



Interim Electricity Storage Operating Guide

Independent Electricity System Operator
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Introduction

An electricity storage unit is defined as the equipment used for the sole purpose of withdrawing electricity from the electricity system, storing that electricity as energy, and re-injecting it, or a portion thereof, as electricity into the electricity system.

In 2020, the IESO completed the Storage Design Project that integrated electricity storage into the IESO Administered Markets (IAM). The project provided a glimpse of how the IESO would integrate storage in the future once it is able to update its tools to account for storage's state-of-charge constraint but it also outlined in detail how the IESO would integrate storage during the interim period before these future updates materialize.

This guide covers:

- The various IESO-administered markets and ancillary service products available for electricity storage participation during the "interim period".
- The IESO connection process applicable for electricity storage facilities.
- Processes and procedures that electricity storage participants must follow once its electricity storage facility is connected and fully operating.
- A high-level overview of some of the market manuals to be most relevant and critical to the near term integration of electricity storage participants and electricity storage facilities.

Interpretation

In any case where there is a discrepancy between the requirements of this guide and the market rules or market manuals, those other documents or terms, as applicable, shall prevail. Further, any term that is italicized in this guide has the meaning given to that term under Chapter 11 – Definitions of the market rules.

Authority

This guide has been prepared to assist in the IESO training of market participants and has been compiled from extracts from the market rules or documents posted on the web site of Ontario's Independent Electricity System Operator. Users of this guide 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 guide, even if such obligations are not specifically referred to herein. While every effort has been made to ensure the provisions of this guide are accurate and up to date, users must be aware that the specific provisions of the market rules or particular document shall govern.

Related Market Manuals

This document is meant to supplement the existing series of market manuals. It is not intended to alter or abrogate any provisions of the market rules or market manuals.

Conventions

We', 'us' and 'our' mean the IESO. 'You' means the market participant.

What is the Interim Design?

The interim design represents a framework for electricity storage participation in the IESO-Administered Markets (IAMs) during a period before storage can be fully integrated into the IESO's dispatch and optimization tools (i.e., the DSO). During this period, the IESO will need to register electricity storage participants with generation and, or load resources in order for the DSO to recognize their unique ability to inject and withdraw energy. In addition, a specific set of market rules were created to support electricity storage participants to manage their operations while ensuring the continued reliable operation of the IESO-controlled grid. The market rules specific to the interim design can be found in Chapter 7 Section 21

What are the various IESO-Administered Markets Available for Electricity Storage Participation?

During the interim period, you will be able to participate in the following products:

- real-time energy market
- operating reserve market
- capacity auction
- regulation
- reactive support service and voltage control service.

Here are some important considerations if you are interested in participating:

- You may participate in the various IESO-administered markets as long as your electricity storage facility has a minimum capacity for energy injections and withdrawals greater than 1 MW.
- Operating Reserve, Regulation, Reactive Support, and Voltage Control are ancillary services, with the latter two being contracted services. The capacity auction is a competitive procurement.
- To participate in real time energy market, operating reserve market and capacity auction, your facility will need to be registered as a dispatchable electricity storage facility.

If you intend to provide regulation, your facility will need to be registered as a self-scheduling electricity storage facility. During the interim, due to IESO tool limitations, a facility providing regulation will need to be limited to an electricity storage facility size of 50 MW and is not allowed to participate in the IESO-administered markets, operating reserve or capacity auction.

In order to provide real-time energy, operating reserve, regulation or reactive support service, voltage control service, you will need to complete the IESO Connection Process as outlined in Section 4 below.

To provide operating reserve, you must be able to provide at least 70 minutes of withdrawal at the minimum operating reserve withdrawal capability you intend to offer as a load resource and at least 130 minutes of injection at your minimum operation reserve injection capability if you intend to offer as a generation resource.

Capacity auction considerations can be found in Section 5.9.2 of this guide

If your electricity storage facility size is less than 10 MW and you do not wish to provide operating reserve, participate in the capacity auction or provide regulation but wish to participate in the energy market, you may register as a self-scheduling electricity storage facility.

