense;
- Transmission Related Amortization of Loss on Recquired Debt;
- Transmission Related Amortization of Investment Tax Credits;
- Transmission Related Municipal Tax Expense (if applicable);
- Transmission Related Payroll Tax Expense;
- Transmission Operation and Maintenance Expense;
- Transmission Related Administrative and General Expense;
- Transmission Related Integrated Facilities Charges;
- Transmission Support Revenue;
- Transmission Support Expense;
- Transmission Related Expense from Generators;
- Transmission Related Taxes and Fees Charge;
- Revenue for Short-Term service under the OATT; and
- Transmission Rents Received from Electric Property.

The rate is calculated as follows: $Rate = \frac{ATRR (\$)}{Coincident\ Peak (MW)}$

Source: CRA Response to OEB Staff Interrogatory 20

IR Topics: Cost Based Rates and Cost Allocation Topics

CRA IR Responses regarding cost allocation:

- CRA states that the export rates studies are “cost-based” to the extent that they are derived from revenue requirements of each grid that are, in effect, a summation of system cost components.
- CRA finds that for the jurisdictions studied export rates are designed to recover total grid annual revenue requirements across demand-based or energy-based usage on the system that result in a flat unit-based rate for Point-to-Point service. (See CRA response: OEB Staff – 20, SEC – 09)
- For US Jurisdictions, this rate design stems from FERC Order 888/999-A principles that seek to create rates that provide open and non-discriminatory access to all users of the grid and contemplate reasonably opportunity for transmission owners to recover costs. (See CRA responses: OEB Staff – 20).

IR Topics: Export Rate Determination and Market Outcomes

CRA IR Responses regarding market outcome considerations:

- CRA did not identify any specific cost allocation methodology applied to design these rates that would seek to allocate costs between domestic and export service classes. (See CRA responses: OEB Staff – 19, OEB Staff – 27, VECC 6.1).
- CRA also did not find in the jurisdictions studied any rate setting approach used for export rates that sought a specific market outcome. (See CRA responses: OEB Staff – 03, OEB Staff - 29)

IR Topics: Intertie Congestion Price (ICP)

CRA IR Responses regarding congestion pricing:

- CRA did not identify any transmission tariff in the jurisdictions it studied that applies a transmission applied cost/charge to export transactions for the purpose of recovering congestion costs. (See CRA IR Responses: OEB Staff – 03(a); Naren Pattani – 04(b)).
- CRA notes that in the US jurisdictions studies, congestion related costs are recovered through energy market locational marginal prices (LMPs) which reflect localized cost differences arising from system constraints. (See CRA IR Response: Naren Pattani – 04(b)).
 - Note – The NYISO Tariff contains a rate component “TUC” (Transmission Usage Charge) for recovery of marginal congestion costs for scheduled network and export transactions. See NYISO OATT, Section 2.7.2.

Appendix 1 - Study Findings by Jurisdiction

Study Findings – PJM

- Under the guidance of FERC Order No. 888, PJM adopted a transmission service structure that includes firm and non-firm point-to-point transmission service to each zone in PJM and to the border of the PJM Region under Part II of the PJM Tariff (“Border Rate”).
- The “Border Rate” reflects the composite or average cost of service in the PJM Region under the principle that all of the facilities are available to provide such service.
- The Border Rate does not apply to any point-to-point transmission service or network service to serve load to Midcontinent Independent System Operator (“MISO”)
- The Border Rate design has not changed significantly since 2012
- Rate Reference: Schedule 7 Long Term and Short Term Firm PTP Transmission Service

