Congestion Revenue Rights (CRR) Upgrade Project
Customer Partnership Group

Sep 20, 2023   *10:00 a.m.–11:00 a.m. (Pacific Time)*

Web Conference Information	Conference Call 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.	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	

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.
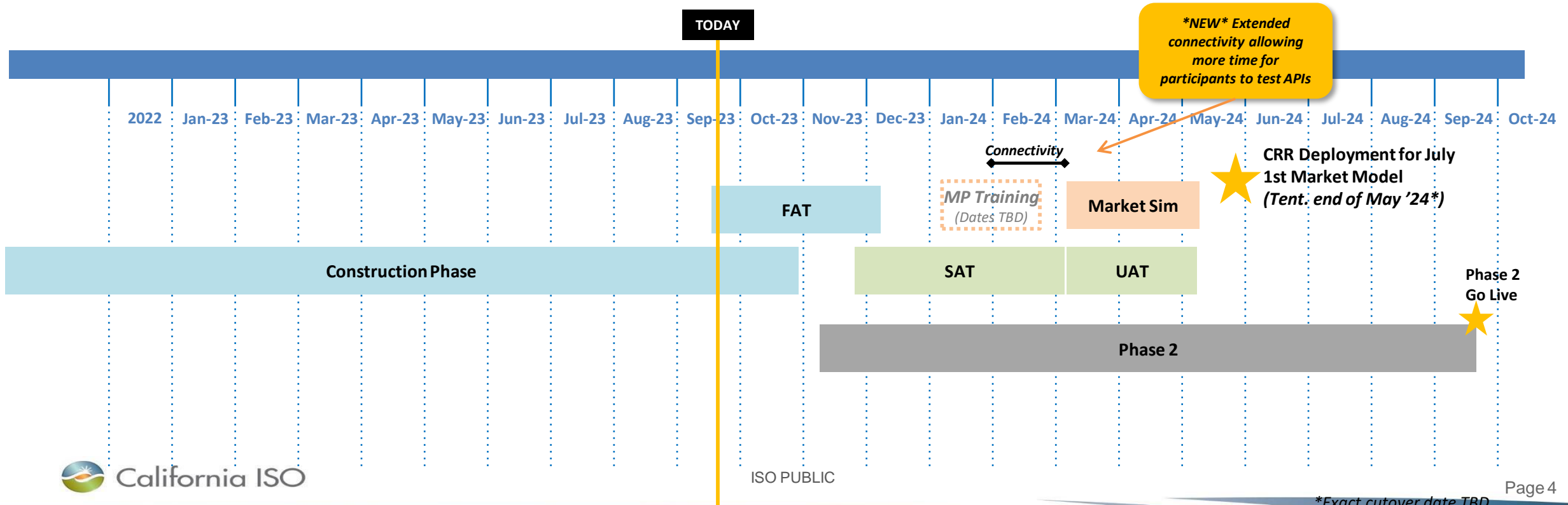 - You may also send your questions via chat to Brenda Corona or to all panelists.

California ISO

Agenda

Time (PST)	Topic
10:00 – 10:05	Welcome
10:05 – 10:10	RECAP: CRR Upgrade Project – Overview / Overview of changes
10:10 – 10:15	CRR Upgrade Project – Project updates • Updated timeline • Draft Market Sim plan
10:15 – 10:45	• B2B Improvement Initiative: API Mocking Service
10:45 – 10:55	Questions
10:55 – 11:00	Next Steps

California ISO

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.

TODAY

NEW Extended connectivity allowing more time for participants to test APIs

2022 | Jan-23 | Feb-23 | Mar-23 | Apr-23 | May-23 | Jun-23 | Jul-23 | Aug-23 | Sep-23 | Oct-23 | Nov-23 | Dec-23 | Jan-24 | Feb-24 | Mar-24 | Apr-24 | May-24 | Jun-24 | Jul-24 | Aug-24 | Sep-24 | Oct-24

Connectivity

CRR Deployment for July 1st Market Model (Tent. end of May '24*)

FAT

MP Training (Dates TBD)

