

Business Practice Manual for Reliability Coordinator Services

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1 Introduction

Welcome to the CAISO **BPM for Reliability Coordination Services**. In this Introduction you will find the following information:

- The purpose of CAISO BPMs
- What you can expect from this CAISO BPM
- Other CAISO BPMs or documents that provide related or additional information

1.1 Purpose of CAISO Business Practice Manuals

The Business Practice Manuals (BPMs) developed by CAISO are intended to contain implementation detail, consistent with and supported by the CAISO Tariff, including: instructions, rules, procedures, examples, and guidelines for the administration, operation, planning, and accounting requirements of CAISO and the markets. Each Business Practice Manual is posted in the BPM Library at: <http://bpmcm.ISO.com/Pages/BPMLibrary.aspx>.

1.2 Purpose of this Business Practice Manual

A reliability coordinator (RC) is an entity with the highest level of authority under the North American Electric Reliability Corporation (NERC) reliability standards responsible for the reliable operation of the high voltage power system, complying with federal and regional grid operation standards. It has a wide area view of the bulk electric system, and has the authority to prevent or mitigate emergency operations in day-ahead and Real-Time operations that may be beyond the operational awareness of individual transmission operators or balancing areas. The RC also provides leadership in system restoration following a major event.

This BPM for Reliability Coordination covers the roles, responsibilities, rules, and operational elements of the CAISO RC and its RC Customers. This BPM also focuses on how the CAISO RC and its RC Customers are expected to carry out reliability coordination duties. This BPM benefits readers who want information regarding the following topics:

- The Roles of the CAISO RC and its RC Customers
- The CAISO RC onboarding process for an RC Customer
- The summary and timing of key deliverables needed to integrate with the CAISO EMS network model
- An overview of the CAISO RC architecture

- An overview of the CAISO RC system integration and data validation tasks
- An overview of the CAISO RC outage coordination requirements
- An overview of the CAISO RC communication with neighboring RCs
- An overview of the CAISO RC data sharing IRO – 010
- An overview of System Operating Limit (SOL) methodology for the CAISO RC region
- An overview of supplemental services offered by the CAISO RC

The provisions of this BPM are intended to be consistent with the CAISO Tariff and RC Operating Procedures described in Section 19.5 of the CAISO Tariff. If the provisions of this BPM nevertheless conflict with the CAISO Tariff or the RC Operating Procedures, the CAISO is bound to operate in accordance with the CAISO Tariff and RC Operating Procedures. Any provision of the CAISO Tariff or RC Operating Procedures that may have been summarized or repeated in this BPM is only to aid understanding. Even though every effort will be made by the CAISO to update the information contained in this BPM and to notify RC Customers of changes, it is the responsibility of each RC Customer to ensure that he or she is using the most recent version of this BPM and to comply with all applicable provisions of the CAISO Tariff and RC Operating Procedures.

A reference in this BPM to the CAISO Tariff, a given agreement, RC Operating Procedure, any other BPM or instrument, is intended to refer to the CAISO Tariff, that agreement, RC Operating Procedure, BPM or instrument as modified, amended, supplemented, or restated.

The captions and headings in this BPM are intended solely to facilitate reference and not to have any bearing on the meaning of any of the terms and conditions of this BPM.

1.3 References

1.3.1 NERC Definitions

Except as defined in [Section 1.3.2](#) or as otherwise defined in this BPM or the CAISO Tariff, terms and expressions used in this BPM shall have the same meanings as those contained in the [NERC Glossary of Terms Used in Reliability Standards](#).

1.3.2 CAISO Definitions

The definition of acronyms and words beginning with capitalized letters that are not NERC definitions are given in the [BPM for Definitions & Acronyms](#).

Other reference information related to this BPM includes:

- Other CAISO BPMs
- CAISO Tariff

2 Reliability Coordination Services Overview

The North American Electric Reliability Corporation (NERC) requires every region, sub region, or interregional coordinating group to establish a Reliability Coordinator to provide the reliability assessment and emergency operations coordination for the Balancing Authorities and Transmission Operators within the regions and across the regional boundaries. The CAISO's RC Services will include outage coordination and day-ahead operational planning, in addition to Real-Time monitoring for reliability. The CAISO RC Services will be conducted in accordance with applicable NERC reliability standards and RC Operating Procedures adopted pursuant to Section 19.5 of the CAISO Tariff.

The main functions of the CAISO RC are as follows:

1. Responsible for regional system reliability for its Reliability Coordinator Area via direct actions or by issuing Operating Instructions (currently IRO-001-4).
2. Responsible for reliability of the Reliability Coordinator Area, which includes continuous monitoring of the Bulk Electric System (BES) Facilities, the status of Remedial Action Schemes (RAS), and Non-BES facilities identified as necessary by the RC, within its Reliability Coordinator Areas (currently IRO-002-5-R5).
3. Prevent instability, uncontrolled separation, or Cascading outages that adversely impact reliability, by ensuring the RC has the data it needs to monitor and assess the operation of its Reliability Coordinator Area (currently IRO-010-2).
4. Identify any System Operating Limit (SOL) exceedances and determine any Interconnection Reliability Operating Limit (IROLs) exceedances within its Reliability Coordinator Area. Ensure coordinated action between Interconnections when implementing Interconnection-wide procedures to prevent or manage potential or actual SOL and IROL exceedances to maintain reliability of the Bulk Electric System (currently IRO-009-2).

5. Ensure coordinated mitigating actions when implementing unscheduled flow relief on Qualified Transfer Paths to manage potential or actual SOL and IROL exceedances (currently IRO-006-WECC-2).
6. Perform analyses and assessments to prevent instability, uncontrolled separation, or Cascading (currently IRO-008-2).
7. Implement CAISO RC Operating Procedures, Operating Processes, or Operating Plans, for activities that require notification or coordination of actions that may impact adjacent Reliability Coordinator Areas, to support Interconnection reliability (currently IRO-014-3).
8. Ensure that outages are properly coordinated in the Operations Planning time horizon and Near-Term Transmission Planning Horizon (currently IRO-017-1).
9. Ensure plans are established and RC personnel are prepared to enable effective coordination of the System restoration process to ensure reliability is maintained during restoration and priority is placed on restoring the Interconnection (currently EOP-006-2).

RC Services the CAISO RC will provide are shown in the table below:

RC Services	Customer Type			
	BA	Generation Only BA	TOP	TOP with Assets but No Load
Outage Coordination	X	X	X	X
Next Day Operations Planning Analysis	X	X	X	X
Real-Time (RT) Situational Awareness	X	X	X	X
Data Exchange to support Operations Planning Analysis and Real-Time Assessments	X	X	X	X
SOL Methodology	X		X	
Restoration Training (EOP-006)	X		X	X
Centralized Messaging for RC Area	X	X	X	X
Stakeholder Working Group Processes	X	X	X	X

RC Services	Customer Type			
	BA	Generation Only BA	TOP	TOP with Assets but No Load
Document Exchange (Plans, Procedures, Studies, and Reports)	X	X	X	X
Interchange Authority	X	X	X	
IRO-010 Data Request	X	X	X	X
Plan Reviews / Approvals (EOP-005, 010, and 011)	X	EOP-011	X	X
Power System Network Modeling	X	X	X	X

Table 1: RC Customer Type

RC Services provided by the CAISO RC will also conform to the requirements of the in-effect CAISO reliability plan that will be provided to NERC as part of its certification, if required, as well as NERC's Reliability Coordinator Standards of Conduct. The CAISO RC will provide RC Services to all transmission operators within its balancing authority area. The CAISO RC will provide the same RC Services to other Balancing Authorities and Transmission Operators within those Balancing Authority Areas that are RC Customers of the CAISO RC. The CAISO RC will separately offer services such as hosted advanced network applications (HANA) to interested RC Customers in accordance with the Reliability Coordinator Services Agreement discussed below.

