
Market Renewal Program

Day-In-The-Life for Nuclear Generators
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AN IESO MARKETPLACE TRAINING PUBLICATION

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Building Ontario's Energy Future: Bringing the Renewed Market to Life

The Market Renewal Program (MRP) is bringing necessary and fundamental changes to the electricity market in Ontario. These changes will bring greater financial and operational certainty to participants, provide benefits to Ontario ratepayers, and build the foundation of Ontario's electricity market to prepare for continued change in the sector. MRP builds from the existing electricity market that has been meeting Ontario's reliability needs cost-effectively for the past two decades, by improving efficiency, removing out-of-market programs and leveling the playing field to bring greater competition between resources.

As the Independent Electricity System Operator (IESO) continues to work closely with stakeholders to answer questions, and finalize the Market Rules and Market Manuals that will govern the future market, it is time to begin to scope the changes that are coming for Market Participants. Doing so will ensure that all participants can prepare for and respond to the opportunities that the renewed market will bring.

This document is the starting point of that change journey. Upon review of the information in this Day-In-The-Life document, participants should have a high-level view of the changes MRP will introduce specific for each participant type, and can start to plan the efforts needed to change the processes and the tools for participating in the renewed market. Work on a full suite of training plans and materials is underway and the IESO will share more information when available. There are a total of 13 different Day-In-The-Life documents available, each tailored to different participant roles. Participants who have more than one role in the Market will want to review the documents specific to each one of those roles.

This document is separated into three parts. The first section will identify some of the key changes in the renewed market, so participants can begin to understand the impacts and opportunities, and plan their participation accordingly. The second section provides a chronological look at the changes in processes and input data that participants will need to consider. Participants can use this information to begin considering how their internal processes will change with the renewed market. The third section will highlight the training and educational materials that the IESO will be producing to support participants through the Market Renewal changes.

This Day-In-The-Life document is intended for an audience that includes Market Participants who operate Nuclear Generation resources.

This Day-In-The-Life summary begins to solidify how participants can embrace and prepare for Market Renewal, so that all participant readiness activities can be completed prior to in-service and the sector can move confidently into the advent of the renewed market.

Key Structures of Market Renewal for Nuclear Generators

The goal of this section is to assist Market Participants to identify areas where modifications to their internal business processes may be needed in preparation for Market Renewal. The table below lists the key market structures that will change, the affected participants, a short description of the change, and a brief summary of the impacts presented by the change.

