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## Purpose

This procedure outlines the steps that may be taken to mitigate an anticipated or actual Over-supply condition known as Over-generation.

## 1. Responsibilities

<b>CAISO System Operator</b>	Implement the procedural steps set forth in this Operating Procedure as directed by CAISO <b>Manager, Real-Time Operations</b> .
<b>Scheduling Coordinator (SC) Participating Generator (PG)</b>	Follow all dispatch instructions and operating orders issued by the CAISO during an Over-generation Condition and any circumstances in which the CAISO considers that an Over-generation Condition is imminent, anticipated or threatened, as per the CAISO Tariff.

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<b>CAISO Manager, Real-Time Operations</b>	Directs timely and appropriate Real-Time actions to ensure the CAISO is participating in Western Interconnection frequency control and reliably operating the CAISO Controlled Grid and Balancing Authority Area.
--	---

## 2. Scope/Applicability

### 2.1. Background

Over-supply: Energy in excess of the CAISO BA's need requiring market curtailment of preferred resources.

Over-generation: Energy in excess of the CAISO BA's need and insufficient bids and or mechanisms to manage in the market.

These conditions may affect the reliable operation of the CAISO Controlled Grid, Balancing Authority Area, and the WECC interconnected Bulk Electric System. Severe Over-generation may result in critically loaded transmission facilities, significant frequency deviations, high or low voltage conditions, and unacceptable system performance.

### 2.2. Scope/ Applicability

This procedure addresses how over-generation is prevented in market processes prior to Real-Time, some common contributors to over-generation, and steps to mitigate over-generation in Real-Time.

## 3. Procedure Detail


### 3.1. Contributions to Over-supply

The following are conditions that occur prior to Real-Time, which can serve as contributors to over-generation realized in Real-Time:

#### 1. Self-Scheduled Resources:

Self-scheduled resources are resources for which a Scheduling Coordinator submits to the CAISO Market a Bid that indicates the quantities in megawatt-hours (MWhs) available to the market but does not specify a price for the corresponding MWhs. This indicates that the Scheduling Coordinator is a price taker. Scheduling Coordinators

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can submit self-schedules for regular supply resources as well as self-schedules that apply specifically for Regulatory Must-Run Generation or Regulatory Must-Take Generation, Existing Transmission Contracts, and Transmission Ownership Right Self-Schedules. Self-scheduled resources do not simultaneously provide decremental bids to the system to assist in the mitigation of over-supply. The CAISO honors self-schedules to the extent feasible and to the extent the market clearing process must modify any self-schedules to clear the market. The market systems follow the relative priorities as specified in the CAISO Tariff.

## 2. Variable Energy Resources:

Variable Energy Resource (VER) is a device for the production of electricity that is characterized by an Energy source that:

- Is renewable;
- Cannot be stored by the facility owner or operator; and
- Has variability that is beyond the control of the facility owner or operator. The Day-Ahead (DA) market balances bid-in supply with bid-in demand to meet the CAISO forecasted load.


## 3. Terminal Conditions:

Terminal Conditions is a feature, in the market optimization, that ensures a resource will remain online to meet its Day-Ahead Schedule for next operating day in the event a resource is kept online past its Day-Ahead Schedule energy for the current day due to system needs. If a binding Day-Ahead committed resource is coming to the end of its Day-Ahead commitment, and there are economic bids that are optimal, the Real-Time commitment may be extended. If the extended commitment of the resource jeopardizes its ability to meet its Day-Ahead commitment for the subsequent day (based on minimum down time), the market mechanisms will ensure that the resource remains online to meet the next day binding Day-Ahead Schedules. Terminal Conditions will maintain multi-stage generating resources at a higher configuration to the extent they cannot transition to a lower configuration and meet their Day-Ahead Schedules, even if they have decremental economic bids.

## 4. IFM Results vs. CAISO Forecast for CAISO Demand (CFCD):

If the IFM does not clear against the CFCD, it is possible for the IFM to clear with demand that exceeds the forecast. The Residual Unit Commitment (RUC) process will commit additional resources to the extent the IFM does not meet sufficient resources to meet the CFCD. The RUC process does not de-commit binding commitments; therefore awarded supply may exceed demand in Real-Time. However, the CAISO may modify the CFCD to ensure; to the extent, the RUC process commits additional resources, so it does not over-commit resources.

