Web Conference Information

Web Address: https://caiso.webex.com/caiso/j.php?MTID=m4c62047c8ca3c36c50e2d1182518f8f9
Audio connection instructions will be available after connecting to the web conference. When prompted, select "Call me" and enter the phone number you will use during the call. You will be called by the conference shortly.

Conference Call Information

1-844-621-3956 United States Toll Free
+1-650-479-3208 United States Toll
Access code: 248 723 65119

Calls and webinars are recorded for stakeholder convenience, allowing those who are unable to attend to listen to the recordings after the meetings. The recordings will be publicly available on the ISO web page for a limited time following the meetings. The recordings, and any related transcriptions, should not be reprinted without the ISO’s permission.

https://www.caiso.com/Pages/documentsbygroup.aspx?GroupId=54E8D66B-1CA6-4935-AD6E-C1C4D6CDD989
Housekeeping

• Next meeting is tentative until notice, will start at 9am due to Market Performance and Planning Forum.
Instructions for raising your hand to ask a question

- If you are connected to audio through your computer or used the “call me” option, select the raise hand icon located on the top right above the chat window.

- Please remember to state your name and affiliation before making your comment.
  - You may also send your questions via chat to Brenda Corona or to all panelists.
<table>
<thead>
<tr>
<th>Time (PST)</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00 – 10:05</td>
<td>Welcome</td>
</tr>
<tr>
<td>10:05 – 10:10</td>
<td>CRR Upgrade Project timeline Update</td>
</tr>
<tr>
<td>10:10 – 10:25</td>
<td>Questions</td>
</tr>
<tr>
<td>10:25 – 11:30</td>
<td>Next Steps</td>
</tr>
</tbody>
</table>
CRR System Upgrade – Project Update & Timeline

*Updated May 2024*

- Construction Phase is complete and Functional System Acceptance Testing (SAT) starts this week
- Connectivity Testing starts in August
- Market Sim starts in September
- Annual Cycle Cutoff will be on current CRR System
- Monthly Cycle Cutoff will still be for Jan 1st 2025 on new CRR System

---

**TODAY**

- Construction Phase is complete and Functional System Acceptance Testing (SAT) starts this week
- Connectivity Testing starts in August
- Market Sim starts in September
- Annual Cycle Cutoff will be on current CRR System
- Monthly Cycle Cutoff will still be for Jan 1st 2025 on new CRR System

---

*Exact cutover date TBD*
QUESTIONS?
Next Steps

• Next meeting is Thursday June 27, 2024 at 9am
• Discuss following topics
• Visit CPG webpage for more information: http://www.caiso.com/informed/Pages/MeetingsEvents/CustomerPartnershipGroups/Default.aspx
REFERENCE SLIDES
# CRR Service Endpoint Details

<table>
<thead>
<tr>
<th>#</th>
<th>Service</th>
<th>GET</th>
<th>POST</th>
<th>Likelihood that file submission may be greater than &gt; 1 MB filesize</th>
<th>CRR System (UI / API)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CRR Historical &amp; Forecasted Load</td>
<td>x</td>
<td>x</td>
<td>Yes</td>
<td>Phase 1: Use UI for submission for now, no API available Phase 2: API submission pattern - TBD</td>
</tr>
<tr>
<td>2</td>
<td>CRR Auction</td>
<td>x</td>
<td>x</td>
<td>Yes</td>
<td>Maximum 500 recs for any file submission to the system 20 bid segments per bid (business rule)</td>
</tr>
<tr>
<td>3</td>
<td>CRR Load Migration</td>
<td>x</td>
<td>x</td>
<td>No</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>CRR Nomination</td>
<td>x</td>
<td>x</td>
<td>Yes</td>
<td>Maximum 500 recs for any file submission to the system</td>
</tr>
<tr>
<td>5</td>
<td>CRR Secondary Market</td>
<td>x</td>
<td>x</td>
<td>No</td>
<td>Maximum 500 recs for any file submission to the system</td>
</tr>
</tbody>
</table>
# CRR Service Endpoint Details

<table>
<thead>
<tr>
<th>#</th>
<th>Service</th>
<th>GET</th>
<th>POST</th>
<th>Potential submission for &gt;1mb filesize</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CRR App Status</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>CRR Market Data</td>
<td>x</td>
<td>n/a</td>
<td>n/a</td>
<td>Only retrieve data, no submission</td>
</tr>
<tr>
<td>3</td>
<td>CRR Market Status</td>
<td>x</td>
<td>n/a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>CRR Messages</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The ISO has decided to upgrade the existing CRR system with a new system that adopts the latest technology stack aligned with the ISO’s technology standards, consolidates all CRR related functions, minimizes human errors, reduces processing time, eliminates manual workarounds, and positions the system to accommodate policy changes down the road.