2.1 Oversight Committee

The Oversight Committee provides input and guidance to the CAISO management on all matters relating to the CAISO's performance of the RC function pursuant to its charter, which will govern the administration of the Oversight Committee and take precedence over this BPM in the event of a conflict. Matters relating to the CAISO's performance of the RC function described in the charter include: (1) oversight of each of the established RC working groups; (2) input and guidance to the CAISO RC management on operational issues relating to RC Services; (3) input and concurrence with respect to overarching reliability coordinator policies and procedures; (4) review and input on new tools or staffing decisions that may substantially affect the budget for and cost of RC Services; and (5) an annual review of composition and structure of the RC working groups.

The Oversight Committee may also decide to perform periodic "operational best practices" reviews of how the CAISO is performing RC Services pursuant to its charter. The reviews will be performed by a team of subject matter experts selected by the Oversight Committee. The first of

any such reviews may take place only after the CAISO has performed RC Services for at least a year, and any subsequent reviews should occur no more frequently than once every three years.

To the extent the Oversight Committee may be interested in addressing the CAISO Board of Governors on any matter of interest to RC Customers, it may do so by following the current process for providing input. This would allow the Oversight Committee to request items to be included on the agenda of regularly scheduled meetings and to provide updates or raise issues at those meetings.

Any changes to RC Services rates, terms and conditions set forth in the CAISO Tariff will be considered in the CAISO public stakeholder process, and would need approval by the CAISO Board of Governors and by FERC.

Any changes to the Oversight Committee charter will be considered in accordance with such charter.

3 RC Contracts Execution Process

The pro forma Reliability Coordinator Services Agreement (RCSA) approved by FERC is in Appendix B of the CAISO Tariff, Agreement Number 22. To execute the RCSA, the RC Customer will complete the RCSA Information Request Sheet that can be found at:

<http://www.caiso.com/rules/Pages/ContractsAgreements/Default.aspx>

On that page, navigate to Pro Forma Agreements and Associated Documentation. Expand the Pro forma Agreements section. The information request sheet will be in this list based on alphabetical order.

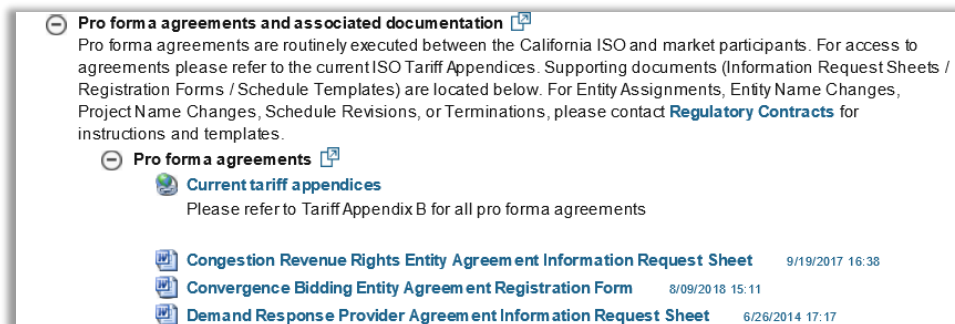


Figure 1: Agreements and Forms on CAISO.com

Once the RC Customer completes the information request sheet, the form should be sent to: RegulatoryContracts@caiso.com.

The Regulatory Contracts Analyst will work with the RC Customer to finalize the RC Services Agreement (RCSA), execute the RCSA, and file it with FERC through the Electronic Quarterly Reporting.

Amendments to the RCSA and any questions, concerns, assignments, or changes in service should also be sent to RegulatoryContracts@caiso.com. Any assignments or changes in service must be coordinated with the CAISO in advance of the quarter in which they are expected to occur.

3.1 RC Customer Requirements

Once an RC customer's agreement is executed, a CAISO Representative will contact the RC customer to begin the onboarding process. This section outlines the requirements that the RC customer.

3.1.1 Electronic Funds Transfer (EFT) Test

This requirement ensures that a RC customer can submit payments to, and receive payments from CAISO. RC customer is required to test its EFT functionality. The California ISO allows the use of the ACH payment services in addition to the Fed Wire payment system for all transactions including settlement of invoices and collateral prepayments. Accordingly, RC customer should select their preferred method of receiving payments **from** and remitting payments **to** the CAISO by completing the applicable sections of the Electronic Funds Transfer (EFT) form. The EFT form needs to be completed by all RC customers.

[ISO Electronic Funds Transfer Procedure](#)
[ISO Electronic Funds Transfer Form](#)

3.1.2 Submit RC customer Emergency Plan

The RC customer is required to provide an up-to-date emergency contact information to the CAISO.

[Emergency Plan Form](#)

3.1.3 Complete Real-Time and Contact Drills

All RC customers must complete real-time and contact drills. These drills demonstrate a twenty-four hour real-time desk capability and sufficient understanding of the CAISO RC services. This test requires approximately ten (10) business days to complete.

4 RC Customer Onboarding

The CAISO RC has developed a process to assist new RC Customers throughout the onboarding process. ~~The initial RC onboarding will be for July 1, 2019 and November 1, 2019 RC Services Dates. However, subsequent new~~ New RC Customers will activate on April 1 each year, which will be their RC Services Date.

4.1 RC Onboarding Process

The goal of the CAISO's onboarding process is to ensure each RC Customer is prepared, informed, and engaged in all aspects of receiving RC Services. The onboarding process includes agreement execution, technology integration testing, and customer service.

~~After the initial startup of RC Services, the~~ The CAISO RC will target April 1 of each year as the initial RC Services Date for subsequent new customers. ~~There will be no implementation cost to obtain RC Services from the CAISO RC.~~ Implementation periods required in advance of the start of RC Services could be between 6 and 12 months depending on the complexity of the RC Customer's resource configuration, system topology, the CIM maturity of the RC Customer's model, and CAISO staffing availability. The implementation period will be determined after an initial CAISO RC assessment is conducted based on the RC Customer's network model and data exchange capabilities, defined in the EMS Network Model section of this BPM.

The RC Customer onboarding process includes the following:

~~1. RC Customer signs the letter of intent and non-disclosure agreement.~~

~~2.1.~~ 1. RC Customer executes the RC Services Agreement (RCSA) with the CAISO RC.

~~3.2.~~ 2. RC Customer works with the CAISO RC to ensure the network model is RC compliant by providing necessary data elements for the model.

~~4.3.~~ 3. RC Customer performs necessary testing activities before go live which include the following:

- a. Connectivity testing – Verify the RC Customer systems can connect to the CAISO systems through the fire walls.
- b. Access Testing – Verify the RC Customer users have appropriate security access for testing and production activation.
- c. System Integration Testing – Ensure all RC Customer and CAISO RC system interfaces are functioning as designed with valid data.

- d. Data Validation – RC Customer and the CAISO RC validate that data submitted by the RC Customer meets WECC and NERC requirements for RC functionality.
- e. Shadow Operations (pre-production activity) – RC Customer and the CAISO RC confirm system readiness and stability.