Market Sim

Construction Phase

SAT

UAT

Phase 2

Phase 2 Go Live

ISO PUBLIC

*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 - Timeline

Market Sim Month

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
week 1		[Post all preloaded data] Open and close by 5pm - T1 mini Make available special processes that have changed	Post T1 mini results MP – review T1 results, need MEQ values and then build nominations when market is opens on Thursday Need Set aside post [time]	open and close at 5pm T2 mini	Post T2 mini results
week 2	CRR team setup for Monthly Mini Auction	[Send process ownership data] Market Sim call to discuss T1&T2 Monthly Mini Auction open Collateral verified	Market Sim Post Monthly Mini Auction Results (starts Settlements) Settlement T+3B	T1/PNP Annual Mini Annual data separate (2025 process, use 2024 annual data and mock it up)	T1/PNP Annual Mini Annual Post results
week 3	Market Sim / UAT – prep for mini Annual 2025	Settlement results available UAT – Open Mini Annual Auction	UAT - Close Mini Annual Auction by 5pm	UAT – post all Reports	UAT – Post Mini Annual Auction Results
week 4		unstructured	unstructured	unstructured	
week 5		unstructured	unstructured	unstructured	

California ISO

B2B Improvement Initiative: API Mocking Service

Rick Lam & Suresh Radhakrishnan

September 20th, 2023

Agenda

- Problem Statement
- OpenAPI Overview
- API Mock Service
- Demo

California ISO

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.
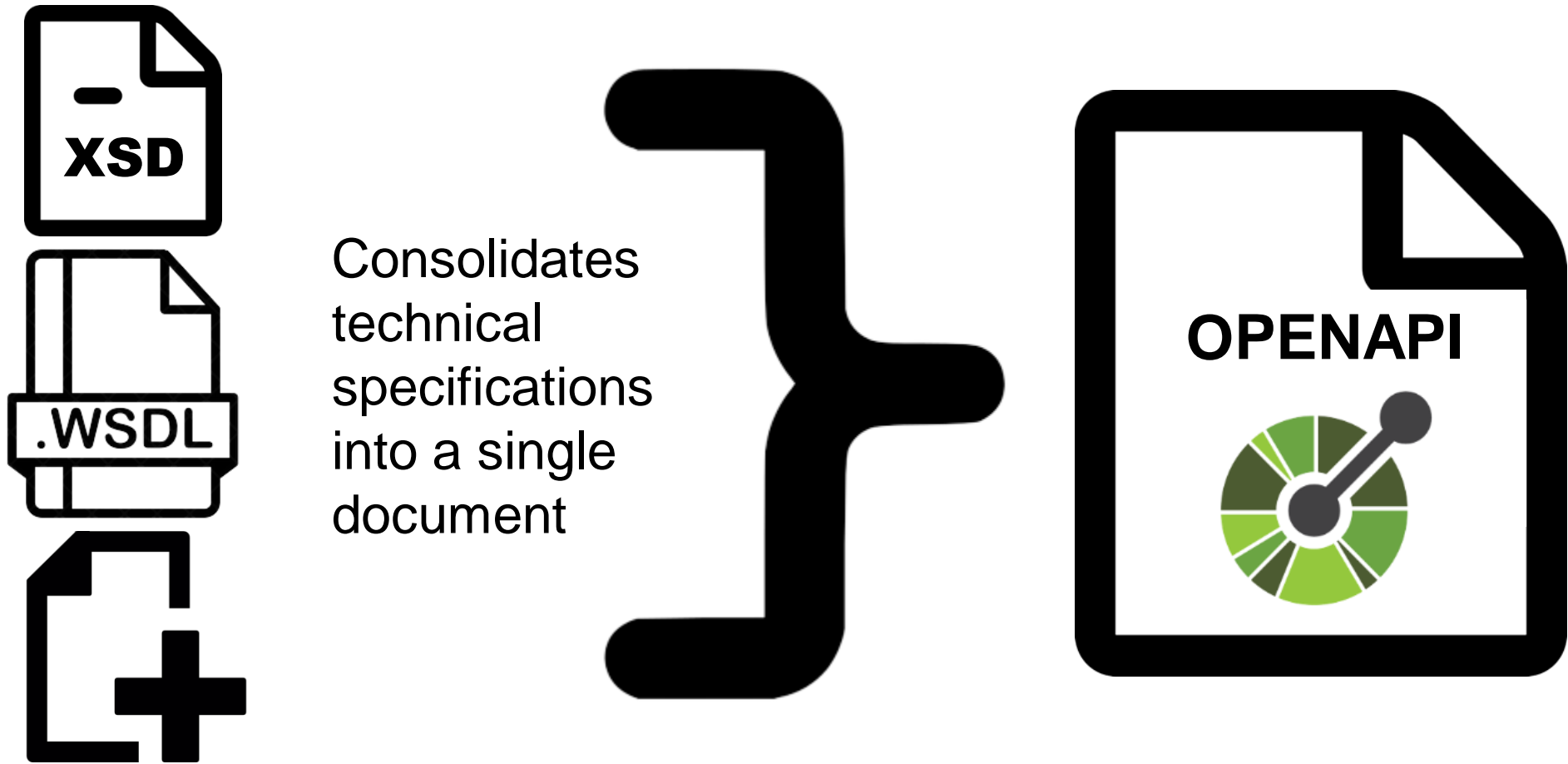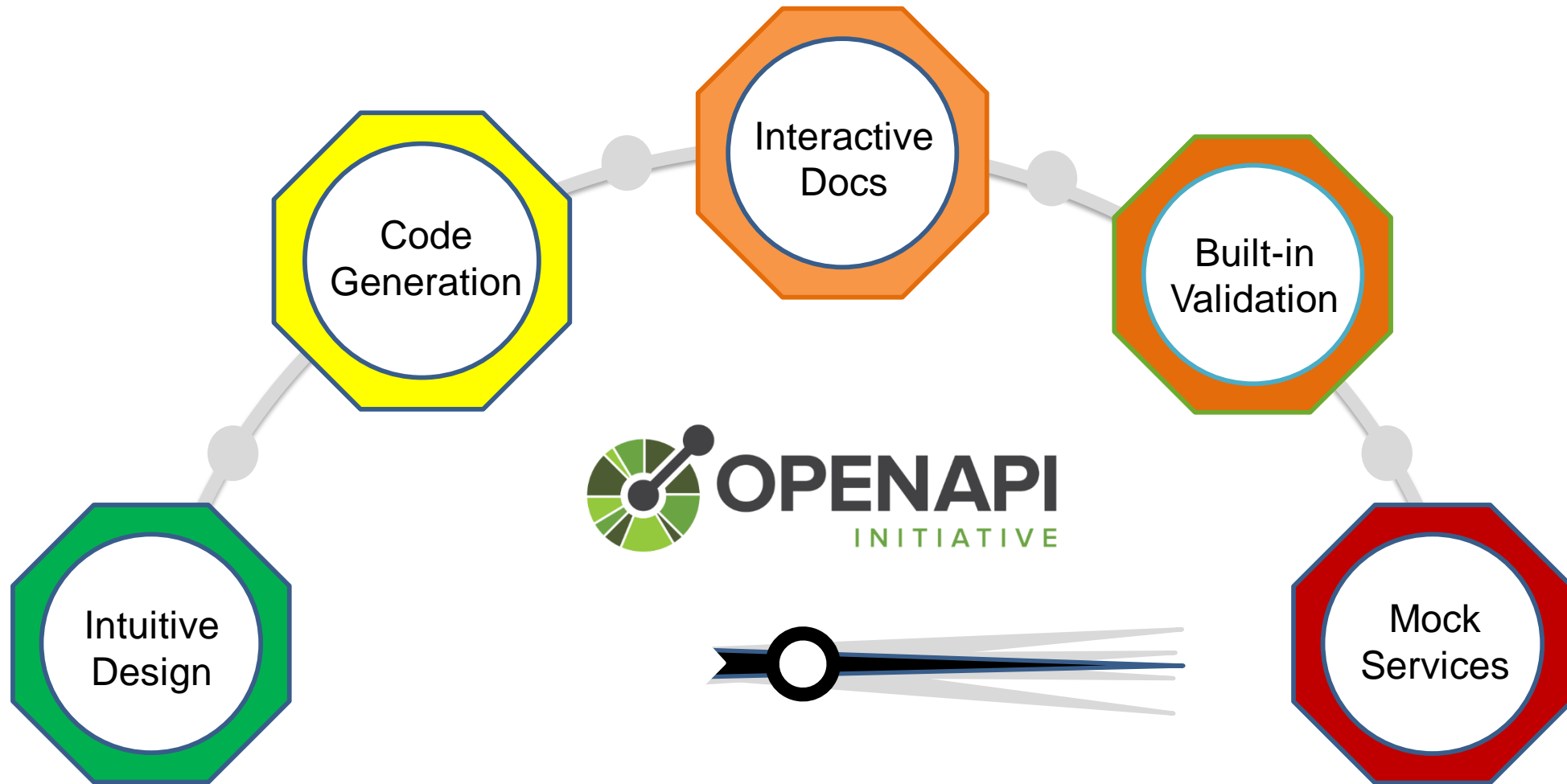
OpenAPI Overview

https://www.openapis.org/

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.