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5. Virtual Bids:

The DA Market could clear a large amount of virtual load/export schedules with a large amount of physical generation/import schedules that would need to be reconciled in Real-Time.

6. Test Energy:


Test energy can contribute to over-supply from the Day-Ahead Market because the resource testing may be producing at energy levels unavailable for reduced dispatch.

### 3.2. Prior to DAM Run

To the extent over-supply condition is anticipated to occur, continue with the steps referenced below (Consider any potential reliability impact to the system in the immediate and/or future operating time horizon such as congestion, resource minimum down time, start-up time and number of start-ups per day):

**Note:** *The order of the actions taken may vary due to system conditions or other operational concerns. It may be necessary to skip actions due to the severity of the situation and/or how quickly Over-generation condition develops. To the extent possible, and when prudent, actions that were skipped in order to maintain reliability may be implemented at a later time.*

CAISO System Operator
<p>1. <b>Determine</b> the potential for, and the estimated magnitude of, over-supply in the CAISO Balancing Authority area relevant to particular hour(s) of the next Operating Day or days and use the following resources to assist in determining Over-supply:</p> <ul style="list-style-type: none"> <li>• Scheduled Supply vs. updated Demand forecasts; <u>and</u></li> <li>• Real-Time Market infeasibilities results (from the Real-Time Economic Dispatch process).</li> </ul> <p>2. <b>Send</b> an MNS Market Notification to all SC's indicating the following:</p> <ul style="list-style-type: none"> <li>• The expected Operating Day and timeframe of anticipated over-supply; <u>and</u></li> <li>• Request decremental Energy bids and limited self-schedules to address the potential Over-supply and to prevent invoking other steps within this Procedure.</li> </ul> <p><b><u>Example Market Notification to all SCs</u></b> - shown on following page.</p>

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<b>CAISO System Operator</b>
<p><b><u>Example Market Notification to all SCs:</u></b></p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p style="text-align: center; background-color: #c8e6c9; margin: 0;"><b>Over-supply Market Notification to All SCs</b></p> <p><i>The CAISO has determined a potential for over supply for the Operating Day [MM/DD\YY] during [HEXX through HEXX]. Oversupply can potentially require market curtailment of preferred resources. The CAISO is requesting: 1) all resources provide additional decremental Energy bids, limit self-schedules 2) bids to export energy to avoid invoking additional steps in Procedure 2390, Over-generation and 3) the CAISO may issue an Operating Instruction for all EIRs (Eligible Intermittent Resources) to not exceed their DOT. Additional notices from the CAISO will follow as necessary.</i></p> </div>

### 3.3. Over-generation in Real-Time

The Fifteen-Minute Market (FMM) automatically optimizes bid in supply to meet demand. If the bid in supply exceeds the CAISO Forecasted Demand, FMM processes will mitigate the over-generation condition economically by optimizing the following:

- The reduction of fifteen minute energy imports;
- Clearance of Export Bids;
- Dispatch of generation resources to lower economic limits;
- Transition of MSG resources to lower configurations; or
- De-commitment of fast-start resources.

The above market actions will utilize the submitted decremental bids to reduce hydro and thermal resources to their minimum operating limits while ensuring all reliability requirements are met. These actions are taken through the market mechanisms to prevent invoking manual intervention to decrease generation or reduce Self-Schedules in Real-Time.


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### 3.3.1. Prior to HASP FMM

If over-generation conditions are not resolved through market mechanisms, System Operators will take into consideration any potential reliability impact to the system, in the immediate and/or future operating time horizon, such as congestion, resource minimum down time, start-up time, and number of start-ups per day.

