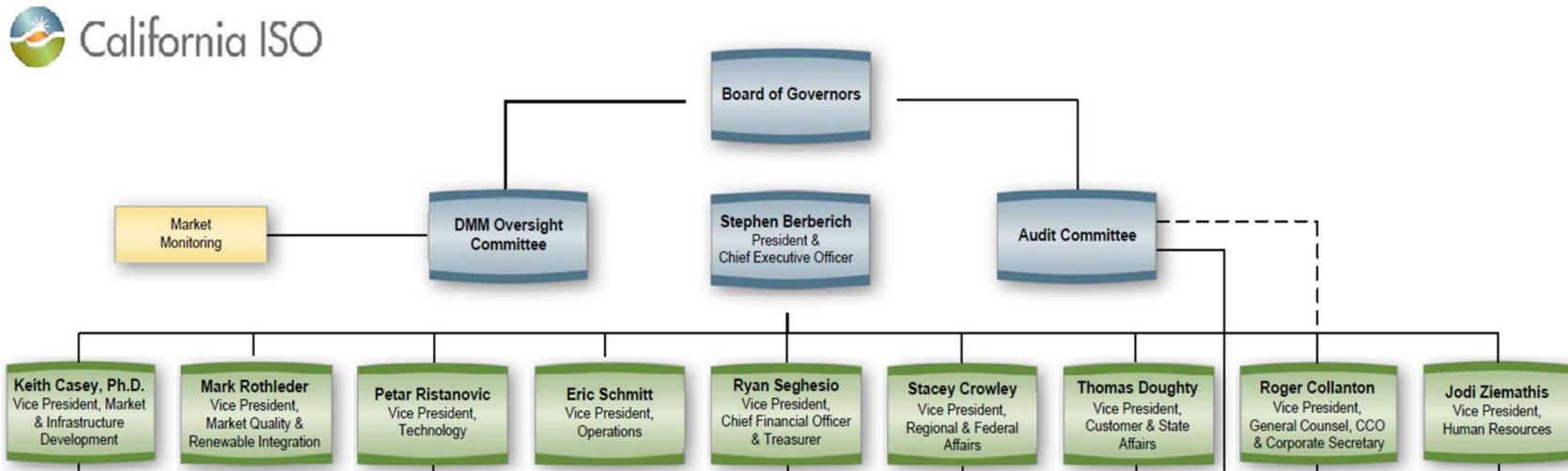


CAISO Market Oversight

The CAISO Department of Market Monitoring (DMM) is responsible for protecting consumers and market participants by identifying and reporting:

- Market design flaws
- Potential market rule violations
- Market power abuses

The CAISO is responsible for implementing DMM policies, both administering market power tests and performing market power mitigation



Local Market Power Mitigation

When there is a binding constraint, how is local market power determined?

- Pivotal Supplier Test
 - If supply is insufficient to meet demand with the supply of any individual supplier removed, then this supplier is pivotal
- Residual Supply Index
 - The residual supply index is the ratio of supply from non-pivotal suppliers to demand
 - A residual supply index less than 1.0 indicates an uncompetitive level of supply
- Oligopoly
 - Consider degree to which 2 or 3 suppliers are jointly pivotal

If determined to have market power, a market participant may have its CAISO bid prices mitigated to a Default Energy Bid (DEB)

- The final mitigated price is the higher of the DEB or the competitive LMP

Default Energy Bids

The CAISO currently employs 3 options for calculating a participant's, or resource's, DEB

1. Variable Cost Option
 - Based on heat rate, fuel price, GHG costs, etc.
2. Locational Marginal Price (LMP) Option
 - Based on lowest 25th percentile of LMPs at which resource was dispatched in the last 90 days
3. Negotiated Rate Option
 - Formula negotiated between the resource's scheduling coordinator and CAISO/DMM

BPA requires an option that adequately reflects the opportunity costs of use limited hydro resources (ULHR)

- Opportunity cost is influenced by:
 - Non-power obligations of hydro resources
 - Expected value of energy in future periods
 - Physical system characteristics (storage, flow limitations, hydrological topology, generating capability)
 - Risk preference of hydro operator
 - Uncertainty of future fuel supply

There are 2 potential negative consequences when CAISO mitigates bids under the existing construct

- Unintended Dispatch/Uneconomic Outcomes (see slides 27-29)
- Overriding project owners' operational and financial risk preferences (see appendix slides 34-35)

Recent Developments: LMPM & DEBs

The CAISO is working through its stakeholder process to address concerns raised by NW parties

Areas of conceptual agreement currently proposed

- **Mitigate for the right time interval:** Mitigation should only apply to the interval when market power has been determined (not balance of the hour)
- **Mitigate the right quantity:** Avoid economic transactions that are driven by mitigation (mitigation should not result in flow reversal)
- A DEB should **reflect the opportunity cost** nature of hydro. Subject to; expected value of energy in future periods, includes markets outside of the CAISO, and physical system characteristics

Areas of continued discussion

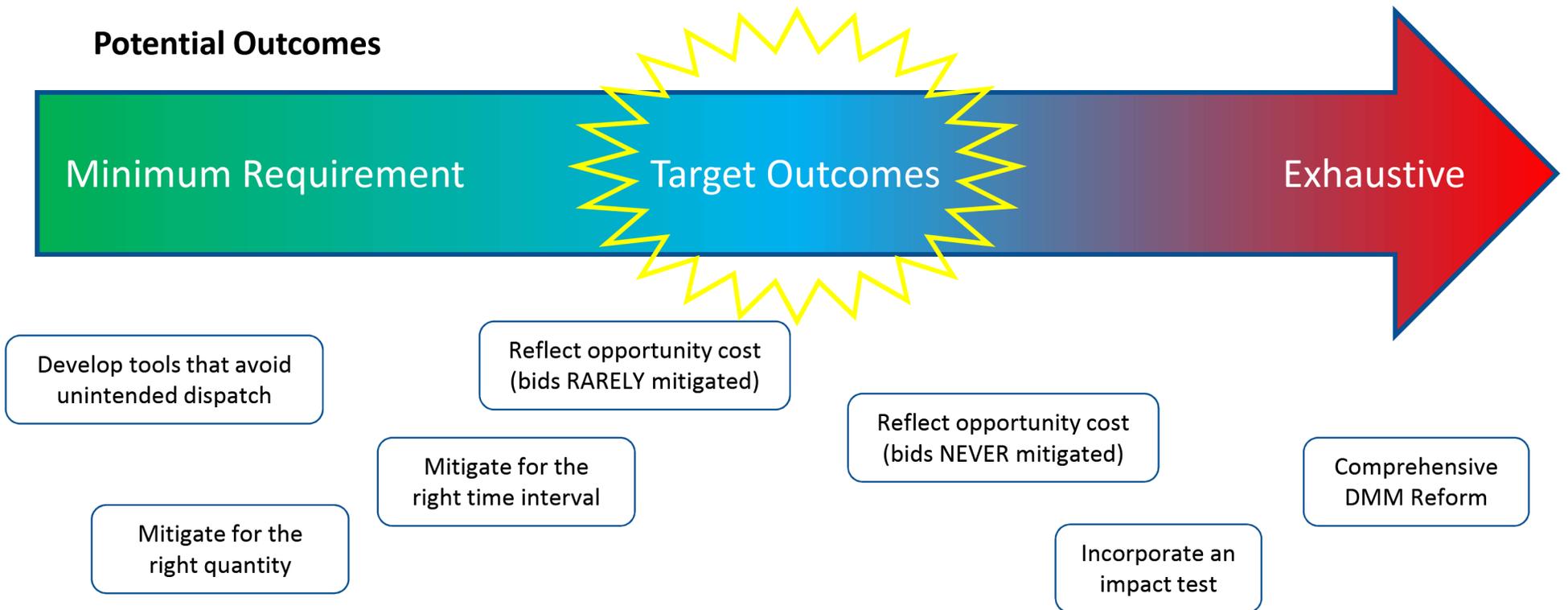
- Distinguishing between the potential versus exercise of market power (impact test)
- Specific parameters that determine opportunity cost

Principles & Potential Outcomes

Principles

- Formulaic DEB must reflect the opportunity value of use limited hydro resources (ULHR)
- Only a ULHR owner/operator can determine if a formulaic DEB adequately reflects opportunity value
- Right size and right timing of bid mitigation
- Avoid unintended dispatch

Potential Outcomes



BPA Engagement Plan

- *BPA is actively participating in the existing stakeholder process*
- *BPA will delay EIM Go Live until LMPM/DEB issues are satisfactorily resolved*

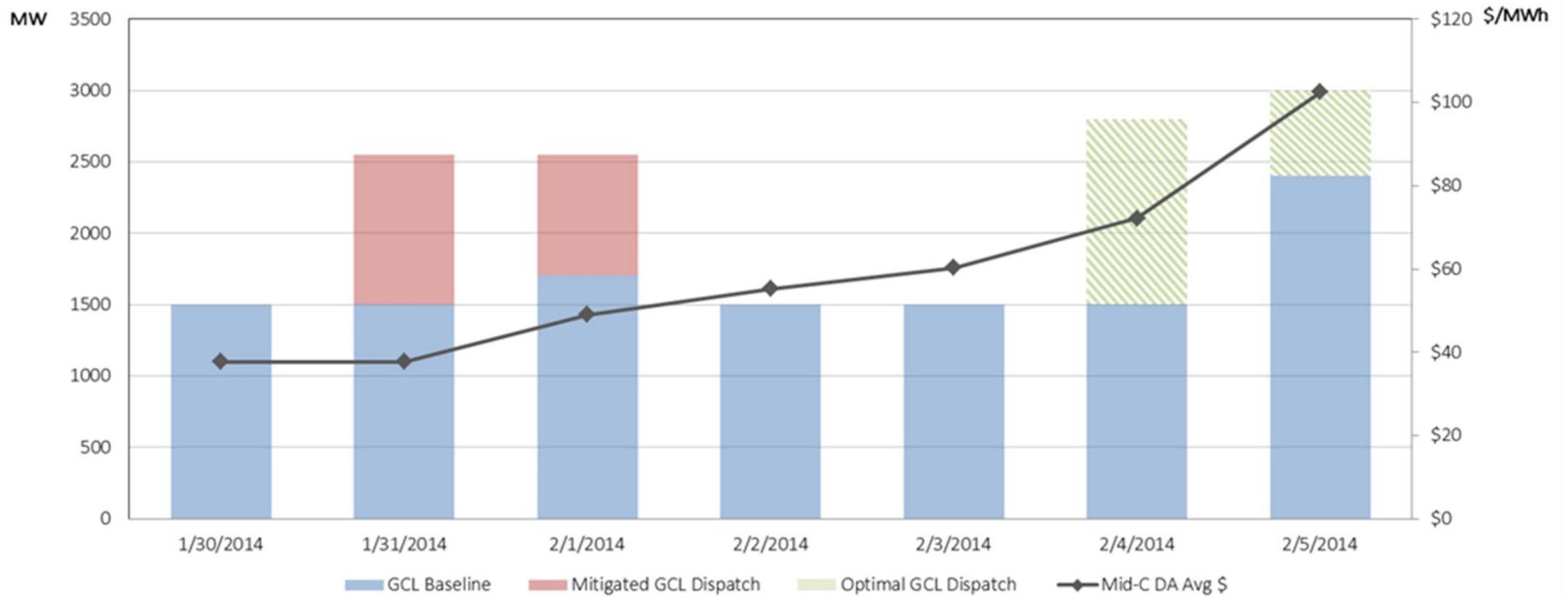
The current trend of the CAISO stakeholder process indicates that certain issues are resolvable, and BPA is targeting its focus accordingly

| <u>Topic</u> | <u>Focus Level*</u> | <u>Rationale</u> |
|--|---------------------|---|
| Current Proposed ISO Revisions | ⇒ HIGH | Potentially significant impacts |
| Develop Tools to Avoid Unintended Dispatch | ⇒ HIGH | Generally limited to BA logistics, with IPP implications |
| Determination of Default Energy Bid | ⇒ HIGH | NW expertise of hydro opportunity cost, significant impacts with potential to resolve most issues |

*Balances: areas of BPA’s expertise, current resources, likelihood of success

Unintended Dispatch due to Mitigation

- Mitigation could negatively impact FCRPS dispatch during cold snap conditions.
- An example of potential changes to GCL's dispatch is below.



