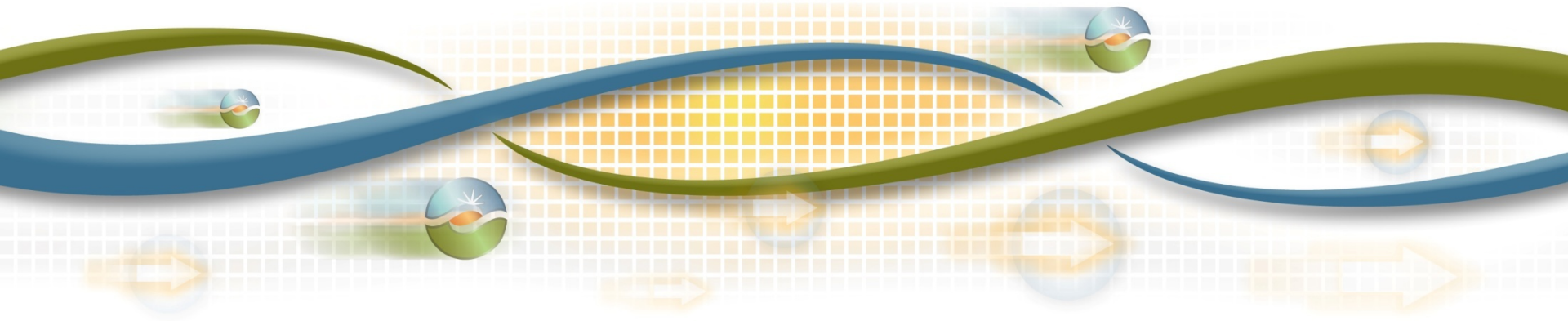


Energy Imbalance Market Design Straw Proposal and Issue Paper

Stakeholder Meeting
April 11, 2013



Agenda

Time	Topic	Presenter
10:00 – 10:10	Introduction	Mercy Parker-Helget
10:10 – 10:45	Opening Remarks	Don Fuller
10:45 – 12:00	Design Straw Proposal	Don Tretheway
12:00 – 1:00	Lunch Break	
1:00 – 2:00	Design Straw Proposal	Don Tretheway
2:00 – 2:30	Issues to be Resolved Part 1	John Anders
2:30 – 2:45	Break	
2:45 – 3:55	Issues to be Resolved Part 2	Mark Rothleder
3:55 – 4:00	Wrap-up and Next Steps	Mercy Parker-Helget

Objective of today's meeting

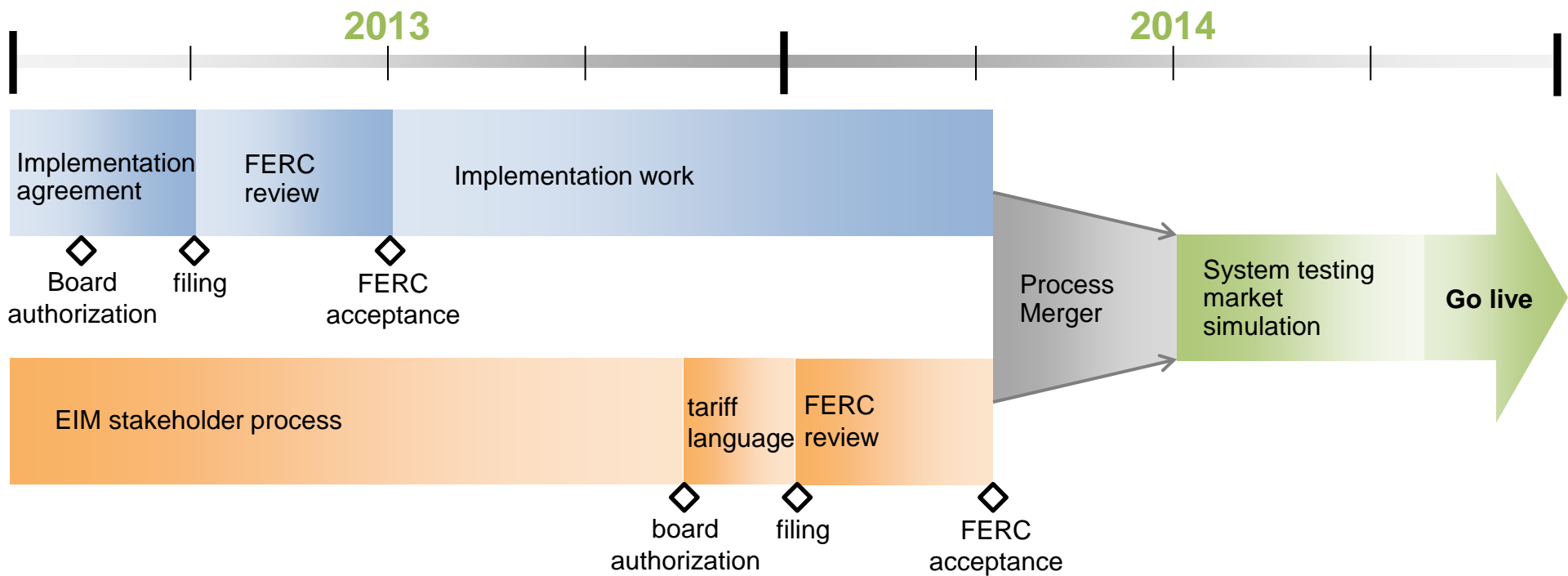
- Welcome new parties to CAISO stakeholder process
- Common understanding of EIM and how it overlays existing CAISO market
- Identify and understand the scope of issues that will need to be resolved through this stakeholder process

