



California ISO


Congestion Revenue Rights (CRR) Upgrade Project Customer Partnership Group

Oct 24, 2024

10:00 a.m.–11:00 a.m. (Pacific Time)

Web Conference Information	Conference Call Information
<p>Web Address: https://caiso.webex.com/caiso/j.php?MTID=m4c62047c8ca3c36c50e2d1182518f8f9</p> <p>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.</p>	<p>1-844-621-3956 United States Toll Free +1-650-479-3208 United States Toll</p> <p>Access code: 248 7236 5119 password: CRRCPG</p>
<p>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.</p>	
<p>https://www.caiso.com/meetings-events/topics/congestion-revenue-rights-crr-settlement-upgrade-project-customer-partnership-group</p>	

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: *3 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 Marquez or to all panelists.

Agenda

Time (PST)	Topic
10:00 – 10:05	Welcome
10:05 – 10:15	Training Schedule and Provisioning Update
10:15 – 10:25	B2B Spec Updates
10:25 – 10:35	Market Sim and Cutover plans
10:35 – 10:45	CRR Upgrade Project timeline Update
10:45 – 10:55	Questions and Next steps

CRR MUI Training Schedule

MUI Training for CRR Holders

Monday, October 28 1:00 pm – 3:30 pm PPT

- Getting started
- Public/Private Messages
- Public/Private/Restricted Downloads
- Bidding in the Auction
- Secondary Market
- MT TOR Approvals

MUI Training for Allocation and Load Migration for Load Serving Entities

Wednesday, November 6 1:00 pm – 3:30 pm PPT

- CRR Nominations
- CRR LT Re-nominations
- Nomination Cap
- Load Data
- Load Migration

Note: Separate training will be scheduled for UDC, TOR and CEC screens.

MapStage AIM Provisioning

- For CRR Holders and Load-Serving Entities that are currently provisioned in AIM as:
 - **EXTERNAL MUI USER WITH NDA or**
 - **EXTERNAL MUI RESTRICTED WITHOUT NDA**
- The ISO will provision/migrate access to:
 - **EXTERNAL CRR HOLDER READ/WRITE ACCESS**
- For CRR NDA Users that are currently provisioned as:
 - **CRRFNM EXTERNAL READ-ONLY or**
 - **EXTERNAL MUI USER WITH NDA**
- The ISO will provision/migrate their access to:
 - **EXTERNAL CRR NDA REPORTS READ-ACCESS**

B2B Spec Update

caiso_crr_auction_v1.1.7.yaml

- Added Error codes SEC0002 SER0022 SER0008 AOV0005 to specification.
- PortfolioName length changed from 50 to 100
- Changed minimum value of Megawatt to zero because the first bid point of a bid curve must have zero Megawatt;
- Modified description of errorMessage for PortfolioCredit object;
- Added description for PortfolioStatusType enum.

caiso_crr_historical_forecasted_load_v1.0.4.yaml

- Added Error codes LHFV0030 (LHFVxxxx) to specification.
- Removed PUMP_LOAD from LoadType enum because it is not used.

caiso_crr_load_migration_v1.2.3.yaml

- Changed 'lse' field's maxLength to 9 and pattern to be numbers only.
- Changed maximum for numberOfCustomers/loadTransferMw from 9999999999999999999 to 9223372036854775807
- Added tou as a required element in LoadPercentage response
- Marked 'LMMarketStatus' model fields as required.

B2B Spec Update

caiso_crr_market_data_v1.1.3.yaml

- Added error code 'MKT0007'.

caiso_crr_nomination_v1.2.1.yaml

- Delete API structure changed to match GET /portfolio [/nomination/v1.0/portfolio].
- PortfolioName length changed from 50 to 100
- Added Error codes SEC0002 SER0022 SER0008 AOV0005 to specification. Error codes/desc changes

caiso_crr_secondary_market_v1.1.2.yaml

- Added error codes 'SMT0107', 'SER0014', 'SER0018', 'SEC0001', 'SMT0146' and 'SMT0138'
- Updated 'OfferStatusType' and 'ResponseStatusType' to be required.
- Updated example of date-time to include single quote.

