# Storage Design Project: Guide to the Draft Market Rule Amendments

In order to facilitate the integration of energy storage resources into IESO-administered markets, changes are required to both Market Rules and Market Manuals. This document provides additional context to the proposed market rule amendments for the interim design being developed through the energy storage design project. Full details on the accompanying stakeholder engagement process are available on the Energy Storage Advisory Group webpage.

The IESO approach in drafting proposed Market Rules is twofold:

- Amendments made for the purposes of implementing the interim design can be found in Chapter 7, section 21 of the draft Market Rules.
- Other amendments, that are expected to last beyond the period that the interim design is in effect, can be found throughout the Market Rules.

The version of the Market Rules used in preparing these storage integration amendments is that which is current as of June 3, 2020. The IESO recognizes that there are other initiatives underway that may result in amendments to the June 3, 2020 version of the Market Rules before the storage integration amendments come into effect. The IESO will reflect and, if needed adjust to, these other amendments in future drafts of the electricity storage integration amendments.

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**Chapter Edits**

| Chapter | Section | Topic | Description |
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| Chapter 2 | 2.1 | Classes of Market Participants | Adds electricity storage participants as a new market participant class. |
| | 6.1 | Technical Requirements | Applies technical and performance requirements to electricity storage facilities. |
| Chapter 2-Appendix 2.2 | 1.1 | Voice Communications | Apply requirements related to voice communication to electricity storage facilities. |
| | 1.2 | Monitoring and Control | Apply requirements related to monitoring and control to electricity storage for Registration and IT requirements |
| | 1.5 | Reclassification of Facilities | To outline rights for reclassifying facilities by size for the purposes of Chapter 2 Appendix and portions of Chapter 5 |
| Chapter 3 | 2.2<br>2.5<br>2.6 | Application of dispute resolution | All changes related to extending the rights related to compensation for outages rejected by the IESO to electricity storage participants. |
| Chapter 4 | 1.1 | Introduction | Adds embedded electricity storage participants who may not be market participants to the requirements in the chapter. |
| | 3.1 | Performance standards and obligations of market participants | Sets out requirements to adhere to data and performance requirements in appendices 4.1 through to 4.4, including those embedded electricity storage participants. |

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| | 3.2 | Development of rules for waivers of standards | Extends ability to obtain reactive power to electricity storage facilities. |
| | 3.6 | Obligations of Electricity storage participants | Electricity storage resources must adhere to requirements related to testing and operating according to their connection agreement and providing certain reliability related information. This section is modelled from section 3.4 for generators. |
| | 4.1 | Connection Agreements | Requirement to have a signed connection agreement. |
| | 5.1 | Compliance, Testing and Monitoring | Sets out requirements for testing and monitoring equipment, maintaining related records, notification of tests, and responsibilities for costs. |
| | 5.2 | IESO-Required tests of Generators and Electricity Storage Participants | Provides that the IESO may require other tests in addition to tests required by connection agreement. |
| | 5.3 | IESO-Required tests of interconnections | IESO may temporary direct the operation of electricity storage facilities and such costs are reimbursable. |
| | 6.4 | Disconnection during an emergency or for safety or reliability reasons | IESO may issue a disconnection order if a unit is synchronized to the grid other than in accordance with section 11.2 of chapter 7. |
| | 7.1 | Provision of connection-related information | Electricity storage participants shall provide reliability data listed in specific appendices. |
| | 7.3A | Monitoring information provided by electricity storage participants to the IESO | Data outlined in appendix 4.24 shall be provided on a continual basis to the IESO by electricity storage participants. This daily capacity and injection information will be published by the IESO. |
| | 7.6A | Alternative Arrangements for Submission of Data Measurements | Includes appendix 4.25 in list of appendices in which market participants may propose alternative arrangements. |