This on-going Customer Partnership Group (CPG) will provide an overview of the schedule, review of external BRS and answer questions. Subsequent meetings will include detailed review and discussion of business process changes impacting market participants.


The goal of this CPG is to ensure customer readiness as this project deploys to Production in 2024.
RECAP: CRR Upgrade Project – Overview of changes

- **Load submission process**
  - At the time of load submission participant will be notified of any failed validation per sink location based on the exceedance load and allow to resubmit

- **OBAALSE process**
  - EQ load election will be submitted through the UI during the OBAALSE load submission

- **Consolidate data publishing in MUI and/or OASIS**
  - Calendar: change from webpost to OASIS
  - Model data: change from webpost to MUI, including both NDA and non NDA files
  - Market Result data: from webpost to MUI

- **Modeling data**
  - Powerflow case to be released in PSSE v30
  - ITC definition will be modeled as source and sink

- **Features added to enable user performing additional tasks**
  - MT_TOR: user to submit through UI, currently performed by CRR group

- **Changes to Load Migration and Source and Sink processes**

- **User access**
  - User will be provisioned to specific functions within the system, based on the application access request approval process

- **Webservices interface for interacting with MUI**
Market Sim - Overview

- Market participant training will complete prior to last week of connectivity, and one week before start of Market Sim
- 4 weeks connectivity
  - Week two CAISO will provide ability for allocation and auction API upload
  - No functionality will be available to test until the start of Market Sim
- 3 week structured scenario execution
- 2 week unstructured
- CAISO will request all interested CRR market participants sign up to participate in Market Sim
- All current user profiles will be migrated into Map-stage for Market Sim, new participants will need to request to be provisioned
## Market Sim Month

<table>
<thead>
<tr>
<th></th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>week 1</strong></td>
<td>[Post all preloaded data] Open and close by 5pm - T1 mini Make available special processes that have changed</td>
<td>Post T1 mini results MP - review T1 results, need MEO values and then build nominations when market IS opens on Thursday Need Set aside post [time]</td>
<td>open and close at 5pm T2 mini</td>
<td>Post T2 mini results</td>
<td></td>
</tr>
<tr>
<td><strong>week 2</strong></td>
<td>Send process ownership data</td>
<td>Market Sim call to discuss T1&amp;T2 Monthly Mini Auction open Collateral verified</td>
<td>Market Sim Post Monthly Mini Auction Results (starts Settlements) Settlement T+3B</td>
<td>T1/PHP Annual Mini Annual data separate (2025 process, use 2024 annual data and mock it up)</td>
<td>T1/PHP Annual Mini Annual Post results</td>
</tr>
<tr>
<td><strong>week 3</strong></td>
<td>Market Sim / UAT – prep for mini Annual 2025</td>
<td>Settlement results available UAT – Open Mini Annual Auction</td>
<td>UAT - Close Mini Annual Auction by 5pm</td>
<td>UAT – post all Reports</td>
<td>UAT – Post Mini Annual Auction Results</td>
</tr>
<tr>
<td><strong>week 4</strong></td>
<td>unstructured</td>
<td>unstructured</td>
<td>unstructured</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>week 5</strong></td>
<td>unstructured</td>
<td>unstructured</td>
<td>unstructured</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
RECAP: CRR Upgrade Project—Overview of changes cont.

• **Source and Sink list release**
  – Remove the existing 30 days ahead of allocation version
  – Will be released in v0, v1 and other updates within the active market period

• **Retired resource mapping**
  – Re-map the retired PNode to the closest electrically connected PNode that is also a biddable location in the CRR processes and has the same source/sink designation as the retired location
  – Baseloading CRR will be mapped based on the model used in the active market period to capture the most accurate topology
  – Mapping will be released for the corresponding market period

• **Source and Sink islanded by outage**
  – With baseloading CRR, sell offer allowed
  – No baseloading CRR, will not be biddable for the effective market
CAISO B2B Improvements – Goals & Current Status

• **Goals**
  - Enhance the developer experience working with CAISO Web API’s
  - Provide API’s in REST/JSON using OpenAPI 3.0 specification
  - Provide examples, mock services and tooling to generate client/server stubs and SDK
  - Provide tests for the API’s using Postman collections
  - Collaboration using Git and forums on developer.caiso.com
  - Simplify authentication using mutual TLS and X.509 certificates