caiso_crr_tor_conversion_v1.1.0.yaml

- Added a missing attribute 'conversionApprovalId' to model 'ConversionApprovalRecord'

JSON Schema Update

LoadMigration/**CRRLoadMigrationTransfer_v1.1.0.draft-07.schema.json**

- Added a field 'tou' for Time of Use (enum) to ImTransferDefType

PrivateAllocationResults/**CRRPrivateAllocation_v1.1.2.draft-07.schema.json**

- Changed minimum MW for this spec from 0.001 to 0.000
- Updated enum for CRRTYPE to be for LSE, OBAALSE, MT, LSE_THCNT, ETC, and TOR.

PrivateGeneral/PublicGeneral/**CRRExistingCRRs_v1.1.1.draft-07.schema.json**

- Added CRRTYPE 'ETC', 'TOR', "CVR", "TER" and "OCALSE" enum values.

PublicMarket/**CRRSetAside_v1.0.2.draft-07.schema.json**

- Changed minimum value of Megawatt from 0.001 to 0.000

PublicMarket/**CRRSourceSink_v1.1.1.draft-07.schema.json**

- Removed 'ConnectivityNode' and renamed 'BusName' to 'AugmentedBusName'

JSON Schema Update

PublicResult/**CRRPublicAllocationResult_v1.0.2.draft-07.schema.json**

- Added ETC and TOR values to CRRType enum.

PublicResult/**CRRPublicAuctionResult_v1.1.0.draft-07.schema.json** & PublicResult/**CRRSourceSinkClearingPrice_v1.1.0.draft-07.schema.json**

- Changed Ref of ClearingPrice from Megawatt to PricePerMW

RestrictedNetwork/**CRRInterface_v1.2.0.draft-07.schema.json**

- Changed DeviceType ENUM to be Line, Transformer, Source, Sink
- Removed minimum value of Megawatt because the limits can be positive and negative.

JSON Schema Update

RestrictedNetwork/CRRLineAndTransformer_v1.1.1.draft-07.schema.json

- Removed FromBusSubstation, ToBusSubstation from being Required fields (to optional)
- Removed Interface from ENUM of DeviceType
- Removed minimum value of Megawatt because the limits can be positive and negative.
- Changed type of 'FromBusNumber' and 'ToBusNumber' to number (instead of integer)

RestrictedNetwork/CRROutage_v1.1.1.draft.-07.schema.json

- Removed Transfer from OutageAction enum

RestrictedNetwork/CRRResource_v1.0.1.draft-07.schema.json

- Changed descriptions of Mw, PMAx, and Megawatt;
- Removed minimum value of Megawatt because the limits can be positive and negative.

UploadFiles/CRRSecondaryMarketResponse_v1.0.1.draft-07.schema.json

- Fixed model definitions for field 'CrrType' and 'HedgeType'

Market Sim plan

- DRAFT - CRR 2024 & 2025 Allocation and Auction Markets Calendar
- Calendar layout of proposed CRR monthly and Annual Market Sim plan

Market Sim 2024

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
<p>week 1</p> <p>T-2w - Connectivity</p> <p>Prior to Market Sim - Kickoff and Overview</p> <ul style="list-style-type: none"> Market Sim Plan High level overview of new system Uploading and Downloading <ul style="list-style-type: none"> Manual Entry, File Upload, API Public/Private Downloads Messages Sorting and Filtering Documentation and Resources Contact Information 	<p><u>Miscellaneous process</u></p> <ol style="list-style-type: none"> UDC Load Migration Submissions and post (N-hour) LT Re-nomination Secondary Market TOR conversion submission <p><u>Allocation Monthly Participants</u></p> <ol style="list-style-type: none"> CEC Load Forecast Submissions Submit Historical Load Submit Forecast Load <p><u>Allocation Annual Participants</u></p> <p>Submit AN Historical Load for 2024</p> <p>Public/Private messages Public/Private downloads (existing CRRs) Market Sim Webex</p>	<p><u>Miscellaneous process</u></p> <ol style="list-style-type: none"> UDC Load Migration Submissions Open Secondary Market TOR conversion approval <p><u>Allocation Monthly Participants</u></p> <p>Post Monthly nomination cap (MEQ T1)</p> <p><u>Allocation Annual Participants</u></p> <p>Post Annual nomination cap (SEQ T1, SEQ LT, UB, SS T1, SS LT)</p> <p>Public/Private messages Market Sim Webex</p>	<p><u>Miscellaneous process</u></p> <ol style="list-style-type: none"> UDC Load Migration Submissions close and post Secondary Market <p>Market Sim Webex 3-4pm PST</p>	<p>Reserved for CRR team data processing and participant responses</p> <p>Environment Patching</p>