California ISO

OpenAPI: Process Improvements

Consolidates technical specifications into a single document

OpenAPI: Process Improvements

Intuitive Design

Code Generation

Interactive Docs

Built-in Validation

Mock Services

OPENAPI INITIATIVE

California ISO

API Mock Service: Not Supported Features

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

Phases		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
Requirements		████							
Design			████						
Construction				████					
Test						██			
Market Participants							████		

No Mocks

Phases		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
Requirements		████							
Design			████						
Construction				████					
Test				██					
Market Participants				████					

Parallel Development And Testing for Our Dev Teams And Customers

With Mocks
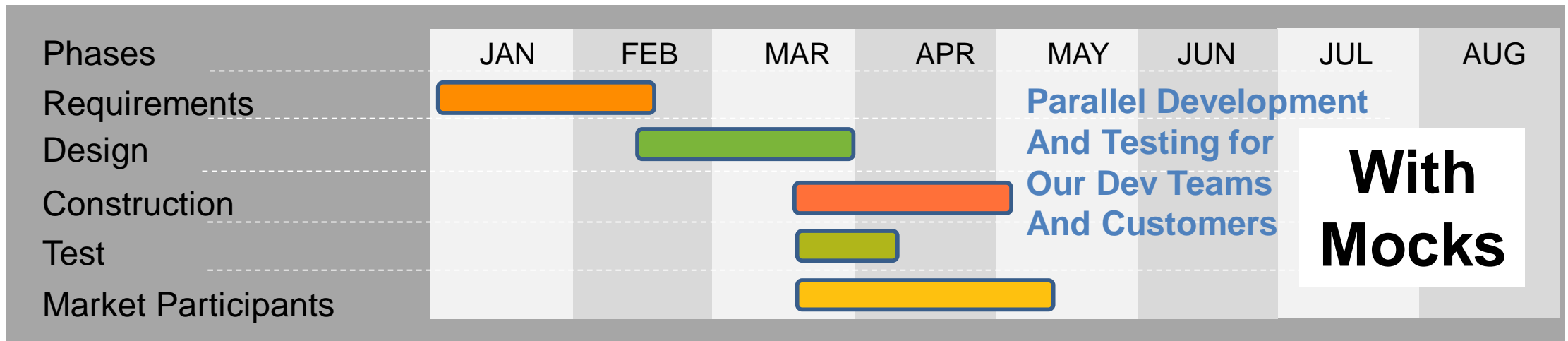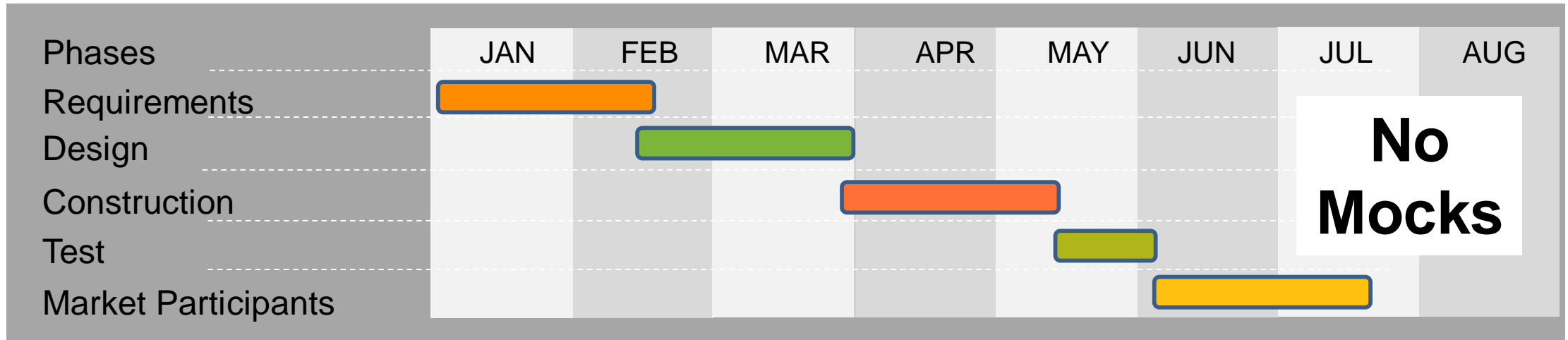
API Mock Architecture

https://developerint.oa.caiso.com/pages/application.aspx?app=CRR

API Mock Demo

DEMO

https://mapstage-apimock.caiso.com/mocks

QUESTIONS?

California ISO

Next Steps

- Next meeting is October 18, 2023

- Discuss following topics

- Visit CPG webpage for more information:
  http://www.caiso.com/informed/Pages/MeetingsEvents/CustomerPartnershipGroups/Default.aspx

California ISO

REFERENCE SLIDES

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_CongestionRightsRevenueUpgrade.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**

California ISO

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**
  - 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/

California ISO

CAISO B2B Improvements – OpenAPI Overview
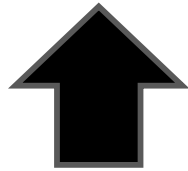
https://www.openapis.org/

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.