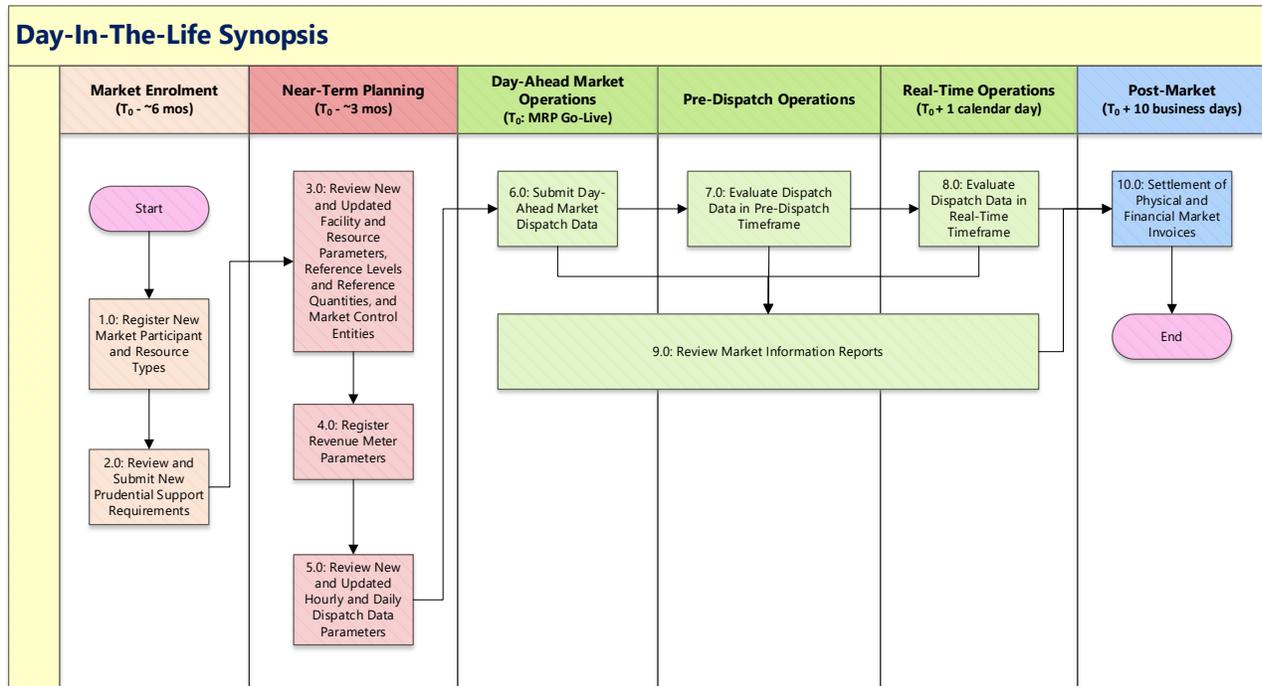
Key Structure	Affected Market Participants (MPs)	Description	Impacts
Single Schedule All Market		<p>The existing uniform price market will be replaced by a Locational Marginal Price (LMP) market that better aligns schedules with dispatch. Active dispatchable and self-scheduling market participants will be settled on the basis of LMPs in both the Day Ahead Market (DAM) and Real Time Market (RTM) at all nodes. Non Dispatchable Loads (NDLs) will pay the Ontario Zonal Price (OZP) plus an adjustment based on the IESO’s Load Forecast Deviation Charge.</p>	<ul style="list-style-type: none"> - The calculations for settlement amounts will change for dispatchable and self-scheduling participants as they will now replace Market Clearing Price/Hourly Ontario Energy Price with LMP prices. - Transparent and efficient LMPs will have greater price fidelity, therefore sending clearer signals to participants in both the short and long term. - LMPs will also remove the need for Congestion Management Settlement Credits. - The calculations for settlement amounts will change for NDLs as they will replace HOEP with OZP and the Load Forecast Deviation Charge.

Key Structure	Affected Market Participants (MPs)	Description	Impacts
Day-Ahead Market (DAM)	All	The DAM introduces the concept of a two-settlement LMP market, where primary settlement is based on DAM results and the RTM is used to settle or balance differences from DAM results. All 'active' participants will be settled on differences between DAM LMPs and RTM LMPs whereas Non-Dispatchable Loads (NDLs) will be settled on the DAM OZP plus the Load Forecast Deviation charge.	<ul style="list-style-type: none"> - Dispatchable MPs will receive greater financial and operational certainty for the next day's operations. - Dispatchable participants have the opportunity to respond to RTM changes that differ from their DAM results. - DAM participants are settled using a two-settlement calculation. Once as a result of their activity in the DAM and again as a result of activity variations in the RT balancing market. - Opportunity for Virtual Transactions (VT) to arbitrage LMPs between DAM and RTM. - There are new optional parameters for hydroelectric participants to submit with their registration and dispatch data to achieve more feasible schedules.
Market Power Mitigation (MPM)	Dispatchable MPs	The MPM framework is designed to prevent dispatchable MPs from exercising market power by economically or physically withholding energy.	<ul style="list-style-type: none"> - MPM provides safeguards for all MPs against the exercise of market power. - Dispatchable MPs may be subject to price or quantity mitigation by the IESO if they are deemed to have market power and their bids/offers or non-financial dispatch data fail the MPM tests.

Key Structure	Affected Market Participants (MPs)	Description	Impacts
New IESO Reports	All MPs	The production of IESO reports will continue. There will also be new reports, and some existing reports will be changed.	<ul style="list-style-type: none"> - MPs may have to alter their APIs or manual processes to analyze new and revised reports. - Some reports will have greater granularity so that MPs can make better market decisions (bidding, siting, arbitrage, etc.).
Make Whole Payments	Dispatchable MPs and Intertie Traders	A financial mechanism whereby impacted MPs are incentivized to follow their dispatch even when they may initially incur a cost or lose an opportunity. Designed to ensure those MPs are made whole financially.	<ul style="list-style-type: none"> - Make Whole Payments maintain system reliability by incentivizing an MP to follow their dispatch. This reduces the risk to both the MP and the IESO.
Area Demand Forecast	All	The current Ontario wide Area Demand Forecast will become more granular. In the future, there will be a separate demand forecast for each of four zones which will be summed to derive demand for Ontario.	<ul style="list-style-type: none"> - Better demand forecasting will allow for better IESO decision making. - Better demand forecasting will allow for better MP decision making (evaluating opportunity costs, outage decisions). - Better demand forecasting will allow for more accurate price signals.

