

**Attachment A – Clean Tariff**

**Energy Storage and Distributed Energy Resources – Phase 4**

**California Independent System Operator Corporation**

**August 27, 2021**

#### **4.13.3 Identification of RDRRs and PDRs**

Each Demand Response Provider shall provide data, as described in the Business Practice Manual, identifying each of its Reliability Demand Response Resources or Proxy Demand Resources and such information regarding the capacity and the operating characteristics of the Reliability Demand Response Resource or Proxy Demand Resource as may be reasonably requested from time to time by the CAISO. All information provided to the CAISO regarding the operational and technical constraints in the Master File shall be accurate and actually based on physical characteristics of the resources. For Proxy Demand Resources and Reliability Demand Response Providers whose maximum Load curtailment is 1 MW or more, Demand Response Providers may elect to specify in the Master File the maximum number of Operating Hours in which the CAISO could commit or dispatch the Proxy Demand Resources or Reliability Demand Response Resources in the Operating Day. Demand Response Providers for Proxy Demand Resources and Reliability Demand Response Resources may elect to specify in the Master File how the Proxy Demand Resource and Reliability Demand Response Resources will bid and be dispatched in the Real-Time Market: in (i) Hourly Blocks, (ii) fifteen (15) minute intervals, or (iii) five (5) minute intervals. If Demand Response Providers do not submit an election in the Master File, the CAISO will set five (5) minute intervals as the default.

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#### **11.6.6 Settlements of Non-Generator Resources**

Settlements for Energy generated or consumed by a Non-Generator Resource or a resource using Non-Generator Resource Generic Modeling functionality will reflect the applicable PNode or Aggregated PNode. For such resources comprising a single PNode, settlement for Energy transactions will reflect the LMP at that PNode. For such resources comprising multiple PNodes, settlement for Energy transactions will reflect the weighted average LMP of the PNode(s) based on the applicable Generation Distribution Factors submitted through the resources' Bid or as registered in the Master File. Consistent with the provisions of Section 11.5.2, the CAISO will impose UIE on a resource's Scheduling Coordinator if the resource does not follow a Dispatch Instruction. When operating in a negative range between PMin and

0, the CAISO will not consider a Non-Generator Resource or a resource using Non-Generator Resource Generic Modeling functionality as Measured Demand so long as the resource can generate Energy. If a Non-Generator Resource operates solely as dispatchable demand response, the CAISO will treat the resource as Measured Demand.

Where Scheduling Coordinators elect to submit end-of-hour state-of-charge targets, storage resources participating as Non-Generator Resources will be ineligible for RTM Bid Cost Shortfalls in the two hours preceding the scheduled Operating Hour. Where Scheduling Coordinators elect to submit Self-Schedules in the CAISO Real-Time Markets, storage resources participating as Non-Generator Resources will be ineligible for RTM Bid Cost Shortfalls in the hour preceding the scheduled Operating Hour.

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### **30.5.6 Non-Generator Resource Bids**

Scheduling Coordinators must ensure that Non-Generator Resource Bids or Bids from resources using Non-Generator Resource Generic Modeling functionality contain the Bid components specified in this Section 30.5 based on how the resource is then participating in the CAISO Markets, namely, whether it is providing Supply, Demand, and/or Ancillary Services Bids. Scheduling Coordinators representing Non-Generator Resources using Regulation Energy Management must submit Bids compliant with the requirements of Section 8.4.1.2.

#### **30.5.6.1 State of Charge Bid Components**

Scheduling Coordinators representing Non-Generator Resources may submit Bids including the State of Charge for the Day-Ahead Market to indicate the forecasted starting physical position of the Non-Generator Resource. In the Real-Time Markets, Scheduling Coordinators representing Non-Generator Resources may submit Bids including end-of-hour state-of-charge parameters as MWh ranges or specific MWh values. Where Scheduling Coordinators seek a state-of-charge range, they may submit a minimum and maximum MWh target. Where Scheduling Coordinators seek a specific state-of-charge value, they may submit equal minimum and maximum MWh targets. The CAISO will use reasonable efforts to commit, schedule, and dispatch Non-Generator Resources to meet their end-of-hour state-of-charge

targets or ranges. Scheduling Coordinators may not submit MWh targets that (i) exceed their Master File energy or capacity limits; (ii) exceed their State of Charge limits; (iii) include a minimum MWh target greater than the maximum MWh target; (iv) conflict with RA Capacity obligations; or (v) preclude meeting an Ancillary Service Award, Schedule, or Obligation. Where Scheduling Coordinators elect to submit end-of-hour state-of-charge targets, the CAISO RTM optimization processes will give them precedence over other Bid components, including without limitation, the Energy Bid Curve and Ancillary Services Bid. Where Scheduling Coordinators elect to submit end-of-hour state-of-charge parameters, the Non-Generator Resources will be ineligible for Bid Cost Recovery pursuant to Section 11.6.6. Scheduling Coordinators representing Non-Generator Resources using Regulation Energy Management may not include end-of-hour state-of-charge parameters.