PJM Interconnection Map

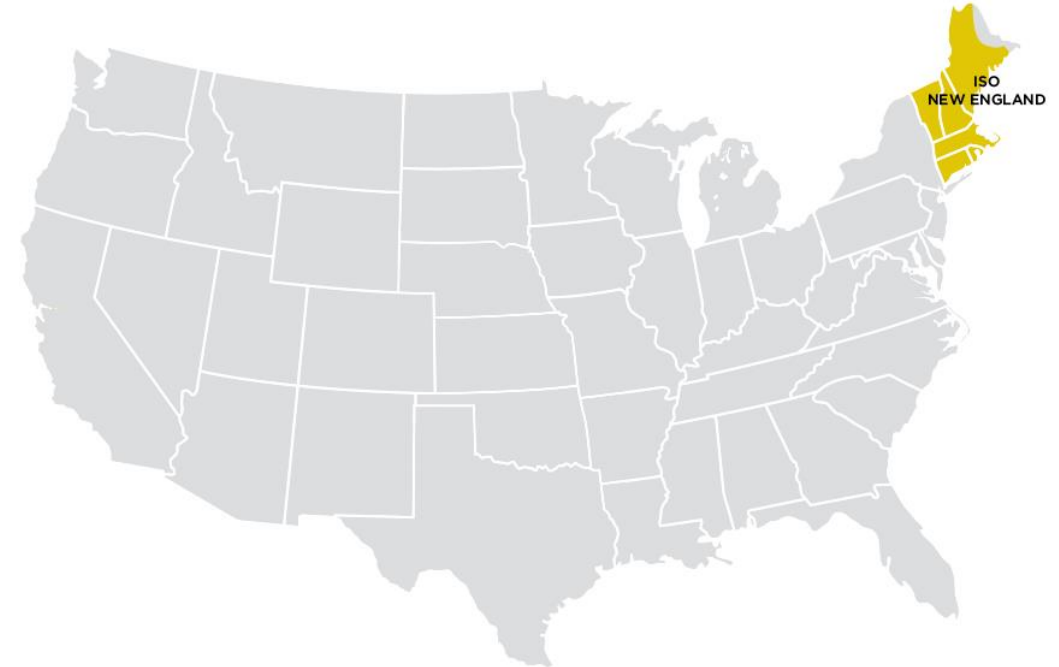


Source: FERC

Study Findings – New England

- In New England, the outbound point-to-point rates – or Through or Out Service (TOUT) setting process was adopted as part of the tariff reform in response to FERC’s restructuring directive in Order No. 888.
- The process used at the time by the New England Power Pool (NEPOOL) was considered compliant by the FERC and adopted during the inception of the ISO.
- No difference between firm and non-firm rates; the ISO can curtail external transactions to maintain reliability as needed.
- ISO-NE and NYISO have entered into a reciprocal agreement - memorandum of understanding (MOU)- such that the TOUT rate is reduced to zero for any transaction that goes through or out of the New England Control Area and has the New England/New York Control Area boundary as its Point of Delivery.
- Rate Reference: Schedule 7 Long Term and Short Term Firm PTP Transmission Service

ISO- New England Map



Source: FERC

Study Findings – New York

- NYISO's ETS method is derived from the pre-ISO era rates used by the NY Power Pool (NYPP).
- NYISO provides Point to Point service with the Firm Point to Point rate including specific Transmission Owner charges needed to recover the embedded cost of transmission.
- The export rate is designed on a \$/MWh basis by zone.
- Non-Firm Point to Point Transmission Service is not available in the markets administered by the NYISO.
- Per the MOU described in the NE slide, there are no Transmission Service Charges for transactions with Point of Delivery to the New England border.
- Rate Schedule: Schedule 7 – Firm Point to Point Transmission Service