BPA Focus Area on DEB

- In the CAISO's ongoing policy initiative process, CAISO's current proposal for use-limited resource default energy bid takes the form:

$$DEB_d = \max\{Index_{l,d}, Index_{l,m+1}, \dots, Index_{l,m+n}\} * (1 + \alpha)$$

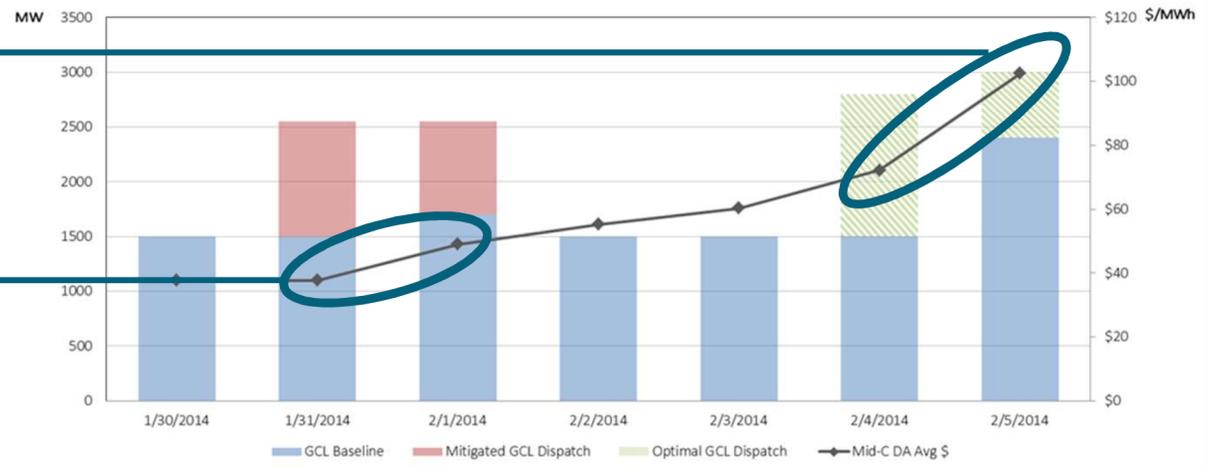
- Day-ahead on-peak index captures short-term opportunity cost on HLH
- Monthly on-peak indices capture long-term opportunity cost on HLH
 - Monthly indices applied as a function of resource storage horizon
- Multiplier (α) acknowledges:
 - Intraday price variation
 - Within-month price variation around the average that is indicated by the index
 - Risk preferences of the bidder
- Other considerations raised
 - Within-month index
 - Multiple locations
 - Location-specific multipliers
 - Minimum adder to maximum index

BPA Focus Area on DEB

For a resource with short-term storage: $DEB_d = \max\{Index_{l,d}, Index_{l,m+1}\} * (1 + \alpha)$

BPA's current opportunity cost is based on view of future prices

With an index multiplier that is too low, the resulting DEB does not capture this view of future prices and could prematurely deplete energy



The likelihood of premature energy depletion is reduced when the DEB accommodates views of future prices. This can be accomplished within the proposed construct by:

- Increasing the multiplier
- Increasing the number of forward indices (*location, months forward, etc.*)

BPA intends to balance its view of an appropriate DEB taking into account mitigation frequency, quantity of MW subject to mitigation, and interests of end-use customers.

Path Forward

- BPA seeks a LMPM framework that ensures that mitigation is applied to an appropriate quantity and only for the time interval that market power is determined
- BPA seeks a methodology for determining the multiplier that is:
 - Empirically based
 - Reproducible
 - Updated on regular, mutually-agreeable cadence
 - Reflective of the opportunity cost of ULHR
- Success looks probable with some combination of the following options:
 - Current NW inspired CAISO efforts are moving in the right direction
 - Bilateral negotiations with DMM
 - Possible Reference Price Adjustment
 - Develop tools that avoid unintended dispatch

Next Steps

- Next meeting scheduled for **Tuesday December 18th** at the Rates Hearing Room in the morning, 9-noon.
 - WebEx and Phone participation will be available
 - Agenda and materials will be distributed in advance via Tech Forum
- We welcome feedback on this meeting. Your comments will help shape future EIM Stakeholder Meetings, please email us at techforum@bpa.gov and reference “EIM Stakeholder Meeting” in the subject. Comments are due by November 28th.
- For more information on BPA’s EIM Stakeholder process and meetings please visit:
<https://www.bpa.gov/Projects/Initiatives/EIM/Pages/Energy-Imbalance-Market.aspx>

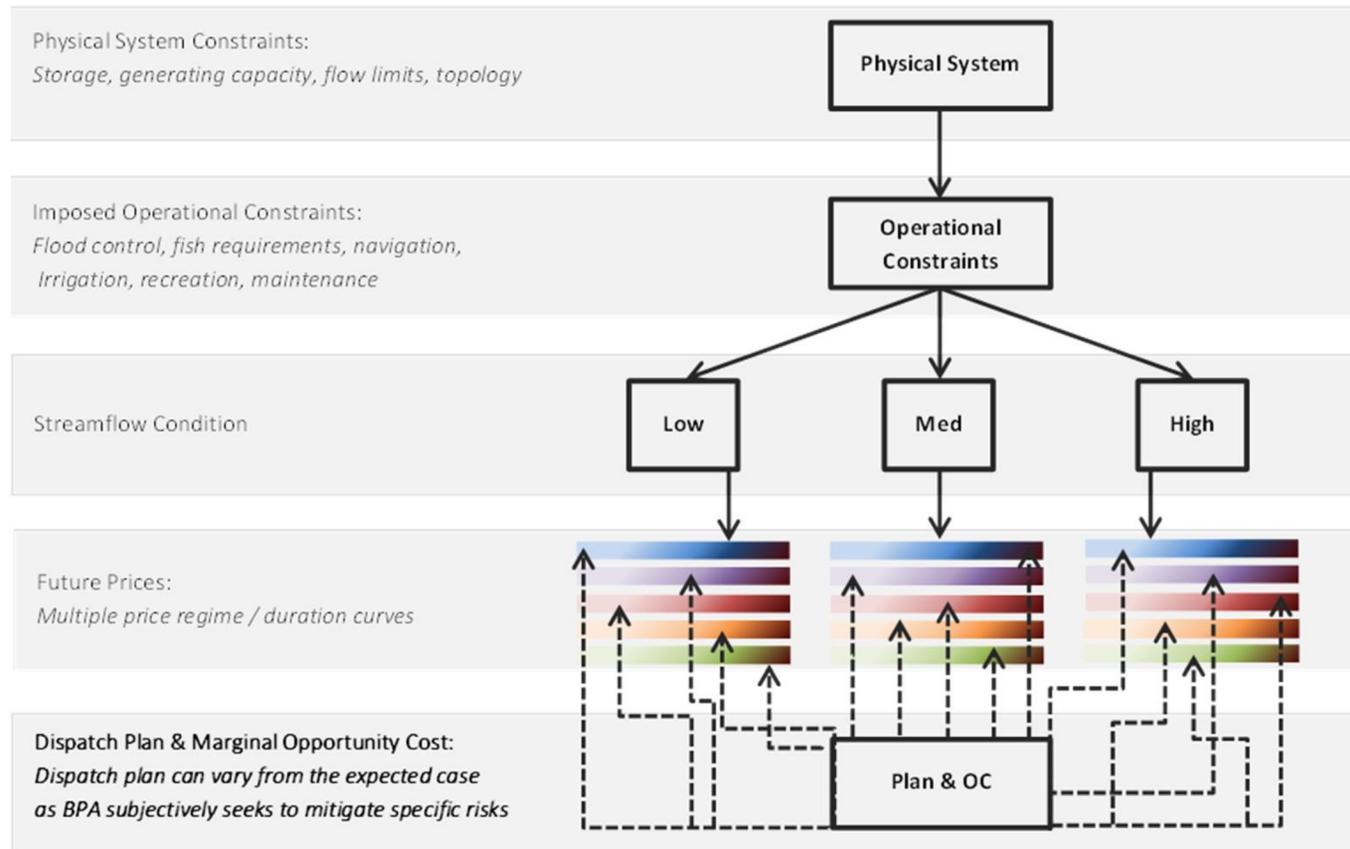
Question and Answer Session



Appendix

System Dispatch/Bids are Risk Informed

Short-Term Planning Problem: Streamflow & Price Uncertainty



Uncertainty necessitates reliance on a variety of SMEs and proprietary models when determining an optimal dispatch plan, with acceptable operational and economic risk

Additional Complications

Interdependencies of streamflow and operational constraints

- Future operational constraints are often influenced by realized streamflow or changes to streamflow forecasts

Feedback relationships between unforeseen/unintended deviations from the optimal plan

- Future operations or future operational constraints may be influenced by unforeseen deviations from the optimal operating plan

Multiple variables determine actual prices

- Actual prices are often influenced by fundamental market conditions, not determined exogenously

Correlation in marketing position across the region

- The prevalence of hydro-based generation in the region means that market participants often have positively correlated marketing positions, exacerbating the impact of streamflow uncertainty on marginal opportunity cost

NW bilateral trading market

- In contrast to an organized market which incentivizes bidding at opportunity cost, the NW bilateral market does not
- Price formation in bilateral trading is significantly influenced by:
 - The perception of market fundamentals
 - Counterparties' opportunity cost
 - An extended (2-3 hour) trading window
 - Market timeline disalignment
 - A variety of other factors

35+ **GRID**
Modernization

JOC Update

Nov. 19, 2019



OVERVIEW



BPA 2018–2023 Strategic Goals

#1

**STRENGTHEN
FINANCIAL HEALTH**

#2

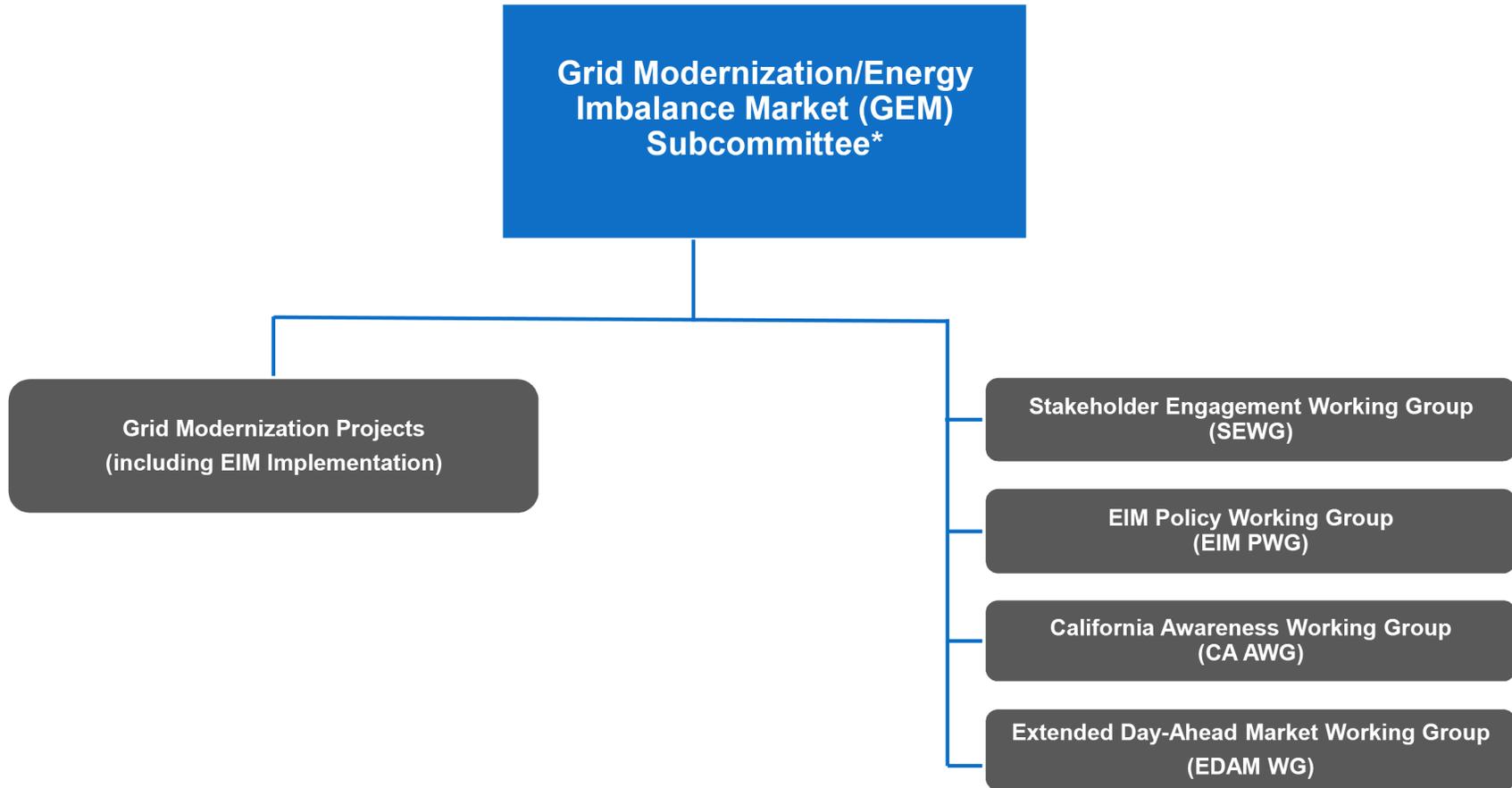
**MODERNIZE
ASSETS &
SYSTEM OPERATIONS**

