
Introduction to Virtual Traders

October 2023

AN IESO MARKETPLACE TRAINING PUBLICATION

This training publication has been prepared by the IESO as a training aid for market participants. The content of this publication is presented for illustrative purposes and is not intended to represent actual market participant data or market outcomes. Users of this training publication are reminded that they remain responsible for complying with all of their obligations under the market rules and associated policies, standards and procedures relating to the subject matter of this training publication, even if such obligations are not specifically referred to herein. While every effort has been made to ensure that any extracts from the market rules or other documents in this training publication are accurate, users must be aware that the specific provisions of the market rules or particular document posted on the web site of Ontario's Independent Electricity System Operator shall govern.



Table of Contents

AN IESO MARKETPLACE TRAINING PUBLICATION	1
1. Purpose	3
2. Background	3
3. Authorization and Registration	3
4. Prudential Support	4
5. Submitting Bids and Offers	4
6. DAM Scheduling and Pricing	6
6.1 Step 1: DAM Virtual Scheduling and Pricing	6
6.2 Step 2: DAM Scheduling Outcomes	7
6.3 Step 3: DAM Pricing Outcomes	8
7. Settlements	9
7.1 Profit/Loss Examples for Scheduled Offers	9
7.2 Profit/Loss Examples for Scheduled Bids	10
7.3 Settlement Charge Types for Virtual Traders	10
8. IESO Reports and Settlement Files	11
Further Reading	12

1. Purpose

This guide provides an overview of key elements related to a virtual trader's participation in the IESO-administered market. This document may be used to assist you in understanding the basics of participating as a virtual trader and the steps an organization must take to register as one.

2. Background

Virtual traders are a new market participation type that the IESO is introducing as part of the Market Renewal Program, and will be available to participants after the new market comes into effect. The key role that virtual traders provide is to help drive price convergence between the Day -Ahead Market (DAM) and the Real-Time Market (RTM). Furthermore, virtual traders also increase liquidity in the DAM, which enhances the financial and operational certainty that the DAM provides. Virtual traders only participate in the DAM with bids and offers for energy similar to physical resources. However, unlike physical resources, virtual traders do not deliver or consume energy in the RTM. They participate in the market in hopes of finding an arbitrage opportunity based on the difference between DAM prices and RTM prices as described in the Settlements section below. The trader may receive a profit or a loss on their transaction depending on whether their prediction of the RTM prices was accurate, or not.

Note that Virtual Traders are not eligible to participate in the Operating Reserve (OR) market.

3. Authorization and Registration

Prospective virtual traders must register as a virtual trader class of market participant with the IESO.

To become authorized, new market participants must follow the authorization process, as described on the IESO's [website](#), and also detailed in [Market Manual 1.5](#). When completing *Part 2 – Active Organization Evidence: Intent of Registration* section of the [online application form](#), select the “Virtual Trader” option (this option will be available at a later date). Prospective market participants must also pay the market registration application fee of \$1,130 (\$1,000 + 13% HST).

Once your organization receives access to Online IESO, prospective virtual traders must follow the steps detailed in [Market Manual 1.5](#) to complete their authorization. This includes:

- submitting banking information,
- assigning contact role(s),

- confirming system access role(s),
- providing prudential support, and
- providing market control entity information.

If your organization is only participating as a virtual trader, you are not required to be licensed by the Ontario Energy Board (OEB) or have a National Energy Board Permit. Furthermore, virtual traders are not required to register any facilities or equipment with the IESO or submit an emergency preparedness plan. Once you have completed all of the applicable requirements, the IESO will provide a Registration Authorization Notice (RAN) through Online IESO to your organization.

Existing market participants do not need to re-register their organization if they wish to participate as a virtual trader. The Rights Administrator for the organization can follow the existing registration process and initiate a request through Online IESO for their organization to be authorized as a virtual trader.

4. Prudential Support

Virtual traders must provide collateral called “prudential support” to cover funds that might be owed to the market if your organization was unable to pay costs owed to the market. Virtual traders must post their required amount of prudential support through Online IESO.

Existing market participants with existing prudential support obligations must provide separate prudential support that is only applicable for their virtual trader transactions. The methodology of how prudential support obligations will be calculated for virtual traders is outlined in the draft amendments to [Market Manual 5.4](#). The IESO will inform organizations who are interested in becoming virtual traders of their new or updated prudential support obligation.