'Day-In-The-Life' Synopsis for the Renewed Market

This section provides an overview of what a typical "Day-In-The-Life" would look like for Market Participants in the renewed market. It highlights process and activity changes, but does not include testing, training, or other timelines for readiness. Market Participants can review this section to guide them in their change journey before, during, and after MRP is in-service. Additional support and information will be provided to Market Participants as details are finalized.



Process Descriptions

1.0: Register New Market Participant and Resource Types

This process impacts new Price Responsive Loads and new Virtual Transaction Energy Traders.

The steps to authorize and register Market Participants remain unchanged. With the introduction of a new Day-Ahead Market, existing eligible Market Participants that currently participate in the Real-Time Market will automatically be granted authorization to participate in future Day-Ahead operations.

Two new Market Participant and resource types are introduced within the authorization and registration process. In the renewed market, Market Participants will be able to identify themselves as a Virtual Transaction Energy Trader and/or register their resources as a Price Responsive Load. Market Participants will be able to directly apply for authorization as a Virtual Transaction Energy Trader within Online IESO. Conversely, Market Participants must first be authorized as a Wholesale Consumer before registering their resources as a Price Responsive Load. Detailed training resources will be provided to demonstrate how Market Participants can become a Virtual Transaction Energy Trader and/or register a load resource as Price Responsive Load in the near future.

2.0: Review and Submit New Prudential Support Requirements

This process impacts all Market Participants.

The prudential support obligations for physical transactions will remain the same, but will be assessed separately from the new virtual transactions. The price basis for that prudential support will also change due to the introduction of a financially binding Day-Ahead Market and the use of locational marginal prices in the renewed market. Market Participants should continue to follow the Prudential Security process to review their prudential support requirements prior to the MRP in-service date. A detailed training resource will be provided to Market Participants to educate them on how the process will change in the renewed market.

3.0 Review New and Updated Facility and Resource Parameters, Reference Levels and Reference Quantities, and Market Control Entities

This process impacts Dispatchable and Non-Dispatchable Generators, Dispatchable Loads, Non-Dispatchable Loads, Price Responsive Loads, Demand Response Resources, Virtual Transaction Energy Traders, Intertie Traders, and Energy Storage Providers.

Facility and Resource Parameters:

The renewed market introduces new and updated facility and resource registration parameters that apply to various generation facilities and load resources in order to successfully operate in the future Day-Ahead Market and Real-Time Market. These parameters will be used as part of dispatch data validation, scheduling and dispatch decisions, and the improved settlement process.

Future training resources will cover the new and updated parameters below:

Hydroelectric Generators

- Forbidden Regions
- Start Indication Value
- Hourly Must Run Flag
- Time Lag
- Cascade Group Name (for cascading hydro resources)
- Forebay Name (for cascading hydro resources)
- Forebay Sequence ID (for cascading hydro resources)

NQS Generators

- Start-Up Offer and Speed-No-Load Offer Eligibility Flag
- Generator Offer Guarantee (GOG) Eligibility Flag
- Duct Firing 10-minute Operating Reserve Capability Flag (for combined cycle plants)

Dispatchable Generators, Non-Dispatchable Generators, Dispatchable Loads, Price Responsive Loads, Hourly Demand Response Resources

- Energy Market Flag

Dispatchable Loads, Non-Dispatchable Loads, Price Responsive Loads, Hourly Demand Response Resources

- Bid/Offer Type

Dispatchable Loads, Non-Dispatchable Loads, Price Responsive Loads

- Maximum Load - Active Power

Dispatchable Loads

- Maximum Registered Ramp Rate

Reference Levels and Reference Quantities:

The Market Renewal Program's use of locational marginal pricing will introduce an updated market power mitigation framework and the need to establish reference levels and reference quantities for the ex-ante and ex-post assessment of dispatch data submitted by dispatchable loads and dispatchable generators. The IESO is currently conducting one-on-one consultations with Market Participants to review their reference levels and reference quantities. Market Participants are recommended to complete their consultations and ensure that their respective reference levels and reference quantities will be registered at least 3 months before the MRP in-service date.