ISO - New York Map

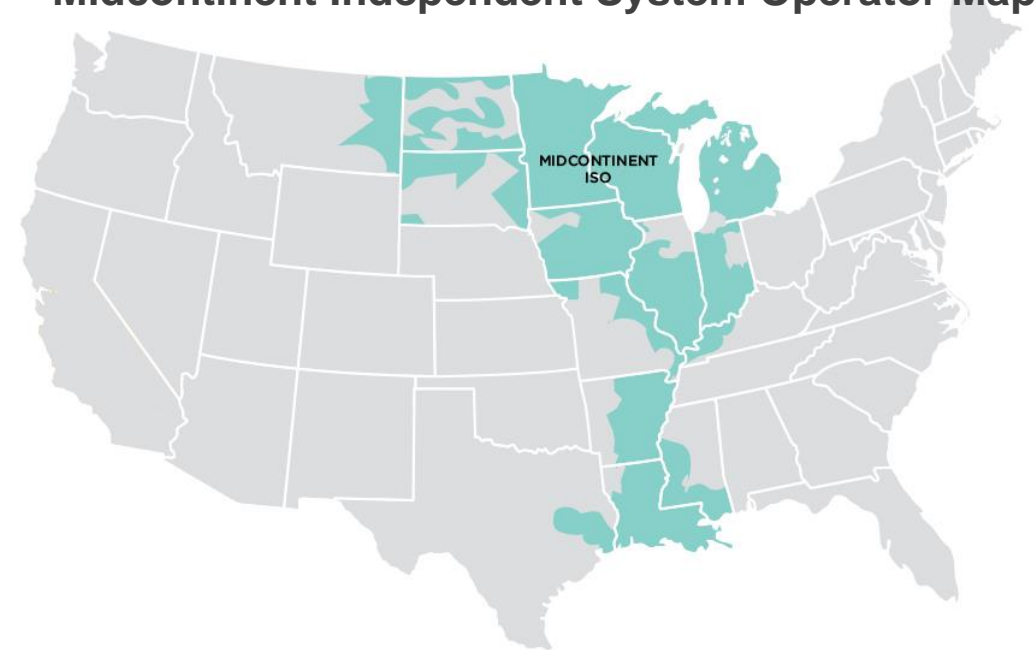


Source: FERC

Study Findings – Midcontinent Independent System Operator

- Export rate design is similar to that of other US jurisdictions
- The MISO export rate does not apply to any point-to-point transmission service or network service to serve load in the Midcontinent Independent System Operator, Inc. (MISO). This reciprocal arrangement falls under the Joint Agreement (JA) between MISO and PJM.
- The JA applies to wheel-through transactions between MISO and PJM
- Rate Reference: Schedules 7 and 8 – Firm and Non-Firm PTP Service

Midcontinent Independent System Operator Map



Source: FERC

Study Findings – SPP

- Order No. 888 principles were applied to the ETS rate design for SPP as well.
- Since the inception of SPP, there has been limited activity related to the update of design to ETS rates
- SPP Schedule 11 Through & Out rate is based on the sum of all base zonal ATRRs and 12 CP average system load and is offered on both a firm and non-firm basis
- Schedules 7 (firm) and 8 (non-firm) also apply to point-to-point export service, where the transmission customer pays the zonal rate for the zone interconnected with the balancing authority area, external to the SPP region, that is the designated point of delivery.
- Rate Reference: Schedule 11 Through and Out Zonal PTP

Southwest Power Pool Map



Source: FERC

Study Findings – CAISO

- CAISO uses energy-based determinants to derive its transmission rate
- Exports are charged the resulting high-voltage transmission access charge (HV-TAC) rate (\$/MWh based) for each transaction.
- In 2000, FERC approved a 10-year transition period to a uniform ISO-wide HV-TAC to encourage high-cost transmission facilities to join the ISO. Over the transition period, the ISO-wide high-voltage revenue requirement was blended with each transmission owner's individual high-voltage revenue requirement
- In 2014, Western Energy Imbalance Market was created. FERC waived high-voltage wheeling access charges for exports sinking to WEIM-participating balancing authority areas.
- Rate Reference: Schedule 3 – Regional Access Charge and Wheeling Access Charge

California System Operator Map



Source: FERC

Study Findings - TransÉnergie (Hydro-Québec)

- Québec offers firm and non-firm point-to-point transmission service and uses demand as its primary point-to-point rate determinant
- Export rates are discounted for certain transactions
- Hydro-Québec offers discounts when it estimates that transactions are otherwise unlikely to clear at the full tariff rate, i.e., during times of low export pricing in neighboring jurisdictions
- Discounting is based on allocation of export value between transmission generation assets, and it is done on a market-based approach, rather than a set formula
- Rate Reference: Schedules 9 and 10, Firm and Non-Firm PTP Service

Hydro-Quebec Map



Source: S&P Global

Study Findings – AESO

- AESO offers two rates:
 - one a transmission rate from merchant interties (Rate XOM) and
 - the other an export transmission rate from an AESO network intertie (Rate XOS).
- The primary billing determinant in Rates XOS and XOM is energy consumption (MWh), at a flat rate.
- AESO's export service is non-firm, fulfilled only when sufficient capacity exists on the transmission system to accommodate the capacity scheduled for export.
- Alberta has a history of considering firm export rates; however current export rates continue to be offered only on a non-firm basis. Some of the issues and reasons for not implementing a firm rate were given include congestion management, lack of sufficient transfer capability, reliability of the lines, and administrative complexities.
- Rate Reference: Export Opportunity Service (XOS), Export Opportunity Merchant Service (XOM).