5. Submitting Bids and Offers

During the registration process, the IESO will provide authorized virtual traders access to submit bids and offers in the DAM for any of the virtual trading zones shown in Figure 1. There are 10 electrical zones in Ontario, but only 9 virtual trading zones (Bruce and Southwest are combined into one Southwest virtual trading zone).

Virtual traders are not restricted to one virtual trading zone, and may offer into multiple trading zones. Virtual bids and offers must be at least 1 MW each, however virtual traders can choose not to submit bids or offers for any hour and any zone that they are registered for.

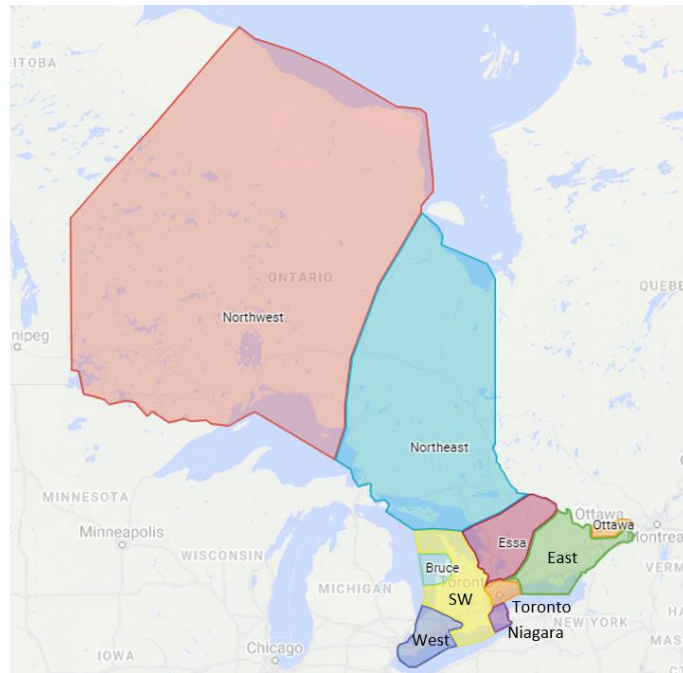


Figure 1 | Virtual Zones

Market participants must use the IESO’s Energy Market Interface (EMI) or an Application Programming Interface (API) that is connected to the Market Information Management (MIM) system to submit bids and offers. In order to communicate with the IESO through an API, the Rights Administrator must request access through Online IESO. The IESO has published updated specifications related to MIM APIs used to submit bids and offers on the, which may be found [here](#).

Offers and bids must be entered into the system a day prior to the dispatch day between 06:00 and 10:00 EPT. The DAM calculation engine starts at 10:00 EPT, and will not accept any changes to offers and bids after 10:00 EPT. The DAM results are expected to be published by 13:30 EPT, however, should there be a delay, the IESO may publish results up to 15:30 EPT as shown below. While virtual transactions are not subject to ex-ante Market Power Mitigation activities, offers and bids are reviewed by the DAM to ensure that they do not exceed the limits approved by the IESO.

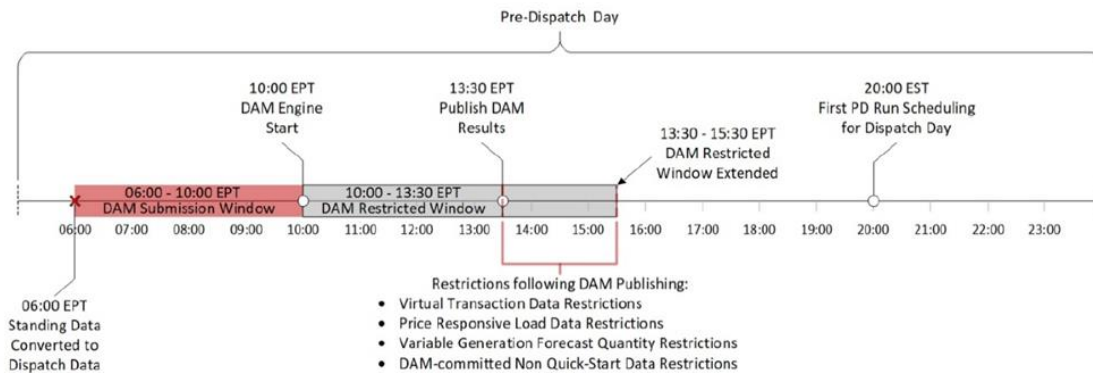


Figure 2 | DAM Timeline

6. DAM Scheduling and Pricing

DAM energy schedules for virtual transactions are produced for every hour of the dispatch day. Corresponding virtual zonal prices for energy are also produced hourly as a weighted average of the locational marginal prices (LMPs) for each load location within each virtual zone. These DAM schedules and corresponding virtual zonal prices will be used as inputs to settle virtual transactions.