ISO Policy Initiative Stakeholder Process

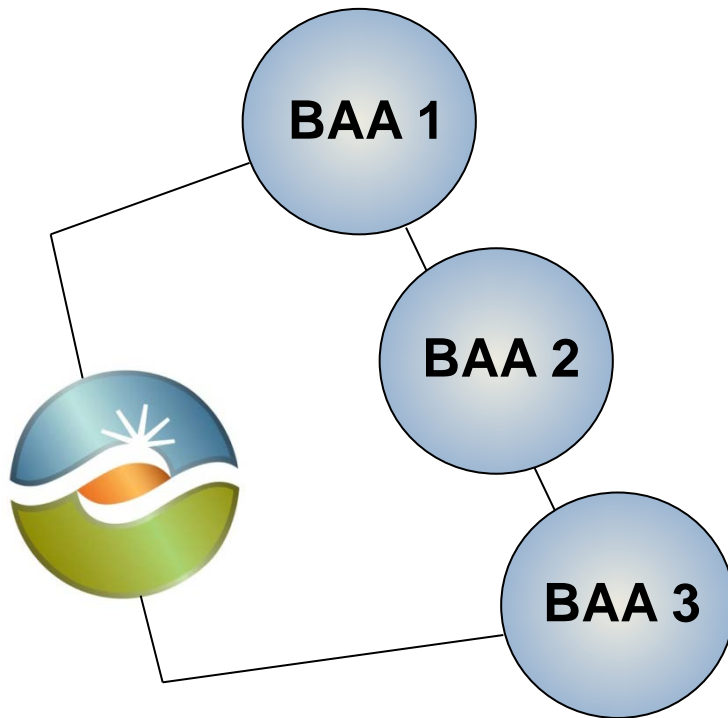


We are here

EIM stakeholder process proceeds in parallel with PacifiCorp implementation

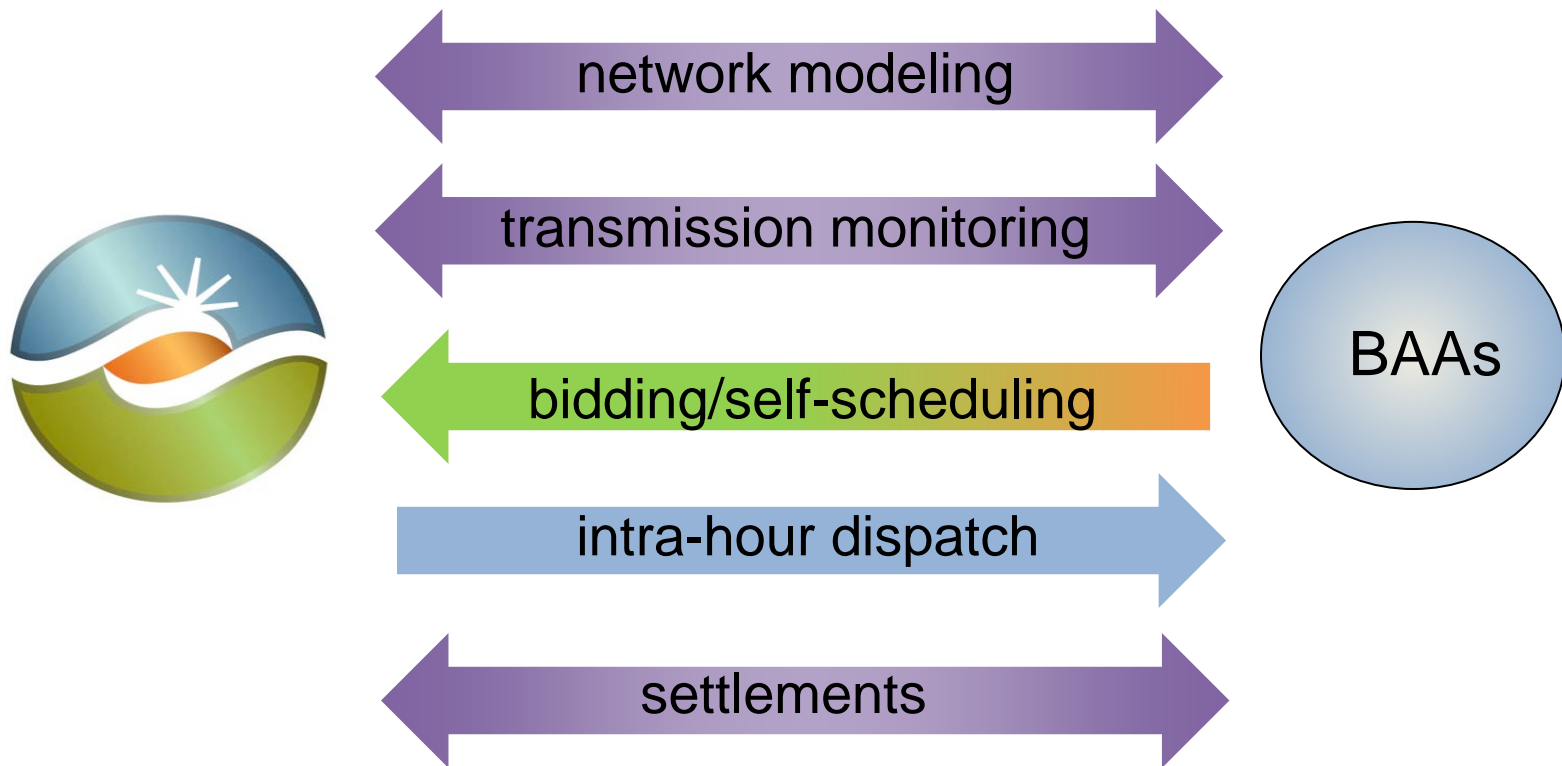


March 2012, CAISO proposed a scalable approach for implementing Energy Imbalance Market (EIM)



- No critical mass required – each participant can enter EIM when ready
- Preserves participants' autonomy and current practices
 - Balancing authorities balance and provide their own ancillary services
 - Balancing authorities can trade bilaterally
 - Participants retain all physical scheduling rights
 - Flexible modes of participation are available

CAISO proposed a scalable approach for implementing Energy Imbalance Market (EIM)



Benefits of Energy Imbalance Market

- Leverages existing CAISO market
- Enhances reliability through improved situational awareness in CAISO and EIM footprint
- Captures the benefits of geographical diversity of load and resources
- Potentially reduces reserve requirements
- Provides easy entry/exit for EIM participation

Design Straw Proposal

Review of EIM design straw proposal

- Real-Time Market Processes
 - Hour-Ahead (HA)
 - Real Time Unit Commitment (RTUC)
 - Real Time Dispatch (RTD)
- Market Input Data
- Market Optimization
- Market Results
- System Operations
- Settlement and Accounting
- Other

Energy Imbalance Market Definitions

EIM Entity is a balancing authority area that is enabling EIM to occur in their area. By enabling EIM, load and generation imbalances within the balancing authority will settle through the EIM.

EIM Participant is a resource within the EIM Entity represented by a Scheduling Coordinator that has voluntarily elected to economically participate in the EIM.

Process Overview Visual

- Will be provided at the stakeholder meeting

FERC Order No. 764 introduces financially binding 15-minute market to real-time market design