Further Reading:

- [IESO Ancillary Services Market Webpage](#)
- [IESO Capacity Auction Webpage](#)
- [Electricity Storage in the IESO-Administered Market: Market Rules Chapter 7, Section 21](#)
- [Market Rules Chapter 5 and Appendix 5](#)
- [Market Rules Chapter 7](#)
- [Market Manual 12: Capacity Auction](#)

I'm Ready to Connect my Facility and Express my Interest in Participating in IAMs

IESO Connection Process

You are required to go through the IESO Connection Process if you are planning to connect a new facility or modify an existing facility. This includes the provision of new/modifications to the provision of an ancillary service. Completing the connection process (which includes the IESO Connection Assessment and Approval Process, Registration Process and Performance Validation Process) can take anywhere from a few months to 3 years depending on the complexity of the project. Therefore, it is important that you plan ahead according to your desired in-service date.

The Connection Process may include some or all the following six stages:

1. Prepare Application
2. Obtain Conditional Approval to Connect
3. Design and Build

4. Authorize Market and Program Participation
5. Register Equipment
6. Commission Equipment and Validate Performance

For more details about this process please refer to the following [link](#) on the IESO website.

Specific details referring to the IESO Connection Assessment and Approval Process can be found in [Market Manual 1.4: Connection Assessment and Approval](#).

Specific details referring to the Market Registration process can be found in [Market Manual 1.5: Market Registration Procedures](#).

For any questions about stages (1) to (3), please contact IESO Connection Assessments at connection.assessments@ieso.ca.

For any questions about stages (4) to (6), please contact IESO Market Registration at market.registration@ieso.ca.

Prudential Security

It is possible for an energy storage facility without an ancillary services contract, or fixed payment contract with the IESO to be a net market debtor in a given settlement period. However remote the risk may be, it is nonetheless a credit risk that may have to be evaluated by the IESO for prudential security purposes. This framework will need to provide a reasonable degree of financial security for other market participants.

Electricity storage facilities shall work within the same prudential security framework that is applicable to all market participants. This framework provides security for all market participants against the mutual risk of a default by any market participant in the IAMs. Under the IESO Market Rules, all market participants may be subject to a default levy in the event that a market participant defaults against the electricity market and there is insufficient prudential security to cover that default. Every aspect of today's prudential security framework is intended to minimize that risk for all involved.

The main storage-specific feature of the prudential security framework, is the manner in which the IESO determines the market participant's prudential support obligation for a storage facility. Here, the IESO will use each facility's:

- Registered cycle efficiency value – i.e., the proportion of energy that is returned for injection into the electricity system after it is withdrawn and stored
- Registered maximum state of charge (SOCMAXg) – i.e., the highest certified state of charge to which the energy storage system can be consistently charged without damage beyond expected degradation from normal use
- Registered duration of service – expressed in minutes, the certified duration of service of the facility is calculated from the Certified Energy Storage Capacity (SOCMAXg) and Certified Power Storage Capacity (Pmax,g) of the facility. Certified quantities are determined during testing.

The amount of energy lost in the process of withdrawing, storing and injecting energy represents the potential financial exposure to the market for energy that will not be returned for sale.

For more information on what how prudential security is calculated or to address any questions, contact prudential@ieso.ca.

Once Connected, what Processes do I have to follow to Participate Day-Ahead and Real-Time Markets?

This section outlines the various processes and procedures that you will need to follow once you have completed registration and are operating in the IESO-administered markets. This section also provides links to further documentation that describe these processes.

DACP

The day-ahead commitment process (DACP) provides a dependable view of the next day's available supply and anticipated Ontario demand. The DACP uses a day-ahead calculation engine (DACE) to optimize energy and operating reserve for the 24 hours of the next day. The DACE determines the least-cost security-constrained solution for a dispatch day based on the bids and offers submitted by all resources. This process plays an important role for the reliability of the IESO controlled grid and affects the financial obligations of day-ahead production cost guarantee-eligible facilities and imports. It is during the DACP process that the IESO makes decisions regarding unit commitments for the following dispatch day.

All dispatchable and self-scheduling electricity storage facilities will be required to submit dispatch data or self-schedules into the IESO day-ahead commitment (DACP) process in the same manner as any other self scheduling or dispatchable generation/load facility, as the case may be. Bids and offers must be submitted between 06:00 and 10:00 EST day-ahead. Bids and offers for the same electricity storage facility must adhere to the "no-overlap rule" whereby no single bid price in the bid curve of its dispatchable load resource may be equal or greater than any offer price of its dispatchable generation resource. While day-ahead participation in operating reserve markets is optional, those electricity storage participants that are eligible to offer operating reserve day-ahead must adhere to the real-time operating reserve rules that stipulate that, for a given electricity storage facility, a resource offering OR cannot simultaneously offer from both the registered generator resource and the registered dispatchable load resource for the same dispatch hour. See market rules Chapter 7, section 21, for all rules related to this section.