CAISO will facilitate ~~monthly~~ webinars for RC Customers, as needed, to provide updates on the onboarding activities and answer ~~customer~~ questions. ~~Once the testing phases begin, the CAISO will hold more frequent meetings with RC Customers to resolve technical, business and process issues that may arise.~~

4.2 RC Onboarding Timeline

~~The CAISO will provide RC Services for the first time on July 1, 2019 and November 1, 2019 for initial RC Customers. Subsequent new~~New RC Customers are targeted to activate on April 1 each year. ~~The process for initial and ongoing activation will be the same. However, the timelines will be different. Below are the timelines for July 1, 2019, November 1, 2019, and April 1 ongoing activation process.~~

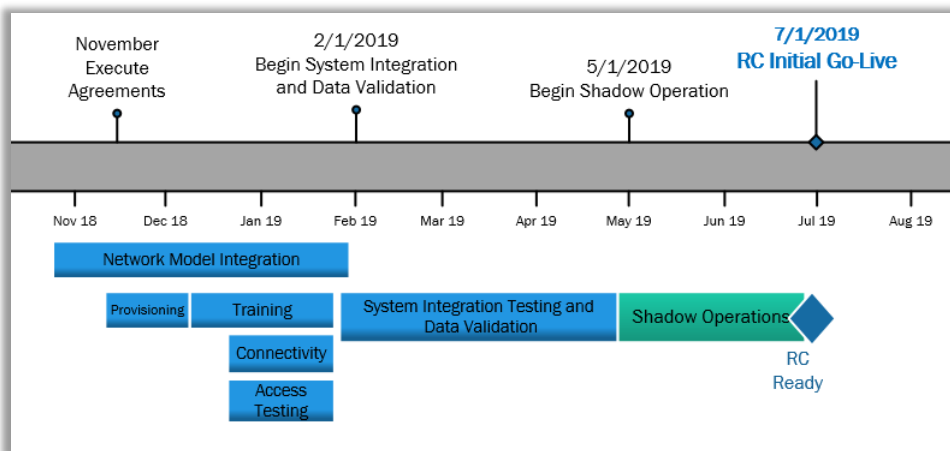


Figure 2: Timeline for Initial RC Offering on July 1, 2019

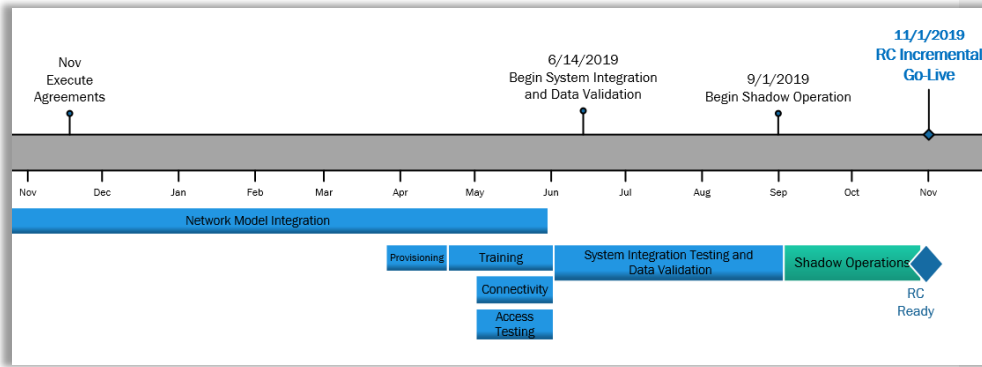


Figure 3: Timeline for Initial RC Offering on November 1, 2019

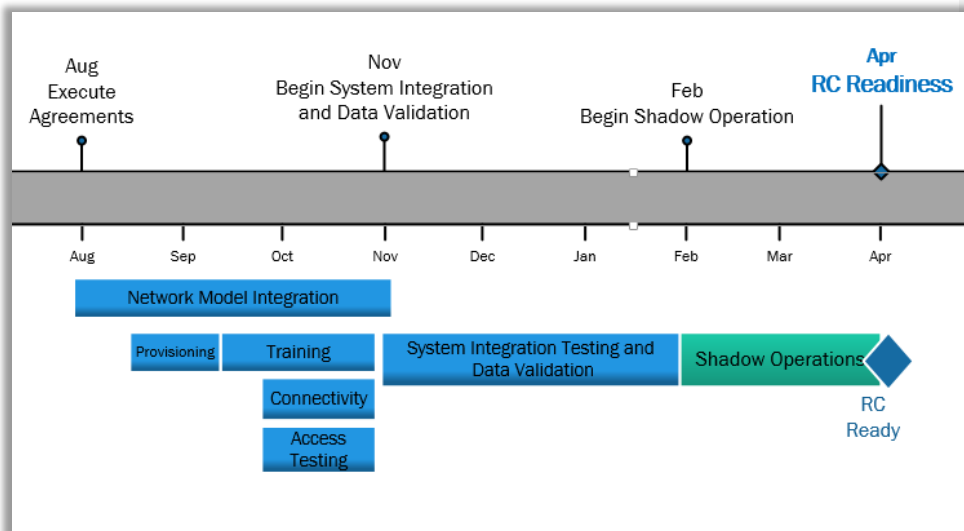


Figure 42: Timeline for Ongoing RC Offerings after 2019

4.3 RC System Access and Provisioning

4.3.1 Assigning User Access Administrators (UAAs) for RC

Each RC Customer will determine if their organization plans to use an existing User Access Administrator (UAA) for RC access or designate a new UAA. New UAAs must read the CAISO User Access Administrator Establishment and Requirements. RC Customers must assign one or more UAA to manage user access requests for CAISO applications.

Each RC Customer must complete the User Access Agreement to assign a new UAA for RC purposes or to add the RC contract type for a current UAA. UAA related questions may be sent to UAARRequests@caiso.com.

4.3.2 Provisioning Users in AIM

The RC Customer's UAA has the responsibility to determine which users need access to each application for the user's specific role within the balancing authority area (BAA) or as transmission operator (TOP). See Section 5.1 for a list of applications. UAAs should refer to the AIM User Guide for the steps and process.

AIM provides UAAs with the ability to view application-level access for their organization's users. Additionally, the AIM application will allow the registered UAA to view the expiration date of their users' certificates and automatically request a renewal within the application.

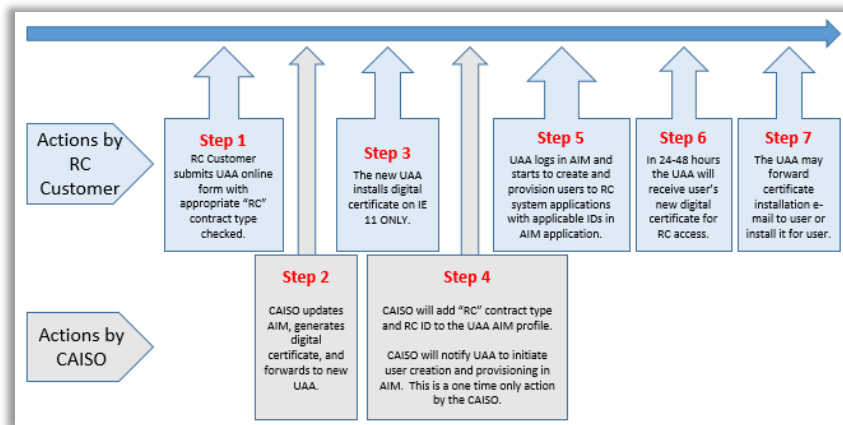


Figure 25: RC System Access and Provisioning Process

4.3.3 Verifying Access

Once the RC Customer user access has been provisioned and certificates are in place, each user will verify that the access is working as expected by using the appropriate system via the systems User Interface (UI) or, where applicable, via an application program interface (API).