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| | 7.7 | Reliability, Maintenance and Repair of monitoring and control equipment | Electricity storage participants shall notify the IESO where there is an outage in their monitoring and control equipment that could impede their provision of information as per Appendix 4.25. |
| | 7.8 | Reclassification of facilities | Provides the IESO with rights to reclassify facilities by size (major, significant, minor, small) for collecting monitoring information and sets out responsibilities of the electricity storage participant if this occurs. |
| Chapter 4 Appendix | 4.2 | Generation and Electricity Storage Facility Requirements | Applies requirements to electricity storage facilities. Note that this appendix will be amended by the performance requirements project and when approved the changes made in the performance requirements project will be reflected in the changes proposed for electricity storage. |
| | 4.24 | IESO Monitoring Requirements; Electricity storage participants | New section that sets out telemetry requirements for electricity storage. |
| | 4.25 | IESO Monitoring Requirements; Electricity storage performance standards | New section that sets out telemetry performance standards for electricity storage. |
| Chapter 5 | 2.2 | Normal operating state | Adds electricity storage operating within equipment ratings to the definition of a normal operating state. |
| | 3.2 | Obligations of the IESO | Adds electricity storage to the responsibilities of the IESO to issue orders, direction for dispatch. |
| | 3.8 | Obligations of Electricity storage participants | Sets out requirements for electricity storage participants to have communication systems in place, provide functional descriptions to the IESO, and provide certain types of information to the IESO related to operating profile of equipment, and any change in this profile. |

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| | 4.1 | System reliability objectives | Objective of the section is to ensure adequate capacity, be that from generation or storage resources |
| | 4.5 | Operating Reserve | Allows electricity storage resources to provide Operating Reserve, and whose forced outage or performance uncertainty may be a reason for why Operating Reserve is required. Note there are additional requirements for storage in providing OR which are detailed in Ch7, section 21. |
| | 4.6 | Auditing and Testing of Ancillary Services | Provides the IESO rights to test electricity storage facilities that are providing ancillary services. |
| | 6.1 | Outage coordination | IESO to provide a list in the market manual of all facilities, including electricity storage, whose outage must be reported. |
| | 6.2 | Outage planning | Electricity storage participants must maintain accurate outage plans for the IESO to include in 18 month assessments, but there are some exceptions for smaller facilities. |
| | 6.3 | Replacement energy | An electricity storage participant may arrange replacement energy with a planned outage. |
| | 6.4 | Submission of outage schedules | Outage schedules must be provided in advance, and the IESO may in some cases revoke previous approvals, specifically for storage in the case where a transmitter's outage might prevent the delivery of storage capacity that has been sold as an export. Distributors must also report to the IESO outages that potentially constrain an embedded electricity storage facility. |
| | 6.5 | Information on planned outages | Includes electricity storage participants as responsible for delivering outage information and the IESO may publish this information. |

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| | 6.6 | Tests | Electricity storage participants who conduct tests that could affect the reliability of the grid are required to notify the IESO. |
| | 6.7 | Compensation for outages that were revoked | When a planned outage is approved in advance, then this approval is revoked, an electricity storage participant is entitled to compensation, subject to certain conditions. |
| | 7.1 | Forecasts prepared by the IESO | Electricity storage participants may be required to provide to the IESO their quarterly and daily load forecasts. |
| | 7.2 | Basis for IESO forecasts | Electricity storage facilities shall be included in forecasts of peak demand and energy demand. |
| | 7.4 | Purposes of Assessments | IESO shall produce quarterly and daily assessments that shall include electricity storage capacity. |
| | 8.1 | Special Protection Systems | Clarifies that the control actions listed where special protection systems have been installed do pertain to electricity storage facilities. |
| | 8.4 | Special Protection Systems | Under certain conditions, where a Special Protection System is installed and the facility is tripped off-line, the electricity storage participant may be eligible for compensation. |
| | 10.2 | Demand Control initiated by a Market Participant | Market Participants that can intentionally and directly interrupt the withdraws by a dispatchable electricity storage facility are required to provide certain notification to the IESO. |
| | 10.5A | Electricity storage participant obligations during abnormal frequency excursions | Sets out requirements for storage to report and restore abnormal frequency excursions. |
| | 11.6 | Emergency facilities | Electricity storage participants shall support the emergency system coordinator when IESO operations need to move from the principal control centre. |