Self-scheduling electricity storage facilities providing regulation service do not have to participate in the DACP.

Participation in the DACP is a pre-requisite to participating in the real-time market during the ensuing dispatch day. It is through the DACP process that you will secure your "Availability Declaration Envelope" (ADE) for the next dispatch day. The ADE represents the maximum quantity of energy that can be included in real-time dispatch data. The ADE is established for the next dispatch day by the most recent dispatch data that was considered and approved in the DACP Schedule of Record (SOR).

The SOR is published after the successful completion of the DACP. The SOR is made up of two sets of private reports—the Day-Ahead Scheduled Energy Reports and the Day Ahead Check/Source ADE Reports. If either of these reports fails to publish, the DACP is declared a failure for that day. On a successful day, the SOR is always published by 15:00 and is always based on the last set of published results.

Further Reading:

[Market Manual 9: Day-Ahead Commitment Process Part 9.0: Day-Ahead Commitment Process Overview](#)

[Market Manual 9: Day-Ahead Commitment Process Part 9.2: Submitting Operational and Market Data for the DACP](#)

[Market Manual 9: Day-Ahead Commitment Process Part 9.3: Operation of the DACP](#)

[Market Manual 9: Day-Ahead Commitment Process Part 9.4: Real-Time Integration of the DACP](#)

Submission of Dispatch Data and Self Schedules in Real Time

Dispatchable generators and the injection resource of dispatchable electricity storage facilities submit offers to sell energy. Dispatchable loads and the withdrawing resource of dispatchable electricity storage facilities submit bids to buy energy or submit offers to provide operating reserve. Self-scheduling electricity storage facilities (not providing regulation), submit self-schedules.

Collectively, all information included in bids, offers, or self-schedules are referred to as 'dispatch data.' Dispatch data includes several elements, not limited to but most notably; price/quantity pairs (for dispatchable resources) self-schedules (for self-scheduling resources), ramp rates, and the facility's 'Resource ID'.

Market participants enter bids, offers, and self-schedules via the [Energy Market Interface](#) in hourly blocks. Given that dispatchable electricity storage facilities are registered as both dispatchable generators and dispatchable loads, and self-scheduling electricity storage facilities (not providing regulation) are registered as a self-scheduling generation resource(s) and non-dispatchable load resource(s), when submitting dispatch data, you are expected to follow the generator, dispatchable load, and self-scheduling generation facility requirements as outlined by the following technical guides:

- [Submitting, Revising and Cancelling Energy Bids](#)
- [Submitting, Revising and Cancelling Energy Offers](#)
- [Submitting, Revising and Cancelling Operating Reserve Offers](#)
- [Submitting, Revising and Cancelling Schedules and Forecasts](#)

Note, these guides outline **how** electricity storage participants participating in real-time markets are to submit dispatch data. You should, however, refer to [Market Manual 4.2 - Submission of Dispatch Data in the Real-Time Energy and Operating Reserve Markets](#) to understand your **obligations** under the market rules and associated policies when submitting, revising or cancelling dispatch data, with specific attention to the details around signaling state of charge capability changes in the IESO's mandatory window and real-time energy and operating reserve dispatch data obligations.

Outage Management

You must request permission and receive advance approval from the IESO for any planned outages to ensure that there is no adverse impact to the reliability and/or operability of the IESO-controlled grid. Outage requests are submitted via the Control Room Operations Window (CROW) outage coordination and scheduling system. All other non-planned outages (i.e., forced, urgent, information and opportunity outages) can be submitted to the IESO as a notification or a late request for advance approval. The various outage types are listed below:

Outage Type	Description
Forced	Non-discretionary outages on equipment that has been automatically or manually removed from service for equipment protection, public safety, environmental concerns or regulatory requirements are classified as forced outages. Such outages have little to no timing flexibility and have precedence.
Urgent	Non-discretionary outages on equipment that must be manually removed from service for equipment protection, public safety, environmental concerns or regulatory requirements are classified as urgent outages.
Planned	Discretionary outage requests that are scheduled to perform preventive maintenance, repairs, inspections, de-staffing and testing for facilities/equipment are classified as planned outages.
Opportunity	Outage requests where market participants are presented with an unexpected opportunity to accomplish work that was not previously planned.
Information	Outages that are exempt from typical submission requirements but are submitted for informational purposes only.