The example below demonstrates how virtual transactions are scheduled and priced in the Day-Ahead Market.

6.1 Step 1: DAM Virtual Scheduling and Pricing

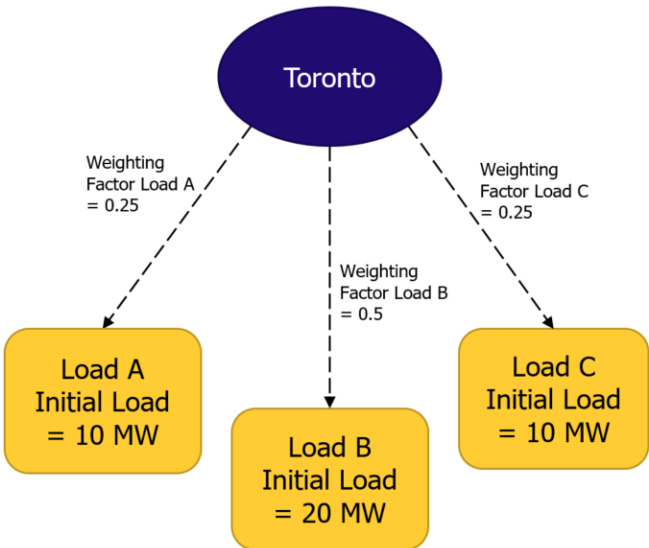


Figure 3 | Weighting Factor Load for Load A, Load B, and Load C

In this example, assume the Virtual Transaction Zone Toronto has three load resources. To determine virtual zonal prices and the distribution of the net schedules for each virtual transaction zone, weighting factors are calculated within the engine.

$$\begin{aligned}
 \text{Weighting Factor Load A} &= \text{Load A Initial Load} \div \text{Total Load in the Virtual Zone} \\
 &= 10 \text{ MW} \div 40 \text{ MW} \\
 &= 0.25
 \end{aligned}$$

$$\begin{aligned}
 \text{Weighting Factor Load B} &= \text{Load B Initial Load} \div \text{Total Load in the Virtual Zone} \\
 &= 20 \text{ MW} \div 40 \text{ MW} \\
 &= 0.50
 \end{aligned}$$

$$\begin{aligned}
 \text{Weighting Factor Load C} &= \text{Load C Initial Load} \div \text{Total Load in the Virtual Zone} \\
 &= 10 \text{ MW} \div 40 \text{ MW} \\
 &= 0.25
 \end{aligned}$$