Alberta Energy System Operator Map



Source: S&P Global

Study Findings – British Columbia

- Two transmission operators in British Columbia
 - BC Hydro
 - Fortis BC
- BC Hydro ETS rates are zero for transmission where the point of delivery is a point of interconnection between BC Hydro's transmission system and the transmission system of FortisBC.
- FortisBC ETS rates are zero for transmission where the point of delivery is a point of interconnection between FortisBC's transmission system and the transmission system of BC Hydro, provided that the power is to be delivered to a load within or beyond the BC Hydro service area;
- Zero rate is not available for delivery of power to BC Hydro system where there is no equivalent point-to-point transmission reservations on the BC Hydro system.
- Rate Reference: BC Hydro – Schedule 01 PTP Service; FortisBC – Schedules 101, 102 LT Firm PTP and Non-Firm PTP service.

British Columbia Map



2022 ETS Rates for British Columbia

2022 ETS Rates for BC Hydro (CAD)

	Annual Service \$/MW-year (Max)	Monthly Service \$/MW-month (Max)	Weekly Service \$/MW-week (Max)	Daily On-Peak Service \$/MW-day (Max)	Daily Off-Peak Service \$/MW-day (Max)	Hourly On-Peak Charge \$/MW (Max)	Hourly Off-Peak Charge \$/MW (Max)	Schedule/Service Name
Firm	83,461.00	6,955.00	1,605.01	228.66		9.53		Schedule 01 – Point-To-Point Transmission Service
Non-Firm		6,955.00	1,605.01	228.66		9.53		Schedule 01 – Point-To-Point Transmission Service

2022 ETS Rates for FortisBC (CAD) (West Kootenay and Okanagan Areas)

	Annual Service \$/kW-year	Monthly Service \$/kW-month (Max)	Weekly Service \$/kW-week (Max)	Daily On-Peak Service \$/kW-day (Max)	Daily Off-Peak Service \$/kW-day (Max)	Hourly On-Peak Charge \$/kW (Max)	Hourly Off-Peak Charge \$/kW (Max)	Schedule/Service Name
Firm		4.5700	1.0570	0.1507		0.0064		Rate Schedule 101 – Long-Term <u>And</u> Short-Term Firm Point-To-Point Transmission Service (Txm)
Non-Firm		4.5700	1.0570	0.1507		0.0064		Rate Schedule 102 – Non-Firm Point-To-Point Transmission Service (Txm)

Source: CRA Response to Energy Probe Interrogatory – 9

Appendix 2 – Export Transmission Rate Summaries

CRA Report 2021 – Table 2 Summary of 2012 Rates for Export Transmission Service (CAD)

		Annual \$/kW-year	Month \$/kW-month	Week \$/kW-week	Day-Peak \$/kW-day	Day-Off- Peak \$/kW-day	Hour- Peak \$/MWh	Hour- Off-Peak \$/MWh
MISO	Firm	29.3756	2.448	0.5649	0.1130	0.0805		
	Non-Firm		2.448	0.5649	0.1130	0.0805	7.0608	3.3531
PJM	Firm	18.669	1.556	0.3590	0.0718	0.0513		
	Non-Firm		1.556	0.3590	0.0718	0.0513	4.4875	2.1350
NYISO	\$2.9233/MWh - \$5.5056/MWh							
ISO-NE	Firm							
	Non-Firm	63.135					7.207	
Trans-Énergie	Firm	72.45	6.04	1.39	0.28			
	Non-Firm	72.45	6.04	1.39	0.20		8.24	

The 2012 Jurisdictional Review report used the average rate of exchange during 2011 that was C\$1.0 = US \$1.0117; Source: Bank of Canada.