CAISO

Day Ahead Schedule



15-Minute Schedule



Real-Time Dispatch

EIM

Adjusted Base Schedule



15-Minute Schedule



Real-Time Dispatch

Real-Time Market Processes

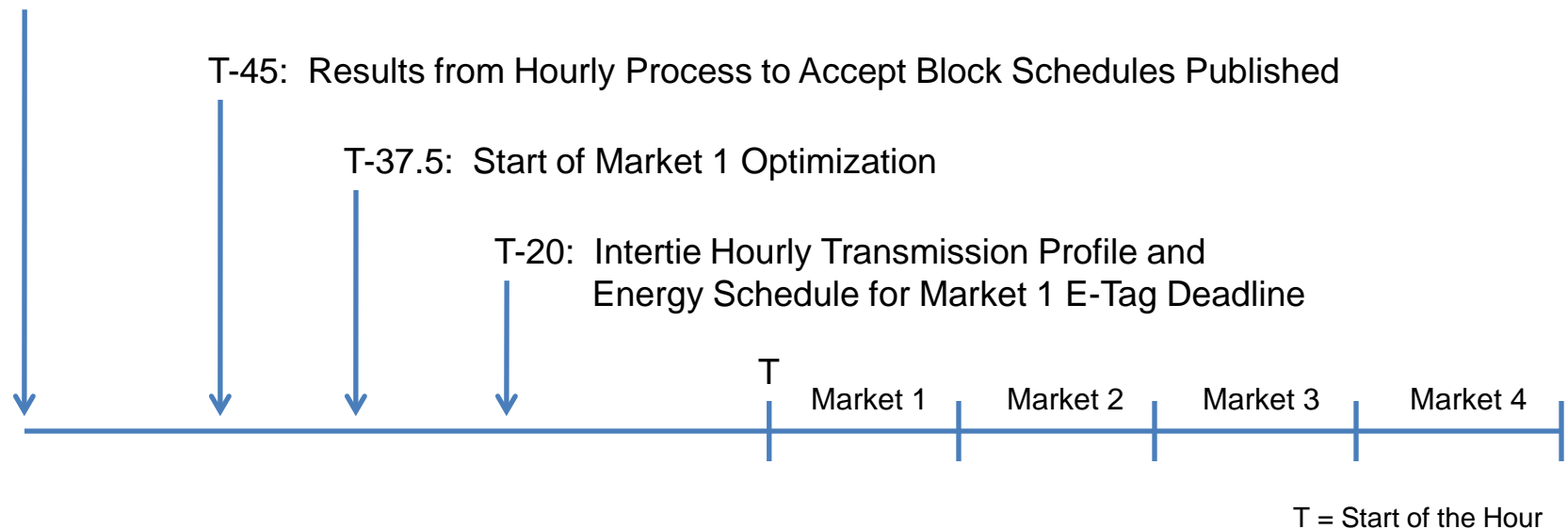
- Hour Ahead Process
 - CAISO accept block intertie transactions
- 15-Minute Market (RTUC)
 - CAISO unit commitment, incremental AS, energy schedules
 - EIM energy schedule changes from adjusted base schedule
- 5-Minute Dispatch (RTD)
 - Energy dispatch within CAISO and EIM footprint

Market Input Data

- As needed
 - Resource operational characteristics
 - Network model topology
 - Static contingencies observed
- Prior to operating hour (T-75 minutes)
 - Economic bids and hourly base schedules
- Ongoing
 - Transmission and generation outages
 - 15-minute base schedules
 - Load and VER forecasts
 - Dynamic contingency list
 - Actual ETC/ATC scheduling limits and ETC uses

