# Congestion Revenue Rights (CRR) Upgrade Project
## Customer Partnership Group

**Sep 20, 2023**  

<table>
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<tr>
<th><strong>Web Conference Information</strong></th>
<th><strong>Conference Call Information</strong></th>
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| Web Address: [https://caiso.webex.com/caiso/j.php?MTID=m4c62047c8ca3c36c50e2d1182518f8f9](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. | 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](https://www.caiso.com/Pages/documentsbygroup.aspx?GroupId=54E8D66B-1CA6-4935-AD6E-C1C4D6CDD989)
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. Note: #2 only works if you dialed into the meeting.
  – 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.
## Agenda

<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>RECAP: CRR Upgrade Project – Overview / Overview of changes</td>
</tr>
<tr>
<td>10:10 – 10:15</td>
<td>CRR Upgrade Project – Project updates</td>
</tr>
<tr>
<td></td>
<td>• Updated timeline</td>
</tr>
<tr>
<td></td>
<td>• Draft Market Sim plan</td>
</tr>
<tr>
<td>10:15 – 10:45</td>
<td>• B2B Improvement Initiative: API Mocking Service</td>
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<tr>
<td>10:45 – 10:55</td>
<td>Questions</td>
</tr>
<tr>
<td>10:55 – 11:00</td>
<td>Next Steps</td>
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</table>
CRR System Replacement Update & Timeline
Updated September 2023

- Construction nearing end, but will continue through Factory Acceptance Testing (FAT)
- **Big Milestone!** Factory Acceptance Testing started week of 9/18, but delayed from target date
- Opportunities identified to compress functional testing timelines (SAT), so time savings anticipated
- **Impact on Go Live Date still TBD** – will know more as FAT progresses
- Connectivity – 3 weeks extend connectivity plus standard one week connectivity.

---

**Construction Phase**

- **TODAY**
  - Construction nearing end, but will continue through Factory Acceptance Testing (FAT)
  - Big Milestone! Factory Acceptance Testing started week of 9/18, but delayed from target date
  - Opportunities identified to compress functional testing timelines (SAT), so time savings anticipated
  - Impact on Go Live Date still TBD – will know more as FAT progresses
  - Connectivity – 3 weeks extend connectivity plus standard one week connectivity.

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**Phase 2**

- CRR Deployment for July 1st Market Model (Tent. end of May’24*)
- Connectivity – 3 weeks extend connectivity plus standard one week connectivity.

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**Factory Acceptance Testing** (FAT)

- *NEW* Extended connectivity allowing more time for participants to test APIs

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**Connectivity**

- 3 weeks extend connectivity plus standard one week connectivity.

---

**Phase 2 Go Live**

- *Exact cutover date TBD*
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>
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<tbody>
<tr>
<td><strong>week 1</strong></td>
<td>[Post all preloaded data]</td>
<td>[Post T1 mini results]</td>
<td>Post T1 mini results</td>
<td>open and close at 5pm T2 mini</td>
<td>Post T2 mini results</td>
</tr>
<tr>
<td></td>
<td>Open and close by 5pm - T1 mini</td>
<td>Open and close by 5pm - T1 mini</td>
<td>(Post T1 mini results)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Make available special processes that have changed</td>
<td>Update T1 mini results, send MEO values, and then build nominations when market opens on Thursday</td>
<td>(Send process ownership data)</td>
<td></td>
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<tr>
<td><strong>week 2</strong></td>
<td>CRR team setup for Monthly Mini Auction</td>
<td>[Send process ownership data]</td>
<td>Market Sim Post Monthly Mini Auction Results (starts Settlements) Settlement T=38</td>
<td>T1/PNP Annual Mini Annual data separate (2025 process, use 2024 annual data and mock it up)</td>
<td>T1/PNP Annual Mini Annual Post results</td>
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<tr>
<td></td>
<td>CRRI team setup for Monthly Mini Auction</td>
<td>Market Sim call to discuss T1 &amp; T2</td>
<td>Market Sim Post Monthly Mini Auction Results (starts Settlements) Settlement T=38</td>
<td>T1/PNP Annual Mini Annual data separate (2025 process, use 2024 annual data and mock it up)</td>
<td>T1/PNP Annual Mini Annual Post results</td>
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<tr>
<td></td>
<td>Monthly Mini Auction open</td>
<td>Monthly Mini Auction</td>
<td>Monthly Mini Auction Results (starts Settlements) Settlement T=38</td>
<td>T1/PNP Annual Mini Annual data separate (2025 process, use 2024 annual data and mock it up)</td>
<td>T1/PNP Annual Mini Annual Post results</td>
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<td>Collateral verified</td>
<td>Monthly Mini Auction</td>
<td>Monthly Mini Auction Results (starts Settlements) Settlement T=38</td>
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<td>T1/PNP Annual Mini Annual data separate (2025 process, use 2024 annual data and mock it up)</td>
<td>T1/PNP 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</td>
<td>UAT - Close Mini Annual Auction by 5pm</td>
<td>UAT - post all Reports</td>
<td>UAT – Post Mini Annual Auction Results</td>
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<tr>
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<td>Settlement results available</td>
<td>UAT - Close Mini Annual Auction by 5pm</td>
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<td>UAT - Close Mini Annual Auction by 5pm</td>
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<td>UAT – Post Mini Annual Auction Results</td>
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*Note: Please refer to the California ISO guide for further details.*
B2B Improvement Initiative: API Mocking Service

Rick Lam & Suresh Radhakrishnan
September 20th, 2023
Agenda

• Problem Statement
• OpenAPI Overview
• API Mock Service
• Demo
Problem Statement:

We need an API mock service to enable parallel development, reduce external dependencies, enhance test coverage, improve collaboration, and accelerate our development and testing cycles while minimizing costs and ensuring data security.
OpenAPI Overview

- The OpenAPI Specification is a specification describing, producing, consuming, and visualizing RESTful web services.