#3

**PROVIDE
COMPETITIVE
PRODUCTS & SERVICES**

#4

**MEET
CUSTOMER NEEDS
EFFICIENTLY & RESPONSIVELY**



* GEM replaces: GM T1 SC, GMSC, EIM SC, CA Awareness Executive Sponsor Meeting, Stakeholder Strategy SC

PROJECT OVERVIEW



GRID MOD

35+
PROJECTS
ACROSS BPA



AUTOMATION



IMPROVED
ACCURACY



ENHANCED
VISIBILITY



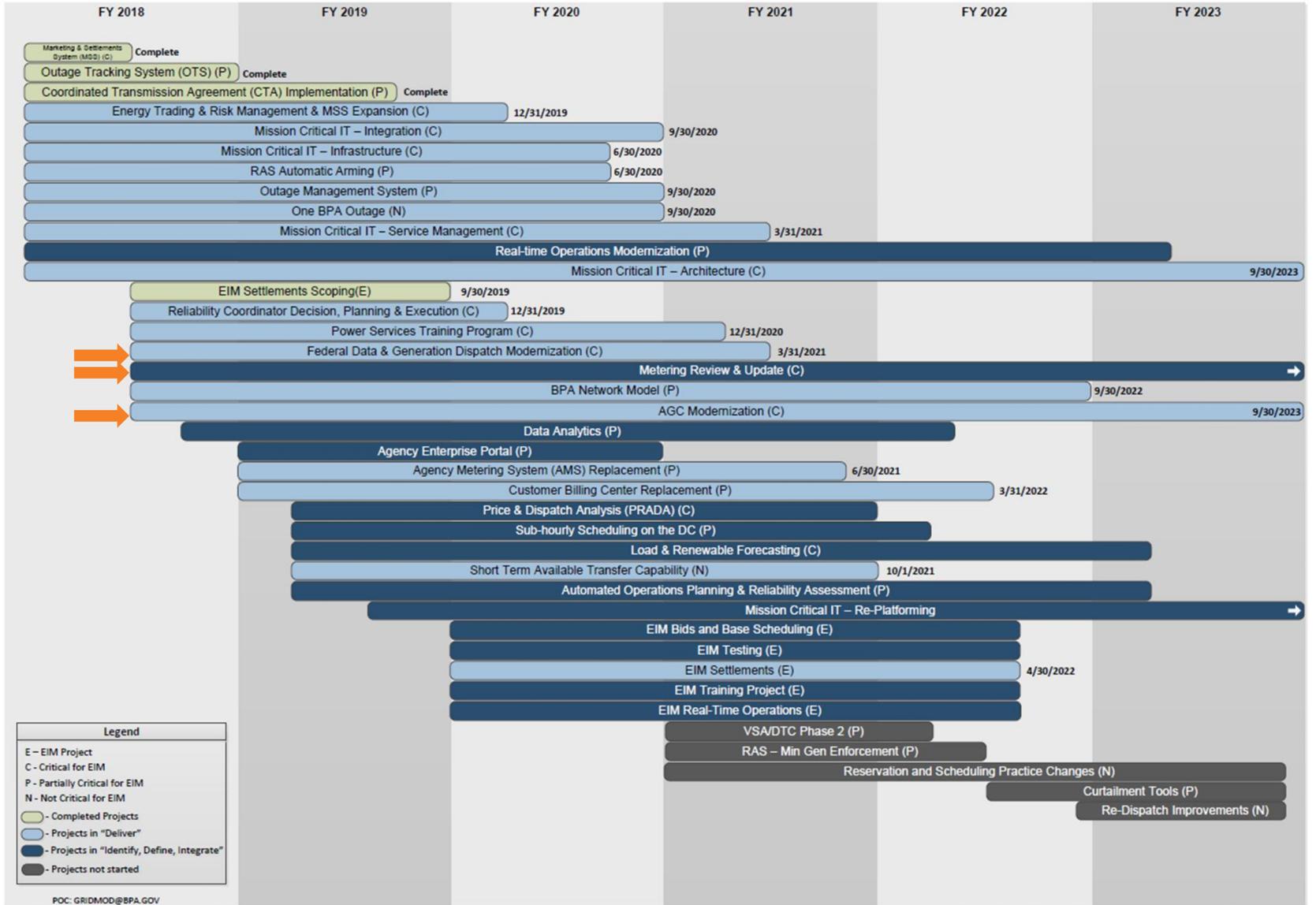
1.
**Support a More
Reliable, Efficient and
Effective System**

2.
**Reduce
Future Costs**

3.
**Create New
Market Opportunities**

Grid Modernization Roadmap

FY20 Q1 Update
Updated as of 10/23/2019 – Subject To Change



Metering Review & Update

GRID Modernization



Increase certainty of power to the transmission grid



Supply revenue quality meter data



Deliver Agency-level communication, coordination and collaboration to enhance metering practices, procedures, policies and guidelines

Metering Review & Update

GRID Modernization

Accomplishments

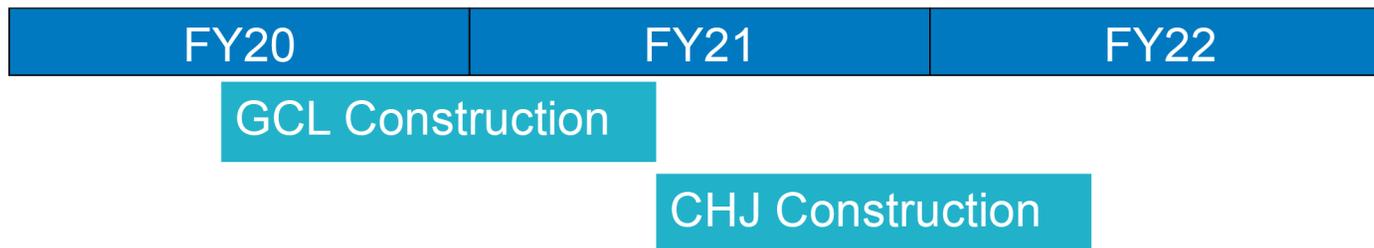
High Side Metering

1. Grand Coulee designs are at 50%

2. Design Kick offs for BPA Substations at USACE Plants near term

Metering Inventory

1. Meter inventory is on track to be accomplished by the end of 2019



AGC MODERNIZATION

GRID Modernization



Increase system flexibility for how BPA holds and deploys reserves



Support marketing of new products and services



Improve communication within BPA and between BPA, neighboring Balancing Authorities and FCRPS generators.



Support BPA's ability to participate in the Western EIM, other energy markets and overall Grid Modernization efforts

AGC MODERNIZATION

GRID Modernization 

Accomplishments

1. Team Building and Alignment between BPA, COE, BOR
2. Bi-Directional control enhancement
3. Reducing DEC Reserve at GCL

FED DATA

GRID Modernization



Reduce station control error to improve grid reliability and system flexibility



Improve communications by standardizing scheduling processes with federal partners



Improve accuracy and timeliness of data shared between federal projects and BPA

FED DATA

GRID Modernization 

Accomplishments

1. Pilot project established at Detroit Dam

2. BOR/USACE Projects signed onto the ISAAC Scheduling Portal

3. Implementation of the CBT Web Messenger enhancement

Seattle
City Light
Tacoma
Power
Portland
General
Electric

WESTERN

E I M



2022

MARKET CONTEXT

- Drivers of market change:
 - Variable energy resources are increasing in the West
 - Ability to realize the value of sub-hourly dispatch with flexible and low carbon hydro resources
 - Transmission use and system operations are changing
 - Western EIM footprint is growing
 - Market evolution

BUSINESS RATIONALE



- A well designed electricity market is built on a foundation of resource adequacy and has features that:
 - Provide for intra-hour energy balancing
 - Compensate explicitly for capacity resources that provide system reliability and flexibility
- BPA views the Western EIM as one piece of a well-designed market.

EVALUATION PRINCIPLES

- BPA is evaluating joining the Western EIM based on six principles:

1. Consistent with statutory, regulatory and contractual obligations.

2. Maintain reliability.

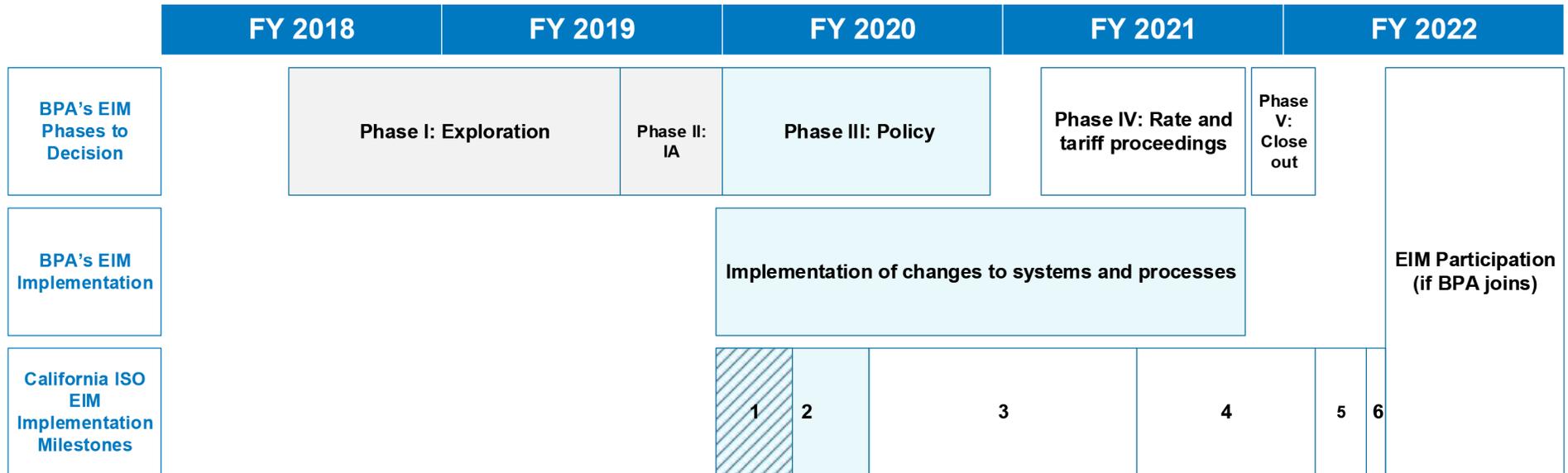
3. Voluntary participation.

4. Sound business rationale.

5. Consistent with the objectives of BPA's strategic plan

6. Transparency of commercial and operational impacts on products and services.

BPA'S EIM TIMELINE



- Milestones:**
1. Effective date
 2. Detailed project management plan
 3. System implementation and connectivity testing for market model
 4. Market simulation
 5. Start of parallel operations
 6. Final preparation of system deployment

EIM IMPLEMENTATION PLAN

- Implementation plan will cover action items for October 2019 – September 2022.
- Mapping a day-in-the-life view of processes and tools that need to change under the EIM.
- Plan to bring on an EIM integrator in December.
- Starting scoping on new EIM projects and updating scope for impacted existing GM projects.

EIM DAY-IN-THE-LIFE BUSINESS MODEL



- Define Generation & Interchange
- Network Model Setup & Synchronization
- Establish Data & Communications
- Establish Metering Framework

- Establish Operating Conditions
- Refine Constraints & Limitations
- Establish Bidding Strategy
- Identify FCRPS Flexibility

- Rights Holders Donate Transmission
- Submit Schedules
- Submit Bids
- Ensure Resource Sufficiency

- Implement Market Dispatch Awards
- Monitor Market Actions
- Balance BAA

- Provide Meter Data
- Manage Settlements & Billing
- Conduct Market Analysis & Process Improvement

NEW WORKSTREAMS

- **EIM Training**
 - Identifying a training manager who will identify training requirements and facilitate training.
- **Set-up/Configuration**
 - Includes Master File data collection of Generation Resource Data Templates.
- **EIM Testing**
 - Testing to ensure all systems work ahead of go-live.

EXTENDED DAY-AHEAD MARKET



EXTENDED DAY-AHEAD MARKET (EDAM)

- Proposal to extend the day-ahead market to the entire EIM footprint.
- BPA evaluating EDAM proposal and engaged in the California ISO's stakeholder process.
- If BPA decides to join the EDAM, it would hold a similar stakeholder process to its decision to sign the EIM implementation agreement.

EDAM ISSUES

- Resource sufficiency
 - BPA needs to understand the implications of a day-ahead resource sufficiency evaluation on its federal power and transmission systems.
- Transmission
 - BPA believes any solution must collect enough revenue to adequately and fairly recover the costs of the federal transmission system.

EDAM ISSUES

- Price formation
 - BPA believes any price formation should adequately reflect the opportunity costs of use-limited hydro resources.
 - Price formation should also fully realize the value of BPA's flexible, carbon-free federal generation.
- Greenhouse gas
 - BPA will engage in the process to improve GHG accounting and evaluate how any changes may impact its customers.
- Governance
 - BPA is participating in the Governance Review initiative.
 - Public power should have a broader role.