Source: CRA Report 2021

CRA Report 2021 – Table 3 Summary of Rates for Export Transmission Service – As Reported in Native Tariffs

		Annual Service \$/kW-year	Monthly Service \$/kW-month	Weekly Service \$/kW-week	Daily On-Peak Service \$/kW-day	Daily Off-Peak Service \$/kW-day	Hourly On-Peak Charge \$/MWh	Hourly Off-Peak Charge \$/MWh
MISO	Firm	41.4593	3.4549	0.7973	0.1595	0.1136		
	Non-Firm		3.4549	0.7973	0.1595	0.1136	9.9662	4.7328
PJM	Firm	18.888	1.574	0.3632	0.0726	0.0519		
	Non-Firm		1.574	0.3632	0.0726	0.0519	4.54	2.16
NYISO³	The energy-based rate for the Firm PTP service is different for each transmission company at the seam of NYISO, and it ranges between \$3.25 per MWh (Hydro-Québec) to \$6.12 per MWh (PJM).							
ISO-NE¹		129.26182						
SPP⁵	Firm	6.8691	0.5724	0.1321	0.0264	0.0189		
	Non-Firm		0.5724	0.1321	0.0264	0.0189	1.651	0.784
CAISO⁴								12.5201
Trans-Énergie²	Firm	78.06	6.51	1.50		0.30		
	Non-Firm		6.51	1.50		0.21		8.91
Alberta⁴								8.28
Ontario⁶								1.85

1. ISO-NE does not distinguish between Firm and Non-Firm transactions and does not offer monthly, weekly, or daily transmission services. It offers hourly transmission service, and this is noted in Table 1 of Section 3 of this report.
2. TransÉnergie offers the same daily transmission service regardless of time of day.
3. Non-firm service not offered.
4. Firm service not offered.
5. Schedules 7 and 8 rates also apply on a zonal basis for Point-to-Point transactions, in a range of \$13.3/kW-year to \$56.7/kW-year for annual firm service, and \$1.52/MWh to \$6.47/MWh non-firm.
6. Not clearly defined as either firm or non-firm, although rate is specified on energy basis and line capacity cannot be reserved for extended periods, therefore implied non-firm.

Source: CRA Response to OEB Staff Interrogatory – 26 (b).

CRA Report 2021 – Table 4 Summary of Rates for Export Transmission Service – All Stated in CAD

		Annual Service \$/kW-year	Monthly Service \$/kW-month	Weekly Service \$/kW-week	Daily On-Peak Service \$/kW-day	Daily Off-Peak Service \$/kW-day	Hourly On-Peak Charge \$/MWh	Hourly Off-Peak Charge \$/MWh
MISO	Firm	52.4801	4.3733	1.0092	0.2019	0.1438		
	Non-Firm		4.3733	1.0092	0.2019	0.1438	12.6154	5.9909
PJM	Firm	23.9089	1.9924	0.4597	0.0919	0.0657		
	Non-Firm		1.9924	0.4597	0.0919	0.0657	5.7468	2.7342
NYISO³		The energy-based rate for the Firm PTP service is different for each transmission company at the seam of NYISO, and it ranges between \$4.11 per MWh (Hydro-Québec) to \$7.75 per MWh (PJM).						
ISO-NE¹		163.6226						
SPP⁵	Firm	8.6951	0.7246	0.1672	0.0334	0.0239		
	Non-Firm		0.7246	0.1672	0.0334	0.0239	2.0899	0.9924
CAISO⁴								15.8482
Trans-Énergie²	Firm	78.06	6.51	1.50		0.30		
	Non-Firm		6.51	1.50		0.21		8.91
Alberta⁴								8.28
Ontario⁶								1.85

Source: CRA Report 2021

1. ISO-NE does not distinguish between Firm and Non-Firm transactions and does not offer monthly, weekly, or daily transmission services. It offers hourly transmission service, and this is noted in Table 1 of Section 3 of this report.
2. TransÉnergie offers the same daily transmission service regardless of time of day.
3. Non-firm service not offered.
4. Firm service not offered.
5. Schedules 7 and 8 rates also apply on a zonal basis for Point-to-Point transactions, in a range of \$16.8/kW-year to \$71.8/kW-year for annual firm service, and \$1.92/MWh to \$8.19/MWh non-firm.
6. Not clearly defined as either firm or non-firm, although rate is specified on energy basis and line capacity cannot be reserved for extended periods, therefore implied non-firm.