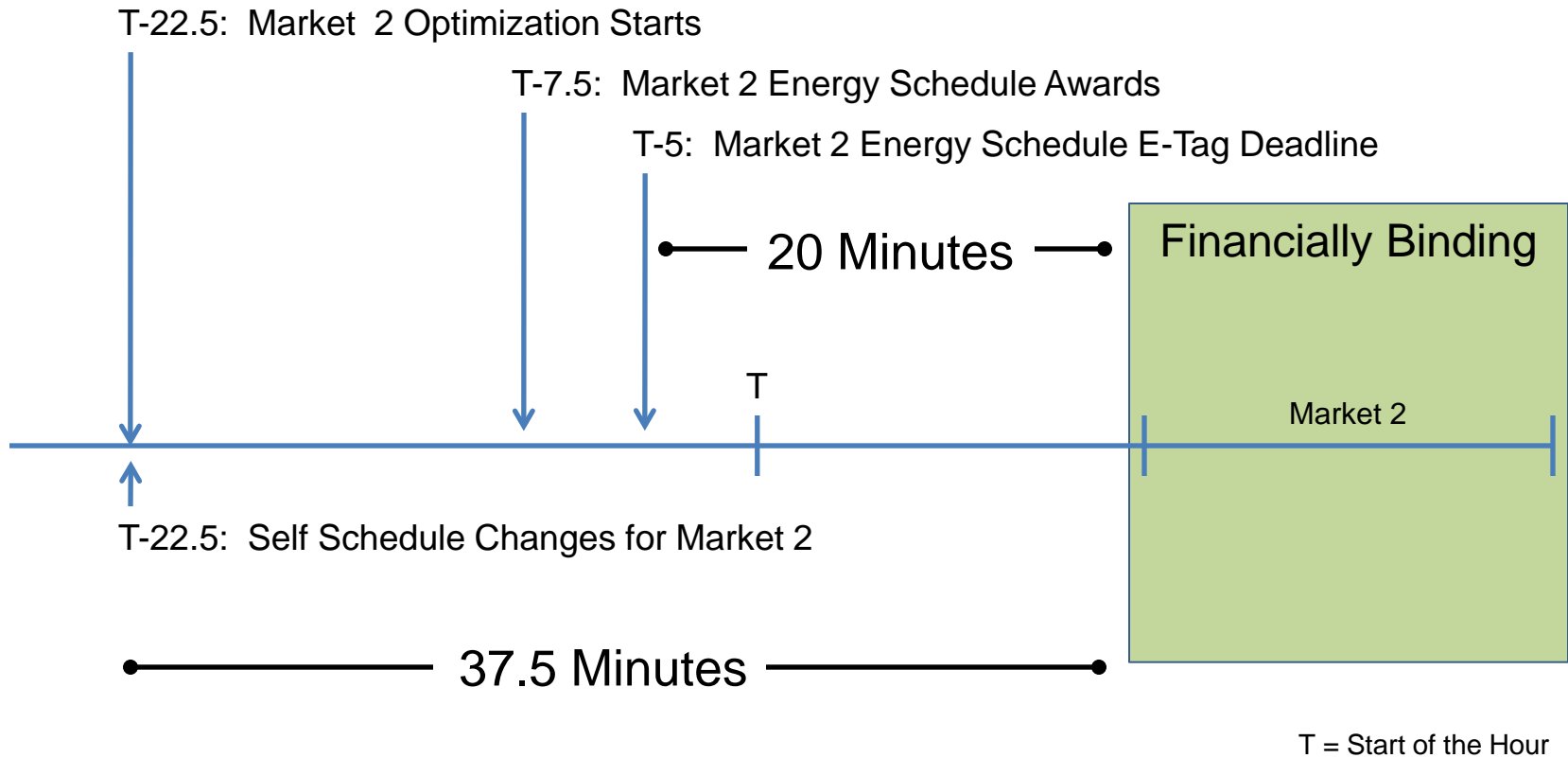
Hourly process for real-time market

T-75: Real-Time Bid Submission Deadline



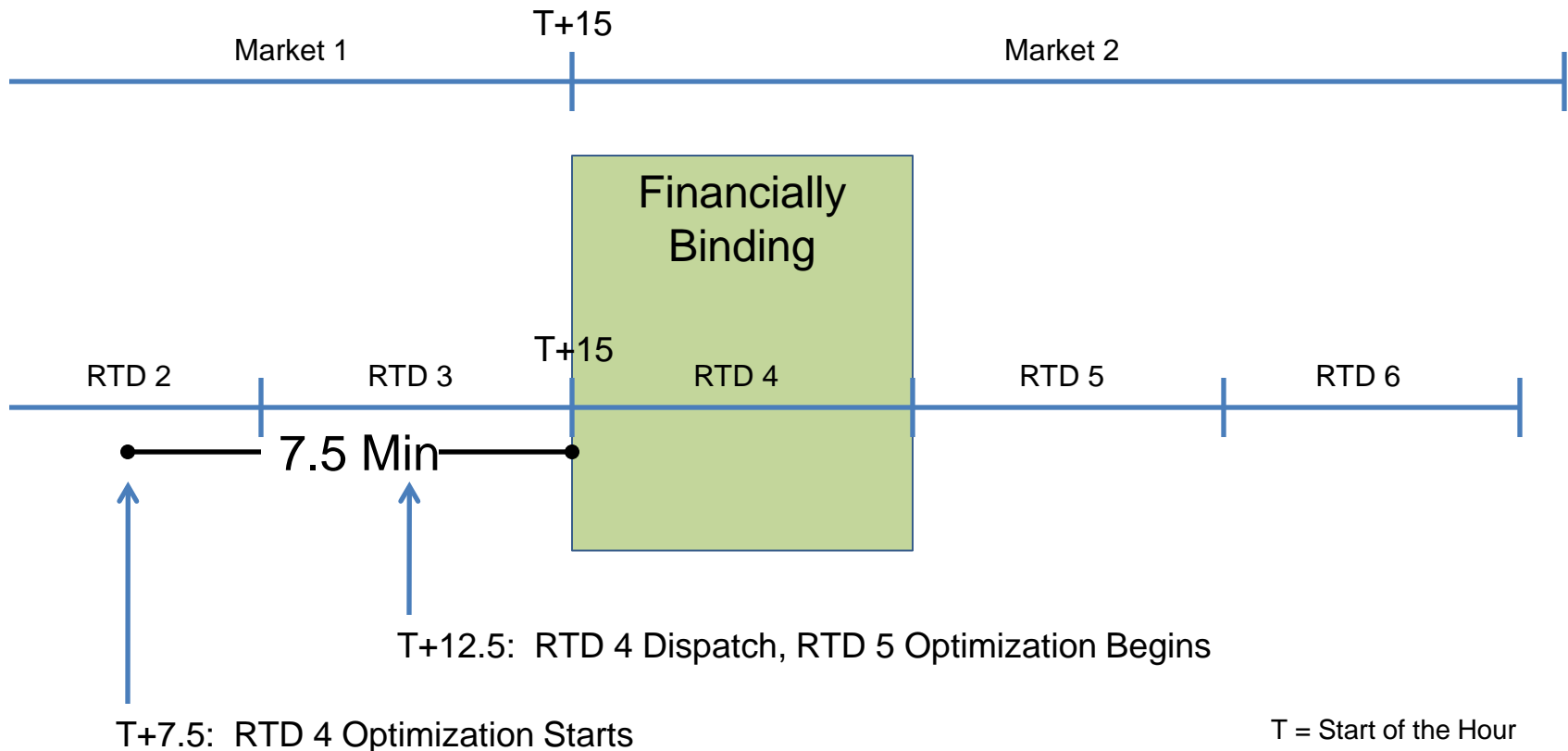
No hourly financially binding schedules in real-time

15-Minute Market Timeline under FERC Order No. 764



- Honor intra-hour 20 minute e-Tag submission to avoid seams issues

RTD Market Timeline under FERC Order 764



- No changes to RTD 5-minute dispatch
- RTD provides operational instruction to all generation and demand response resources

Establishment of Load Aggregation Points (LAP)

- EIM Entity defines the LAPs within its BAA
 - For example, internal to the CAISO LAPs are defined by utility service territories
 - The number of LAPs must be weighed against the availability of multiple granular load forecasts
- CAISO is responsible for determining Load Distribution Factors (LDFs) with its state estimator
 - CAISO uses LDFs to distribute LAP forecast to individual nodes within the network model
 - CAISO publishes LDFs used in the day-ahead market three days after the trade date
 - CAISO will not communicate load forecast at LDF granularity to the EIM Entity

Load forecasting

- Load forecast by LAP should be net of “behind the meter” generation
- Two options for load forecast for establishing base schedule:
 - Use ISO forecast
 - Use EIM Participant forecast, but subject to over/under scheduling charges when errors exceed 4% threshold

Base schedule should be balanced prior to start of real-time market

Load forecast from prior slide

=

Resource plans: base schedules

- Self-scheduled resources
- Intertie schedules