CAISO System Operator		
<p>1. <b>Determine</b> the potential for, and the estimated magnitude of, Over-generation in the CAISO Balancing Authority area relevant to particular hour(s) of the current Operating Day and use the following resources to assist in determining Over-generation:</p> <ul style="list-style-type: none"> <li>• Scheduled Supply vs. updated Demand forecasts; <u>and</u></li> <li>• Real-Time Market infeasibilities results (from the Real-Time Economic Dispatch process).</li> </ul> <p>2. <b>Send</b> a Market Notification(s) via the Market Notification system (MNS) and/or ADS, indicating the following:</p> <ul style="list-style-type: none"> <li>• Amount of Over-generation expected;</li> <li>• Expected timeframe;</li> <li>• <b>Request</b> decremental Energy bids to mitigate the Over-generation;</li> <li>• <b>Request</b> notification of Must-Take and/or Must-Run Generation that can be decremented;</li> <li>• <b>Advise</b> that the CAISO is issuing an Operating Instruction to Scheduling Coordinators to operate generating units at their dispatch operating target; <u>and</u></li> <li>• <b>Advise</b> SCs, any threat to system reliability, in the event that Scheduling Coordinators do not respond to this Notice of Over-generation that the CAISO may invoke other steps, as outlined in this procedure (Including but not limited to utilizing Exceptional Dispatch decremental energy, Pro-Rata Generator Reductions and/or mandatory Generator Reductions).</li> </ul> <p style="text-align: center;"><b><u>Example Market Notification to all SCs:</u></b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #c6efce;"> <th style="text-align: center;">Over-Generation Market Notification to All SCs</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;"> <p><i>For hour(s) ending ____ through ____, the CAISO anticipates Over-generation in the amount(s) of ____ MW.</i></p> <p><i>The CAISO is requesting all resources provide additional decremental Energy bids and limit self-schedules to avoid invoking additional steps in Procedure 2390 Over-generation. The CAISO may issue an Operating Instruction for all Eligible Intermittent Resources to not exceed their DOT.</i></p> <p><i>Balancing Authorities with ability to take Energy from CAISO BA, please contact the CAISO Real-Time Transmission <b>Dispatcher</b> to arrange transaction.</i></p> </td> </tr> </tbody> </table>	Over-Generation Market Notification to All SCs	<p><i>For hour(s) ending ____ through ____, the CAISO anticipates Over-generation in the amount(s) of ____ MW.</i></p> <p><i>The CAISO is requesting all resources provide additional decremental Energy bids and limit self-schedules to avoid invoking additional steps in Procedure 2390 Over-generation. The CAISO may issue an Operating Instruction for all Eligible Intermittent Resources to not exceed their DOT.</i></p> <p><i>Balancing Authorities with ability to take Energy from CAISO BA, please contact the CAISO Real-Time Transmission <b>Dispatcher</b> to arrange transaction.</i></p>
Over-Generation Market Notification to All SCs		
<p><i>For hour(s) ending ____ through ____, the CAISO anticipates Over-generation in the amount(s) of ____ MW.</i></p> <p><i>The CAISO is requesting all resources provide additional decremental Energy bids and limit self-schedules to avoid invoking additional steps in Procedure 2390 Over-generation. The CAISO may issue an Operating Instruction for all Eligible Intermittent Resources to not exceed their DOT.</i></p> <p><i>Balancing Authorities with ability to take Energy from CAISO BA, please contact the CAISO Real-Time Transmission <b>Dispatcher</b> to arrange transaction.</i></p>		

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### 3.3.2. Post HASP FMM

If an Over-generation condition occurs or persists in Real-Time, the Real-Time Market (RTM) attempts to relieve over-generation, taking into account reliability needs, by dispatching resources down using economic Bids. Additionally, based on resources' bids, RTUC may optimally de-commit resources in Real-Time.

If the over-generation condition persists, or is expected to persist, System Operators will take into consideration any potential reliability impact to the system, in the immediate and/or future operating time horizon, such as congestion, resource minimum down time, start-up time and number of start-ups per day.