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### **31.2 Day-Ahead MPM Process**

After the Market Close of the DAM, and after the CAISO has validated the Bids pursuant to Section 30.7, the CAISO will perform the MPM process, which is a single market run that occurs prior to the IFM Market Clearing run. The Day-Ahead MPM process determines which Bids need to be mitigated to the applicable Default Energy Bids in the IFM pursuant to Section 31.2.3. For Maximum Net Dependable Capacity of Legacy RMR Units, Bids will be mitigated to the RMR Proxy Bids pursuant to Section 31.2.3. The Day-Ahead MPM process optimizes resources to meet Demand reflected in Demand Bids, including Export Bids and Virtual Demand Bids, and to procure one hundred (100) percent of Ancillary Services requirements based on Supply Bids submitted to the DAM. Virtual Bids and Bids from Demand Response Resources and Participating Load are considered in the MPM process, but are not subject to Bid mitigation. Energy storage resources whose PMax is less than five (5) MW are considered in the MPM process, but not subject to Bid mitigation. Bids from Participating Load resources that are not subject to Bid mitigation will also be considered in the MPM process. Bids from resources comprised of multiple technologies that include Non-Generator Resources will remain to be subject to all applicable market

power mitigation under the CAISO Tariff, including Local Market Power Mitigation. The mitigated or unmitigated Bids and RMR Proxy Bids identified in the MPM process for all resources that cleared in the MPM are then passed to the IFM. The CAISO performs the MPM process for the DAM for the twenty-four (24) hours of the targeted Trading Day.

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### **34.1.5 Mitigating Bids in the RTM**

#### **34.1.5.1 Generally**

After the Market Close of the RTM, after the CAISO has validated the Bids pursuant to Section 30.7 and Section 34.1.4, and prior to conducting any other RTM processes, the CAISO conducts a MPM process. The results are used in the RTM optimization processes. Bids on behalf of Demand Response Resources and Participating Load are considered in the MPM process but are not subject to Bid mitigation. Energy storage resources whose PMax is less than five (5) MW are considered in the MPM process, but not subject to Bid mitigation. Bids from resources comprised of multiple technologies that include Non-Generator Resources will remain subject to all applicable market power mitigation under the CAISO Tariff, including Local Market Power Mitigation.

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### **39.7.1 Calculation of Default Energy Bids**

Default Energy Bids shall be calculated by the CAISO, for the on-peak hours and off-peak hours for both the DAM and RTMs, pursuant to one of the methodologies described in this Section. The Scheduling Coordinator for each Generating Unit owner or Participating Load must rank order the following options of calculating the Default Energy Bid starting with its preferred method. The Scheduling Coordinator must provide the data necessary for determining the Variable Costs unless the Negotiated Rate Option precedes the Variable Cost Option in the rank order, in which case the Scheduling Coordinator must have a negotiated rate established with the Independent Entity charged with calculating the Default Energy Bid.

If no rank order is specified for a Generating Unit or Participating Load, then the default rank order of (1) Variable Cost Option, (2) Negotiated Rate Option, (3) LMP Option will be applied. For the first ninety (90) days after changes to resource status and MSG Configurations as specified in Section 27.8.3, including the first ninety (90) days after the effective date of Section 27.8.3, the Default Energy Bid option for the resource is limited to the Negotiated Rate Option or the Variable Cost Option. Default Energy Bids used for purposes other than for calculating Reasonableness Thresholds will be subject to the Soft Energy Bid Cap, unless the CAISO has approved a Reference Level Change Request pursuant to Section 30.11 in support of an Energy Bid above the Soft Energy Bid Cap. Scheduling Coordinators for storage resources participating as Non-Generator Resources also may rank the storage resource option among their options. If no rank is specified for a storage resource participating as a Non-Generator Resource, then the default rank will be (1) Variable Cost Option and (2) LMP Option. Scheduling Coordinators for storage resources participating as Non-Generator Resources must provide the data necessary for determining the storage resource option if that option is the first in rank order.

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#### **39.7.1.8 Storage Resource Option**

For storage resources participating as Non-Generator Resources, the storage resource option will calculate the Default Energy Bid by selecting the maximum of (1) the sum of the expected energy cost and the variable storage operation cost and, in the RTM, (2) the storage opportunity cost. The calculation is completed by adding ten percent (10%) to the value. To calculate the Default Energy Bid, the CAISO will use the PMin, PMax, Run Times, and other charging and discharging parameters registered in the Master File.

The expected energy cost represents the average cost to procure the amount of energy needed to charge the resource during the lowest-priced continuous block of time such that the resource can discharge completely, accounting for the resource's charging duration and round-trip efficiency, and excluding losses. To calculate this component in the Day-Ahead Market, the CAISO will use the average price of Energy during the lowest priced hours based upon the final Energy Supply Bids from the MPM process at

the relevant PNode, not to be below \$0/MWh. To calculate this component in the Real-Time Market, the CAISO will use the average price of Energy during the lowest priced hours based upon the LMP from the IFM at the relevant PNode on the Trading Day, not to be below \$0/MWh.