Market Control Entities (MCE):

Market Participants who are registered as dispatchable and non-dispatchable generation resources, dispatchable loads, price responsive loads, physical and virtual hourly demand response resources, dispatchable and self-scheduling electricity storage resources, virtual transaction energy traders, and intertie traders will need disclose their Market Control Entities information in Online IESO. Disclosing MCEs is a new requirement that identifies entities who have the ability to control or influence the participation of a Market Participant in the future Day-Ahead and Real-Time Market. The criteria that will be used by Market Participants to identify their MCEs will be provided in the updated market rules and market manuals, as well as a future training resource.

4.0 Register Revenue Meter Parameters

This process impacts Dispatchable and Non-Dispatchable Generators, Dispatchable and Non-Dispatchable Loads, Demand Response Resources, Price Responsive Loads, Transmitters, Local Distribution Companies, Ancillary Service Providers (particularly generators that have Automatic Generation Control capability or are part of Reliability Must-Run contracts), and Energy Storage Providers.

To participate in the new Day-Ahead Market, Market Participants will be required to meet the same metering registration requirements that have been outlined for participation in the Real-Time Market. Owners of facilities are still expected to identify its Registered Market Participant (RMP) and its associated Metered Market Participant (MMP). Similar to today's Real-Time Market, MMPs will also be responsible for the financial settlement amounts in the future Day-Ahead Market.

5.0 Review New and Updated Hourly and Daily Dispatch Data Parameters

This process impacts all Dispatchable Generators.

New dispatch data requirements will be introduced in the renewed market. Some of the existing parameters may also be modified as the market moves from a two-schedule market to a single schedule market, as well as the introduction of a financially binding Day-Ahead Market. These changes are intended to create a more efficient scheduling process and to better reflect the physical operating constraints for specific generation facilities.

NQS Generation Facilities

NQS generators will be able to submit the following new/revised parameters:

- new lead time data associated with specific thermal states (mandatory if the resource is GOG-eligible);
- updated minimum generation block down time to include values for hot, warm, and cold thermal states (mandatory);
- a speed no-load offer to replace the existing speed no-load cost parameter (optional); and
- a start-up offer to replace the existing start-up cost parameter (optional).

Hydroelectric Generators

Hydroelectric generators will have the option to submit the following new/revised parameters:

- new minimum hourly output, hourly must-run, and minimum daily energy limit;
- new linked resources, time lags, and MWh ratios;
- new shared daily energy limit;
- new maximum number of starts per day; and
- an updated format for forbidden regions.

Variable Generators

Variable generators will have the option to offer either the IESO's centralized variable generation forecast quantity or offer their own forecast quantity.

6.0 Submit Day-Ahead Market Dispatch Data

This process impacts Dispatchable and Non-Dispatchable Generators, Dispatchable Loads, Demand Response Resources, Price Responsive Loads, Virtual Transaction Energy Traders, Intertie Traders, Ancillary Service Providers, and Energy Storage Providers.

The Day-Ahead Commitment Process (DACP) and the current Day-Ahead Calculation Engine (DACE) will be replaced by a new financially binding DAM and a new DAM Calculation Engine.

The submission window of dispatch data for energy and operating reserve in the future Day-Ahead Market will be from 06:00 EPT to 10:00 EPT (currently this window is from 06:00 EST to 10:00 EST). Standing dispatch data must also be submitted by 06:00 EPT on the day prior to dispatch day (T_0) in order to be converted on the same day. Any revisions to the standing dispatch data after 06:00 EPT on T_0 will undergo conversion on dispatch day ($T_0 + 1$ calendar day) and will be in effect on the following day ($T_0 + 2$ calendar days). Furthermore, ancillary service providers that provide regulation service will be required to submit their availability data prior to 08:00 EPT. This is to align with the DAM timeline where accepted automatic generation control nominations are communicated to Market Participants prior to 10:00 EPT, and used as an input in the DAM Calculation Engine.

The DAM Calculation Engine executes in a single run starting from 10:00 EPT to 13:30 EPT. If the engine is successful, binding DAM schedules, commitments and prices, as well as an updated adequacy report for the next dispatch day will be published at 13:30 EPT of the current day.

Virtual Transaction Energy Traders

The DAM Calculation Engine will take virtual bids and virtual offers as inputs. These virtual bids and offers cannot result in physically consuming or injecting Day-Ahead scheduled energy in the Real-Time Market and will therefore not be used as inputs into the Real-Time Calculation Engine.