Market Sim 2024

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
<p>week 2</p> <p>Reserved for CRR team data processing and participant responses</p> <p>CRR team setup for Monthly Markets</p>	<p><u>Allocation Monthly Participants</u></p> <ol style="list-style-type: none"> 1. Submit Nominations for Tier 1 Monthly Market 2. Windows Close on <u>Wednesday</u> 3. Download Nomination Cap data 4. Download Allocation Market MN V0 ETC and T1 model results(NDA user) <p><u>Auction Monthly Participants</u></p> <ol style="list-style-type: none"> 1. Submit Auction Portfolios Monthly Auction Market <ul style="list-style-type: none"> • Buy Bids, Sell Offers • Credit - provide \$10mil to all MPs for testing 2. Windows Close on <u>Thursday</u> 3. Download Auction market model results(NDA user) <p>Market Sim Webex</p>	<p><u>Allocation Monthly Participants</u></p> <ol style="list-style-type: none"> 1. Download Allocation Market T1 Results 2. Submit Nominations for Tier 2 Monthly Market 3. Windows Close on <u>Thursday</u> 4. Download Nomination Cap T2 data 5. Download Allocation Market T2 model results(NDA user) <p>Market Sim Webex</p>	<p><u>Allocation Monthly Participants</u></p> <p>Review results</p> <p><u>Auction Monthly Participants</u></p> <p>Review results</p> <p>Market Sim Webex 3-4pm PST</p>	<p>Reserved for CRR team data processing and participant responses</p> <p>Environment Patching</p>

Market Sim 2024



MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
<p>week 3</p> <p>Reserved for CRR team data processing and participant responses</p> <p>CRR team setup for Annual markets</p>	<p><u>Allocation Annual Participants</u></p> <ol style="list-style-type: none"> 1. Submit Nominations for Tier 1 Annual Market 2. Windows Close on <u>Wednesday</u> 3. Download Nomination Cap data 4. Download Allocation Market AN V0 V1 and T1 model results(NDA user) <p>1. Submit Nominations for LT Annual Market</p> <ol style="list-style-type: none"> 2. Windows Close on <u>Wednesday</u> 3. Download Nomination Cap data 4. Download Allocation Market ETC and LT model results(NDA user) <p><u>Auction Annual Participants</u></p> <ol style="list-style-type: none"> 1. Submit Auction Portfolios Annual Auction Market <ul style="list-style-type: none"> • Buy Bids, Sell Offers • Credit - provide \$10mil to all MPs for testing 2. Re-submit for any processes or scenarios which had issues previously 3. Windows Close on <u>Thursday</u> 4. Download Auction market model results(NDA user) <p>Market Sim Webex</p>	<p><u>Allocation Annual Participants</u></p> <ol style="list-style-type: none"> 1. Submit Nominations for Tier 2 Annual Market 2. Windows Close on <u>Thursday</u> 3. Download Nomination Cap T2 data 4. Download Allocation Market T1 Results <p>Market Participant Webex 3-4pm PST</p>	<p><u>Allocation Annual Participants</u></p> <p>Review results</p> <p><u>Auction Annual Participants</u></p> <p>Review results</p> <p><u>Miscellaneous Annual process</u></p> <ol style="list-style-type: none"> 1. Submit Auction Portfolios for Participant requested scenarios <p>Market Sim Webex</p>	<p>Reserved for Q&A sessions, issue reporting, etc.</p> <p>Environment Patching</p>