Further Reading:

[Market Manual 7: System Operations Part 7.3: Outage Management](#)

Policies and Procedures Relating to Reliable Operations of the IESO Controlled Grid

You play an important role along with the IESO in ensuring the reliable operations of the IESO-controlled grid. As such, the IESO has established various procedures and policies to guide market participants. These procedures and policies relate to adequacy and system security which are the components of reliability.

Adequacy refers to the ability of the power system to supply the electrical demand on the system, taking into account scheduled and reasonably expected unscheduled outages of system elements. System security refers to the ability of the power system to withstand sudden disturbances or unanticipated loss of elements.

[Market Manual 7.1: IESO-Controlled Grid Operating Procedures](#) documents the key procedures used by the IESO and market participants to ensure the reliability of the IESO-controlled grid. Here you can find your responsibilities and the IESO's responsibilities under various operating states and operating conditions, how you and the IESO Control Room should be communicating with each other under different situations and what is expected with respect to voltage control and frequency regulation.

You will also find in this manual the hierarchal list of control actions that the IESO can take leading up to and during an "emergency operating state." The actions taken by the IESO with regards to your facility will be dependent on whether you are registered as a dispatchable electricity storage facility or a self-scheduling electricity storage facility.

[Market Manual 7.4: IESO Controlled Grid Operating Policies](#) provides policies and principles used to guide the development of IESO procedures and control actions and can assist market participants in meeting their obligations in the operational time frame.

Contacting the IESO Control Room

If you have been designated by the IESO through the registration process as a facility that has an impact on the reliability of the IESO-controlled grid, you should promptly report to the IESO all matters that affect the operation of the ICG. Communication shall be made by telephone to the IESO control room staff.

The following table provides (i) general communication guidelines (ii) how to communicate to us if you experience an event during normal and abnormal conditions (iii) how to communicate to us if you need to synchronize or desynchronize and (iv) instances where the IESO may be initiating communication with you.

Further Reading:

[Market Manual 7: System Operations Part 7.1: IESO-Controlled Grid Operating Procedures](#)

Settlements

Forms

For information on which forms electricity storage participant should be using, see [Market Manual 5.5 - Physical Markets Settlement Statements](#).

Station Service Rebates

Electricity storage facilities in the IESO-administered markets consume energy as electricity storage station service. Metered market participants for certain electricity storage facilities are eligible for a reimbursement of the hourly uplifts and non-hourly settlement amounts related to the volume of energy actually consumed as electricity storage station service. Refer to Chapter 9, Sections 2.1A.13A and 2.1A.13A.3 of the market rules to find the eligibility requirements and the specific conditions for this rebate.

If you¹ believe that your electricity storage facility is eligible for a generation station service rebate, you should:

- Download IMO_FORM_1419 “Application for Designation of a Facility for Generation Station Service and Electricity Storage Station Service Rebate” from our web site;
- Complete all applicable sections; and
- Submit the form to us in accordance with [Market Manual 5.5 - Physical Markets Settlement Statements](#).

We will:

- review your application;
- request additional information in order to assess the application, if necessary;
 - determine if your electricity storage facility meets the requirements for the rebate designation; and
 - notify you in writing of our determination.

If you meet the requirements for rebate designation, we will adjust the hourly uplifts and non-hourly settlement amounts that may have accumulated at the electricity storage station service delivery point during the periods where the eligible electricity storage facility was a net injector of energy into the IESO-controlled grid.

Reimbursement amounts are calculated at month-end and are applied to the last trading day of the month as a manual line item on the preliminary settlement statements and the final settlement statement for each electricity storage facility as charge type 119 – Station Service Reimbursement Credit.

The offsetting charge type 169 – Station Service Reimbursement Debit is included on the preliminary settlement statement and the final settlement statement of all load customers for the last trading day of the month.

See [Market Manual 5.5 - Physical Markets Settlement Statements](#) for further details.

Charge types and equations

See [Market Manual 5.5 - Physical Markets Settlement Statements](#) for settlement programs that apply to electricity storage and cross reference with applicable charge type in the IESO’s Charge Types and Equations technical reference manual. Note, the IESO does not anticipate updating the charge types and equations set out in Section 2.2, the variable descriptions set out in Section 2.1 above, or any

¹ In this Section 1.6.1 and 1.6.2, “you” refers to a *metered market participant*.

other potentially affected parts of this document to reflect those market rule amendments until the IESO's commercial reconciliation tools shall have been updated.