CAISO System Operator		
<p>1. <b>Send</b> a Market Notification(s) via the Market Notification system (MNS) and ADS, indicating the following:</p> <ul style="list-style-type: none"> <li>• Amount of Over-generation expected;</li> <li>• <b>Request</b> decremental Energy bids to mitigate the Over-generation;</li> <li>• <b>Request</b> notification of Must-Take and/or Must-Run Generation that can be decremented;</li> <li>• <b>Advise</b> SCs that generating units should be operating at their dispatch operating target; and</li> <li>• <b>Advise</b> SCs that with this threat to system reliability, in the event that Scheduling Coordinators do not respond to this Notice of Over-generation, that the CAISO may invoke other steps outlined in this procedure (Including but not limited to utilizing Exceptional Dispatch decremental energy, Pro-Rata Generator Reductions and/or mandatory Generator Reductions).</li> </ul> <p style="text-align: center;"><b><u>Example ADS Notification to all SCs:</u></b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #90ee90;">Over-ADS Notification to All SCs</th> </tr> </thead> <tbody> <tr> <td> <p><i>The CAISO is experiencing Over-generation in the amount(s) of ____ MW.</i></p> <p><i>The CAISO is requesting all resources provide additional decremental Energy bids and limit self-schedules to avoid invoking additional steps in Procedure 2390 Over-generation. Scheduling Coordinators are requested to follow all ADS and verbal instructions to reduce the Over-generation condition. The CAISO may issue an Operating Instruction for all Eligible Intermittent Resources to not exceed their DOT.</i></p> <p><i>Balancing Authorities with ability to take Energy from CAISO BA, please contact the CAISO Real-Time Transmission Dispatcher to arrange transaction.</i></p> </td> </tr> </tbody> </table> <p>2. <b>Cancel</b> all test energy for duration of the anticipated over-generation.</p>	Over-ADS Notification to All SCs	<p><i>The CAISO is experiencing Over-generation in the amount(s) of ____ MW.</i></p> <p><i>The CAISO is requesting all resources provide additional decremental Energy bids and limit self-schedules to avoid invoking additional steps in Procedure 2390 Over-generation. Scheduling Coordinators are requested to follow all ADS and verbal instructions to reduce the Over-generation condition. The CAISO may issue an Operating Instruction for all Eligible Intermittent Resources to not exceed their DOT.</i></p> <p><i>Balancing Authorities with ability to take Energy from CAISO BA, please contact the CAISO Real-Time Transmission Dispatcher to arrange transaction.</i></p>
Over-ADS Notification to All SCs		
<p><i>The CAISO is experiencing Over-generation in the amount(s) of ____ MW.</i></p> <p><i>The CAISO is requesting all resources provide additional decremental Energy bids and limit self-schedules to avoid invoking additional steps in Procedure 2390 Over-generation. Scheduling Coordinators are requested to follow all ADS and verbal instructions to reduce the Over-generation condition. The CAISO may issue an Operating Instruction for all Eligible Intermittent Resources to not exceed their DOT.</i></p> <p><i>Balancing Authorities with ability to take Energy from CAISO BA, please contact the CAISO Real-Time Transmission Dispatcher to arrange transaction.</i></p>		



Over-supply/Over-generation

Distribution Restriction: None


CAISO System Operator

3. **Contact** Scheduling Coordinators, via phone with participating resources that are not following their ADS instructions and still operating above their dispatch operating target, and issue an Operating Instruction to return to DOT, regardless of their resource type.
  - **Monitor** the response of these resources to confirm that the dispatch instructions have been followed.
4. **Ensure** the market dispatches any resources with unused decremental bids via economic dispatch.
5. **Contact** SCs for any available additional pump load that can be placed on-line.
6. Based on response to market message,
  - **Initiate** transactions as needed with the neighboring BAs for energy sales for the affected hours.
  - **Issue** Manual Dispatch for these transactions.
7. **Evaluate** resources with Self -Schedules (not previously reduced automatically by the market), such as Hourly Block Self-Schedules, and resources without market bids, for possible reductions.
  - **Issue** an Exceptional Dispatch decrementing Self-Scheduled resources as necessary pro-rata, to the extent feasible, to maintain reliable operation of the grid using the list of units identified.
8. **Consider** fast start units that can be shut down and are not needed for reliability.
  - **Issue** Exceptional Dispatch as necessary, to de-commit the units.
9. **Evaluate** resources with must take provisions that have the availability to decrement in Real-Time.
  - **Issue** an Exceptional Dispatch for any Regulatory Must-Take Generating Units that are able to be decremented.
10. **Issue** Operating Instruction to the most effective and least impactful resources on Automatic Generation Control (AGC) to go off AGC and reduce their output to PMin.
  - **Issue** an Exceptional Dispatch instruction to resources to meet applicable operating parameters.