6.2 Step 2: DAM Scheduling Outcomes

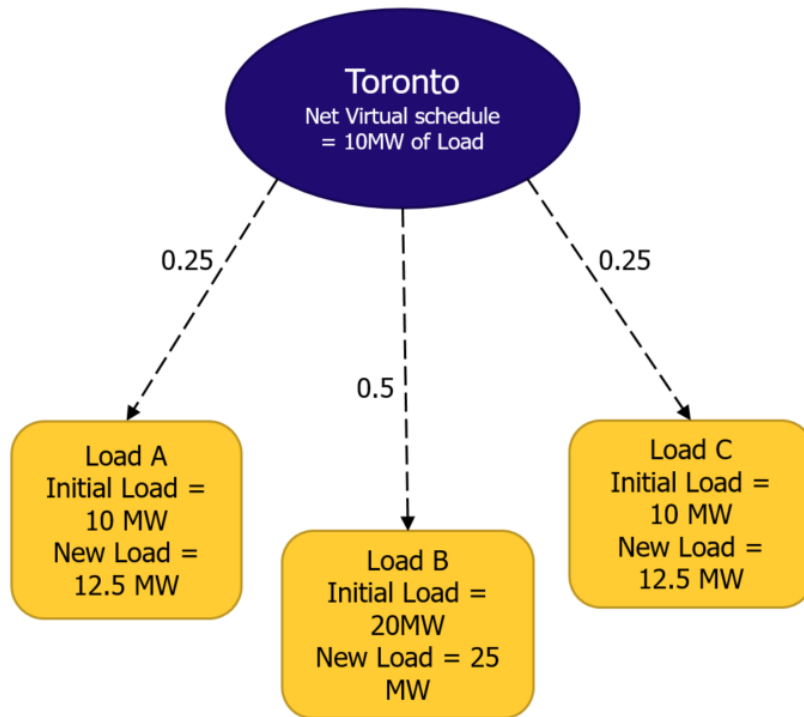


Figure 4 | Load Distributed to Load A, Load B and Load C

Assume the following virtual transactions have been scheduled for Toronto:

- TORONTO_OFFER:HUB = 20 MW (Supply)
- TORONTO_BID:HUB = 30 MW (Load)
- Net Virtual Schedule = 10 MW of Load

To calculate the load that will be distributed to each of the load resources, multiply the Net Virtual Schedule of the virtual zone by the weighting factor that was calculated for each load under Step 1, and then add the initial load to the respective load resources.

$$\begin{aligned}\text{Load Distribution for Load A} &= 10 \text{ MW} * 0.25 + 10 \text{ MW} \\ &= 12.5 \text{ MW}\end{aligned}$$

$$\begin{aligned}\text{Load Distribution for Load B} &= 10 \text{ MW} * 0.5 + 20 \text{ MW} \\ &= 25 \text{ MW}\end{aligned}$$

$$\begin{aligned}\text{Load Distribution for Load C} &= 10 \text{ MW} * 0.25 + 10 \text{ MW} \\ &= 12.5 \text{ MW}\end{aligned}$$

6.3 Step 3: DAM Pricing Outcomes

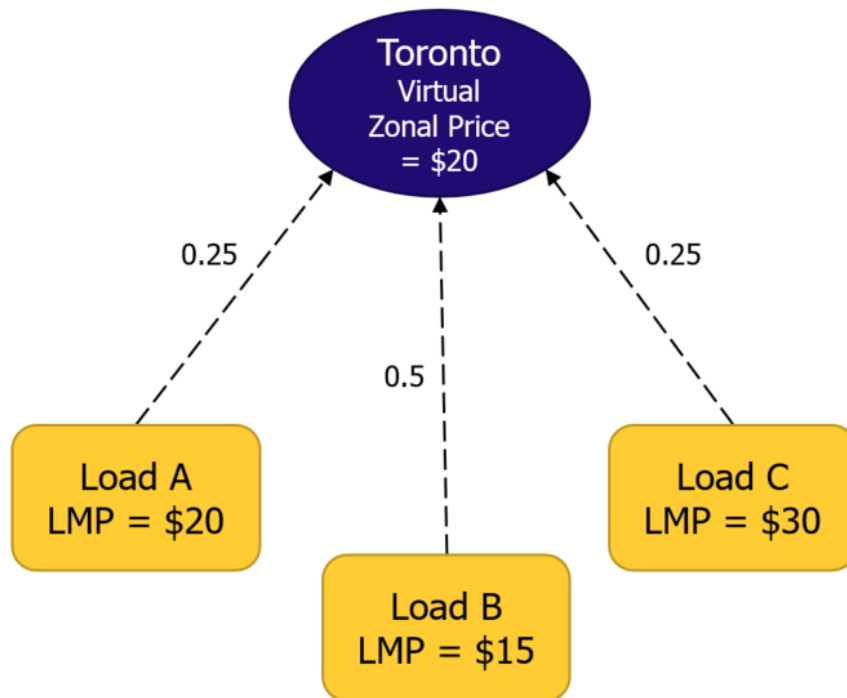


Figure 5 | Load Distributed to Load A, Load B and Load C

Corresponding virtual zonal prices for energy are produced hourly as a weighted average of the locational marginal prices (LMPs) for each load location within the virtual zone.