- OpenAPI is known to many developers as a standard that enables API reference documentation to be generated automatically from the specification document.

https://www.openapis.org/
OpenAPI: Process Improvements

Consolidates technical specifications into a single document
OpenAPI: Process Improvements

- Code Generation
- Interactive Docs
- Built-in Validation
- Intuitive Design
- Mock Services
Features Not Support by the current version of API Mock Service:

- Cannot support any API responses with binary data
  - i.e. application/octet-stream
- Business specific use cases
- Transactions or Process Flows
- Performance Testing
- Security Testing
API Mock Service: Benefits and Supported Features

- Improves collaboration between our Dev teams and Market Participants
- Early feedback to address Design & Requirements errors
- Connectivity Testing and Certificate Validation for Market Participants
- Early QAT Setup and Validation
- Specification File Validation
- Data Dictionary Validation

- No code necessary to test the services
- Supports Chaos Engineering
- No Confidential Data Risk
- Contract Driven Development
- Supports All OpenAPI project development
- Supports All REST API Testing Tools
- Language and Platform Agnostic
- Self-contained, DB or external storage needed
## API Mock Service: Project Delivery Improvements

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<th>Phases</th>
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<th>MAR</th>
<th>APR</th>
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- NoMocks

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<td>Market Participants</td>
<td>Parallel Development And Testing for Our Dev Teams And Customers</td>
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</table>

- WithMocks
API Mock Architecture


CRR Congestion Revenue Rights

Overview

This application supports the ISO's Congestion Revenue Rights (CRR) related processes. CRR are financial instruments, made available through the CRR allocation, CRR auction and Secondary Registration System, that enable CRR holders to manage variability in congestion costs based on locational marginal pricing.

RESTful services

Add a new column to link to the API Mock service for each module.
API Mock Demo

DEMO

https://mapstage-apimock.caiso.com/mocks
QUESTIONS?
Next Steps

• Next meeting is October 18, 2023
• Discuss following topics
• Visit CPG webpage for more information:
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**
• **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

RECAP: CRR Upgrade Project—Overview of changes cont.
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 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

• 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

https://www.soapui.org/learn/api/soap-vs-rest-api/
• The OpenAPI Specification is a specification describing, producing, consuming, and visualizing RESTful web services.

• OpenAPI is known to many developers as a standard that enables API reference documentation to be generated automatically from the specification document.
CAISO B2B Improvements – OpenAPI Specification File

Consolidates technical specifications into a single document
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>
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CAISO B2B Improvements – Example: CRR Auction API

```yaml
openapi: 3.0.0
servers:
  - url: https://virtserver.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:
    name: "1hedge-support@resource-innovations.com"
  tags:
    - name: write
      description: require read/write access
    - name: read
      description: requires read only
paths:
  /auction/v1.0/portfolio:
    get:
      tags:
        - read
      summary: gets bids and offers for given market name or operation id
      description: |
        By passing in the appropriate market name, portfolio name or operation id, a CRR auction portfolio will be returned.
      operationId: getPortfolio
      parameters:
        - in: query
          name: MarketName
          required: true
          description: "market name for which bids and offers are needed"
        - in: query
          name: portfolioName
          description: "portfolio name for which bids and offers are needed"
        - in: query
          name: operationId
          description: "operation id for which bids and offers are needed"
      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.

**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>
</table>

**GET**

/auction/v1.0/portfolios

```bash
curl -X GET "https://virtserver.swaggerhub.com/RI-GM/caiso_crr_auction_v1.0.6_openapi/1.0.0/auction/v1.0/portfolio?marketName=portfolioName&participantName=""
```
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>
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<tbody>
<tr>
<td>Allocation Nomination Portfolio</td>
<td>POST/GET</td>
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<tr>
<td>Auction Bid Portfolio</td>
<td>POST/GET</td>
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<td>Historical and Forecasted Load</td>
<td>POST/GET</td>
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<td>GET</td>
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<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>
CAISO B2B Improvements – File Naming Convention

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:

- **v1.0.0**: File is published to market participants.
- **v1.0.1**: Edits were made to documentations, no functional changes.
- **v1.0.2**: Edits were made to documentations, no functional changes.
- **v1.0.3**: Edits were made to documentations, no functional changes.
- **v1.1.0**: Added a Minor version for a service.
- **v1.1.1**: Edits were made to documentations, no functional changes.
- **v1.2.0**: Added a Minor version for a service.
- **v1.3.0**: Added a Minor version for a service.
- **v2.0.0**: Added a Major version for a service.
- **v2.0.1**: Edits were made to documentations, no functional changes.
- **v3.0.0**: Added a new service.