4.4 System Integration and Data Validation

The purpose of this section is to provide details for the RC Customer on what to expect during the testing phases of the RC Services implementation. Systems, applications, and other IT solutions developed or acquired for RC implementation are tested for quality and implementation readiness during this time. This is also the time that the RC readiness criteria is documented.

The CAISO RC implementation process includes testing phases to ensure the reliability coordination integrations function as designed.

The first two phases are initial testing to ensure the RC Customer systems and users can access necessary CAISO applications.

1. Connectivity Testing
2. Access and Provisioning

The third and fourth phases involve more detailed testing to ensure integrations are working as expected and the RC Customer is ready for shadow operations.

3. System Integration Testing
4. Data Validation

The fifth and final phase is the final validation with production data that demonstrates that the RC Customer has completed all the requirements to receive RC Services from the CAISO.

5. Shadow Operations

Details on the systems and the interfaces that will be validated during the testing phases can be found in the [Day in the Life Reliability Coordination Services document](#) located on the RC secured site.

System specifications for the CAISO internal systems can be found on the CAISO public site: <http://www.caiso.com/participate/Pages/ApplicationAccess/Default.aspx>.

4.5 RC Readiness Criteria

RC Customer readiness will be subject to pre-defined criteria, which are described below. Prior to the RC Services Date, the CAISO RC will conduct appropriate steps to ensure that each criteria is evaluated compared with the metric and threshold.

Readiness Criterion Identifier	Readiness Category	Criteria	Measurable Elements	Threshold*
1	Agreements / Approvals	Execute necessary agreements with RC Customer.	The CAISO RC and prospective RC Customer have executed the RC Agreement before the onboarding process formally begins.	The prospective RC Customer will execute the agreement as outlined in the RC BPM within the timelines specified.
2	Network Model Integration	CAISO EMS network model includes all RC Customers.	Verify EMS Network Model with each RC Customer to ensure that it is accurate.	Each RC Customer confirms network model is accurate.
3	Operating Procedures	RC Operating Procedures	The CAISO RC Operating Procedures are defined and updated.	RC Operating Procedures are approved by RPSC/RC Oversight Committee.

Readiness Criterion Identifier	Readiness Category	Criteria	Measurable Elements	Threshold*
4	Operating Guides	RC Operating Guides	The CAISO RC Operating Guides are defined, updated, and coordinated with applicable impacted Reliability Coordinators.	RC Operating Guides are defined.
5	Messaging	CAISO RC able to Receive and Send Alerts	BA/TOP has messaging account, can log in, view their message dashboard, and is able to successfully send and receive alerts to all CAISO RC Customers.	Grid Messaging System available for CAISO operations training and RC Customer training. CAISO RC and at least one RC Customer has completed testing of Grid Messaging System prior to certification. All RC Customer testing will be complete prior to Shadow Operations.
6	RC Customer Integration	RC Customer integrated with CAISO RC per onboarding requirements	RC Customer completed all required integration tasks.	Complete testing of all required integration tasks for at least one RC Customer before Shadow Operations.
7	Shadow Operations	Execution of Shadow Operations	Shadow Operations Operational Planning Analysis (OPA) and Real-Time (RT) criteria defined and being monitored and measured in accordance with the Shadow Operations Plan.	Shadow Operations routine items have been measured and meet the criteria set forth in the NERC Reliability Standards. Procedures for Shadow Operations event items have been defined and verified.
8	Executive Statement	Executive Statement of Readiness	CAISO and RC Customer have exchanged readiness statements.	Readiness statements have been exchanged at least 30 days prior to the RC Services Date.

Table 2: RC Readiness Criteria

Exceptions to Thresholds

Any exceptions to the adherence to the thresholds listed above will be considered by the CAISO RC in accordance with the procedures for granting exceptions outlined below, explained fully, and noted on the readiness dashboard that is posted on the CAISO website. Exceptions will also be explained in the executive statement of readiness.

Any exception to a threshold will be reviewed by the responsible staff, escalated to the senior officers ultimately responsible for readiness, and documented in the readiness report that supports the statement. The CAISO RC will strive to avoid exceptions by providing comprehensive updates and proactively managing issues and risks. When an exception is required, it will be defined by specifying what is not conforming and why an exception is necessary.

Readiness Reporting

The readiness criteria dashboard will track target completion, status, and evidence collected for each readiness criteria. Updates will be publicly posted in accordance with the CAISO Tariff timelines for readiness reporting. The CAISO will use the same tracking framework to support readiness checklists.

An example of the executive statement for readiness related to RC Customer onboarding is included below.

Dear CAISO Representative,

This statement provides notice that [RC Customer]'s processes and systems have satisfied or will have satisfied the readiness criteria set forth in the Business Practice Manual for RC Services, [with or without] exception from the readiness criteria specified in the Business Practice Manual for RC Services [and that despite such exceptions the criteria will be met]. This statement is conditional on [the resolution of any known issues and] any unforeseen issues that undermine the satisfaction of the readiness criteria.

If, subsequent to this statement, [RC Customer] determines that it cannot proceed with implementation on the RC Services Date, [RC Customer] will notify the CAISO of the delay, the reason for the delay, and the proposed new RC Services Date, if it can be determined, and whether it will need to re-issue a portion or all of the readiness statement.

Sincerely,

[RC Customer]

Senior Executive

5 Architecture

This section provides information on the systems and interfaces required for RC Services.

The submission and retrieval of data to the CAISO RC, as per NERC Standard Requirements such as IRO-010 and IRO-017, is necessary in order to facilitate performance of RC functions.

5.1 CAISO RC System Interfaces

Tool / Interface	Function
1. Access and Identity Management (AIM)	<i>The AIM application user interface shall be used for provisioning users and assigning roles to users.</i>
2. RC Collaboration Site / RC Portal	<i>Files and documents are managed and accessed through a secured site: Initially the RC Collaboration Site; Later migration to the RC Portal</i>
3. Resource Interconnection Management System (RIMS)	<i>The network model is submitted through RIMS as CIM, PSSE, PSLF or PowerWorld Format. If none of those formats are available, documents describing the model can be provided.</i>
4. Outage Management System (OMS)	<i>The OMS application supports both a user interface and web service APIs using CAISO standard web services to manage outages.</i>
5. RCSPRC-BSAP	<i>Generation forecasts are submitted through the Reliability Coordinator Scheduling Portal (RCSPRC-BSAP). The RCSPRC-BSAP application supports both a user interface and web service APIs using CAISO standard web services.</i> Note: <i>EIM entities shall continue to use the existing BSAP interface and not submit generation forecasts through RCSPRC-BSAP.</i>
6. Advanced Load Forecasting System (ALFS)	<i>Load forecasts are submitted through ALFS. ALFS supports web service APIs using CAISO standard web services.</i>
7. WIT, eTagging, and ECC	<i>The WIT, eTagging, and ECC tools will continue to be used and hosted by the vendor.</i>
8. Phasor Data Collector (PDC)	<i>The CAISO RC will act as a regional Phasor Data Collector (PDC) for identified phasor data. This regional PDC will collect data from local PDCs provided by RC Customers. Historical phasor data will be made available for download through a web interface.</i>