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| | 12.1 | Communication methods | Sets out requirements for embedded storage providers to have voice communication, monitoring and control equipment as outlined in the appendix of chapter 2. |
| | 12.2 | Voice communication | Includes embedded electricity storage in requirements for voice communication facilities |
| | 12.3 | Electronic Data | IESO energy management system information shall include functions related to control, analysis and scheduling of electricity storage facilities. |
| Chapter 5-Appendix | 1.3 | Reactive Support and Voltage Control- Generation and Electricity Storage facilities | Includes electricity storage facilities in requirements for RSVC services. |
| | 1.4 | RSVC- Neither generation nor electricity storage | Revises title to reflect addition of electricity storage as a resource type. |
| Chapter 6 | 11.1 | Performance of Metering Installation | Sets out the basis upon which the IESO will estimate metering data when there is an outage of metering installation equipment. |
| Appendix 6.2-Alternative Metering Installation standards | 1.1A<br>1.5 | Metering installation not comprised of two meters | Sets out requirements for collating of metering data for self-scheduling electricity storage facilities. |
| | 1.11 | Instrument transformers- primary connection point | Requirements for metering installations that do not comply with proximity requirements outlined elsewhere. |
| | 1.14 | Estimation pending rectification | Sets out the basis upon which the IESO will estimate metering data when the registration of that meter has been revoked or expires. |
| Appendix 6.3-Inspecting and Testing Requirements | 1.5 | Frequency of routine testing | Removes the term "load" from load facility, broadening the applicability of the clause that sets out the frequency at which metering tests are to be taken so as to include electricity storage facilities that are withdrawing. |

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| Chapter 7 | 2.1 | Requirements for operating on the grid | Sets out the minimum size threshold of 1 MW for electricity storage. |
| | 2.2 | Registered Facilities | Sets out the requirements, including information requirements, for registration with the IESO. Sets out the minimum facility size requirement for participation in the IESO markets. Section also sets out the requirements for registering as a self-scheduler and a commissioning facility. Note that the ability to register an electricity storage facility between 10 and 50MWs as a self-scheduler for the purposes of providing regulation is an interim provision that can be found in Chapter 7, section 21. |
| | 2.3 | Aggregated facilities | Sets out the conditions that allow the IESO to refuse requests to aggregate facilities, and includes electricity storage in the types of facilities. |
| | 2.4 | Planned retirements | Includes electricity storage in the notification requirements of planned facility retirements |
| | 3.3 | Dispatch data submissions | Includes section 21.6 as one of the exceptions to the rule that no market participant may make changes to dispatch data within 2 hours of dispatch. |
| | 3.3A | Dispatch data for the day ahead commitment process | Sets out the requirements for the day ahead commitment process, the conditions for changing offers in real time, and the IESO approval of such submissions. Additions replicate what applies to dispatchable generation for electricity storage. |
| | 3.4 | Form of dispatch data | Relates to the offers to inject energy and the bids to withdraw energy, the requirements for a self-scheduler, and when an electricity storage will have either its injections or withdraws reduced to zero. Note: the interim requirement |

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| | | | that an electricity storage participant provides bids and offers for the two units (load and generator) that make up an electricity storage facility can be found in Chapter 7, section 21. |
| | 3.7A | Self-scheduling electricity storage | Requirement that a MP for a self-scheduling electricity storage facility shall submit dispatch data. |
| | 4.4 | Inputs to dispatch algorithm | Inputs to price insensitive load, electricity storage included as input. |
| | 5.2 | Information used to determine pre-dispatch schedules | Self scheduling electricity storage used in IESO forecasts, similar to self-scheduling generation facilities. |
| | 5.5 | Release of pre-dispatch schedule information | IESO shall release schedule information to each market participant including electricity storage participants. |
| | 6.3 | Determining real-time schedule | IESO shall use information from electricity storage injections and withdrawals to determine the real-time schedule. |
| | 7.4 | IESO Dispatch of operating reserve | Electricity storage participant shall maintain ability to provide operating reserve if they have offered this. Note that the constraints for electricity storage in providing operating reserve can be found in section 21. |
| | 7.5 | Compliance with dispatch instructions | If the IESO does not believe that a facility will follow dispatch instructions in the future, it can represent it as a self-scheduling electricity storage facility. |
| | 8.4A | Additional compensation for complying with dispatch instructions | This section sets out compensation provided for electricity storage participants during periods of time where there is administrative pricing in effect, and the conditions for this compensation. |
| | 9.1 | IESO procurement markets | Includes electricity storage as resource that the IESO can enter into contracts with for ancillary services. |