Market Sim 2024

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
week 4		Unstructured <ul style="list-style-type: none"> Re-submit for any process of scenarios for customer specific testing Market Sim Webex	Unstructured	Unstructured Market Sim Webex	Reserved for CRR team data processing and participant responses Environment Patching
week 5		Unstructured Cont.	Unstructured Cont.	Unstructured Cont. Market Sim Webex	Reserved for CRR team data processing and participant responses Environment Patching

November 2024

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
 Annual	 December  January  Market Sim/Cutover			1 2025 Auction Open
4 Dec List of outages post by 5P Post January Source/Sink List 2025 Auction Closes 5P	5 Dec Incr. Update by 5P Market Sim – Week 1	6 Market Sim – Week 1	7 Dec Tier 1 Opens 1A Dec Tier 1 Closes 5P Jan Hist Load Wind Opens 1A Jan Hist Load Wind Closes 5P Market Sim – Week 1	8 Jan Frcst Load Wind Opens 1A Market Sim – Week 1
11 Dec Post Tier 1 Results by 5P Post 2025 Auction Results by 5P Jan Frcst Load Wind Closes 5P	12 Dec Post Set-Aside Dec Tier 2 MEQ Market Sim – Week 2	13 Dec Tier 2 Opens 1A Dec Tier 2 Closes 5P Market Sim – Week 2	14 Market Sim – Week 2	15 Dec Post Tier 2 Results by 5P Market Sim – Week 2
18 Market Sim – Week 3	19 Dec Auction Opens 1A Market Sim – Week 3	20 Dec Auction Closes 5P Dec UDCs submit LM data by 12P Market Sim – Week 3	21 Market Sim – Week 3	22 Dec Auction results post by 5P Market Sim – Week 3
25 Jan Post CRR FNM by 5P Market Sim – Week 3	26 Market Sim – Week 3	27 Jan Post MEQ Market Sim – Week 3	28 Holiday (Thanksgiving)	29 Holiday (Thanksgiving)



December 2024

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	
2 Post February Source/Sink List	3 Market Sim – Week 4	4 Market Sim – Week 4	5 Market Sim – Week 4	6 Jan List of outages post by 5P	
9 Feb Hist Load Wind Opens 1A Feb Hist Load Wind Closes 5P	10 Jan Incr. Update by 5P Feb Forecast Load Wind Open 1A Market Sim – Week 5	11 Feb Forecast Load Wind Closes 5P Market Sim – Week 5	12 Jan Tier 1 Opens 1A Jan Tier 1 Closes 5P Market Sim – Week 5	13 Jan Post Tier 1 Results by 5P	
16 Jan Post Set-Aside Jan Tier 2 MEQ	17 Jan Tier 2 Opens 1A Jan Tier 2 Closes 5P	18	19 Jan Post Tier 2 Results by 5P	20 Jan UDCs submit LM data by 12P	
23 Jan Auction Opens 1A	24 Jan Auction Closes 5P	25	26 Feb Post CRR FNM by 5P	27 Jan Auction results post by 5P	
30 Feb Post MEQ	31			<div> <div></div> January </div> <div> <div></div> February </div> <div> <div></div> Market Sim/Cutover </div>	



January 2025

January 2025					
MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	
 February  March  Market Sim/Cutover		1 Holiday (New Year's Day)	2	3 Feb List of outages post by 5P	
6 Post March Source/Sink List	7 Feb Incr. Update by 5P	8 Mar Hist Load Wind Opens 1A Mar Hist Load Wind Closes 5P (Entered in current system, will be migrated to new System)	9 Feb Tier 1 Opens 1A Feb Tier 1 Closes 5P Mar Frcst Load Wind Opens 1A	10 Mar Frcst Load Wind Closes 5P	
13 Feb Post Tier 1 Results by 5P	14 Feb Post Set-Aside Feb Tier 2 MEQ	15 Feb Tier 2 Opens 1A Feb Tier 2 Closes 5P	16	17 Feb UDCs submit LM data by 12P Feb Post Tier 2 Results by 5P	
20 Holiday (Martin Luther King's B-Day)	21	22 Feb Auction Opens 1A	23 Feb Auction Closes 5P	24	
27 Feb Auction results post by 5P	28 Mar Post CRR FNM by 5P – on SFTP site Production Deployment –Phase 1 cutover	29 Production Deployment –Phase 1 cutover	30 Production Deployment –Phase 1 cutover	31 Production Deployment – Phase 1 cutover Complete	