Tool / Interface	Function
9. ICCP	<i>Telemetry data and Real-Time monitoring and measurement data will be collected and propagated through ICCP links.</i>
10. Grid Messaging System (GMS)	<i>Messages will be sent and received through the Grid Messaging System (GMS).</i>
11. Hosted Advanced Network Applications (HANA)	<i>Contingency analysis results for scheduled runs (Real-Time, fifteen-minute, and day-ahead) will be available through the HANA user interface. Reports based on these runs are also available through the HANA user interface.</i>
12. Customer Inquiry, Dispute, and Information (CIDI)	<i>CIDI is used for submitting issues, questions, and disputes.</i>
13. CAISO Markets Results Interface (CMRI)	<i>CMRI publishes the Generation and Load forecast data that was submitted by all RC Customers. This will include all RC Customer data submitted through ALFS, Base Schedule Aggregation Portal (BSAP), and RGSPRC-BSAP.</i>
14. MRI-Settlements (MRI-S)	<p><i>. For RC Customers outside of the CAISO BA, submission of Net Energy for Load and Net Generation will be through the MRI-Settlements application and be available through both user interface and CAISO standard web services.</i></p> <p><i>Settlements bill determinant files, statements, and invoices will be available through MRI-S via both the user interface and CAISO standard web services</i></p>

Table 3: CAISO RC System Interfaces

5.2 CAISO RC Interface Types

RC Customers can submit and retrieve information from CAISO applications as follows:

Preferred approaches:

1. RC Customers may use the user interface (UI) to submit and retrieve information.
2. RC Customers may use business to business (B2B) web services to submit and retrieve information from CAISO systems. CAISO uses the Simple Object Access Protocol (SOAP), a standards-based web services access protocol. SOAP relies exclusively on XML to provide messaging services.

For more information on web services, request access to the [CAISO developer web page](#).

If neither of the preferred approaches are viable, then either of the following approaches may be used:

1. RC Customers may use their existing coordinated outage system (COS) web service to submit outage information to CAISO OMS system. CAISO will map COS data structure to OMS data structure through an adapter. This interface will be adapted to use certificate based authentication.
2. RC Customers may use their existing Electric Industry Data Exchange (EIDE) web service to submit generation and load forecast information to CAISO systems. CAISO will map EIDE data structure to CAISO interface data structures through an adapter. This interface will be adapted to use certificate-based authentication.

6 EMS Network Model

6.1 Purpose

The purpose of this section is to provide an entity who is joining the CAISO RC Services with a summary and timing of key deliverables that are needed for integrating with the CAISO EMS network model.

6.2 Overview

The CAISO models transmission and generation assets in several systems; specifically, the Network Model in the CAISO Energy Management System (EMS) and the Master File.

The Energy Management System (EMS) is used to monitor the Real-Time status of the Bulk Electric System (BES) and to provide the Real-Time estimated power system solution necessary to determine the initial condition for Real-Time applications.

The Master File contains specific resource attributes necessary for the functioning of the CAISO applications supporting the RC Services.

As part of the RC Customer implementation, the CAISO RC and RC Customer will integrate the RC Customer's EMS model into the CAISO EMS model. When these changes are implemented, the CAISO RC will receive Real-Time data using an inter-control center communications protocol (ICCP) data link from the RC Customer. The RC Customer will follow the CAISO's process to ensure incremental updates to the RC Customer's network model are synchronized between the RC Customer and the CAISO EMS systems. Network model submission will depend on the method of data transfer. See the remainder of this section as well as the CAISO's [Business Practice Manual for Managing Full Network Model](#) for details on the production process.

The RC Customer will work with the CAISO RC and its EMS vendor to export the RC Customer's EMS network model to the CAISO RC. This includes exchange of, but not limited to, displays, data points, limits, contingencies, and Remedial Action Schemes (RAS) data. The RC Customer will work with the CAISO RC to integrate this data into the CAISO's EMS network model. The RC Customer and the CAISO RC will establish an ICCP to be used for transferring Real-Time data from the RC Customer to the CAISO RC. This document does not supersede the CAISO's [Business Practice Manual for Managing Full Network Model](#) located on the CAISO's public website.

6.3 Network Model Integration

Integrating a new RC Customer network model into the CAISO EMS Network Model is dependent on the RC Customer's capability to communicate to CAISO the Network Model information. Refer to the [CAISO Reliability Coordinator Area – Full Network Model Overview](#) for additional information about the initial set up of the EMS Network Model.

6.4 EMS Network Model Maintenance

CAISO maintains a Network Model for use by the CAISO markets and RC Services. The [BPM for Managing Full Network Model](#) describes the process an RC Services Customer follows in providing data used to support the model and in gaining access to model data. The EMS Network Model contains all of the related information for neighboring Balancing Authority Areas (BAAs) within WECC for which the CAISO RC is providing RC Services for as well as some, but not all of the information for the BAAs within WECC for which the CAISO is not providing RC Services.

A Balancing Authority (BA) receiving RC Services from the CAISO RC will maintain their own Network Model processes with resources within their BAA, and will export that information to the CAISO RC on a regular basis for promotion into CAISO's EMS Network Model and subsequent use for reliability coordination purposes. Any issues identified by the CAISO RC in the RC Customer's model information will be resolved before promoting the information into a model used by the CAISO RC. RC Customers are responsible for coordinating their network model updates with other impacted parties, including neighboring BAs and WECC as appropriate.

The CAISO Network Model timeline can be found in Section 5.1 of the [BPM for Managing Full Network Model](#). Before every network model update, an RC Customer will complete and provide a network model update template document to the CAISO RC. This document will contain a detailed description of the updates for communication between the CAISO RC and the RC Customer network model teams. The document is posted on the Network and Resource Modeling section of the CAISO website and should contain any changes to the RC Customer's network model including, but not limited to, new equipment, equipment commissioning and decommissioning, date and time, new system configurations, display changes, SCADA point changes, and interconnection changes.

The RC Customer shall make the network model update document available to the CAISO RC before the commissioning and decommissioning of transmission or generation equipment. This will help resolve and cross the gap between the different cycles of network model updates among the CAISO RC and the various RC Customers. The document is only used to synchronize the EMS network models between an RC Customer and the CAISO RC.

An RC Customer will export its EMS network model to the CAISO RC along with an associated limits file. In order for the CAISO RC to implement an RC Customer's model into the CAISO's EMS network model in a timely manner, the RC Customer will send the required information to the CAISO RC based on the full network model timeline in Section 5.1 of the [BPM for Managing Full Network Model](#).

While an RC Customer's model deployment cycle may differ from the CAISO's network model update timeline, RC Customer model changes should follow the effective timelines specified and maintained in Section 5.1 of the [BPM for Managing Full Network Model](#). New resources must complete the interconnection processes of their host Balancing Authority Area (BAA) prior to being included in an EMS Network Model build.

All resources within an RC Customer's BAA must be included in the CAISO's Full Network Model. The Market Participating Asset Implementation (MPAI) guide posted on the CAISO website contains requirements for establishing new resources, network changes, updates, and new transmission equipment with CAISO. An RC Customer must also submit the supplement resource information template for all generating resources within its BAA. The information should be submitted on a timely basis in accordance with CAISO's network model update timeline.

As previously described, the [BPM for Managing Full Network Model](#) explains how the Full Network Model and its associated processes are used to support market operations. For RC Customers, references to the Integrated Forward Market (IFM), Use Limited Resources, Congestion Revenue Rights (CRR) Systems, Participating Transmission Ownership, Metered Sub-Systems, Utility Distribution Companies, Trading Hubs, and Residual Unit Commitment (RUC) Zones are not applicable. The RC Customers will need to follow the Market Participant Asset Implementation (MPAI) process in order to accommodate for BAA and Transmission Operator Area (TOPA) topology changes and those changes to be included in future model releases.