The variable storage operation cost represents the variable costs of operating a storage resource beyond its designed daily cycling range, submitted by the Scheduling Coordinator in \$/MWh. The CAISO will validate the storage operation cost based on manufacturer warranty, available data, and supporting documentation submitted by the Scheduling Coordinator. The storage opportunity cost represents the opportunity cost of being dispatched during lower-priced RTM intervals, equal to the cost of Energy the resource could discharge during the highest-priced continuous RTM block, accounting for the resource's discharge duration. To calculate this component in the Real-Time Market, the CAISO will use the lowest price of Energy during the highest priced period over which the resource could have discharged, based upon the LMP from the IFM at the relevant PNode on the Trading Day.

**Attachment B – Marked Tariff**

**Energy Storage and Distributed Energy Resources – Phase 4**

**California Independent System Operator Corporation**

**August 27, 2021**



#### **4.13.3 Identification of RDRRs and PDRs**

Each Demand Response Provider shall provide data, as described in the Business Practice Manual, identifying each of its Reliability Demand Response Resources or Proxy Demand Resources and such information regarding the capacity and the operating characteristics of the Reliability Demand Response Resource or Proxy Demand Resource as may be reasonably requested from time to time by the CAISO. All information provided to the CAISO regarding the operational and technical constraints in the Master File shall be accurate and actually based on physical characteristics of the resources. For Proxy Demand Resources and Reliability Demand Response Providers whose maximum Load curtailment is 1 MW or more, Demand Response Providers may elect to specify in the Master File the maximum number of Operating Hours in which the CAISO could commit or dispatch the Proxy Demand Resources or Reliability Demand Response Resources in the Operating Day. Demand Response Providers for Proxy Demand Resources and Reliability Demand Response Resources may elect to specify in the Master File how the Proxy Demand Resource and Reliability Demand Response Resources will bid and be dispatched in the Real-Time Market: in (i) Hourly Blocks, (ii) fifteen (15) minute intervals, or (iii) five (5) minute intervals. If Demand Response Providers do not submit an election in the Master File, the CAISO will set five (5) minute intervals as the default.

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#### **11.6.6 Settlements of Non-Generator Resources**

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0, the CAISO will not consider a Non-Generator Resource or a resource using Non-Generator Resource Generic Modeling functionality as Measured Demand so long as the resource can generate Energy. If a Non-Generator Resource operates solely as dispatchable demand response, the CAISO will treat the resource as Measured Demand.

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#### **30.5.6.1 State of Charge Bid Components**

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precedes the Variable Cost Option in the rank order, in which case the Scheduling Coordinator must have a negotiated rate established with the Independent Entity charged with calculating the Default Energy Bid. If no rank order is specified for a Generating Unit or Participating Load, then the default rank order of (1) Variable Cost Option, (2) Negotiated Rate Option, (3) LMP Option will be applied. For the first ninety (90) days after changes to resource status and MSG Configurations as specified in Section 27.8.3, including the first ninety (90) days after the effective date of Section 27.8.3, the Default Energy Bid option for the resource is limited to the Negotiated Rate Option or the Variable Cost Option. Default Energy Bids used for purposes other than for calculating Reasonableness Thresholds will be subject to the Soft Energy Bid Cap, unless the CAISO has approved a Reference Level Change Request pursuant to Section 30.11 in support of an Energy Bid above the Soft Energy Bid Cap. Scheduling Coordinators for storage resources participating as Non-Generator Resources also may rank the storage resource option among their options. If no rank is specified for a storage resource participating as a Non-Generator Resource, then the default rank will be (1) Variable Cost Option and (2) LMP Option. Scheduling Coordinators for storage resources participating as Non-Generator Resources must provide the data necessary for determining the storage resource option if that option is the first in rank order.

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losses. To calculate this component in the Day-Ahead Market, the CAISO will use the average price of Energy during the lowest priced hours based upon the final Energy Supply Bids from the MPM process at the relevant PNode, not to be below \$0/MWh. To calculate this component in the Real-Time Market, the CAISO will use the average price of Energy during the lowest priced hours based upon the LMP from the IFM at the relevant PNode on the Trading Day, not to be below \$0/MWh.

The variable storage operation cost represents the variable costs of operating a storage resource beyond its designed daily cycling range, submitted by the Scheduling Coordinator in \$/MWh. The CAISO will validate the storage operation cost based on manufacturer warranty, available data, and supporting documentation submitted by the Scheduling Coordinator.

The storage opportunity cost represents the opportunity cost of being dispatched during lower-priced RTM intervals, equal to the cost of Energy the resource could discharge during the highest-priced continuous RTM block, accounting for the resource's discharge duration. To calculate this component in the Real-Time Market, the CAISO will use the lowest price of Energy during the highest priced period over which the resource could have discharged, based upon the LMP from the IFM at the relevant PNode on the Trading Day.