- Base generation schedules

Resource plans also include:

- Ancillary services reservations protected from dispatch
- Operational characteristics (e.g., ramp rate)
- Economic Bids

Base schedule must be balanced or they will be adjusted prior to start of EIM.

Establishment of balanced and feasible adjusted base schedule (1 of 2)

- Base schedules must consider transmission losses and be free from congestion within the EIM Entity
- CAISO will perform an AC optimal power flow (ACOPF) on base schedule
 - The objective function will minimize the MW re-dispatch necessary to resolve congestion, not based on economics
 - Only resources that have economic bids can be re-dispatched
- The changes to base schedules are not settled in EIM, but become the baseline to measure imbalances

Establishment of balanced and feasible adjusted base schedule (2 of 2)

- CAISO will provide feedback on schedules up to the binding 15-minute market
 - ACOPF with net interchange fixed run to set the adjusted base schedule
 - 15-minute market
 - Changes to advisory schedules result in 15-minute market awards
 - 5-minute market
 - Uses the awarded 15-minute schedule from the 15-minute market as starting point

Market Optimization uses the economic bids submitted at T-75 minutes

- New: 15-minute process under FERC Order No. 764
 - Multi-interval Security Constrained Unit Commitment
 - Runs every 15 minutes with 15-minute interval granularity
 - Intra-hour market's schedules maintain balance: change in generation matches interchange
 - Imbalance energy is the difference between adjusted base schedule and 15-minute schedule