7 Outage Coordination

In accordance to NERC IRO-017 Reliability Standard, the CAISO RC has an established Outage Coordination Process. Each Balancing Authority (BA) and Transmission Operator (TOP) within the CAISO Reliability Coordinator Area is required to follow this process (reference to NERC IRO-017 Reliability standard). The purpose of Outage Coordination is to:

- Address NERC Reliability Standard IRO-017-1
- Describe the applicable functional RC Customer roles and responsibilities
- Provide for timely coordination and conflict resolution of transmission and generation outages within the CAISO RC Area
- Achieve and maintain Bulk Electric System (BES) reliability

Details of the Outage Coordination process can be found at [RC0320](#)

7.1 Outage Management Tool

The Outage Management System (OMS) is a secure software system that enables parties to interact with the CAISO RC to electronically complete the various transactions included in the Outage management business processes. The OMS includes a web client version for use by an individual and an Application Program Interface (API) version for use in computer-to-computer data transfers. The OMS application is considered the primary interface for submission of outage information for the Long-Range, Mid-Range, Short-Range, OPA, and Real-Time outage processes.

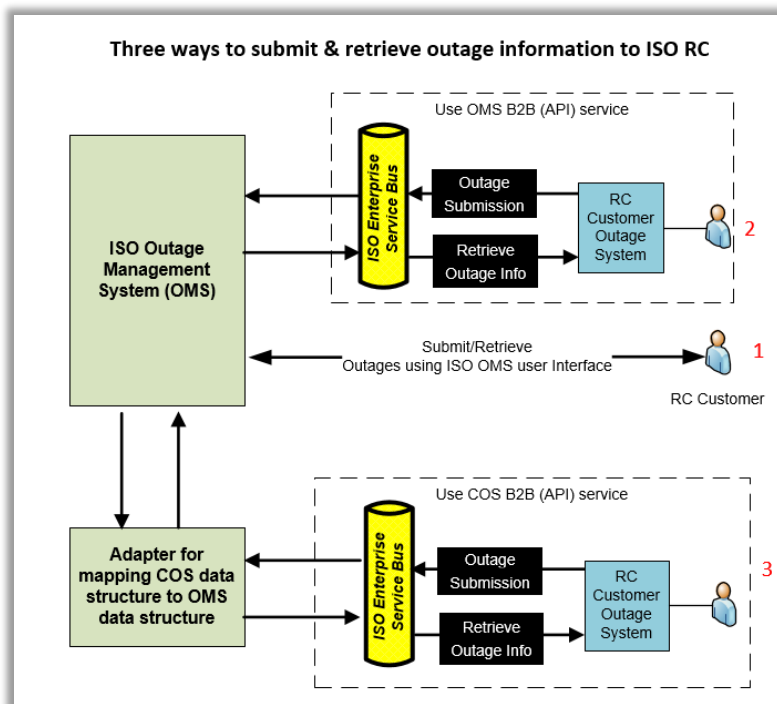


Figure 36: CAISO RC Outage Management System

If an RC Customer currently has its own mechanisms for managing and coordinating outages (i.e. through another software tool, spreadsheets, e-mails, etc.) those processes can continue. However, all outage data being requested as a part of the Outage Coordination must be submitted per the submission requirements specified in this document. If OMS become unavailable at any time during the Outage Coordination Process, the CAISO RC will communicate information regarding an alternate means of submitting outage data.

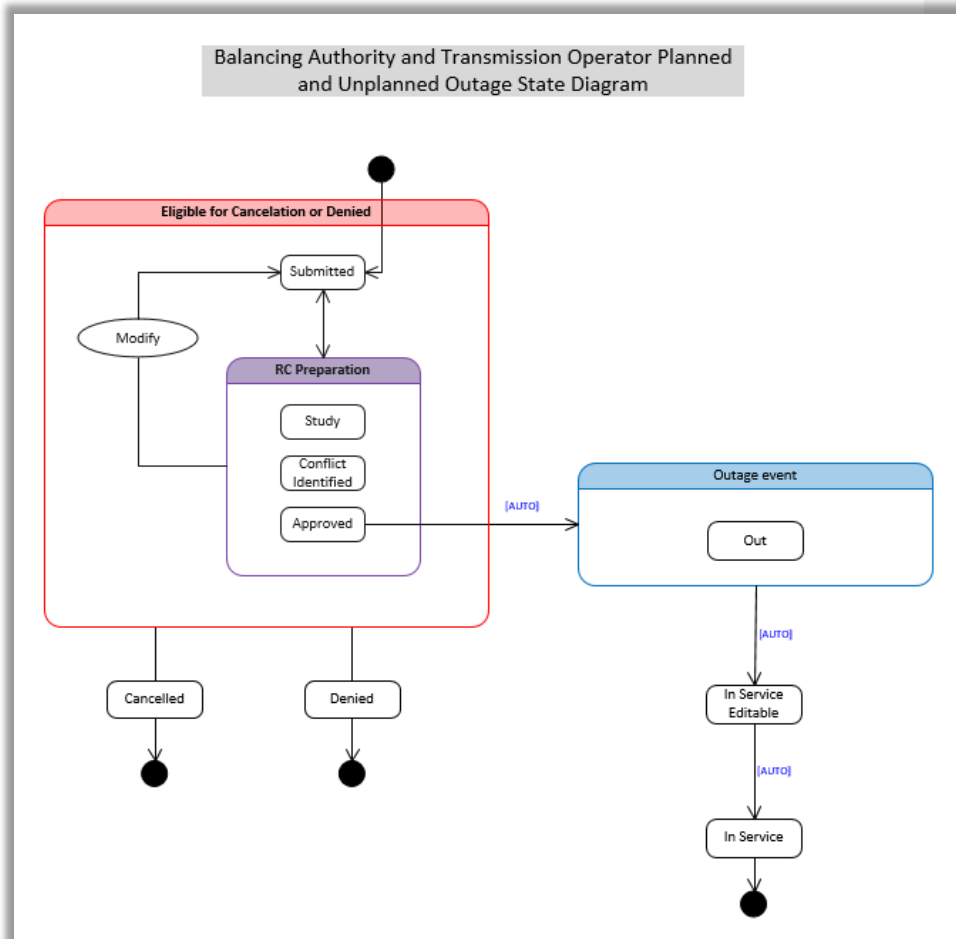


Figure 7: CAISO RC Outage State Transitions

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8 Real-Time Operations Processes and Procedures

Pursuant to NERC Standards, the CAISO RC maintains operational reliability of its Reliability Coordinator Area in coordination with its neighboring Reliability Coordinator's wide-area view. The CAISO RC is situationally aware of the status of its monitoring tools and facilities (both BES and Non-BES that impacts reliability) under its purview as well as facilities in neighboring Reliability Coordinator Areas that may impact reliability in the CAISO Reliability Coordination Area. The scope of the CAISO RC's purview includes both transmission and balancing operations. The CAISO RC has the authority to direct NERC functional entities to take actions to ensure that its Reliability Coordinator Area operates reliably. Some of the typical tasks the CAISO RC will perform to maintain reliability in the CAISO Reliability Coordination Area are listed below:

1. Monitor all reliability-related parameters along with its data quality.
2. Identify, communicate, and direct actions if necessary to mitigate reliability threats and limit violations.
3. Operate within Interconnection Reliability Operating limits (to protect from instability, uncontrolled separation, and Cascading).
4. Perform coordinated operational and reliability analysis and assessments (next-day, actual, and contingency).
5. Oversee and direct revisions to transmission and generation outage schedules as necessary to preserve reliability.
6. Direct curtailment of Interchange that adversely impacts reliability.
7. Implement CAISO RC Emergency Procedures (up to and including load shedding) to maintain reliability.
8. Coordinate system restoration.