Using the example above, the virtual zonal price for Toronto is calculated as follows:

$$\begin{aligned}\text{Virtual Zonal Price} &= (\$20 \times 0.25) + (\$15 \times 0.5) + (\$30 \times 0.25) \\ &= \$20\end{aligned}$$

7. Settlements

The new market uses a two-settlement system where the total settlement amount is the sum of the DAM amount and the RTM amount as shown by the formulas below (additional information on this formula may be found [here](#)). Since virtual traders do not participate in the RTM, the formula can be simplified as below. The simplified formula demonstrates the opportunity for a virtual trader, since they may gain a profit (or loss) based on the difference between the price of electricity in the DAM and the RTM multiplied by the quantity they cleared in the DAM.

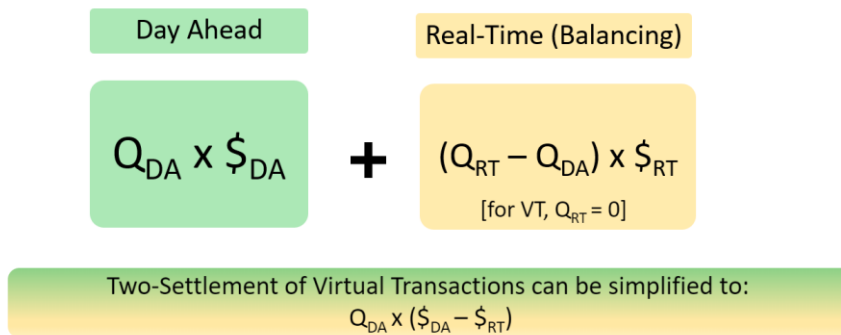


Figure 6 | Two-Settlement System

Virtual traders can submit either a bid or an offer to the DAM, which they are financially committed to if scheduled by the DAM. Virtual offers scheduled to supply energy in the DAM will profit when the day-ahead price is greater than the real-time price. Virtual bids scheduled to consume energy in the DAM will profit when the day-ahead price is less than the real-time price. The examples below demonstrate this concept.

7.1 Profit/Loss Examples for Scheduled Offers

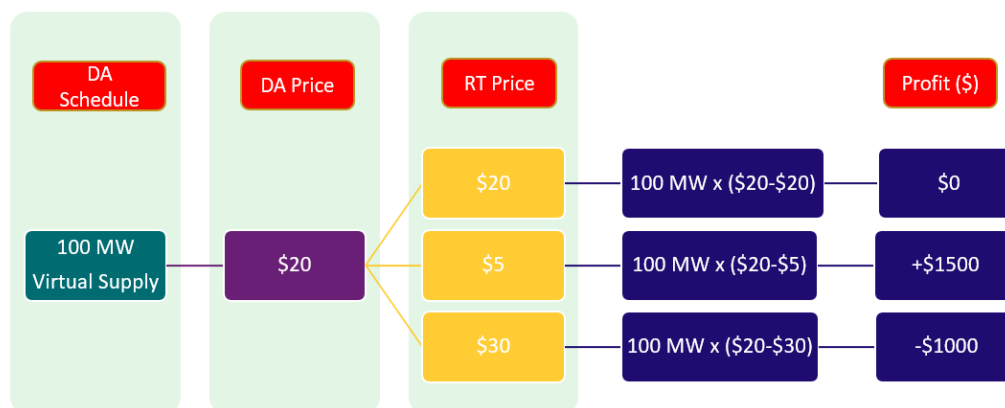


Figure 7 | Profit/Loss Examples for Scheduled Virtual Offers

This example illustrates settlement results related to energy schedules in the DAM using the equation provided in Figure 7. There are 3 scenarios that are illustrated. In each scenario, a virtual trader has been scheduled to supply 100MW of energy and the DAM price is cleared at \$20.

In the first scenario, the real-time price clears at \$20. Because there is no difference between the DAM price and the RTM price, there is no profit or loss to the virtual trader.

In the second scenario, the real-time price is \$5, which is less than the DAM price; therefore, the virtual trader receives a profit of \$1500.

In the last scenario, the real-time price is \$30, which is more than the DAM price; therefore, the virtual trader must pay \$1000.