More information available at:

www.bpa.gov/goto/gridmodernization

www.bpa.gov/goto/EIM



EIM Decision-Making Process White Paper

February/March 2019¹

(b)(5)



EIM 101 Workshop

September 13, 2018

BPA Rates Hearing Room



Agenda

- Housekeeping
- What is the California ISO
- What is BPA
- What is a Balancing Authority
- What is the EIM
- Governance
- Transmission
- Roles and Definitions
- Market Activities
- Base Schedules + Bids + Market Timing
- Resource Sufficiency Tests
- Settlements

WebEx and Phone Participants

- We have muted all calls on entry, if you have a question, you will need to unmute by using *6, then please identify yourself by name and organization.
- Please do not put this call on hold OR take other calls while you are dialed into this one.
- Noisy lines may be disconnected from the meeting.

Format of EIM 101 Workshop

- There is a lot of material to present today
- We plan to leave time at the end for an open Q&A
- After each topic we will provide an opportunity to ask clarifying questions, as time permits
- We welcome feedback on the workshop – please send any to techforum@bpa.gov and reference “EIM 101 Workshop” in the subject

Upcoming EIM Stakeholder Meetings

- Oct. 11, 2018, 9 a.m.-12 noon, BPA Rates Hearing Room and by WebEx
- Nov. 20, 2018, time TBD, BPA Rates Hearing Room and by WebEx
- For more information please visit www.bpa.gov/goto/EIM

Purpose of EIM 101 Workshop

- Provide a common understanding of how the EIM currently works so that all stakeholders can engage in future meetings/workshops
- Help identify policies and business practices that may impact BPA's potential EIM participation

Credits & Disclaimers

- Several slides in this presentation have been reproduced (*occasionally with modifications*) with permission from the CAISO and Utilicast
- Information provided is believed to be accurate as of the publication date of this presentation
- The CAISO market rules and processes are under continual development
- Additional [resources](#) and information are available in the [appendix](#) of this presentation

What is the California ISO?



The California ISO (CAISO, CISO, ISO)

- One of nine independent grid operators in North America
- One of 39 balancing authorities in the western interconnection
- Operates markets for wholesale electricity – Day Ahead and Real Time
- Manages the California transmission system
- Manages new power plant interconnections in California
- Plans grid expansions in California
- Operates the Western Energy Imbalance Market (EIM)

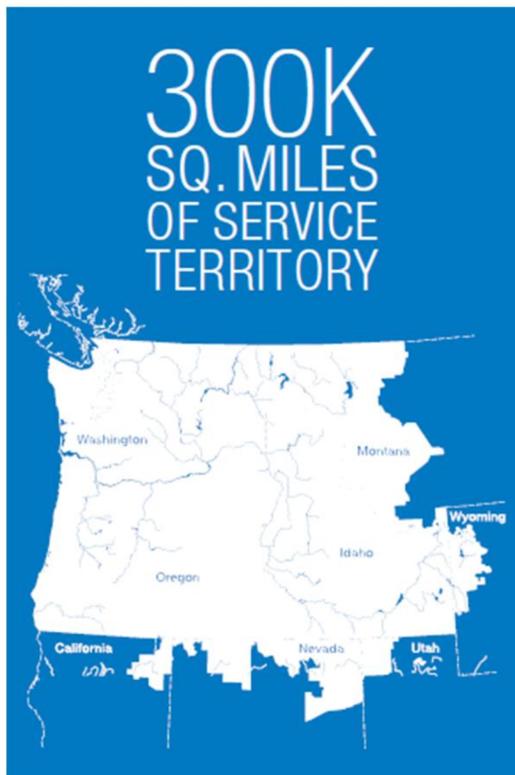


What is the Bonneville Power Administration?



Bonneville Power Administration

- BPA is a Federal Power Marketing Agency located in the Pacific Northwest.



General Information

| | |
|-----------------------------------|---------------------|
| BPA established | 1937 |
| Service area size (square miles) | 300,000 |
| Pacific Northwest population | 13,712,171 |
| Transmission line (circuit miles) | 15,238 |
| BPA substations | 260 |
| Employees (FTE) | 2,891 ^{1/} |

1/ FTE for fiscal year 2017 from the FY 2017 Congressional Budget.

Customers

| | |
|--|------------|
| Cooperatives | 54 |
| Municipalities | 42 |
| Public utility districts | 28 |
| Federal agencies | 7 |
| Investor-owned utilities | 6 |
| Direct-service industries | 2 |
| Port districts | 1 |
| Tribal utilities | 3 |
| Total | 143 |
| Marketers (power and transmission) ^{2/} | 200 |
| Transmission customers | 532 |

2/ As of February 2018.

Transmission System

| Operating voltage | Circuit miles |
|---------------------------|-------------------|
| 1,100 kV | 1 |
| 1,000 kV | 264 ^{8/} |
| 500 kV | 4,869 |
| 345 kV | 570 |
| 287 kV | 229 |
| 230 kV | 5,328 |
| 161 kV | 119 |
| 138 kV | 56 |
| 115 kV | 3,520 |
| below 115 kV | 282 |
| Total^{9/} | 15,238 |

8/ BPA's portion of the PNW/PSW direct-current intertie. The total length of this line from The Dalles, Oregon, to Los Angeles is 846 miles.

9/ Total circuit miles as of February 2018.

Federal Hydro Projects

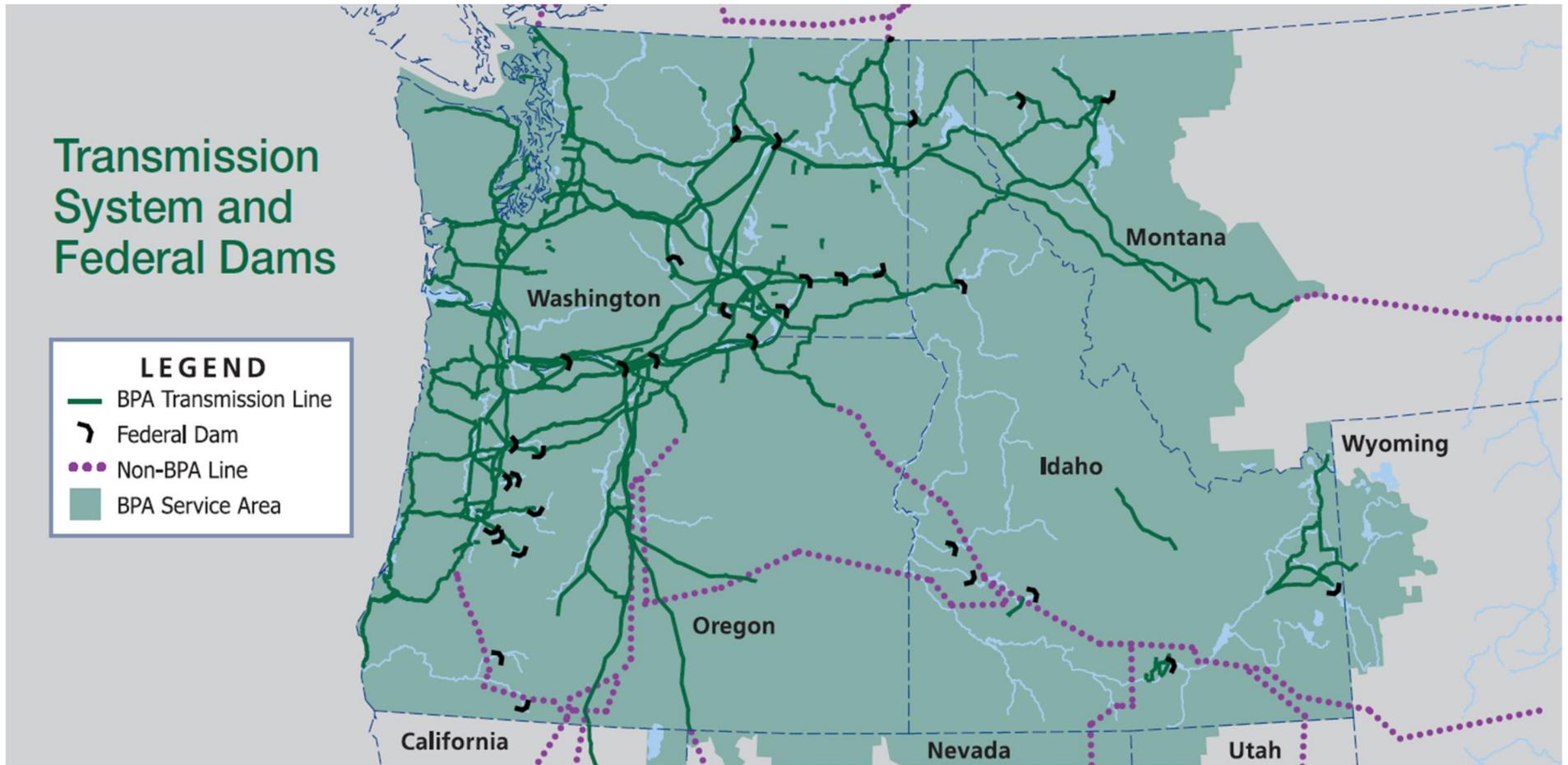
31 federal dams (max. capacity) 22,458 MW

Projects owned and operated by:
 U.S. Army Corps of Engineers (14,651 MW) 21 dams
 Bureau of Reclamation (7,807 MW) 10 dams

Federal Generation

Hydro generation 9,377 aMW
 Total generation 10,313 aMW
 60-min. hydro peak generation 14,192 MW
 60-min. total peak generation 14,600 MW
 All-time 60-min. total peak generation record (June 2002) 18,139 MW

Bonneville Power Administration



What is a Balancing Authority?



What is a Balancing Authority?

- A Balancing Authority (BA) is the entity that integrates resource plans ahead of time, maintains Demand and resource balance within one or more Balancing Authority Areas, and supports Interconnection frequency in real time.
- A Balancing Authority Area (BAA) is the collection of generation, transmission and loads within the metered boundaries (interchanges or tie-lines) of the balancing authority where load/resource balance is maintained
- 39 BAAs in the Western Interconnection
- While interconnected, each BAA operates independently

What is AGC

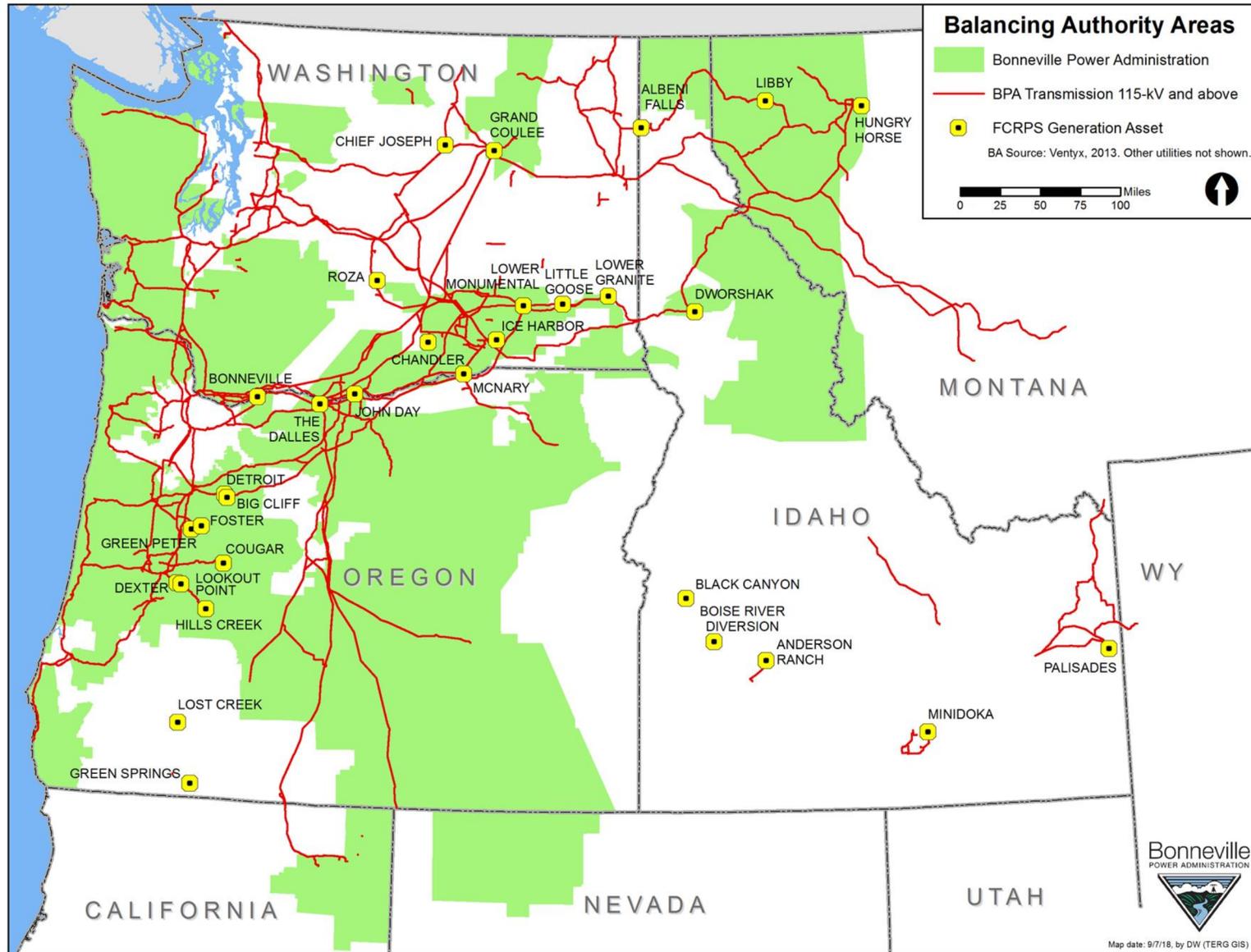
- Automatic Generation Control (AGC) is used to manage the BAA's Area Control Error (ACE) per the following basic equation (deemphasizing tie-line meter error, and ATEC):

$$ACE = (NI_A - NI_S) - 10B (FA - FS) - I_{ME} + I_{ATEC}$$

Where:

- NI_A = Net Actual Interchange - The algebraic sum of **actual** megawatt transfers across all Tie Lines, including Pseudo-Ties, with all Adjacent BAAs within the same Interconnection
- NI_S = Net Scheduled Interchange - The algebraic sum of all **scheduled** megawatt transfers, including Dynamic Schedules, with all Adjacent BAAs within the same Interconnection, including the effect of scheduled ramps
- B = Frequency Bias Setting (MW/0.1Hz).
- FA = Actual Frequency.
- FS = Scheduled Frequency.
- I_{ME} = Interchange Meter Error.
- I_{ATEC} = Automatic Time Error Correction

BPA's Balancing Authority Area



BPA Has 253 points of interchange (tie-lines) with 18 adjacent BAAs

What is the EIM?