February 2025

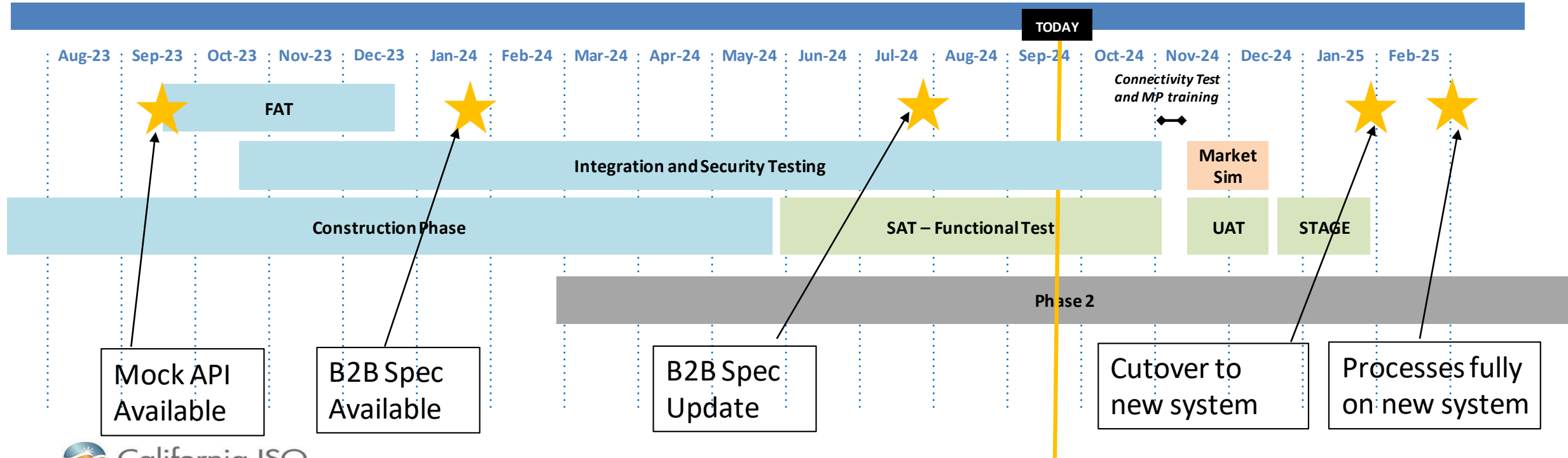
	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	
	 March  April					
	3 New System Online Mar Post MEQ Post April Source/Sink List	4	5 Apr CEC Load Wind Opens 1A Apr CEC Load Wind Closes 5P	6 Mar List of outages post by 5P Mar Incr. Update by 5P Apr <u>Hist</u> Load Wind Opens 1A Apr <u>Hist</u> Load Wind Closes 5P	7 Mar Tier 1 Opens 1A Mar Tier 1 Closes 5P Apr <u>Frcst</u> Load Wind Opens 1A	
	10 Apr <u>Frcst</u> Load Wind Closes 5P	11 Mar Post Tier 1 Results by 5P	12 Mar Post Set-Aside Mar Tier 2 MEQ	13 Mar Tier 2 Opens 1A Mar Tier 2 Closes 5P	14	
	17 Holiday (Presidents Day)	18 Mar Post Tier 2 Results by 5P	19	20 Mar UDCs submit LM data by 12P Mar Auction Opens 1A	21 Mar Auction Closes 5P Apr Post CRR FNM by 5P	
	24	25 Mar Auction results post by 5P	26 Apr Post MEQ	27	28	