CAISO RC Operating Procedures have been written to provide guidance to the RC on how to carry out the reliability tasks listed above. These procedures will help to ensure reliable operation of the BES in the CAISO Reliability Coordination Area. The CAISO RC Operating Procedures cover a wide range of topics such as outage review and coordination, coordinating with neighboring RCs, mitigating SOL and IROL exceedances, system emergencies, system

restoration, etc. Detailed information on all of the CAISO RC Operating Procedures can be found [here](#).

9 Coordination with Neighboring Reliability Coordinators

In accordance with NERC Reliability Standard, IRO-014, the CAISO RC has established CAISO RC Operating Procedures and RC Operating Guides on coordination with neighboring Reliability Coordinators, to provide guidelines for communicating and coordinating operations with adjacent (neighboring) Reliability Coordinators to ensure the reliability of the Western Interconnection. This procedure is scheduled to be reviewed and updated annually with no more than 15 months between reviews; will require written agreement from all RCs; and will be distributed to all RCs that are required to take indicated action(s) within 30 days of an update.

9.1 Agreements with Neighboring Reliability Coordinators

The CAISO RC and other RCs operating in the Western Interconnection have a shared responsibility to maintain system reliability in the Western Interconnection. There are coordination agreements in place to facilitate communication, notification, exchange of information, and coordination of actions.

The coordination agreements detail requirements to which both parties are committed to preserve reliability. The agreements address a wide range of topics, including data exchange, ATC calculation, outage coordination, emergency operations, etc. These agreements provide for the ongoing cooperation between the signatories by the establishment of joint operating committees that meet periodically to discuss and resolve operational issues. [NERC Standard IRO-014, R1-R7].

10 Data Exchange - IRO-010

Pursuant to NERC Reliability Standard IRO-010-2 R1, the CAISO RC provides a documented specification to applicable functional entities of the data necessary for the CAISO RC to perform its Operational Planning Analyses, Real-Time monitoring, and Real-Time Assessments. The CAISO RC maintains the data specification in RC Operating Procedure, RC0120 - Guidelines for IRO-010 RC Data Specification and Collection and Attachment, RC0120A - RC IRO-010 Data Specification. These Operating Procedure documents provide a list of data and information which includes Real-Time network and balancing authority measurement data, forecast and resource schedule data, outage data, power system modeling data, documentation and procedures and Real-Time notifications. These also include provisions for notification of current Protection System and Remedial Action Scheme status or degradation that impacts System reliability. The

data specification identifies the responsible entities, frequency and acceptable methods for data provision.

10.1 Data Format

Each applicable entity that is required to provide data to the CAISO RC shall appoint one or more contacts who are responsible for working with the CAISO RC in order to provide the requested data in the specified format. Where appropriate, the CAISO RC will provide supporting documentation such as technical specifications and templates.

The appointed contact person(s) shall notify the CAISO RC via the operationscompliance@caiso.com e-mail of any instances where the specified formats or security protocols are not agreeable. The CAISO RC will collaborate with the applicable entities to resolve data conflicts in a mutually agreed upon manner that ensures System reliability.

11 System Operating Limits (SOL) Methodology

In accordance to NERC Standard FAC-011-3 R1, the CAISO RC has an established System Operating Limit (SOL) Methodology for the Operations Horizon.

The SOL methodology is applied to the CAISO RC Area for developing SOLs and Interconnection Reliability Operating Limits (IROLs) for use in the Operations Horizon pursuant to NERC Reliability Standards FAC-011-3 and FAC-014-2.

All requirements for establishing SOLs and IROLs are contained in the [System Operating Limit \(SOL\) Methodology Document](#).

12 RC Services Settlements and Billing

This section provides the Settlements and Billing processes within the context of the RC Services. The business process for settlement of the fiscal results for electing to receive RC Services from the CAISO RC is outlined in the [BPM for Settlements and Billing](#). That BPM provides an overview of the settlement, billing, invoicing, and financial clearing business functions, an overview of key settlement and billing principles, and an overview of the settlement and invoicing cycles.

12.1 Reliability Services Net Energy for Load

12.1.1 RC Customers External to CAISO Balancing Authority Area

For RC Customers external to the CAISO Balancing Authority Area, the RC Customer must submit specified billing volume data through the Market Result Interface – Settlement (MRI-S) portal no later than September 30, annually. [If September 30 falls on a weekend or a CAISO holiday, the submittal deadline is the next Business Day.](#) RC Customers who are associated with generation-only BAAs, will submit their total annual Net Generation in MWh for the period of January 1 through December 31 of the previous year. RC Customers who are associated with BAAs that serve load, will submit their total annual Net Energy for Load in MWh for the period of January 1 through December 31 of the previous year. RC Customers who are TOPs, have requested to be directly billed, and have no Net Energy for Load during the period of January 1 through December 31 of the prior year, will indicate such to the CAISO RC.

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If the RC Customer does not submit the required billing volume data by the specified date, the CAISO RC will defer to the RC Customer's default MWh as specified in the Reliability Coordinator Services Agreement (RCSA) to determine the RC Customer's billing volume data. For an RC Customer that is associated with generation-only Balancing Authority Areas, the default billing volume data shall be calculated as the product of the install capacity of the generation times a 90 percent capacity factor times 8,760 hours in a year. For an RC Customer that is associated with Balancing Authority Areas that serve load, the default MWh shall be calculated as the product of 1.25 times the RC Customer's default Net Energy for Load MWh specified in the RCSA.

12.1.2 RC Customers Internal to CAISO Balancing Authority Area

For RC Customers and Scheduling Coordinators within the CAISO Balancing Authority Area that serve load, the CAISO RC shall calculate a Net Energy for Load for each RC Customer and Scheduling Coordinator that serves load in accordance with CAISO Tariff Section 11.20.9. RC Customers that are TOPs and do not serve load shall be identified in the CAISO Master File.

12.2 Reliability Services Informational Statement

The CAISO RC shall publish an informational statement containing billing volume data submitted by RC Customers by October 30 of each year. If publication of information statement falls on a weekend or a CAISO holiday, the statement will be issued on the next Business Day. RC Customers should validate the billing volume data contained within the Reliability Services informational statement and submit updated billing volume data, if necessary, by November 30 following the publication of the informational statement. If an RC Customer does not update their billing volume data by November 30, it will be deemed that the billing volume data published in the Reliability Services informational statement to be valid and accepted. If November 30 falls on a weekend or a CAISO holiday, the submittal deadline is the next Business Day.

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12.3 RC Services Charge Codes

A detailed description of each Reliability Services settlement Charge Code, including business rules and specific data calculation formulas, is found in the *BPM Configuration Guide* documents posted under the Settlements and Billing section of the BPM Document Library on the CAISO website. The [BPM for Settlements and Billing](#) provides details on how to use and read a *BPM Configuration Guide*.