Price Responsive Loads

All dispatch data associated with price responsive load resources will only be evaluated in the DAM scheduling process but will not be included for evaluation in the IESO Real-Time Market.

Variable Generators

The new variable generator forecast quantity dispatch data parameter will only be used in the DAM Calculation Engine. It will not be included for evaluation in the IESO Real-Time Market.

7.0 Evaluate Dispatch Data in Pre-Dispatch Timeframe

This process impacts Dispatchable and Non-Dispatchable Generators, Dispatchable Loads, Demand Response Resources, Price Responsive Loads, Virtual Transaction Energy Traders, Intertie Traders, and Energy Storage Providers.

The future Pre-Dispatch Calculation Engine produces results starting at 20:00 EST and will continue to run on an hourly basis. The first engine run at 20:00 EST will have the longest look-ahead period of 27 hours starting from hour ending 22 (HE22) of the current day to hour ending 24 (HE24) of the next day. The engine run at 19:00 EST of the following day will have the shortest look-ahead period of 4 hours from hour ending 21 (HE21) to hour ending 24 (HE24) of that day. The Pre-Dispatch Calculation Engine resets its look-ahead period to the next 27 hours on its next engine run at 20:00 EST.

The schedules and commitments for all hours of the Pre-Dispatch look-ahead period are provided to all energy suppliers, dispatchable loads and intertie traders through their individual private reports. Advisory LMPs and zonal prices are published through the IESO's public reports.

Pseudo Unit (PSU) Offers

In the renewed market, PSU offers will be used in all three calculation engines. Market Participants that elect to use the PSU model will not be required to re-submit offers for physical units for the Pre-Dispatch Calculation Engine or Real-Time Calculation Engine.

Intertie Traders

The Pre-Dispatch Calculation Engine will evaluate and schedule both DAM-scheduled and non-DAM scheduled intertie transactions for the first two hours of the Pre-Dispatch look-ahead period. For all hours in the Pre-Dispatch look-ahead period beyond the first two, the Pre-Dispatch Calculation Engine will only evaluate and schedule DAM-scheduled intertie transactions, up to the MW quantity of the DAM schedule.

8.0 Evaluate Dispatch Data in Real-Time Timeframe

This process impacts Dispatchable and Non-Dispatchable Generators, Dispatchable Loads, Demand Response Resources, Price Responsive Loads, Virtual Transaction Energy Traders, Intertie Traders, and Energy Storage Providers.

The mandatory window continues to be in place to restrict changes to bids and offers two hours in advance of Real-Time. The Real-Time Calculation Engine will continue to run every five minutes and perform multi-interval optimization on a set of 11 five-minute intervals. The first and upcoming interval within this set is referred to as the dispatch interval while the remaining intervals are referred to as advisory intervals.

The Real-Time Calculation Engine will continue to use the bids and offers already submitted by Market Participants, as well as data provided by the IESO. Additionally, the new algorithm will use reference levels instead of the bid/offer data from a Market Participant as a result of any failures on the market power mitigation price impact test during Pre-Dispatch, and any security constraint sets and loss adjustments that were provided by the security assessment function. Enhancements have also been made to account for:

- new dispatch data parameters for hydroelectric generation facilities;
- pseudo-unit scheduling and dispatch; and
- coordinated de-commitment of NQS generation facilities.

9.0 Review Market Information Reports

This process impacts all Market Participants.

The process of delivering reports, and the format of reports available to Market Participants will remain the same in the future market. However, with the update included within the Market Renewal Program, there will be about 50 new reports, and 100 current reports that will need amendments. Specifications on these reports will be forthcoming for participants to understand the changes, and effectively use the data within these reports.

10.0 Settlement of Physical and Financial Market Invoices

This process impacts all Market Participants.

Market Participants will continue to receive preliminary and final settlement statements, and will still be required to follow the same market settlement timelines following in-service of Market Renewal.