CRR System Upgrade – Project Update & Timeline

Updated September 2024 - **TO BE UPDATED FOR 10/24 CPG CALL**

- Functional UI Site Acceptance Testing and integration testing continues. UI test cases are 92% passed.
- Connectivity Testing – 1 week after above testing, starting November 4th, just before Market SIM
- Training – 2 weeks before Market SIM in late October
- Market SIM - 3 weeks structured, then 2 weeks unstructured starting on November 12th
- 2025 Annual Cycle, carried out in 2024, will occur on the current Production CRR application
- *1 week Cutover to new CRR application 1/27/25 to 1/30/25*
- *March is first month with processes fully on the new system*



QUESTIONS?

Next Steps

- Next meeting is tentatively scheduled for Thursday Nov 21, 2024
- Visit CPG webpage for more information: <https://www.caiso.com/meetings-events/topics/congestion-revenue-rights-crr-settlement-upgrade-project-customer-partnership-group>

REFERENCE SLIDES

CRR Service Endpoint Details

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

CRR Service Endpoint Details

#	Service	GET	POST	Potential submission for >1mb filesize	Comments
1	CRR App Status	x	n/a	n/a	Only retrieve data, no submission
2	CRR Market Data	x			
3	CRR Market Status	x			
4	CRR Messages	x			

RECAP: CRR Upgrade Project - Overview

- 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.
- http://www.caiso.com/Documents/BusinessRequirementsSpecification_Con gestionRightsRevenueUpgrade.pdf
- 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 NDAfiles
 - 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

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 marketperiod

- **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**

- POC updates and notes and recording from meetings are posted on developer forum at <https://developer.caiso.com/forum/topics.aspx?ForumID=4>.
- Documents uploaded to the Developer Forum:
<https://developer.caiso.com/forum/messages.aspx?TopicID=6119>
 - 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/>