California ISO

CAISO B2B Improvements – OpenAPI Specification File

XSD

.WSDL

Consolidates technical specifications into a single document

OPENAPI

California ISO
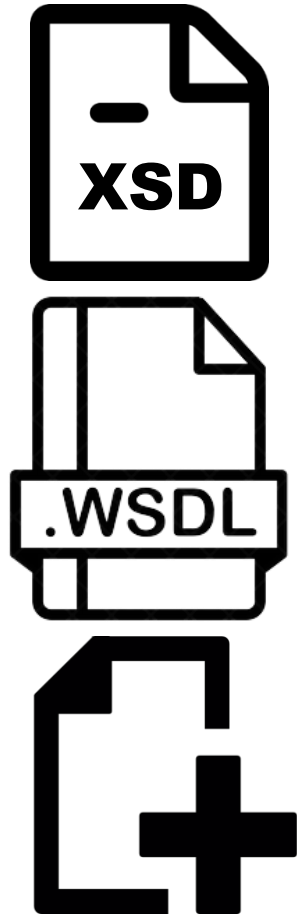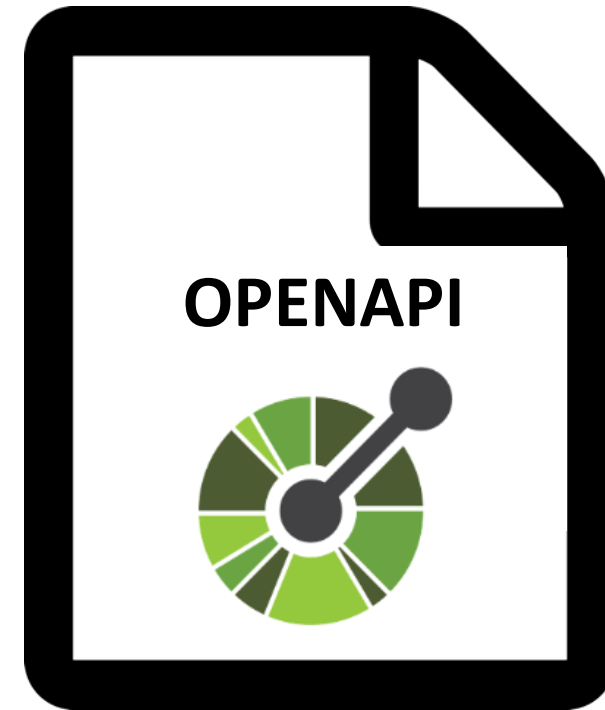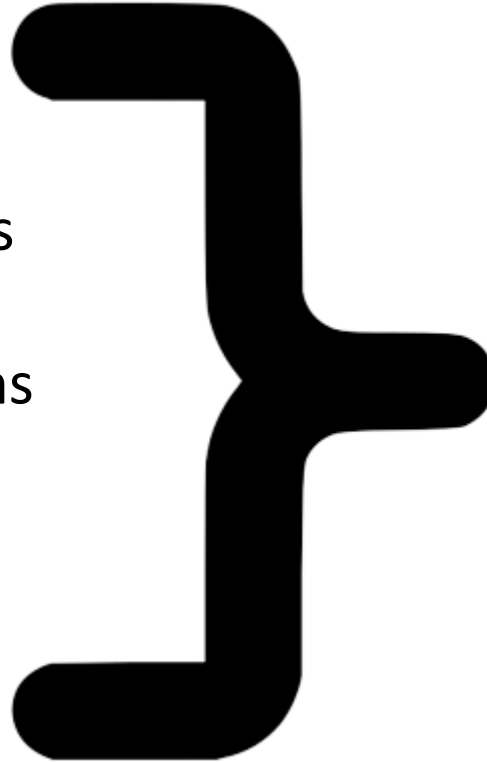
CAISO B2B Improvements – CRR Developer Forum

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

RESTful services

About status

SERVICE	SPECIFICATION	DOCUMENTATION	STATUS	RELEASE	EFFE(
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 B2B Improvements – Example: CRR Auction API

CAISO B2B Improvements – Free Swagger Editor Tool

https://editor.swagger.io/

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

California ISO

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.

California ISO

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 Release Notes

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
v**2**.0.0   Added a Major version for a service
v2.0.**1**   Edits were made to documentations, no functional changes
v**3**.0.0   Added a new service

California ISO