Market Optimization uses the economic bids submitted at T-75 minutes

- 5-minute dispatch process
 - Multi-interval Security Constrained Economic Commitment
 - Runs every 5 minutes with 5-minute interval granularity
 - Imbalance energy is the difference between 15-minute schedule and 5-minute dispatch
- LMP marginal cost of congestion component reflects congestion contribution from binding network constraints

EIM Entity identifies resource constraints to address reliability issues which cannot be modeled

- CAISO will enforce reliability constraint with in EIM area until the dispatch is reflected in the base schedule
- CAISO will not issue exceptional dispatch instructions to EIM Entity resources
- Any resource constraint for reliability will be settled at the EIM LMP

Market Results (1 of 2)

- 15-minute adjusted base schedules will be published to SCs through CAISO Market Results Interface (CMRI)
- 15-minute energy schedules will be published to SCs through CMRI
- 5-minute dispatch instructions will be communicated to the EIM Entity and the SCs
- Net scheduled interchange will change every five minutes through the Dynamic Schedule to ensure AGC control accuracy for the CAISO and EIM Entity

Market Results (2 of 2)

- Locational marginal prices for 15-minute market and RTD will be published on OASIS for all nodes and LAPs.
- Binding transmission constraints and shadow prices will be published on OASIS
- Additional market data that requires an NDA is published on CMRI

EIM System Operations (1 of 3)

- EIM Entity responsible for meeting Ancillary Services requirements per NERC and WECC
- Reserve sharing schedules
 - EIM Entity is responsible for their share of DCS compliance
 - EIM Entity deploys operating reserves and regulation in conformance with NERC and WECC policies
 - If reserves are dispatched, they will be subject to EIM imbalance settlement until reflected in the adjusted base schedule
 - Capacity to meet reserve sharing obligations is included in the resource plans used for base schedules. The capacity is protected for dispatch through EIM.

EIM System Operations (2 of 3)

- WECC's Unscheduled Flow Mitigation Procedure (UFMP)
 - If EIM Entity initiates UFMP, CAISO will adjust the applicable constraint limit to accommodate.
 - If not initiated by EIM Entity, CAISO will manage congestion in EIM by automatically activating constraints when flows exceed 85% of capacity
 - This allows the EIM dispatch to try and resolve the congestion
 - Alerts the EIM Entity that they may be required to initiate UFMP
 - Once activated, constraint will be enforced to maintain flows below the limit

EIM System Operations (3 of 3)

- EIM Entity responsible for dispatching contingency reserves
- CAISO and EIM Entity address respective shortfalls through regulation or other procedures during scarcity
- EIM Entity coordinates Load curtailment with its UDCs.
- In the event of a market disruption, the CAISO will enforce a net interchange constraint to decouple the BAA
- EIM Entity is responsible for managing dispatch in the event communication is lost with CAISO

EIM Settlement and Accounting (1 of 4)

- Instructed imbalance energy settled in two tiers at the relevant LMP:
 - 15-minute instructed imbalance energy; and,
 - 5-minute instructed imbalance energy
- Uninstructed imbalance energy treatment based upon meter granularity
 - Generation, participating load, and dynamic resources that are metered in 5-minute intervals settle at relevant interval LMP
 - Non-participating Load settles at the volumetric hourly weighted average LMP for the DLAP based upon the difference between the actual and the load forecast used

EIM Settlement and Accounting (2 of 4)

- Unaccounted for Energy
 - Net energy delivered into UDC adjusted for service losses
 - EIM Entities need to define UFE service areas within footprint
- Inadvertent Energy
 - EIM Entity responsible for tracking and administering payment via WECC process
 - CAISO will maintain a dynamic schedule to track energy between EIM Entities and CAISO
 - The hourly energy will be updated on the e-Tag within 60 minutes of the end of the operating hour
- Settlement Metering is required for Generators. Options:
 - CAISO Metered Entity
 - Scheduling Coordinator Metered Entity

EIM Settlement and Accounting (3 of 4)

- Interchange Meter Data
 - E-Tag information will be deemed delivered for settlement
- Forecasting Services
 - CAISO Load forecast is included in Administrative Rate
 - VER forecasting available for \$0.10 per MWh
- CAISO Payment Calendar will be the same for EIM
- Neutrality
 - Rounding adjustments apply on a 5-minute basis