What is the EIM?

- An **intra-hour** centralized **energy** market used to **economically** and **securely** dispatch **participating resources** to **efficiently** balance supply, transfers between participating Balancing Authority Areas (**EIM Entity BAAs**), and load across the market's footprint (**EIM Area**).
 - The EIM does this **every 5-minutes!**
- An extension of the CAISO's Real-Time Market (**RTM**) in response to the efforts of the Western Interstate Energy Board (WIEB) and the PUC EIM group

What is the EIM?

- EIM's priority is to serve load and imbalance at the lowest possible cost (**Economic Dispatch**).
- It does so while simultaneously ensuring generation, and transmission limitations are respected (**Security Constrained**).
- It utilizes **Bid Ranges** (INC/DEC) from voluntarily offered **participating resources** to come up with the most economical and **reliable/secure** solution of generation to meet load and interchange demands.
- No penalty for promptly communicated reliability actions (Manual Dispatch); imbalance settlements still apply

What is the EIM?

- What is Included in EIM?
 - Unit commitment for short start resources
 - Forward looking congestion management - will respond to forced and planned outages
 - 15min market (FMM or RTPD)
 - Advisory market awards published for 4-7 FMM intervals
 - 5min dispatch (RTD)
 - Advisory market awards published for 9-13 RTD intervals
- What is NOT included in EIM?
 - Capacity Ancillary Services (regulation, spin, non-spin)
 - Ancillary Services Base Schedules are supported
 - Optimal Contingency Dispatch
 - Manual Dispatch of Contingency Reserves is supported

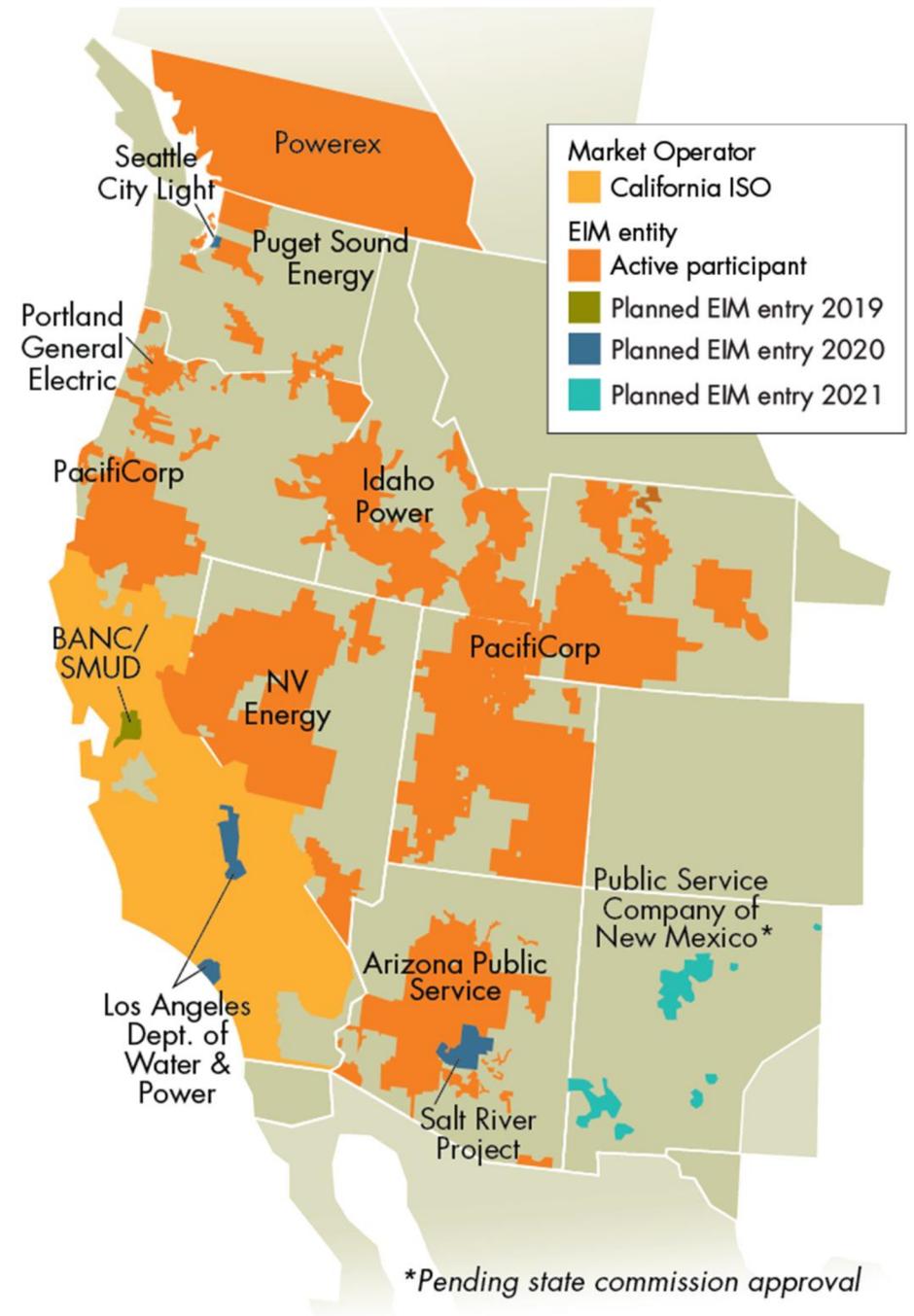
EIM Area Map

Existing Entities:

- PAC
- NVE
- APS
- PSE
- PGE
- PWX
- IDP

Upcoming Entities:

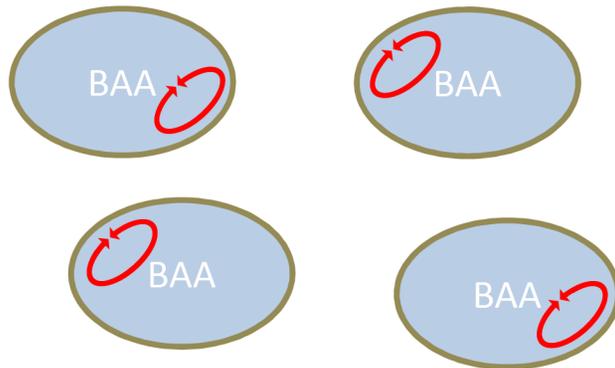
- BANC/SMUD (2019)
- LADWP (2020)
- SCL (2020)
- SRP (2020)
- PNM (2021)



EIM Summary

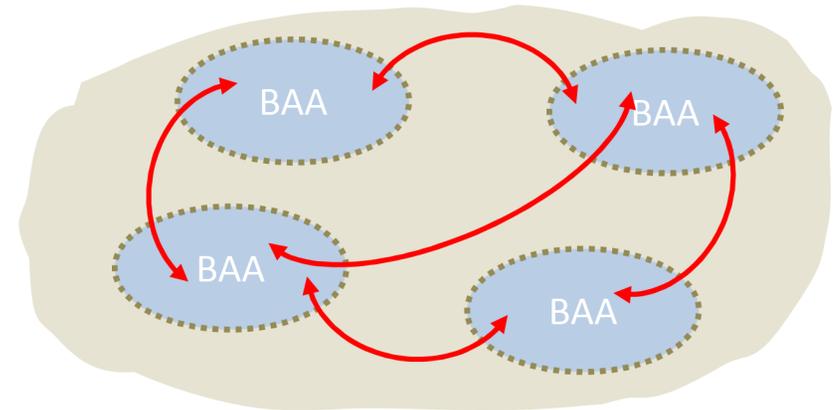
Without EIM:

Each BA must balance loads and resources within its borders.



With EIM:

The market dispatches resources across BAAs to balance demand



EIM Benefits

- Reduce costs by serving imbalance and load from most economic resources
- Enhances reliability by improving system visibility and responsiveness to planned and unplanned events
- Results in more efficient dispatch of resources within/between BAAs
- Leverages geographical diversity of loads and resources in the market footprint
- Congestion Management

EIM Summary

What an EIM **IS**:

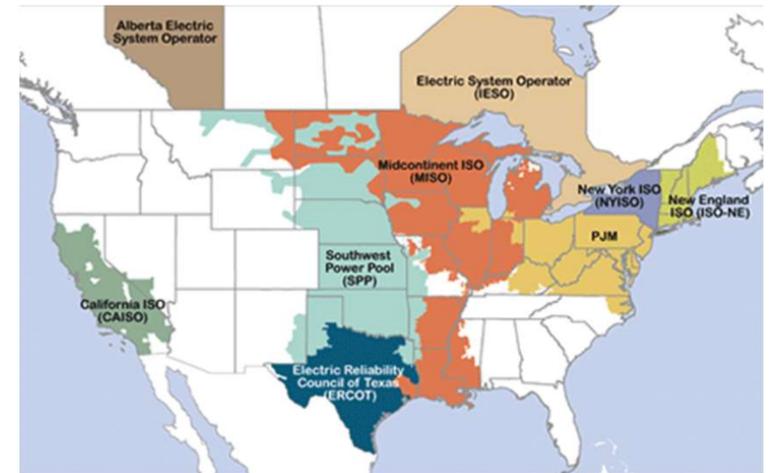
- An intra-hour **real-time** energy market to serve load and imbalance across participating Balancing Authorities (EIM Entities) and the CAISO (a.k.a. the EIM Area)
- A tool for centralized 5-minute dispatch of generators that have been **voluntarily** offered to the market (at a price)
- **Economically dispatches** offered resources
- **Security-constrained**, meaning transmission and reliability constraints are not exceeded, improving grid reliability, reducing energy supply cost and enhancing integration of renewable resources

What an EIM is **NOT**:

- An RTO (with planning, day-ahead markets, BA consolidation)
- A centralized unit commitment tool
- A capacity market
- A replacement for the current contractual bi-lateral business structure

Are these EIM things new?