CRA Report 2021 - Table 5- Energy-Only Rates for Export Transmission Service – All Stated in CAD\$/MWh

		Annual Service \$/MWh	Monthly Service \$/MWh	Weekly Service \$/MWh	Daily On-Peak Service \$/MWh	Daily Off-Peak Service \$/MWh	Hourly On-Peak Charge \$/MWh	Hourly Off-Peak Charge \$/MWh
MISO	Firm	5.9909	5.9908	5.9909	8.4124	5.9916		
	Non-Firm		5.9908	5.9909	8.4124	5.9916	12.6154	5.9909
PJM	Firm	2.7293	2.7293	2.7291	3.8291	2.7373		
	Non-Firm		2.7293	2.7291	3.8291	2.7373	5.7468	2.7342
NYISO³		The energy-based rate for the Firm PTP service is different for each transmission company at the seam of NYISO, and it ranges between \$4.11 per MWh (Hydro-Québec) to \$7.75 per MWh (PJM).						
ISO-NE¹		18.6784						
SPP⁵	Firm	0.9926	0.9925	0.9926	1.3924	0.9968		
	Non-Firm		0.9925	0.9926	1.3924	0.9968	2.0899	0.9924
CAISO⁴								15.8482
Trans-Énergie²	Firm	8.9110	8.9178	8.9041	12.5000			
	Non-Firm		8.9178	8.9041	8.7500		8.91	
Alberta⁴							8.28	
Ontario⁶							1.85	

1. ISO-NE does not distinguish between Firm and Non-Firm transactions and does not offer monthly, weekly or daily transmission services. It offers hourly transmission service, and this is noted in Table 1 of Section 3 of this report.
2. TransÉnergie offers the same daily transmission service irrespective of time of day.
3. Non-firm service not offered.
4. Firm service not offered.
5. Schedule 7 and 8 rates also apply on a zonal basis for Point-to-Point transactions, in a range of \$1.52/MWh to \$6.47/MWh.
6. Not clearly defined as either firm or non-firm, although rate is specified on energy basis and line capacity cannot be reserved for extended periods, therefore implied non-firm.

Source: CRA Report 2021

Appendix 3 – Export Transmission Rate Adders by Jurisdiction

CRA Report 2021 - Rate Adders – MISO

Table 6 – MISO Ancillary Services and Other Charges Applicable to ETS Transactions (USD)

MISO			
Item	Peak \$/MWh	Off-Peak \$/MWh	Source
Scheduling, System Control, and Dispatch Service	0.1901	0.0903	Schedule 1
Reactive Supply and Voltage Control	0.4859	0.2308	Schedule 2
ISO Cost Recovery Adder	0.1144	0.1144	Schedule 10
Network Upgrade Charge for Transmission Expansion Plan	0.8865	0.4210	Schedule 26
Black Start Service	0.0080	0.0038	Schedule 33
Cost Recovery of NERC Recommendation or Essential Action	0.0197	0.0094	Schedule 45
FTR-related	0.0072	0.0072	Schedule 16
Market Administration	0.0932	0.0932	Schedule 17
Local Balancing Authority Cost Recovery	0.0127	0.0127	Schedule 24
Total Charges	1.8177	0.9828	

CRA Report 2021 - Rate Adders – PJM

PJM		
Item	\$/MWh	Source
PJM Administrative Fees	0.47	
NERC/RFC	0.03	2019 State of the Market Report for PJM - Introduction Table 1-10
Voltage Control	0.44	
Black Start	0.08	
Operating Reserve	0.04	
Regulation & Frequency Control	0.12	
Synchronized Reserve	0.04	
Transmission Owner (Schedule 1A)	0.09	
Transmission Enhancement Cost Recovery	0.55	
Total Charges	1.86	

CRA Report 2021 - Rate Adders – ISONE and NYISO

NYISO		
Item	\$/MWh	Source
NYISO Cost of Operations	0.73	
FERC Fee Recovery	0.10	NYISO Monthly
Voltage Support and Black Start	0.45	Report - Appendix
Operating Reserve	0.61	B Page 38
Regulation & Frequency Control	0.11	(Updated to
Uplift: Statewide Share	(0.13)	October 2020)
Total Charges	1.87	

ISO-NE			
Item	\$/MWh	\$/kW-year	Source
Scheduling, System Control, and Dispatch Service	0.199	1.745	Schedule 1
Reactive Supply and Voltage Control Service	0.125	1.093	Schedule 2
Total Charges	0.324	2.838	