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| | 9.2 | Voltage control and reactive support | Includes electricity storage as a resource that can provide reactive support |
| | 11.1 | Generator and Electricity Storage synchronization procedures | Includes electricity storage into the procedures related to synchronization. |
| | 11.2 | Generator and Electricity Storage synchronization procedures | Sets out the process for synchronization to the IESO controlled grid. |
| | 11.3 | Process for desynchronization | Sets out the notification required and conditions permitted for refusal of desynchronization requests. |
| | 12.1 | IESO system status reports and advisory notices | IESO is to publish forecasts of hourly electricity storage capacity, similar to what is done for generation capacity, demand, etc. Major change advisory notices are also to be published where there is a major change to this capacity. |
| | 12.2 | Over generation and under generation advisories | Includes electricity storage as a resource when there are over or under-generation advisory notices. |
| | 19.10 | Eligibility Requirements for Capacity Storage Resources | Sets out the requirements for satisfying capacity obligations with electricity storage resources. |
| | 19.11 | Energy Market Participation for Capacity Storage Resources | Sets out how a capacity storage resource shall participate in the IESO energy market. |
| | 21.1 | Purpose | This is the section that contains the market rules implementing the interim design for electricity storage resources. This purpose section outlines that these are interim rules intended to be replaced when electricity storage resources are more fully integrated into the market rules. They are contained in this specific section for convenience of reference. |
| | 21.2 | Market Registration | An electricity storage facility shall be registered two times, one as a generation resource for the injections it can provide, and second as a load resource for withdrawals. |

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| | 21.3 | Provision of Regulation Service | Electricity storage participants wishing to provide regulation service must register as a self-scheduler and cannot participate in the energy or operating reserve markets. |
| | 21.4 | Day-Ahead- Energy Offers and Energy Bids | As part of the day-ahead commitment process, electricity storage participants must ensure that their bids to withdraw energy does not overlap with their offers to inject energy. |
| | 21.5 | Real-Time Energy Offers and Energy Bids | The bids and offers for an electricity storage facility must not overlap, and if they do, there is no entitlement to congestion management settlement credits. |
| | 21.6 | Revisions to Dispatch Data | Reductions in the quantities offered or bid may be made to dispatch data by electricity storage facilities within two hours of a given dispatch hour due to state of charge limitations. |
| | 21.7 | Operating Reserve | Conditions as outlined in the design document that govern the ability for an electricity storage facility to provide operating reserve. |
| | 21.8 | Interpretation | This outlines how the amendments will pertain to electricity storage facilities. |
| Chapter 8 | 2.1.2 | Physical Bilateral Contract Data and Quantities | Includes electricity storage participants and facilities in the ability to participate in bi-lateral contracts. |
| Chapter 9 | 2.1A | Station service | Sets out how station service will be applied to electricity storage, including how shared costs will be apportioned, and what conditions need to exist to qualify for reimbursement of station service. |
| | 2.2 | Metering Data Recording and Collection Frequency | Specifies the frequency in which meters must record power from a self-scheduling electricity storage facility. |

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| | 3.1 | Determination of hourly settlement amounts | Includes self-scheduling electricity storage into list of market participants whose quantities are provided on an hourly basis. |
| | 3.3 | Hourly Settlement amounts in the real time energy market | Includes self-scheduling electricity storage into formula for net energy market settlement credit (NEMSC) |
| | 3.5 | Hourly settlement amounts for congestion management | Includes electricity storage into the formulas for determining CMSC, sets out conditions where an electricity storage facility either withdrawing or injecting may not be entitled to CMSC and allows for the recovery of CMSC where needed, including when the no-overlap rule is violated in section 21 of Chapter 7. |
| | 3.8 | Hourly settlement amounts for operating deviations | Provides the formula used to charge electricity storage participants (either withdrawing or injecting) who have offered operating reserve, but have not been able to provide the full amount for what they offered. |
| Chapter 9-Appendix | 1.5 | Validation, Estimation and Editing: Main/Alternate Metering Installation | Provides how to estimate metering data when this is necessary. |
| Chapter 10 | 2.3.2.1 | Arranging for Transmission Service and Dispatch | Includes electricity storage facilities in the list of resources that are subject to dispatch by the IESO. |
| Chapter 11 | New definitions are included for electricity storage resources, and several modifications are made to existing definitions to integrate electricity storage resources. | | |

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