• **Update**
    - PowerPoint presentation and webinar recording
    - Draft version of CRR Auction Service OpenAPI Specifications
    - Draft version of CRR business validate message bundle
CAISO B2B Improvements – SOAP vs REST

**SOAP**

- POST /GetStock HTTP/1.1
- Host: www.example.org
- Content-Type: application/soap+xml

```xml
<?xml version="1.0"?>
<soap:Envelope
  xmlns:soap="http://www.w3.org/2001/12/soap-envelope"
  soap:encodingStyle="http://www.w3.org/2001/12/soap-encoding">
  <soap:Body
    xmlns:m="http://www.example.org/stock">
    <m:GetStockPrice>
      <m:StockName>IBM</m:StockName>
    </m:GetStockPrice>
  </soap:Body>
</soap:Envelope>
```

**REST**

- GET http://example.org/stock/IBM

```html
https://www.soapui.org/learn/api/soap-vs-rest-api/
```

- SOAP (Simple Object Access Protocol) provides the following advantages when compared to REST:
  - Language, platform, and transport independent (REST requires use of HTTP)
  - Works well in distributed enterprise environments (REST assumes direct point-to-point communication)
  - Standardized
  - Provides significant pre-build extensibility in the form of the WS* standards
  - Built-in error handling
  - Automation when used with certain language products

- REST (Representational State Transfer) is easier to use for the most part and is more flexible. It has the following advantages when compared to SOAP:
  - Uses easy to understand standards like swagger and OpenAPI Specification 3.0
  - Smaller learning curve
  - Efficient (SOAP uses XML for all messages, REST mostly uses smaller message formats like JSON)
  - Fast (no extensive processing required)
  - Closer to other Web technologies in design philosophy
  - As one REST API tutorial put it: SOAP is like an envelope while REST is just a postcard
CAISO B2B Improvements – CRR Developer Forum


**RESTful services**

<table>
<thead>
<tr>
<th>Service</th>
<th>Specification</th>
<th>Documentation</th>
<th>Status</th>
<th>Release</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRR Auction</td>
<td>crr_auction_1.0.0.yaml</td>
<td>crr_auction_1.0.0.html</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>CRR Historical and Forecasted Load</td>
<td>crr_historical_and_forecasted_load_1.0.0.yaml</td>
<td>crr_historical_and_forecasted_load_1.0.0.html</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>CRR Market Data</td>
<td>crr_market_data_1.0.0.yaml</td>
<td>crr_market_data_1.0.0.html</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>CRR Market Status</td>
<td>crr_market_status_v1.0.0.yaml</td>
<td>crr_market_status_v1.0.0.html</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>CRR Message</td>
<td>crr_message_1.0.0.yaml</td>
<td>crr_message_1.0.0.html</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>CRR Nomination</td>
<td>crr_nomination_1.0.0.yaml</td>
<td>crr_nomination_1.0.0.html</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>CRR Secondary Market</td>
<td>crr_secondary_market_1.0.0.yaml</td>
<td>crr_secondary_market_1.0.0.html</td>
<td>FRODO,LATEST</td>
<td>Spring 2020</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>crr_secondary_market_0.0.0.yaml</td>
<td>crr_secondary_market_0.0.0.html</td>
<td>MAP-STAGE</td>
<td>DRAFT</td>
<td>NA</td>
</tr>
<tr>
<td>CRR Toll Conversion</td>
<td>crr_toll_conversion_1.0.0.yaml</td>
<td>crr_toll_conversion_1.0.0.html</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>
CAISO CRR API Mock Services

https://mapstage-apimock.caiso.com/mocks?appname=crr

Specifications:

- mock_caiso_crr_auction_v1.0.0.html
- mock_caiso_crr_historical_and_forecasted_load_v1.0.0.html
- mock_caiso_crr_market_data_v1.0.0.html
- mock_caiso_crr_market_status_v1.0.0.html
- mock_caiso_crr_message_v1.0.0.html
- mock_caiso_crr_nomination_v1.0.0.html
- mock_caiso_crr_secondary_market_v1.0.0.html
- mock_caiso_crr_for_conversion_v1.0.0.html
CAISO B2B Improvements – Example: CRR Auction API

```
openapi: 3.0.0
servers:
  - url: https://virtservserver.swaggerhub.com/RI-GM/caiso_crr_auction_v1.0.0_openapi/1.0.0
info:
  description: This includes all openapi services for CRR bids and offers
  version: "1.0.0"
  title: CRR Auction API
  contact:
    email: Hedge-support@resource-innovations.com
  tags:
    - name: write
      description: require read/write access
    - name: read
      description: requires read only
paths:
  /auction/v1.0/portfolio:
    get:
      summary: Gets bids and offers for given market name
      description: By passing in the appropriate market name, portfolio bids and offers will be returned.
      operationId: getPortfolio
      parameters:
        - $ref: '#/components/parameters/MarketName'
      responses:
        '200':
          description: search results matching criteria
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/Portfolio'
```