For each RC Customer external to the CAISO Balancing Authority Area, the CAISO RC shall calculate an RC Services Charge as the maximum of (i) the minimum RC Services Charge or (ii) the product of the volume data and the annual RC Services Charge rate. For an RC Customer or Scheduling Coordinator internal to the CAISO Balancing Authority Area, the CAISO RC shall calculate the RC Services Charge as the product of the total Net Energy for Load, in accordance with CAISO Tariff Section 11.20.9, and the annual RC Services Charge rate. RC Customers that are TOPs with no Net Energy for Load shall be charged the minimum RC Services Charge.

The CAISO will provide RC Customers with an RC Services Invoice by the first business day of each calendar year for RC Services to be provided during that calendar year. RC Customers are required to make timely payment to the CAISO RC of all charges on an invoice no later than twenty-one (21) business days from the date of the invoice unless otherwise specified in the RCSA. The CAISO shall take all actions provided in Section 19.7 of the CAISO Tariff, included but not limited to, if payment is not received by the last business day in January, the RC Customer will be charged a \$1,000 one-time late payment fee on a supplemental invoice, and will be considered to be in default. If the 21st business day falls after January 31, then the invoice shall be due 21 business days from the date of issuance.

12.4 Disputes

Any dispute with the published results of CAISO's settlement process for the Reliability Services invoice must be submitted to the CAISO RC by the RC Customer or Scheduling Coordinator within 21 business days of the date of issuance and are governed by the dispute process outlined in the [BPM for Settlements and Billing](#). RC Customer must pay RC Services Invoice regardless of dispute in accordance with Section 19.7(4) of the CAISO Tariff. RC Customers are not permitted to dispute any RC Services invoice, except in the event that an error in the invoice causes the invoiced amount to differ from the amount that would result from the application of the rate set forth in the CAISO Tariff. In other words, RC Customers will be able to dispute errors in the CAISO's calculation of the RC Services charge, but not the underlying inputs or other issues. If the CAISO RC determines that an invoice contains such a calculation error, and the resolution of the dispute makes correction necessary, the CAISO RC will issue a corrected invoice.

13 Transition to Another RC

If the RC Customer desires to terminate the RC Services with the CAISO RC, the RC Customer may terminate the RC SA, without penalty, by giving the CAISO RC not less than twelve (12) months advance written notice after the Initial Term. This notice will be given on or before April 1 of the current calendar year and such termination will become effective on April 1 of the following year. Request for termination should be sent to: RegulatoryContracts@caiso.com.

If the RC Customer gives the CAISO RC less than twelve (12) months' notice after the Initial Term and is being billed directly for the RC Services in accordance with Section 5.3 of the RC SA, the RC Customer will be charged an amount equal to the balance of the RC Service Charge remaining on the twelve (12) month required notice period. Any outstanding financial right or obligation or any other obligation under the CAISO Tariff of the RC Customer that has arisen while that RC Customer was receiving services under this Agreement, and any provision of this Agreement necessary to give effect to such right or obligation, will survive until satisfied.

With respect to any notice of termination given pursuant to this Section, the CAISO will timely file a notice of termination with FERC, or will otherwise comply with the requirements of FERC Order No. 2001 and related FERC orders. For entities defined under Section 201(f) of the Federal Power Act, 16 U.S.C. 824(f), termination will be effective upon twelve (12) months' notice irrespective of acceptance by FERC.

In addition, the CAISO RC will reasonably assist the RC Customer to transition to another Reliability Coordinator prior to the effective date of the transition, including providing data and assistance, provided that the RC Customer will reimburse the CAISO RC for its reasonable costs for such assistance.

14 Supplemental Services

14.1 Hosted Advanced Network Applications (HANA)

The CAISO RC offers technical/hosted services (HANA) to help an RC Customer meet other NERC and WECC obligations. These services are distinct from the RC function and will be billed as such. The CAISO RC provides these services in accordance with the RCSA and CAISO Tariff Sections 19.3 and 19.8.

RC Customers who select supplemental HANA services will be able to view network model one-line diagrams, as well as the violations reported by the Real-Time state estimation and Real-Time contingency analysis. In addition, study users will be able to perform study power flow as well as study contingency analysis.

HANA services will be available to TOPs and BAs that receive RC Services from CAISO. HANA service levels include:

Base HANA (included in RC core services)

- View TOP contingency analysis results

HANA Visualization (supplemental service subscription required)

- Read-only access and view to Real-Time State Estimator application. Read-only access to view Real-Time Contingency Analysis (RTCA). This includes visualization using network model one-line diagrams.

HANA Study (supplemental service subscription required)

- Includes HANA Visualization
- Access and ability to perform study powerflow utilizing CAISO's advanced network applications
- Access and ability to perform study Contingency Analysis utilizing CAISO's advanced network applications

The RC Customer must notify the CAISO RC in writing 90 calendar days prior to when the RC Customer wants to start the HANA services it elects [by sending a request for service to RegulatoryContracts@caiso.com](mailto:RegulatoryContracts@caiso.com).

HANA Visualization and HANA Study both require a 3-year initial commitment. The initial 3-year cost will include a one-time start-up fee and an annual ongoing fee for the software license and CAISO RC support. Annual enrollment in HANA services will continue unless the RC Customer

submits a 12-month exit notification in writing to the CAISO RC. The exit notification must align with the RC Customer's anniversary date. After the initial 3 years of HANA service, the annual cost to the RC Customer will be just the annual ongoing fee.

The CAISO RC will invoice the RC Customer for their HANA services in advance of their anniversary date then every year thereafter on their anniversary date. Payment will be due within twenty-one (21) business days from the date of the invoice.

14.2 CIP-014 Physical Security

The purpose of Critical Infrastructure Protection Standard 014 (CIP-014) is to identify and protect transmission stations and substations, and their associated primary control centers that if rendered inoperable or damaged as a result of a physical attack could result in instability, uncontrolled separation, or cascading within an Interconnection. Requirement R1 of the standard requires each TOP to perform periodic risk assessments of its transmission stations and substations that meet the criteria specified in the applicability section of the standard. The risk assessments consist of transmission analyses designed to identify the critical transmission stations and substations. Requirement R2 of the standard further requires each TOP to have an unaffiliated third party, such as a registered Planning Coordinator or RC, verify the risk assessment it performed under Requirement R1.

The CAISO RC currently provides this risk assessment verification service to its Participating Transmission Owners (PTOs). The CAISO RC will extend this service to TOPs who are RC Customers, if requested.

The CAISO RC will use the same process and criteria to review the risk assessment(s) once the RC Customer provides a written notice to the CAISO RC at QueueManagement@caiso.com to review the assessment, technical data required to assess the request, and payment of the \$50,000 deposit. In response to the request, the CAISO RC will evaluate the risk assessment which may include recommendations for the addition or deletion of a transmission station(s) or transmission substation(s). Once the evaluation of the risk assessment is completed, the CAISO RC will provide a report of its recommendations and meet with the RC Customer, if requested.

The RC Customer will be responsible for the actual costs incurred by the CAISO RC and applicable third parties used in conducting the assessment. If the actual costs of the assessment are less than the deposit provided by the RC Customer, the RC Customer will be refunded the balance. If the actual costs of the assessment are greater than the deposit provided by the RC Customer, the RC Customer shall pay the balance within 30 days of being invoiced.

If the RC Customer fails to timely pay the actual costs exceeding the deposit and such costs have not been disputed, the default provisions of Section 19.8 of the CAISO Tariff default provisions.

The CAISO RC is not obligated to continue to conduct the risk assessment unless and until the RC Customer has paid all undisputed amounts.