CRA Report 2021 - Rate Adders – SPP

SPP			
Item	Peak \$/MWh	Off-Peak \$/MWh	Source
Scheduling, System Control, and Dispatch Service	0.3060	0.1450	Schedule 1
Tariff Administrative Charges	0.3130	0.3130	Schedule 1A
Reactive Supply and Voltage Control	0.0040-0.6580	0-0.0200	Schedule 2
FERC Assessment Charge	0.0834	0.0834	Schedule 12
Total Charges	0.7064-1.3604	0.5414-0.5614	

CRA Report 2021- Rate Adders – TransEnergie

TransEnergie							
Item	Annual per kW reserved	Monthly per kW reserved	Weekly per MW reserved	Daily Firm per MW reserved	Daily Non-Firm per MW reserved	Hourly Non-Firm per MW reserved	Source
System Control Service	Currently this is not a separate rate and is included in transmission charge.						Schedule 1
Voltage Control Service	0.31	0.03	5.96	1.19	0.85	0.04	Schedule 2
Frequency Control Service	0.31	0.03	5.96	1.19	0.85	0.04	Schedule 3
Energy Imbalance	Imbalance service charges are calculated and applied based on conditions in neighboring markets at time of service.						Schedule 4
Energy Imbalance							Schedule 5
OR – Spinning Reserve	1.15	0.10	22.12	4.42	3.15	0.13	Schedule 6
OR – Non– Spinning Reserve	0.57	0.05	10.96	2.19	1.56	0.07	Schedule 7
Total Charges	2.34	0.21	45.00	8.99	6.41	0.28	

Source: CRA Response to Vulnerable Energy Consumers Coalition Interrogatory - 41

Appendix 4 – Overview of Charles River Associates, Inc.



**About CRA's
Energy &
Infrastructure
Practice**

About CRA – an overview of the firm



Charles River Associates (CRA) has for over 50 years been a leading global consulting firm offering investigative, economic, and strategic expertise to major law firms, corporations, financial institutions, and governments around the world.

In Energy & Infrastructure, we help a wide range of clients to assess investment strategies & opportunities, devise winning strategies, identify & access value pools, navigate & decode uncertainty, and transform operating models. We combine evidence-based research, rigorous analysis, regulatory & economic insight, together with proven industry experience to deliver value.

Increasingly, our analysis is **driven by the accelerating Energy System Transition**, requiring clients to bring short- & medium-term objectives in sync with long-term implications and requirements.

Since its founding in 1965, CRA continues to distinguish itself in the professional services arena and is proud to have worked with **94% of the AmLaw 100** law firms and **83% of the Fortune 100** companies.

50+



Years advising clients

1,000+



Consultants
(+ extended network of
senior experts)

23



Offices in 10 countries

About CRA – where we are and what we do

Headquarters



Boston (Global)

Tel +1-617-425-3000
200 Clarendon Street
Boston, MA 02116-5092
United States

London (Europe)

Tel +44 (0)20 7664 3700
8 Finsbury Circus
London EC2M 7EA
United Kingdom

Global offices



North America

- Chicago
- College Station
- Dallas
- Los Angeles
- New York
- Oakland
- Salt Lake City
- San Francisco
- Summit
- Tallahassee
- Toronto
- Washington D.C.

Latin America

- São Paulo

Europe

- Amsterdam
- Brussels
- Cambridge
- Munich
- Paris
- Zurich

Asia Pacific

- Sydney

Services



- Antitrust, IP, and Competition
- Auctions and Competitive Bidding
- Class Certification
- Cybersecurity and Incident Response
- Damages and Valuation
- eDiscovery and Structured Data
- Financial Economics
- Forensic Accounting and Valuation
- Intellectual Property
- International Arbitration
- Labor and Employment
- Management Consulting
- Mergers & Acquisitions
- Regulatory and Compliance
- Risk, Investigations and Analytics
- Securities and Financial Markets
- Strategy
- Transfer Pricing

Industries



- Agriculture
- Chemicals
- Communications & Media
- Consumer Products
- Energy & Infrastructure
- Entertainment
- Financial Services
- Health Care
- Life Sciences
- Metals, Mining, & Materials
- Sports
- Technology
- Transport

<https://www.crai.com>



CRA has long standing experience in working with various clients across a wide range of services



We help clients make and execute better strategic, operating and organisation choices by combining our expert knowledge, analytics, and operational capabilities

Our clients



Regulators/Governments

Investors/Asset Mgmt.