Reliability Standards

As a market participant, you are required to comply with the market rules. Market participants that meet the applicability criteria established by the IESO are also required to comply with all applicable North American Electric Reliability Corporation (NERC) and Northeast Power Coordinating Council (NPCC) reliability standards. NERC and NPCC are standards authorities that define the reliability requirements for planning and operating the interconnected North American bulk electric system.

For a high level overview of the various documents and processes applicable to monitoring and enforcing compliance with reliability standards in Ontario, please refer to [Market Manual 11: Reliability Compliance Part 11.0 Reliability Compliance Monitoring and Enforcement Overview](#).

For a list of the applicable NERC reliability standards and NPCC criteria and how compliance of each is demonstrated by you and your facilities, please refer to [Market Manual 11: Reliability Compliance Part 11.1: Applicability Criteria for Compliance with NERC Reliability Standards and NPCC Criteria](#)

The Ontario Reliability Compliance Program is part of the larger Compliance Monitoring and Enforcement Program (CMEP) designed and executed to monitor and enforce compliance with market rules, including reliability standards. For more details about the Ontario Reliability Compliance Program and how the IESO monitors your compliance with reliability standards, please refer to [Market Manual 11: Reliability Compliance Part 11.2: Ontario Reliability Compliance Program](#)

For a list of all the reliability information that is required to be shared between you and the IESO in relation to maintaining the reliability of the IESO-controlled grid, please refer to [Market Manual 11: Reliability Compliance Part 11.3: Reliability Information Catalogue](#)

If your electricity storage facility has been deemed a Bulk Electric System facility based on NERC reliability standards, but you wish to seek an exemption, you can submit a request to the IESO. For information on the Bulk Electric System exemption process and what is involved, please refer to [Market Manual 11: Reliability Compliance Part 11.4: Ontario Bulk Electric System \(BES\) Exception](#)

If you have specific requirements related to reliability standards compliance, please contact the IESO at orcp@ieso.ca.

Reliability Outlook and Reliability Assessments Information Requests

To help the IESO prepare and publish its Reliability Outlook, where security and adequacy are assessed over an 18-month period, you will need to provide information about its facility annually between March 1 and April 1 or when as soon as possible when material changes are anticipated. For more information about this process, please refer to [Market Manual 2: Market Administration Part 2.11: Reliability Outlook and Related Information Requirement](#).

You will also need to provide the IESO information about your facility and its plans for the period beyond the 18-month period for the period covering the next 10 years and 6 months starting from July 1 of the current calendar year. This information is to be submitted annually between March 1 and April 1. For more information about this process, please refer to [Market Manual 2: Market Administration Part 2.8: Reliability Assessments Information Requirements](#).

Electricity storage participants with further questions regarding either of these processes can contact the IESO via forecasts.assessments@ieso.ca.

Participation Requirements for Elective Programs

Capacity Export Requests

You are eligible to participate in Capacity Export Opportunities with your injection unit (i.e., generator resource).

Market participants with Ontario-based generating capacity that the IESO has determined to be surplus to Ontario's reliability and planned resource adequacy requirements have the opportunity to export their surplus capacity to designated external control areas during specified periods of time. These market participants (referred to as Prospective Capacity Sellers) are required to secure IESO approval before they can participate in a Capacity Export Opportunity.

Electricity storage participants with further questions regarding this program can contact the IESO via forwardmarkets@ieso.ca.

Further Reading:

You can find more details about this program and which external control areas are currently participating in [Market Manual 13: Capacity Exports Part 13.1 Capacity Export Requests](#).

Details on how to submit a request with your registered generator resource can be found in [External Guide to Using Online IESO for Capacity Exports](#).

Capacity Auction

Capacity auctions acquire capacity for one commitment period, which consists of one or more obligation period.

You may be eligible to participate through the use of your generator resource if you have a dispatchable electricity storage facility.

Electricity storage participants with further questions regarding this program can contact the IESO via customer.relations@ieso.ca.

Further Reading:

[Market Manual 12.0 Capacity Auction](#).

Related Market Manuals

See the various market manual references as outlined in the various sections of this guide. Market Manuals are located [here](#).

– End of Document –

References

- IESO Phase 1 Energy Storage Contract
- IESO Energy Storage Design Project – Draft Design Document, [Version 1.0](#)

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