- Nope! They've been around for years. They aren't always called an EIM, but most organized energy markets (RTOs/ISOs) run a regional SCED based 5-minute market
 - PJM (RT SCED)
 - MISO (Real-Time and Operating Reserves Market)
 - SPP (Real-Time Balancing Market)
 - NYISO (Real-Time Market)
 - ISO-NE (Real-Time Energy Market)
 - ERCOT (Real-Time Market)
 - CAISO (Real-Time Market)



EIM Governance



EIM governance structure designed by transitional committee of western stakeholders

EIM Governing Body (GB)

- 5 independent (non-stakeholder) members
- delegated authority over EIM-related market rules
- selected by S/H nominating committee, confirmed by ISO Board
- provides western entities a decision-making voice

EIM Body of state regulators (BOSR)

- advises EIM Governing Body and ISO Board on matters of interest
- currently 8 state officials from EIM states
- provides a state regulatory perspective

Regional Issues Forum (RIF)

- public vehicle for discussion of EIM-related issues, including impacts to neighboring balancing authority areas
- organized by ten self-selected sector liaisons
- may produce opinions for EIM governing body or ISO Board of Governors

Transmission



Transmission Access

- Transmission is provided in the EIM consistent with non-discriminatory Open Access principles.
- There is no explicit charge for transmission usage in the EIM.
- Transmission is currently provided in two ways:
 - Unused transmission provided directly by Transmission Service Providers (TSP) at no charge
 - Reserved transmission donated by Merchants

EIM Transfer Schedules

- The EIM primarily uses **dynamic schedules** to transfer energy between EIM BAAs
 - One exception is on the COI where separate 15-minute normal schedules and 5-minute dynamic schedules are used due to DTC issues
- The EIM Transfer for an EIM BAA is an algebraic quantity (positive for export and negative for import) for the **NET** energy exchange between a given BAA and the remaining BAAs in the EIM Area facilitated by the EIM

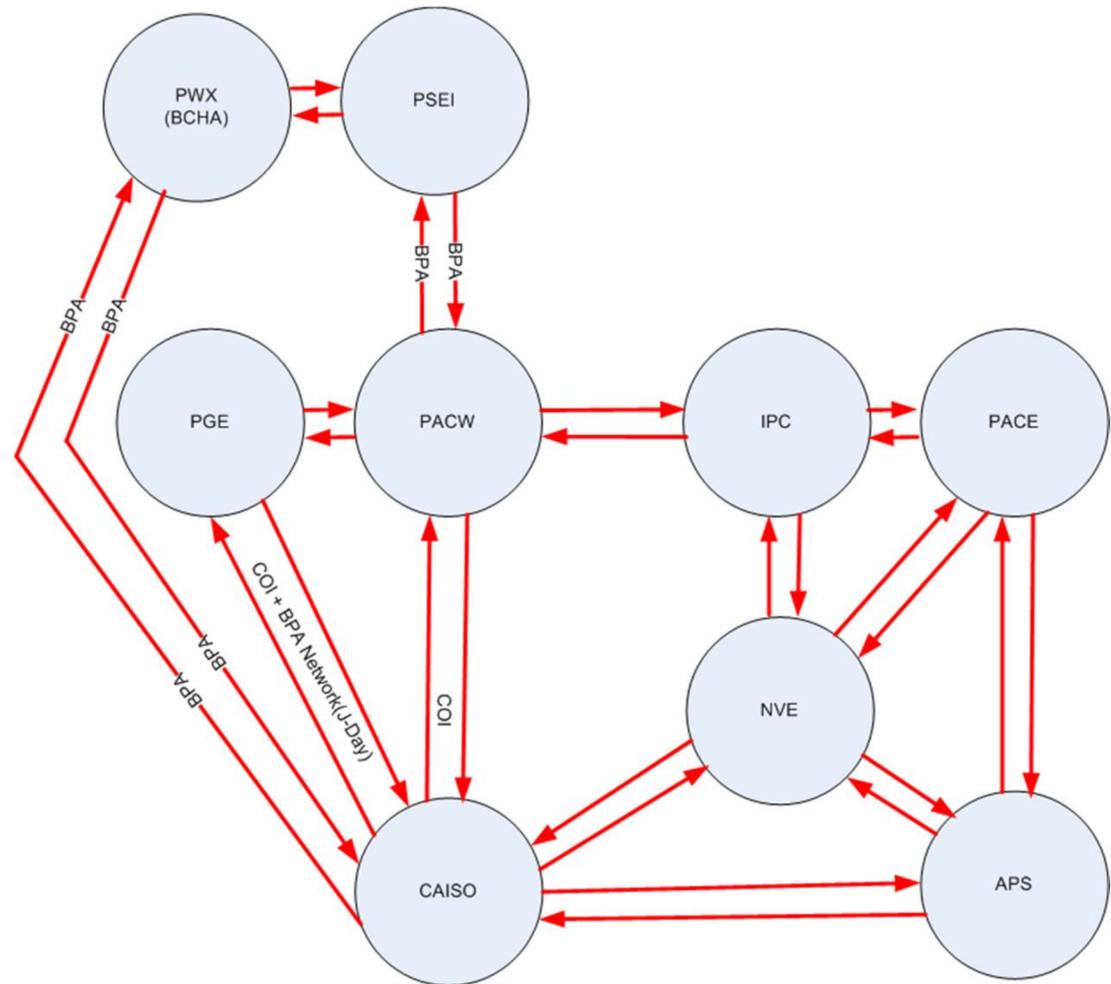
<https://www.caiso.com/Documents/TechnicalPaper-EnergyImbalanceMarket-EnergyTransferScheduling.pdf>

Energy Transfer System Resources (ETSR)

- System Resources are defined in each EIM BAA to anchor the Energy Transfer schedules from that BAA to other BAAs in the EIM Area for tracking, tagging, and settlement.
 - Analogous to a Source or Sink on an e-Tag
- ETSRs are defined as aggregate system resources at the EIM BAA Default Generation Aggregation Point (DGAP), which is an aggregation of all supply resources in the BAA.
- Each ETSR is defined as either an import or an export resource, and it is associated with an EIM intertie with another EIM BAA, or a CAISO intertie with the CAISO.

EIM Transfers (Today)

- Transfers between EIM Entities are currently limited to these transfer paths
- EIM will facilitate **wheeling** of EIM energy through EIM Entities (e.g., CAISO → NVE → PACE → PACW → PSEI) when more efficient transmission paths are constrained



Roles and Definitions



Roles and Definitions

- **EIM** is the operation of the ISO's real-time market to manage transmission congestion and optimize procurement of energy to balance supply and demand for the CAISO and EIM BAAs combined (EIM Area)
- **Market Operator** is the CAISO

Roles and Definitions

- **EIM Entity** is a Balancing Authority that
 - Represents one or more Transmission Service Providers that make transmission available for EIM
 - Enters into the pro forma EIM Implementation Agreement to enable the EIM in its BAA
 - Determines the resources and the transmission service required for eligibility to participate in the EIM
 - By enabling the EIM, real-time load and generation imbalances within the EIM BAA will be settled through the EIM

Roles and Definitions

- **EIM Participating Resource (EIMPR)** is a resource located within the EIM Entity BAA that
 - Is eligible and elects to participate in the EIM
 - Enters into the pro forma EIM Participating Resource Agreement
 - Receives 15-minute schedule and 5-minute dispatch
- **EIM Non-Participating Resource (EIMNPR)** is a resource that elects to not participate in the EIM
 - Hourly resource and import/export schedules

Roles and Definitions

- **EIM Entity Scheduling Coordinator** is the EIM Entity (or a designated third-party) that
 - Is certified by the ISO
 - Enters into the pro forma EIM Entity Scheduling Coordinator Agreement, under which it is responsible for:
 - Approving resource plans for the EIM Entity BAA
 - Submits Settlement Quality Meter Data (SQMD)
 - Uninstructed imbalance energy settlement of resources not participating in EIM
 - Distributing costs or revenues from uplift allocations to the EIM Entity BAA

Roles and Definitions

- **EIM Participating Resource Scheduling Coordinator** is the participating resource (or a designated third-party) that:
 - Is certified by the ISO
 - Enters into the pro forma EIM Participating Resource Scheduling Coordinator Agreement
 - Interfaces with the Market Operator to
 - Submit resource plans
 - Receive dispatch instructions and market awards
 - Receive settlement statements and bills

Roles and Definitions

- **EIM Transmission Service Provider** is a transmission owner or customer (may be a 3rd party separate from the EIM Entity) that
 - Controls transmission in the EIM Entity BAA
 - Can voluntarily inform the EIM Entity that it is making its transmission available for EIM
- **EIM Transfer** is an exchange of real-time energy between a BAA in the EIM Area and the rest of the EIM Area using transmission capacity made available for the EIM

Roles and Definitions

- **Base Schedule** is a forward hourly energy schedule
 - It is the **reference for measuring imbalance deviations** for EIM settlement
 - It includes generation and interchange schedules, and load forecast
- **Resource Plan** is the combination of
 - Base schedules
 - Energy bids
 - Ancillary services schedules

Roles and Definitions

- **Base Schedule Coordinator** is the participating or non-participating resource (or a designated third-party) that submits base schedules and ancillary services schedules
- **EIM Entity Base Schedule Coordinator** is the EIM Entity (or a designated third-party) that submits base schedules and ancillary services for EIM non-participating resources, and all EIM resources after *T-55'*