CAISO B2B Improvements – CRR Developer Forum

<https://developer.caiso.com/pages/application.aspx?app=CRR>

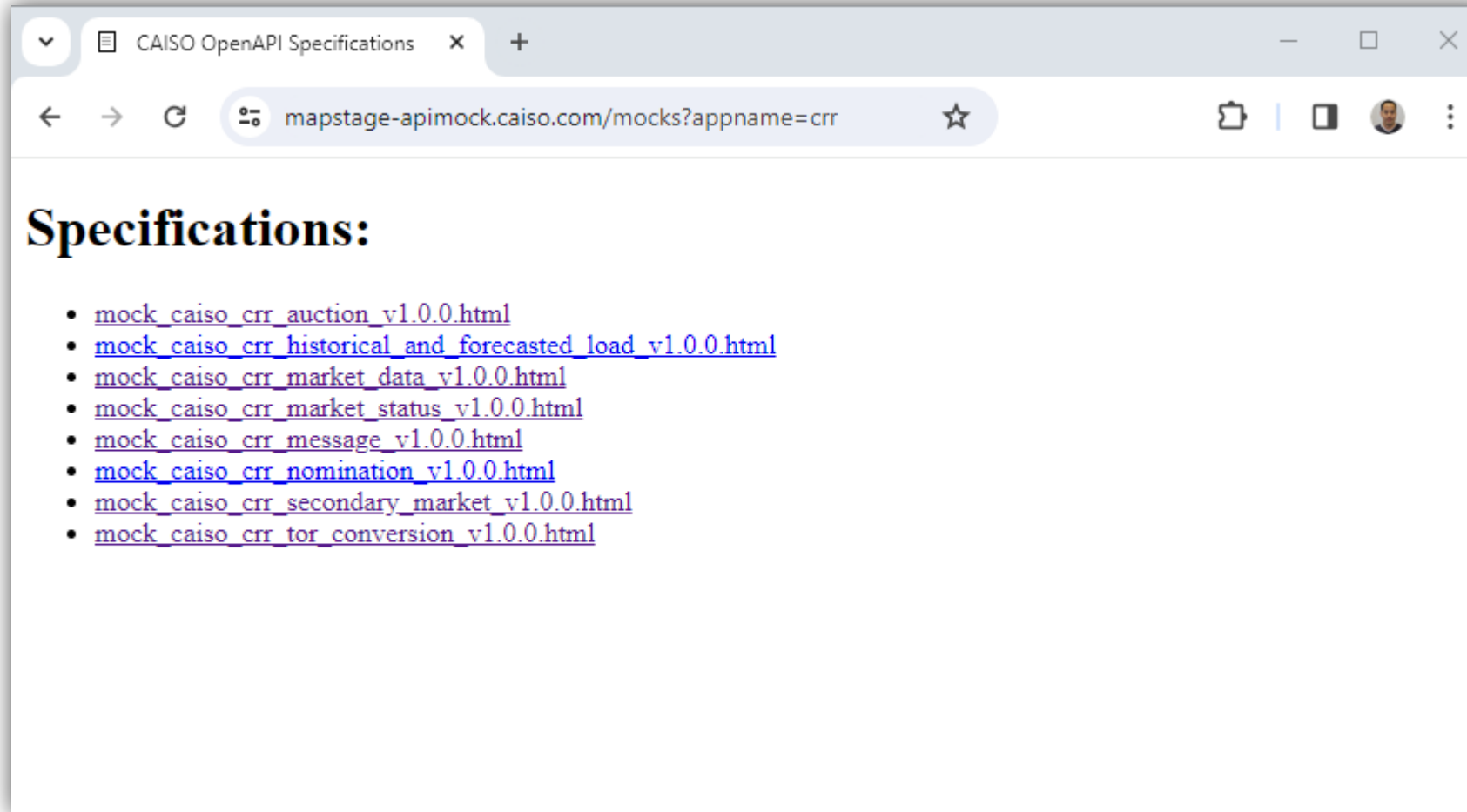
RESTful services

 About status

<div>Search RESTful services</div> <div>Filter</div>					
SERVICE	SPECIFICATION	DOCUMENTATION	STATUS	RELEASE	EFFECTIVE DATE
CRR Auction	crr_auction_1.0.0.yaml	crr_auction_1.0.0.html	NA	NA	NA
CRR Historical and Forecasted Load	crr_historical_and_forecasted_load_1.0.0.yaml	crr_historical_and_forecasted_load_1.0.0.html	NA	NA	NA
CRR Market Data	crr_market_data_1.0.0.yaml	crr_market_data_1.0.0.html	NA	NA	NA
CRR Market Status	crr_market_status_v1.0.0.yaml	crr_market_status_v1.0.0.html	NA	NA	NA
CRR Message	crr_message_1.0.0.yaml	crr_message_1.0.0.html	NA	NA	NA
CRR Nomination	crr_nomination_1.0.0.yaml	crr_nomination_1.0.0.html	NA	NA	NA
CRR Secondary Market	crr_secondary_market_1.0.0.yaml	crr_secondary_market_1.0.0.html	● PROD_LATEST	Spring 2020	NA
	crr_secondary_market_0.0.0.yaml	crr_secondary_market_0.0.0.html	● MAP_STAGE	DRAFT	NA
CRR Tor Conversion	crr_tor_conversion_1.0.0.yaml	crr_tor_conversion_1.0.0.html	NA	NA	NA

CAISO CRR API Mock Services

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



CAISO B2B Improvements – Example: CRR Auction API

```
+ 1 openapi: 3.0.0
+ 2 servers:
+ 3   - url: https://virtserver.swaggerhub.com/RI-GM/caiso_crr_auction_v1.0.0_openapi/1.0.0
+ 4
+ 5 info:
+ 6   description: This includes all openapi services for CRR bids and offers
+ 7   version: "1.0.0"
+ 8   title: CRR Auction API
+ 9   contact:
+ 10    email: ihedge-support@resource-innovations.com
+ 11
+ 12 tags:
+ 13   - name: write
+ 14     description: require read/write access
+ 15   - name: read
+ 16     description: requires read only
+ 17
+ 18 paths:
+ 19   /auction/v1.0/portfolio:
+ 20     get:
+ 21       tags:
+ 22         - read
+ 23       summary: gets bids and offers for given market name
+ 24       operationId: getPortfolio
+ 25       description: |
+ 26         By passing in the appropriate market name, portfolio name, and participant name, the auction portfolio will be returned.
+ 27       parameters:
+ 28         - $ref: '#/components/parameters/MarketName'
+ 29         - $ref: '#/components/parameters/PortfolioName'
+ 30         - $ref: '#/components/parameters/ParticipantName'
+ 31
+ 32       responses:
+ 33         '200':
+ 34           description: search results matching criteria
+ 35           content:
+ 36             application/json:
+ 37               schema:
+ 38                 $ref: '#/components/schemas/Portfolio'
```