CRR Auction API

API and SDK Documentation

Version: 1.0.0

This includes all openapi services for CRR bids and offers

Read

getPortfolio

gets bids and offers for given market name, portfolio name, and logged-in user

By passing in the appropriate market name, portfolio name, and participant name, the auction portfolio will be returned.

GET

```
/auctionv1.0/portfolio
```

Usage and SDK Samples

<table>
<thead>
<tr>
<th>Curl</th>
<th>Java</th>
<th>Android</th>
<th>Objective-C</th>
<th>JavaScript</th>
<th>C#</th>
<th>PHP</th>
<th>Perl</th>
<th>Python</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CAISO B2B Improvements – Free Swagger Editor Tool

https://editor.swagger.io/
CAISO B2B Improvements – New Web Services for CRR

<table>
<thead>
<tr>
<th>Service</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allocation Nomination Portfolio</td>
<td>POST/GET</td>
</tr>
<tr>
<td>Auction Bid Portfolio</td>
<td>POST/GET</td>
</tr>
<tr>
<td>Historical and Forecasted Load</td>
<td>POST/GET</td>
</tr>
<tr>
<td>Existing CRRs (CRR Market Data)</td>
<td>GET</td>
</tr>
<tr>
<td>Market Data (CRR Market Data)</td>
<td>GET</td>
</tr>
<tr>
<td>Market Results (CRR Market Data)</td>
<td>GET</td>
</tr>
<tr>
<td>Private Allocation Results (CRR Market Data)</td>
<td>GET</td>
</tr>
<tr>
<td>Private Auction Results (CRR Market Data)</td>
<td>GET</td>
</tr>
<tr>
<td>Load Migration Data</td>
<td>POST/GET</td>
</tr>
<tr>
<td>Market Status (Market Info)</td>
<td>GET</td>
</tr>
<tr>
<td>CRR Messages</td>
<td>GET</td>
</tr>
<tr>
<td>Secondary Market</td>
<td>POST/GET</td>
</tr>
<tr>
<td>TOR Conversion</td>
<td>POST/GET</td>
</tr>
</tbody>
</table>
A2A/B2B OpenAPI File Naming Conventions for versioning:

File name example: `caiso_crr_market_info_v1.0.0_openapi.yaml`

Version Numbering Format: **MAJOR.MINOR.MINI**

- **MAJOR** version of the file name will be incremented if there are any new services added or any major version update to any of the existing services.

- **MINOR** version of the file name will be incremented if there any minor version update to any of the existing services.

- **MINI** version of the file name will be incremented if there are only documentation changes/corrections, with no service changes.
CAISO B2B Improvements

Each version update of the file name will reset the version numbers on the right

Version numbers will be tracked into the YAML file as part of the ReleaseNotes

Example:

<table>
<thead>
<tr>
<th>Version</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>v1.0.0</td>
<td>File is published to market participants</td>
</tr>
<tr>
<td>v1.0.1</td>
<td>Edits were made to documentations, no functional changes</td>
</tr>
<tr>
<td>v1.0.2</td>
<td>Edits were made to documentations, no functional changes</td>
</tr>
<tr>
<td>v1.0.3</td>
<td>Edits were made to documentations, no functional changes</td>
</tr>
<tr>
<td>v1.1.0</td>
<td>Added a Minor version for a service</td>
</tr>
<tr>
<td>v1.1.1</td>
<td>Edits were made to documentations, no functional changes</td>
</tr>
<tr>
<td>v1.2.0</td>
<td>Added a Minor version for a service</td>
</tr>
<tr>
<td>v1.3.0</td>
<td>Added a Minor version for a service</td>
</tr>
<tr>
<td>v2.0.0</td>
<td>Added a Major version for a service</td>
</tr>
<tr>
<td>v2.0.1</td>
<td>Edits were made to documentations, no functional changes</td>
</tr>
<tr>
<td>v3.0.0</td>
<td>Added a new service</td>
</tr>
</tbody>
</table>