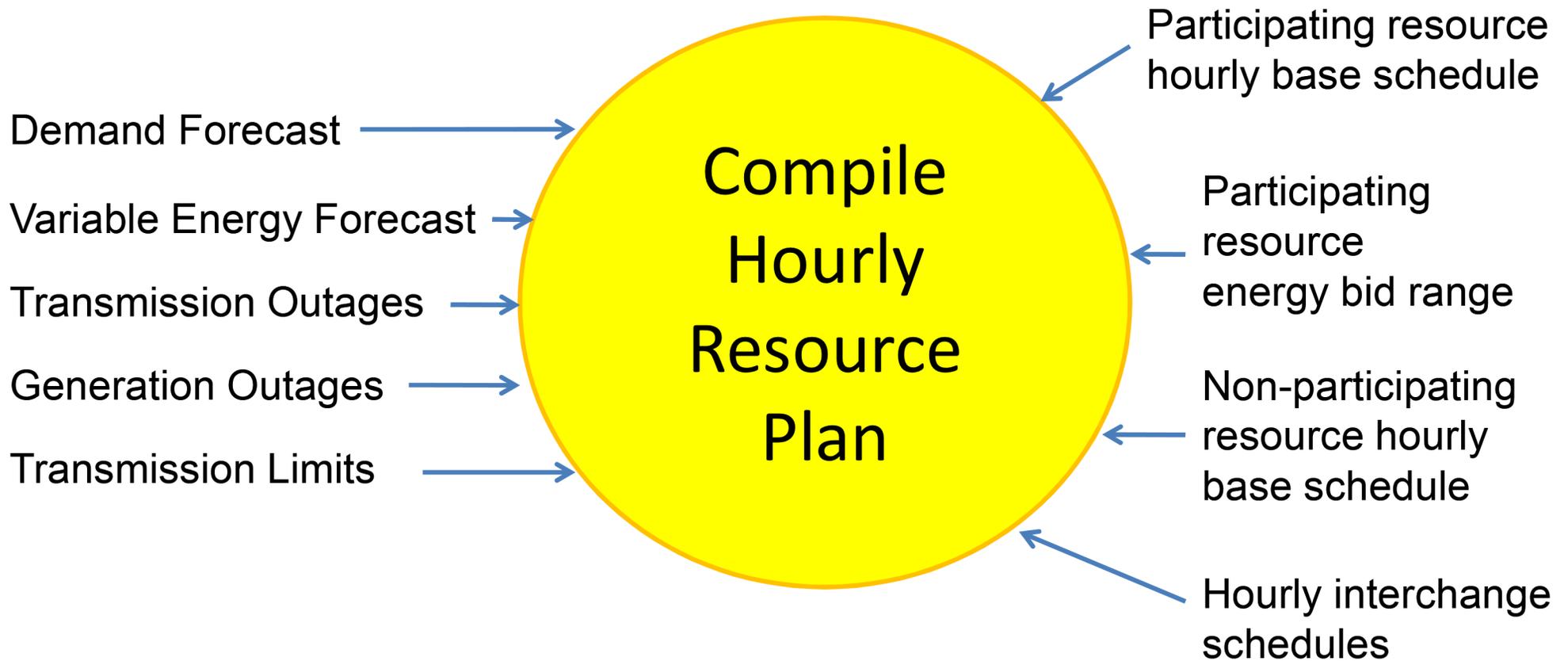
Break



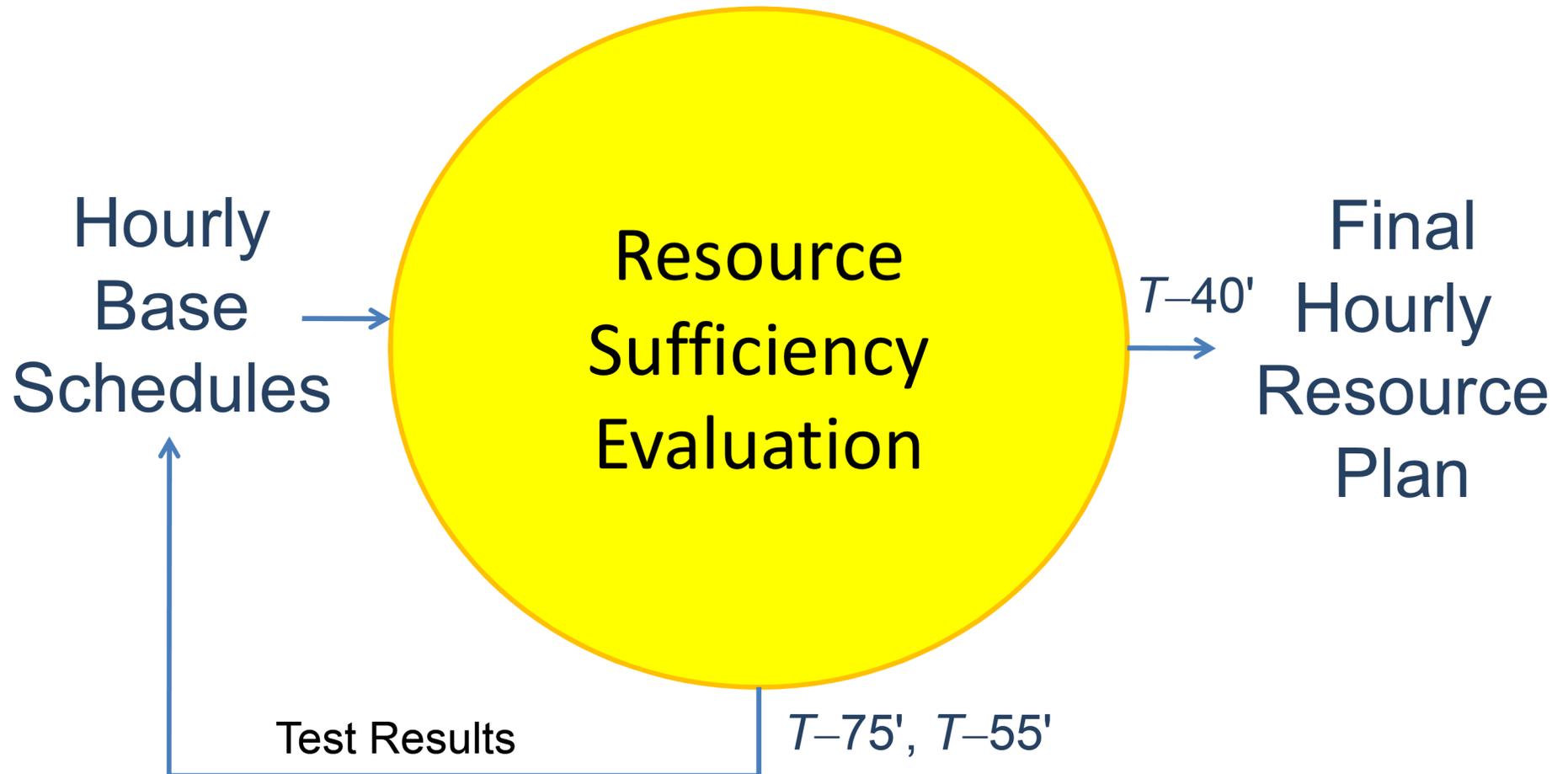
Market Activities



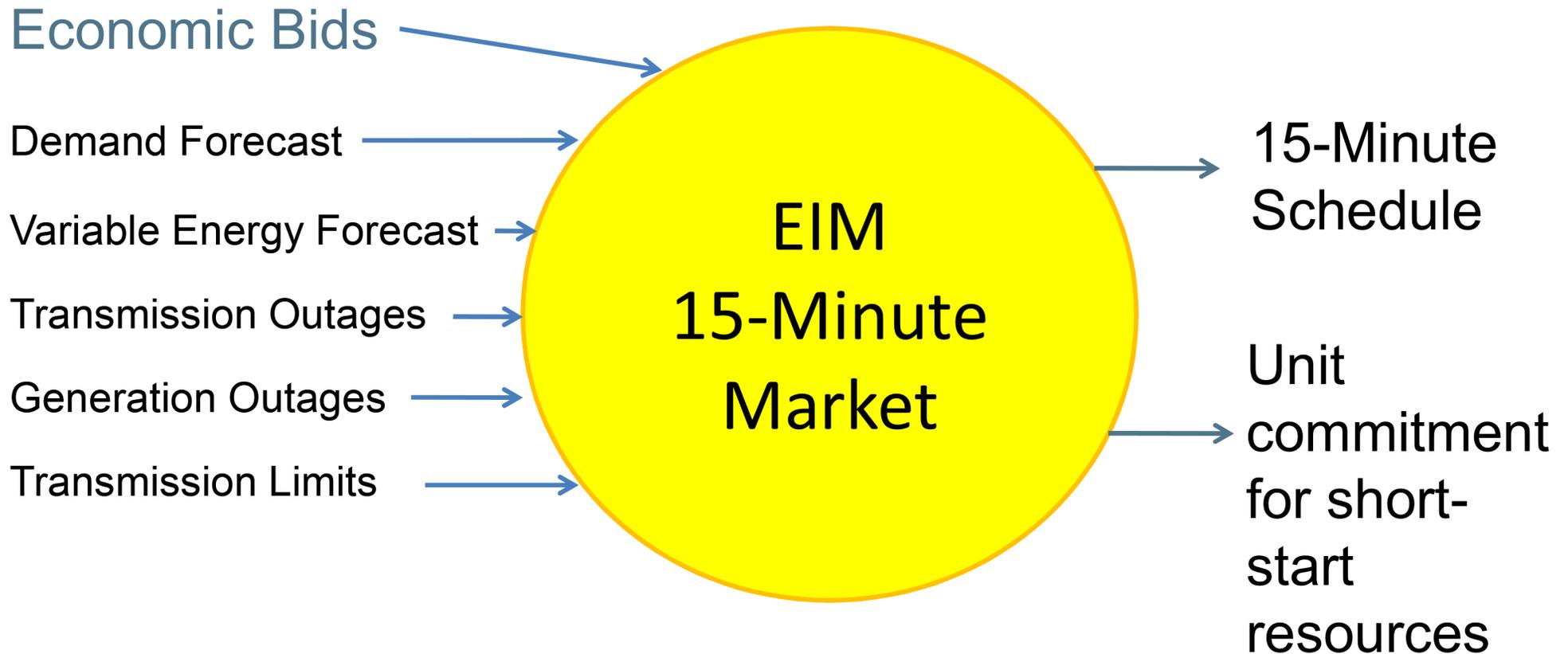
Market Activities



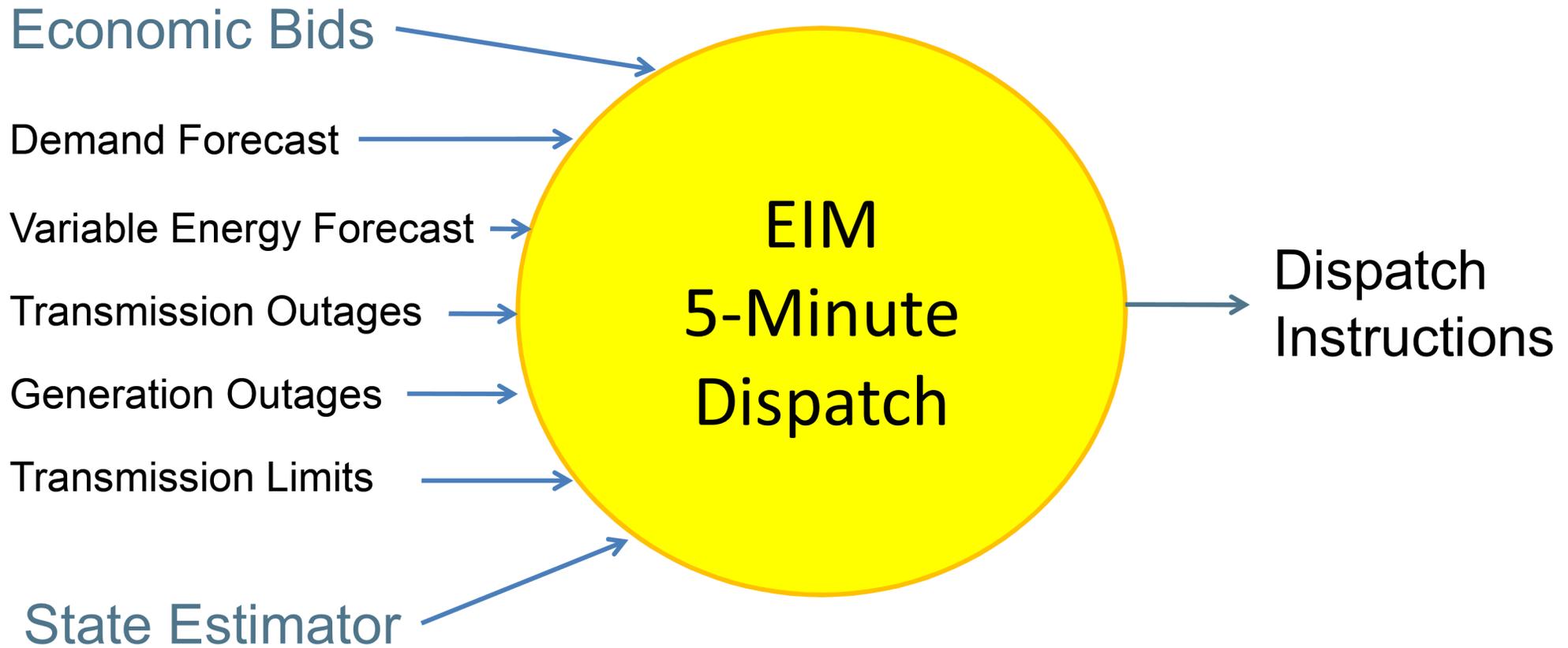
Market Activities



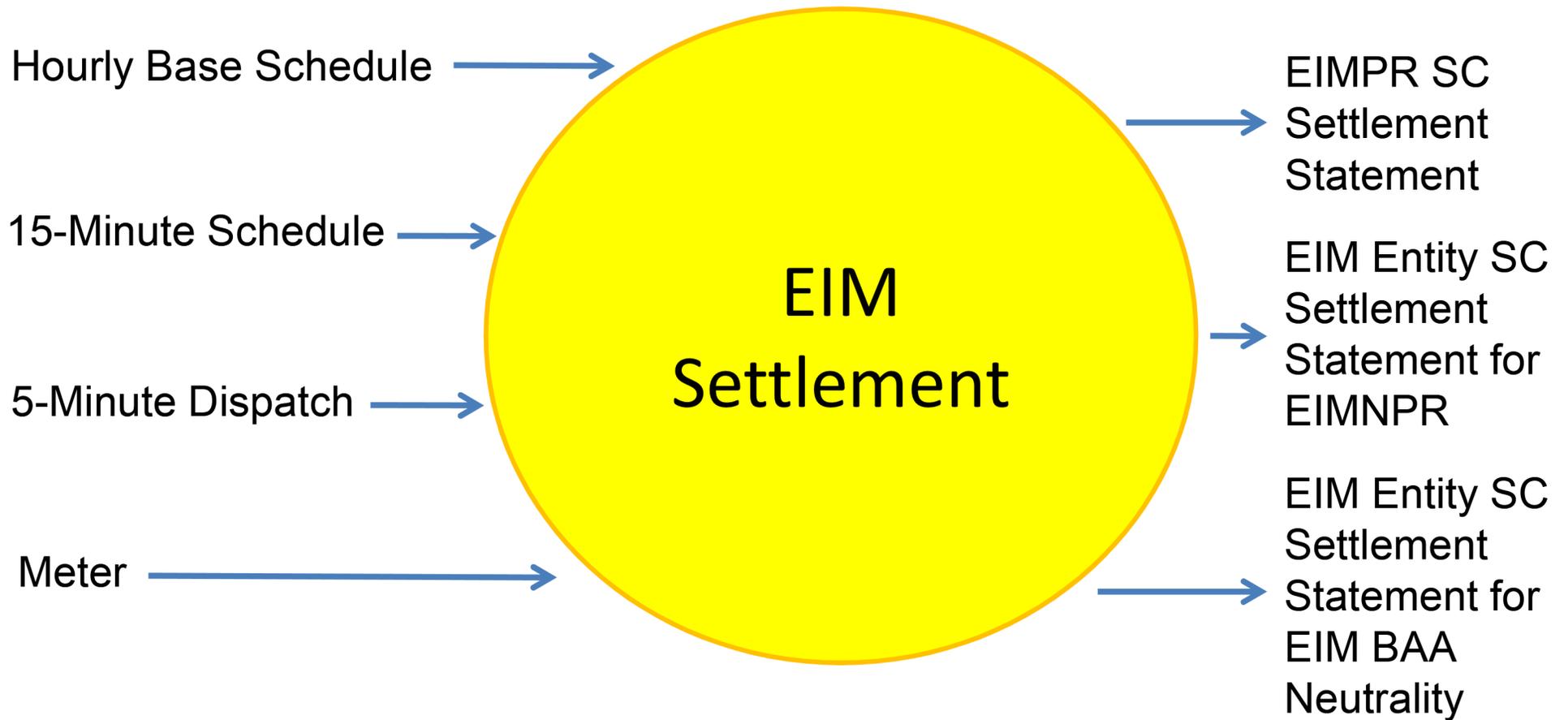
Market Activities



Market Activities



Market Activities



Base Schedules + Bids + Timing



Base Schedule

- Generation and Interchange must equal Load.