API SUMMARY

API METHODS - READ

getPortfolio
getPortfolioList
getPortfolioRequiredCredit
getPortfolioStatus

API METHODS - STATUS

getStatus

API METHODS - WRITE

deletePortfolio
portfolioCreation
portfolioSubmission
postPortfolioRetraction

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

/auction/v1.0/portfolio

Usage and SDK Samples

Curl Java Android Obj-C JavaScript C# PHP Perl Python

```
curl -X GET \
-H "Accept: application/json" \
"https://virtserver.swaggerhub.com/RI-GM/caiso_crr_auction_v1.0.0_openapi/1.0.0/auction/v1.0/portfolio?marketName=&portfolioName=&participantName="
```

CAISO B2B Improvements – Free Swagger Editor Tool

<https://editor.swagger.io/>

The screenshot displays the Swagger Editor web application. The left pane shows the OpenAPI definition in YAML format, and the right pane shows the rendered API documentation.

Swagger Editor Interface:

- Left Pane (YAML Definition):**

```
1 openapi: 3.0.0
2 servers:
3   - url: https://virtserver.swaggerhub.com/RI-GM/
      /caiso_crr_auction_v1.0.0_openapi/1.0.0
4
5 info:
6   description: This includes all openapi services for CRR bids and
      offers
7   version: "1.0.0"
8   title: CRR Auction API
9   contact:
10    email: ihedge-support@resource-innovations.com
11
12 tags:
13   - name: write
14     description: require read/write access
15   - name: read
16     description: requires read only
17
18 paths:
19   /auction/v1.0/portfolio:
20     get:
21       tags:
22         - read
23       summary: gets bids and offers for given market name, portfolio
24         name, and logged-in user
25       operationId: getPortfolio
26       description: |
27         By passing in the appropriate market name, portfolio name,
28         and participant name, the auction portfolio will be
29         returned.
30       parameters:
31         - $ref: '#/components/parameters/MarketName'
32         - $ref: '#/components/parameters/PortfolioName'
33         - $ref: '#/components/parameters/ParticipantName'
```
- Right Pane (Rendered API):**
 - Header:** CRR Auction API 1.0.0 OAS3
 - Description:** This includes all openapi services for CRR bids and offers. [Contact the developer](#)
 - Servers:** https://virtserver.swaggerhub.com/RI-GM/caiso_crr_auction_v1.0.0_openapi/
 - Tags:** write (require read/write access)
 - Endpoints:**
 - POST** /auction/v1.0/portfolioCreation: creates a new auction portfolio
 - POST** /auction/v1.0/portfolioSubmission: submits portfolio to the specified auction
 - POST** /auction/v1.0/portfolioRetraction: retracts portfolio from being submitted to the specified auction

CAISO B2B Improvements – New Web Services for CRR

Service	Operation
Allocation Nomination Portfolio	POST/GET
Auction Bid Portfolio	POST/GET
Historical and Forecasted Load	POST/GET
Existing CRRs (CRR Market Data)	GET
Market Data (CRR Market Data)	GET
Market Results (CRR Market Data)	GET
Private Allocation Results (CRR Market Data)	GET
Private Auction Results (CRR Market Data)	GET
Load Migration Data	POST/GET
Market Status (Market Info)	GET
CRR Messages	GET
Secondary Market	POST/GET
TOR Conversion	POST/GET

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 marketparticipants
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