7.2 Profit/Loss Examples for Scheduled Bids

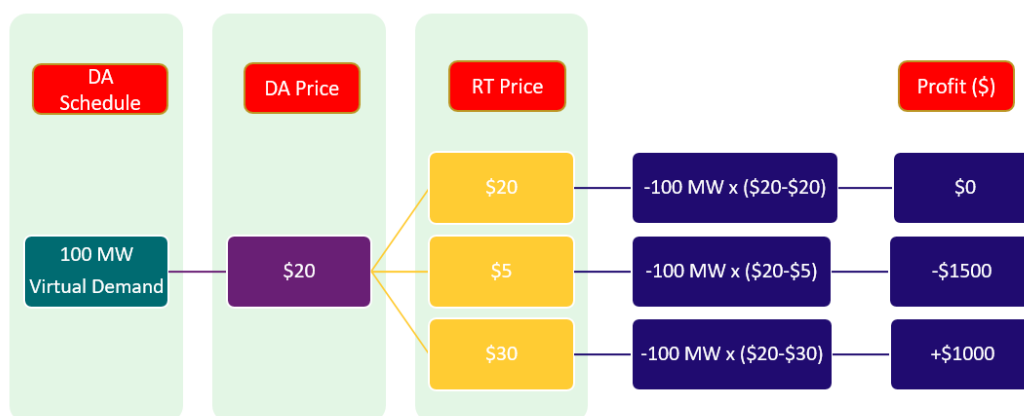


Figure 8 | Profit/Loss Examples for Scheduled Virtual Bids

This example illustrates settlement results related to energy schedules in the DAM using the equation provided in Figure 8. There are 3 scenarios that are illustrated. In each scenario, a virtual trader has been scheduled to purchase 100MW of energy and the DAM price is cleared at \$20.

In the first scenario, the real-time price clears at \$20. Because there is no difference between the DAM price and the RTM price, there is no profit or loss to the virtual trader.

In the second scenario, the RTM price is \$5, which is less than the DAM price; therefore, the virtual trader must pay \$1500.

In the last scenario, the real-time price is \$30, which is more than the DAM price; therefore, the virtual trader receives a profit of \$1000.

7.3 Settlement Charge Types for Virtual Traders

Virtual Transactions will be settled under the following charge types:

- CT 1106 – Day-Ahead Market Settlement Amounts for Virtual Transaction to Sell
- CT 1107 – Real-Time Market Settlement Amounts for Virtual Transaction to Sell
- CT 1108 – Day-Ahead Market Settlement Amounts for Virtual Transaction to Buy
- CT 1109 – Real-Time Market Settlement Amounts for Virtual Transaction to Buy

More information regarding these charge types can be found in the [IESO Charge Types and Equations List](#).

8. IESO Reports and Settlement Files

Market participants will continue to receive their settlement statement and data files through the private reports section of the IESO Reports Site.

The IESO will also publish a number of reports that virtual traders may use to inform their market activity:

Table 1 | Day-Ahead, Pre-Dispatch and Real-Time Market Reports

Year	New or Existing	Public or Private	Description
	Existing	Private	Hourly DAM energy schedules for virtual transactions, issued after DAM completion.
	New	Private	Daily confirmation of an MP's daily and hourly dispatch data submitted into the DAM, issued after DAM completion
	New	Public	Aggregated sums of virtual energy offers and bids submitted and cleared by virtual transaction zone and hour, issued after DAM completion.
	New	Public	Hourly virtual zonal price for each virtual transaction zone, issued after DAM
	New	Public	Hourly virtual zonal price for each virtual transaction zone, issued on an hourly basis.
	New	Public	5-minute virtual zonal price for each virtual transaction zone, issued every 5 minutes.



Further Reading

Market Rules under the [MRP Webpage](#):

- Market Rules Chapter 7: System Operations and Physical Markets
- Market Rules Chapter 9: Markets Settlement, Markets Billing and Fund Administration

Market Manuals under the [MRP Webpage](#):

- Market Manual 1.5: Market Registration Procedures
- Market Manual 4.1: Submitting Dispatch Data in the Physical Markets
- Market Manual 4.2: Operation of the Day-Ahead Market
- Market Manual 5.5: IESO-Administered Market Settlement Amounts

**Independent Electricity
System Operator**

1600-120 Adelaide Street West
Toronto, Ontario M5H 1T1

Phone: 905.403.6900

Toll-free: 1.888.448.7777

E-mail: customer_relations@ieso.ca

ieso.ca



[@IESO_Tweets](https://twitter.com/IESO_Tweets)



[linkedin.com/company/IESO](https://www.linkedin.com/company/IESO)