EIM Settlement and Accounting (4 of 4)

- **Administrative Costs**
 - Cost effective for October 2014-December 2014
 - CAISO GMC and Cost of Service Study will be updated for the rates starting 2015
 - Startup costs equal \$0.03 times the total annual energy usage
 - Administrative rate is \$0.19 per MWh volume as calculated by:
 - Generation = MAX (5% Gross Generation, Generation Imbalance Energy: 5-minute vs. 15-minute)
 - Load = MAX (5% Gross Load, Load Imbalance Energy: 5-minute vs. 15-minute)
- Dispute resolution is through Customer Inquiry, Dispute and Information (CIDI)

Other design items

- Market monitoring provided by CAISO
- Third party arrangements between EIM Entity and EIM Participants can be made as necessary
- All EIM Entities and EIM Participants must fulfill regulatory compliance obligations
- EIM Participants responsible for following EIM tariff related to the Enforcement Protocol

Issues to Resolve

Stakeholder process will address following EIM policy issues

- Market rule oversight
- Market rule structure
- Transmission service
- Process for new EIM entities joining
- Uplift allocations
- Greenhouse gas accounting
- Others identified through stakeholder process

Market Rule Oversight and Rule Structure (1 of 2)

- Initial EIM implementation under existing CAISO market rule oversight
- EIM oversight may evolve over time based on stakeholder feedback
- Immediate options bounded by current governance
 - Further changes require additional consideration
- EIM rules proposed to be a discrete part of CAISO tariff

Market Rule Oversight and Rule Structure (2 of 2)

- Market Administrator Model
 - Oversight of EIM rules under the CAISO Board
 - Possible EIM Advisory Committee
- Market Operator Model
 - Independent body from the current CAISO Board
 - Presents risks to a low incremental EIM cost
- Hybrid Model
 - Contract enhancements to EIM operator relationship
 - Can be considered as a future arrangement

Transmission Service

- Since initial transfer capability between CAISO and PacifiCorp will be limited, CAISO proposes no charge for as-available transmission
- EIM may adopt transmission rates for EIM transfers, subject to agreed upon limits establish in the EIM design

Uplift and Cost Allocation

- Uplifts and cost allocation will follow published cost allocation guiding principles
- EIM design will seek to minimize comingled costs to the extent possible.
- Based upon EIM design, allocations of real-time costs made to Measured Demand (Metered Demand + Exports) may need to be revised

The cost allocation guiding principles consist of seven elements

1. Causation
2. Comparable treatment
3. Accurate price signals
4. Incentivize behavior
5. Manageable
6. Synchronized
7. Rational

CAISO committed to ensuring EIM design will properly account for GHG costs

- Entities that import energy to California have obligation to surrender compliance instruments to CARB
- The net incremental transfer to CAISO from EIM will be tracked through e-Tag for dynamic schedules
- The market optimization will consider GHG costs

Process for New EIM Entities

- Encourage interested parties to engage as early as possible
 - For 2014, assessment based upon system complexity and timing of commitment
- Anticipate future implementations will occur on an annual commitment cycle with 12-18 month lead time
 - Implementation requires significant network modeling changes
 - Must align with CAISO spring and fall software release cycle
- New entrants pay start up fee (\$0.03 per MWh Demand)
 - Payment will be established through implementation agreement filed with FERC

Next Steps: Comments to EIM@caiso.com by April 10

Item	Date
Post Straw Proposal	April 4, 2013
Stakeholder Meeting (Folsom)	April 11, 2013
Stakeholder Comments Due	April 19, 2013
Post Revised Straw Proposal	May 30, 2013
Stakeholder Meeting (Folsom)	June 6, 2013
Stakeholder Comments Due	June 14, 2013
Post 2 nd Revised Straw Proposal	July 2, 2013
Stakeholder Meeting (Phoenix)	July 9, 2013
Stakeholder Comments Due	July 19, 2013
Post Draft Final Proposal	August 13, 2013
Stakeholder Meeting (Portland)	August 20, 2013
Stakeholder Comments Due	August 27, 2013
Post Draft Tariff Language	September 16, 2013
Stakeholder Comments Due	September 23, 2013
Stakeholder Meeting (Folsom)	September 30, 2013
Board Decision	November 8, 2013

The ISO offers comprehensive training programs

- Welcome to the CAISO
- Introduction to CAISO Markets
- Market Transactions
- EIM specific training is under development

Training calendar - <http://www.caiso.com/participate/Pages/Training/default.aspx>

Contact us - markettraining@caiso.com