Gas & Electric Utilities

Power Producers

O&G/LNG/Hydrogen

Our services



Market & Competitive Analysis

Transaction Advisory & Valuation Services

Portfolio & Asset Optimisation

Rate and Policy Analysis & Strategy

Strategy Development & Planning

Transformation, Operations & Execution Support

**Advisory
Regulatory
Disputes**

Our value add for our clients



Sector Experience: Our team has a deep understanding of energy sector, its transition, and its impact on other part of the economy

Specialist Skills: Our team has extensive expertise in energy market modelling, project finance and valuation, risk simulations, scenario analysis, strategy development, business and operating model design, restructuring and large-scale transformations

Varied Perspectives: Our team benefits from the experience of utility executives, regulators, financiers, traders, project developers and strategy practitioners. This allows us to approach issues from difference perspectives

Quality of Output: Our focus on the highest quality output allows our clients to make difficult decisions more confidently and faster

Collaborative Working: Our expert-led teams work in deep collaboration with clients and their project teams to share and build on existing knowledge for greater understanding



CRA combines strategic, regulatory, and economic market analytical insights with hands-on capabilities to transform business to create real value for clients

Strategy and Management Advisory

Strategy Development



- Strategic planning processes
- Market entry and participation strategy
- Commercial and competitive strategy
- Role of hydrogen in broader strategy

Portfolio and Asset Optimisation



- Portfolio design and asset screening
- Trading and hedging approach
- Risk management strategies
- Portfolio mix strategy

Transformation & Implementation



- Business model transformation
- Project management and governance
- Cultural change and stakeholder management

Operational Excellence



- Operational diagnostics
- Business process optimisation
- Cost optimisation and process design
- Operational excellence review
- Performance management

Market Analysis, Economic, and Regulatory

Market Analysis & Modelling



- Market and rate studies, including pricing and forecasting
- Competitor analysis and benchmarking
- Scenario analysis and development

Regulatory Policy Analysis & Strategy



- Policy design and rate impact analysis
- Regulatory review and analysis
- Regulatory stakeholder engagement

Hydrogen Value Chain Analysis



- Hydrogen economics modelling
- Investment case development
- Hydrogen strategy and project delivery
- Business and commercial options

Transaction Advisory & Valuation



- M&A strategy and target identification
- Asset and company valuation
- Transaction due diligence
- Litigation and damages

Energy, Technology, and Sustainability

Technology Assessment



- Technical and operational process evaluation
- Technology lifecycle GHG emissions
- Policy and subsidy implications

Decarbonisation Pathways



- Scenario planning based on technology, climate, and policy
- Capital allocation and investment prioritisation

Sustainability



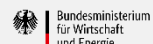
- Decarbonisation and net-zero strategy
- Materiality analysis and reporting
- Green finance framework and green bond support

Energy Transition



- Renewables and storage planning
- Future of gas infrastructure
- Biofuels and biogas
- Smart networks

Selected clients



Our capabilities and expertise allow us to offer bespoke support to help address specific needs

CRA combines deep, regulatory and economic market analytics and insight with hands-on capabilities to execute strategies and transform business to create real value for shareholders



Our capabilities and expertise allow us to offer bespoke support to help address specific strategic and operational needs

Market & Competitive Analysis



- Market studies, including pricing and forecasting
- Competitor analysis and benchmarking
- Scenario analysis/development
- Positioning assessment

Transformation, Operations & Execution Support



- Transformation strategy and implementation support
- Restructures, PMI, operating/steering model design
- Cost optimisation and process re-design
- Operational excellence reviews, performance mgmt.

Regulatory Policy Analysis & Strategy



- Policy design and impact analysis
- Rate and Regulatory studies
- Audits and compliance advice
- Decarbonisation and net-zero strategy

Portfolio & Asset Optimisation



- Portfolio design/asset screening
- Trading and hedging approach
- Risk management strategies
- Portfolio mix strategy

Strategy Development & Planning



- Strategic planning processes
- Market entry and participation strategy
- Commercial and competitive strategy
- Business model options design and evaluation

Transaction Advisory & Valuation Services



- Asset/company valuation
- Transaction due diligence
- Damages quantification
- Litigation support

Data Analytics and Insights

Please contact:

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