The expected changes to the settlements process will be on the calculation and content of these statements and invoices themselves. The changes are as a result of the following factors:

- The settlement charges will reflect a single schedule market, the use of locational marginal pricing and instances when mitigated dispatch data are applied as a result of failures on mitigation conduct or impact tests.
- A two-settlement system will be used in the renewed market to ensure better reconciliation of DAM settlement amounts with RTM results and to incorporate virtual transactions. This will only be applied to dispatchable facilities, including price responsive loads. Non-dispatchable loads will be settled based on the actual energy withdrawn in Real-Time and the DAM Ontario zonal price adjusted for load forecast deviations.
- Congestion Management Settlement Credit (CMSC) payments and its associated uplifts, as well as Generation Cost Guarantee (GCG) payments and recovery debits, will be retired. New market charges, credits, guarantees, make-whole payments and uplifts will be introduced in the future energy market. These changes will be described in a future training resource.
- The Day-Ahead Production Cost Guarantee (DA-PCG) and Real-Time GCG programs will be replaced by the DAM Generator Offer Guarantee (DAM-GOG) and Real-Time Generator Offer Guarantee (RT-GOG) programs respectively. Associated charges will be displayed in future settlement statements.
- The renewed market will provide DAM Make-Whole Payments (DAM-MWP) for lost cost to resources that have been scheduled in DAM and Real-Time Make-Whole Payments (RT-MWP) for lost cost and lost opportunity cost to resources that follow their dispatch instructions in RTM.
- Financial Transmission Rights (FTRs) will no longer be settled using Real-Time Market prices and will instead use DAM LMPs.

Market Participant Readiness: Training Forecast for Nuclear Generators

A key component to ensuring each Market Participant is fully ready for the launch of MRP, is an effective testing and training program. As each Market Participant faces different impacts of what Market Renewal will mean, the training program will provide some insights into the types of areas where each participant will need to devote time and effort to prepare for the changes that Market Renewal will bring. Training documents will be accessible to all Market Participant segments, but in many cases will only be required by a limited audience.

The lists of training topics below will begin to scope the size of the changes, and assist Market Participants to plan who should participate in these testing and training efforts. Most topics will have detailed training documents and guides, designed for review by the Participant. Some topics may also follow-up with an interactive IESO Q&A session, and more complex topics or processes may be delivered via live or recorded training sessions, where appropriate. The IESO will provide updates to Market Participants as training materials become available in the future.

Testing:

Hands-on opportunities for Market Participant staff to test the use of modified web interfaces, existing system accesses, APIs, and reporting outputs. IESO will also provide sandbox environments for the EMI, Dispatch Services, Online IESO, and the IESO Reports. These environments will be available during the MRP preparation period, to practice user skills, and test compatibility of revised interfaces with MP internal systems.

Connectivity Testing and Information Updates:

- confirm all existing contacts and access rights are correct and up to date
- confirm all of the IESO-MP communications channels are functioning

Online IESO Tool:

- enter new/modified Market Authorizations
- enter new required data for facility registration
- review Prudential Security - changes to price basis calculations

EMI Tool (Energy Market Interface) (and EMI API):

- no new dispatch data parameters for this MP segment
- test modified EMI tool layout of existing data parameters

Dispatch Services Tool (and Dispatch API):

- test the updates to the Dispatch Services tool, including API

IESO Reports, including Settlement Reports:

- sample versions of files will be available for all updated or new public/private reports
- new 'schema' files to be issued for all updated or new reports, including Settlement reports

Training:

Written documents (training guides/quick takes) will be designed for the following MRP change topics that will directly impact end users in this market segment. These will provide either the details of the theory and knowledge for these topics, or the specific steps for new processes. These documents will focus on the key areas of change from Market Renewal. Once participants review the relevant materials, some topics may also include a follow-up discussion where needed.

Detailed Training Topics for Nuclear Generators

- Day-Ahead Market Quick Take
- Introduction to Market Power Mitigation
- Two-Settlement Guide
- Market Prices Guide
- Guide to Prudentials for the IESO
- Calculation Engines Guide
- Guide to Submitting New Registration Parameters and Forms in Online IESO
- Instructions to View and Update Reference Levels and Quantities in Online IESO
- Submitting, Revising and Cancelling Bids and Offers in EMI
- Web-Based Dispatch Services

Awareness:

Suggested training materials that are designed to provide readers with a more general awareness or understanding of specific MRP topics, which are not a key area of change for this participant type. These topics typically represent areas that will not impact participants in this market segment directly, but which will provide some understanding of how the overall market functions.

Awareness Overview Topics for Nuclear Generators

- Renewed Market Overview: Intertie Transactions and Transmission Rights
- Four Area Demand Forecast Quick Take
- Introduction to Virtual Traders
- Settlement Changes to the Transmission Rights - Quick Take

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