*Note: This action is a last resort and reduces the availability of automatic generation control to control the system potentially reducing system reliability.*

To the extent, the above steps are successful in reducing the Over-generation condition; the Real-Time prices may reflect the normal balanced conditions.




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### 3.4. Recovering from Over-generation

Actions taken as the Over-generation condition improves and the CAISO's supply and demand imbalance reduces:

**Note:** *Previously committed energy sales will be honored through the arranged hours.*

CAISO System Operator				
<ol style="list-style-type: none"> <li>1. <b>Return</b> resources to AGC.</li> <li>2. <b>Return</b> Regulatory Must-Take Generating Units to their schedules.</li> <li>3. <b>Return</b> the Generating Units and Pump Load to their Schedules, one at a time, by reversing the previously implemented steps, while ensuring system reliability. <ul style="list-style-type: none"> <li>• <b>Terminate</b> new requests for Exceptional Dispatch Exports;</li> <li>• <b>Restore</b> Exceptional Dispatch Generation that was previously decremented;</li> <li>• <b>Remove</b> Exceptional Dispatch Pump Load;</li> <li>• <b>Allow</b> canceled test energy to resume;</li> <li>• <b>Send</b> a Market Notification via the MNS and ADS, <b>indicating</b> the following:</li> </ul> <p><b>Example Market Notification to all SCs:</b></p> <table border="1" style="width: 100%;"> <thead> <tr> <th style="background-color: #c6efce;">Market Notification for Recovering from Over-generation</th> </tr> </thead> <tbody> <tr> <td> <p><i>"For hour(s) ending ____, the CAISO expects the Over-generation condition to subside."</i></p> <p><b>Or</b></p> <p><i>"From hour(s) ending ____ to ____, the CAISO mitigated an over-generation condition, per CAISO Operating Procedure 2390 Over-supply/Over-generation. The CAISO is not anticipating an over-generation condition for hour(s) ending ____."</i></p> </td> </tr> </tbody> </table> </li> </ol> <p>4. <b>Send</b> <b>Grid</b> Messaging System (<b>GMS</b>) message to "All" within distribution list.</p> <p><b>Example GMS message to All:</b></p> <table border="1" style="width: 100%;"> <thead> <tr> <th style="background-color: #c6efce;">GMS message for Recovering from Over-generation</th> </tr> </thead> <tbody> <tr> <td> <p><i>"For hour(s) ending ____, the CAISO expects the Over-generation condition to subside and is ending Operating Instructions if issued."</i></p> <p><b>Or</b></p> <p><i>"From hour(s) ending ____ to ____, the CAISO mitigated an over-generation condition per CAISO Operating Procedure 2390 Over-supply/Over-generation. The CAISO is not anticipating an over-generation condition for hour(s) ending ____."</i></p> </td> </tr> </tbody> </table>	Market Notification for Recovering from Over-generation	<p><i>"For hour(s) ending ____, the CAISO expects the Over-generation condition to subside."</i></p> <p><b>Or</b></p> <p><i>"From hour(s) ending ____ to ____, the CAISO mitigated an over-generation condition, per CAISO Operating Procedure 2390 Over-supply/Over-generation. The CAISO is not anticipating an over-generation condition for hour(s) ending ____."</i></p>	GMS message for Recovering from Over-generation	<p><i>"For hour(s) ending ____, the CAISO expects the Over-generation condition to subside and is ending Operating Instructions if issued."</i></p> <p><b>Or</b></p> <p><i>"From hour(s) ending ____ to ____, the CAISO mitigated an over-generation condition per CAISO Operating Procedure 2390 Over-supply/Over-generation. The CAISO is not anticipating an over-generation condition for hour(s) ending ____."</i></p>
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## 4. Supporting Information

### Operationally Affected Parties

Shared with the Public.

### References

Resources studied in the development of this procedure and that may have an effect upon some steps taken herein include but are not limited to:


CAISO Tariff	Section 7.8.
CAISO Operating Procedure	
NERC Requirements	
WECC Criterion	
Other References	

### Definitions

Unless the context otherwise indicates, any word or expression defined in the Master Definitions Supplement to the CAISO Tariff shall have that meaning when capitalized in this Operating Procedure.

The following additional terms are capitalized in this Operating Procedure when used as defined below:

<b>Regulatory Must-Run Generation</b>	Hydro Spill Generation and Generation that is required to run by applicable federal or California laws, regulations, or other governing jurisdictional authority. Such requirements include, but are not limited to hydrological flow requirements, environmental requirements, such as minimum fish releases, fish pulse releases and water quality requirements, irrigation and water supply requirements, or the requirements of solid waste Generation, or other Generation contracts specified or designated by the jurisdictional regulatory authority as it existed on December 20, 1995, or as revised by federal or California law or Local Regulatory Authority.
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<b>Regulatory Must-Take Generation</b>	<p>Generation from the following resources that the relevant Scheduling Coordinator schedules directly with the CAISO as Regulatory Must-Take (RMT) Generation:</p> <ul style="list-style-type: none"> <li>• Generation from Generating Units subject to <ul style="list-style-type: none"> <li>○ An Existing QF Contract or an Amended QF Contract, or</li> <li>○ A QF power purchase agreement for a QF 20 MW or smaller pursuant to a mandatory purchase obligation as defined by federal law.</li> </ul> </li> <li>• Generation delivered from a Combined Heat and Power (CHP) Resource needed to serve its host thermal requirements up to RMT Max in any hour; and</li> <li>• Generation from nuclear units.</li> </ul>
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## Version History

Version	Change	Date
13.6	Updated Sections 3.5, 3.51 and 3.52 to provide clarity (highlighted as applicable).	4/14/17
14.0	<p>Periodic Review: Updated procedure title to include Over-supply.</p> <p>Section 2: Revised background detail and removed second paragraph of Scope/Applicability.</p> <p>Section 3.2: Updated Example Market Notification to all SCs.</p> <p>Sections 3.4 &amp; 3.5.1: Changed Interchange Scheduler to Transmission Dispatcher.</p> <p>Sections 3.4, 3.5.1, 3.5.2 &amp; 3.6: Added "... and Automated Dispatch System (ADS)..." to action for sending Market Notifications.</p> <p>Section 3.5: Deleted redundant paragraph (duplicate in 3.5.1).</p> <p>Section 3.5.2 added step 2 to align with procedure attachment 2390B.</p> <p>Replaced many references of Over-generation with Over-supply throughout with distinction between the two in Section 2.1.</p> <p>Replaced most references of RMT with Reliability messaging system.</p> <p>Replaced references of Market Messaging system (MNS) with Market Notification system (MNS).</p> <p>Updated to include over-supply notification for EIR and VER.</p> <p>Changed to or added 'Operating Instruction' in several places.</p> <p>Corrected messaging system identified in several places.</p> <p>Replaced Interchange Scheduler with Transmission Desk.</p> <p>Updated all ISO references to CAISO.</p> <p>Added the RC to Operationally Affected Parties.</p>	5/20/21

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 <b>California ISO</b>	<b>Operating Procedure</b>	<b>Procedure No.</b>	2390
		<b>Version No.</b>	14.1
		<b>Effective Date</b>	9/11/23
<b>Over-supply/Over-generation</b>		<b>Distribution Restriction: None</b>	

Version	Change	Date
	Updated Definitions section for acronym clarity. Removed history prior to 5-years. Minor format and grammar updates.	
14.1	Updated from Shift Manager to Manager, Real-Time Operations or Manager of Real-Time Operations and updated from Transmission Desk to Transmission Dispatcher. Updated remaining instances of ISO to CAISO and updated from Reliability messaging system to Grid Messaging System (GMS). Removed history prior to five years and minor formatting.	9/11/23

## 5. Periodic Review Procedure

### Review Criteria & Incorporation of Changes

There are no specific criteria for reviewing or changing this document, follow instructions in CAISO Operating Procedure 5510.

### Frequency

Every three (3) Years

## Appendix

2390B Over-generation Mitigation  
2390C Legacy QFs Curtailment Restrictions  
2390D DCPD Non-Urgent Curtailment

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