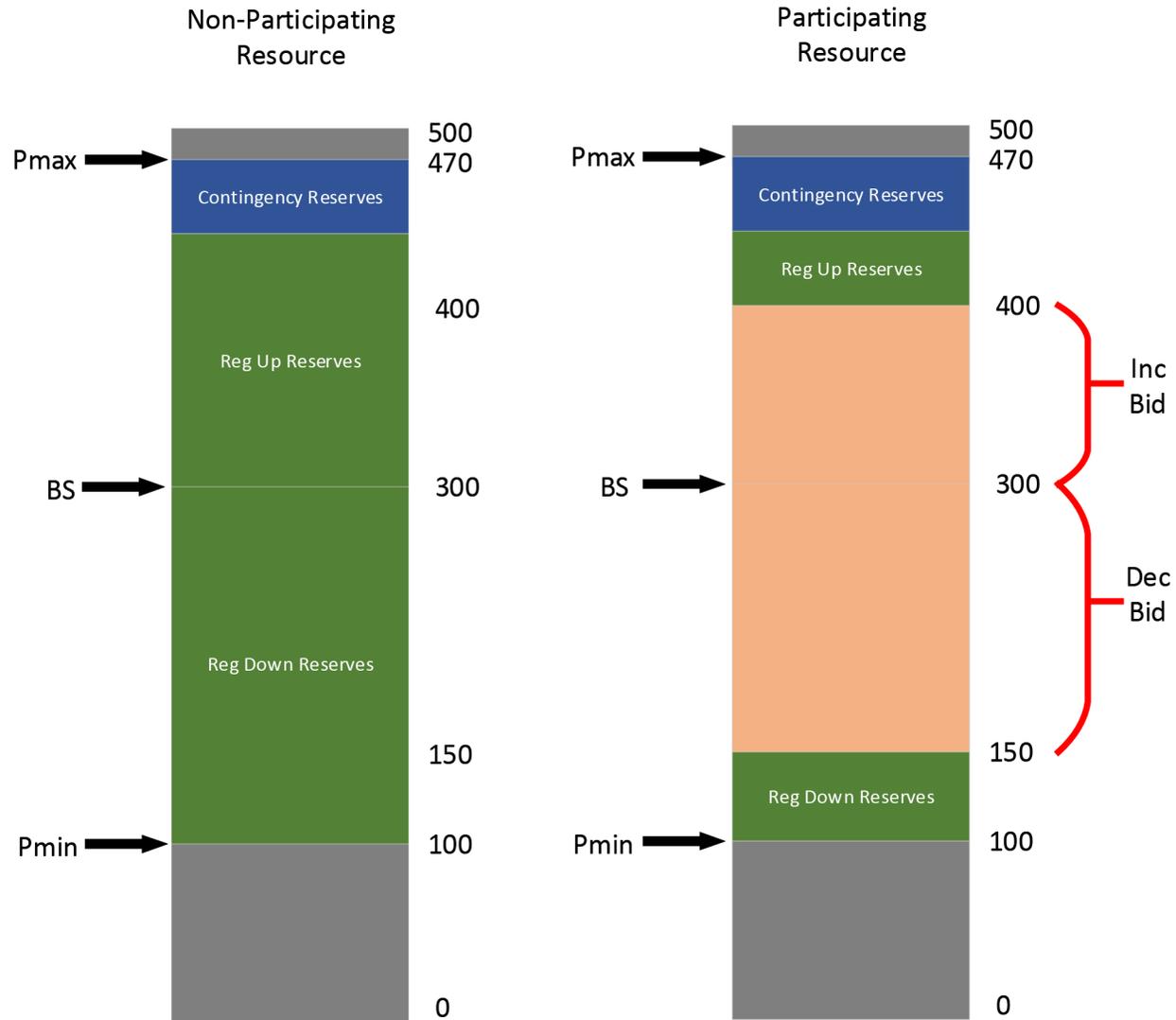
$$G + I = L$$

- Submitted T-75, T-55, and T-40 ahead of the hour.
- Solely used as initial starting points of units and to pass hourly sufficiency tests.

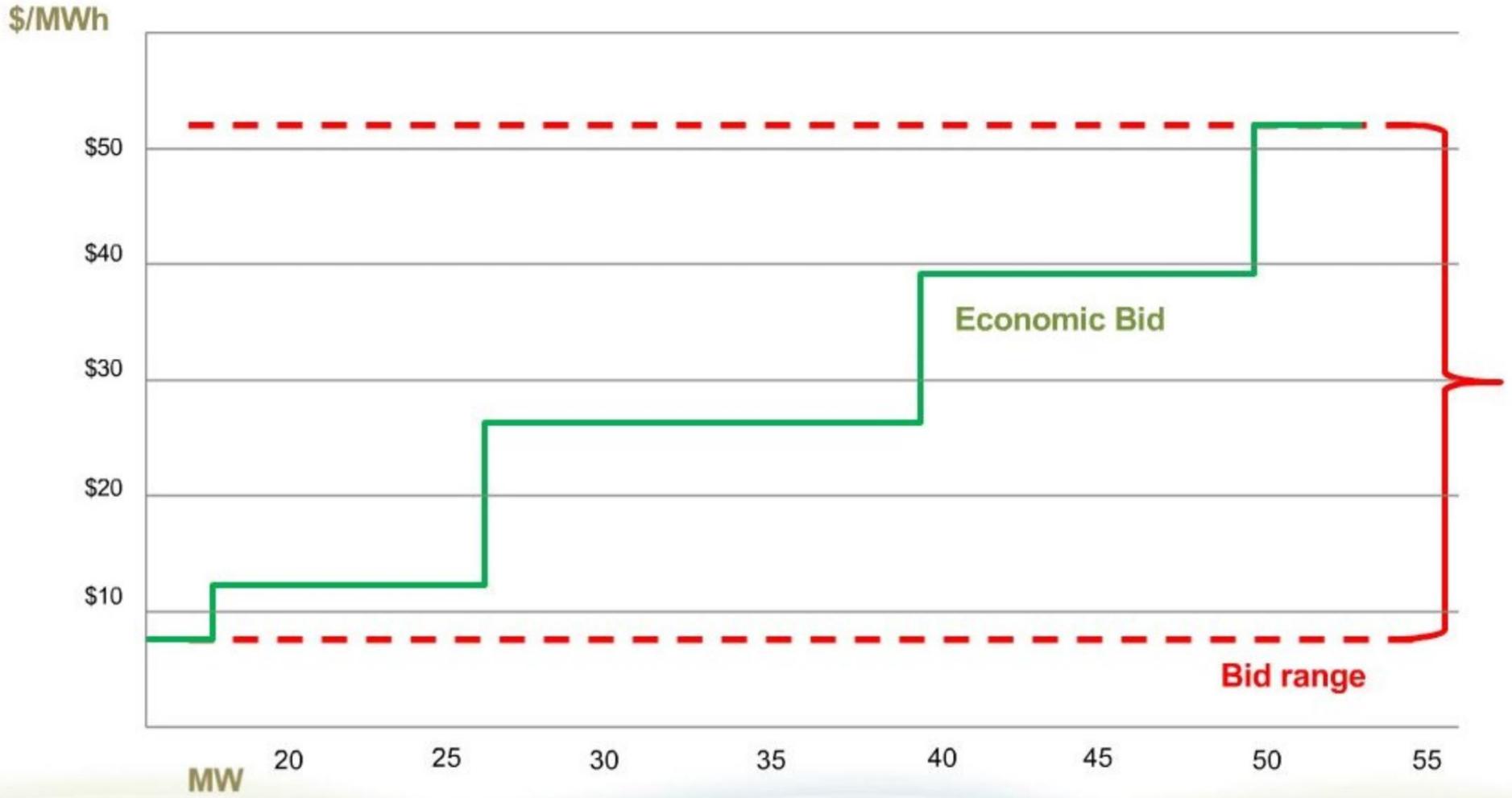


Bids

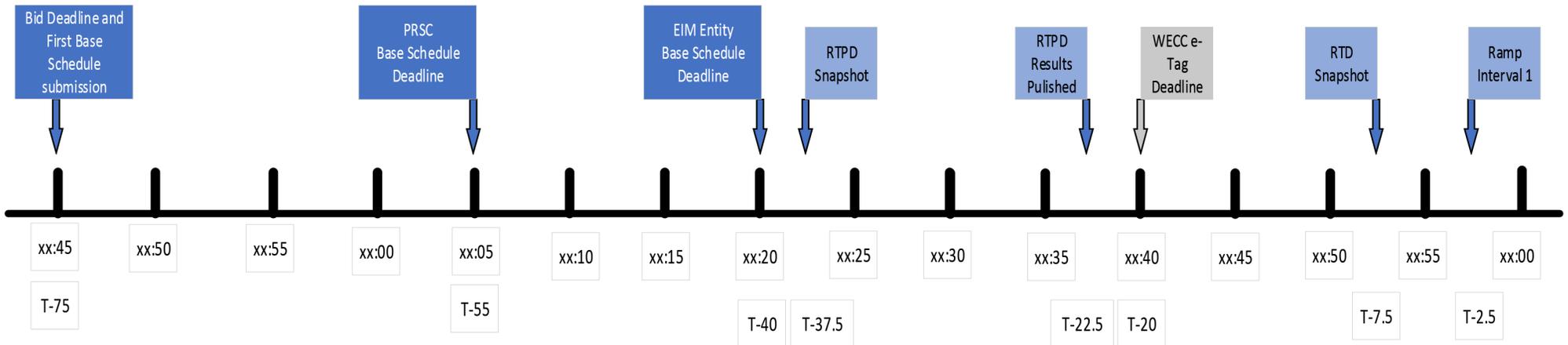
- Non-Participating vs Participating Resources
- Bids submitted by T-75
 - Cannot change bid after T-75
 - Locked for 135 minutes



Bids



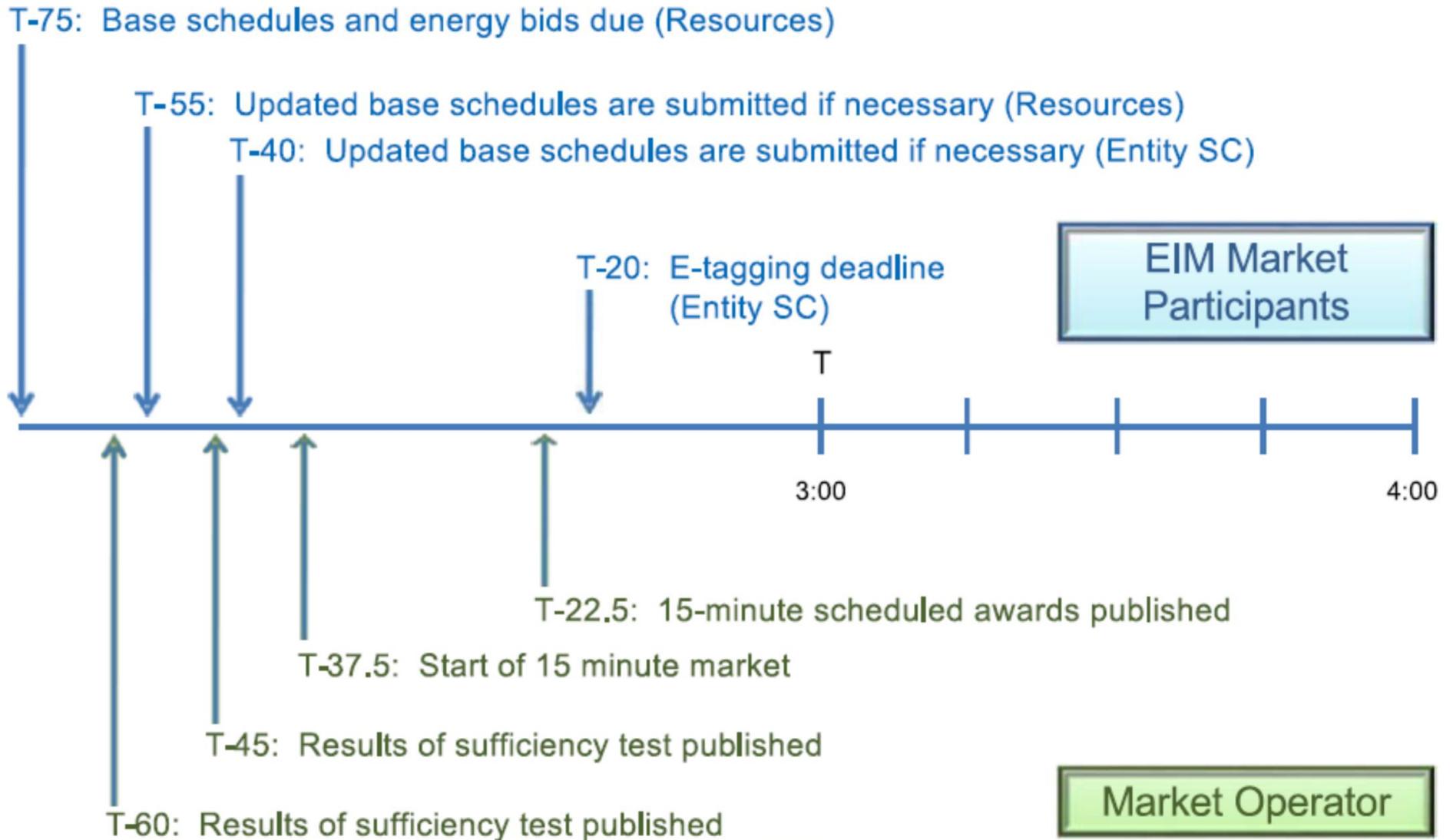
Base Schedule Timing



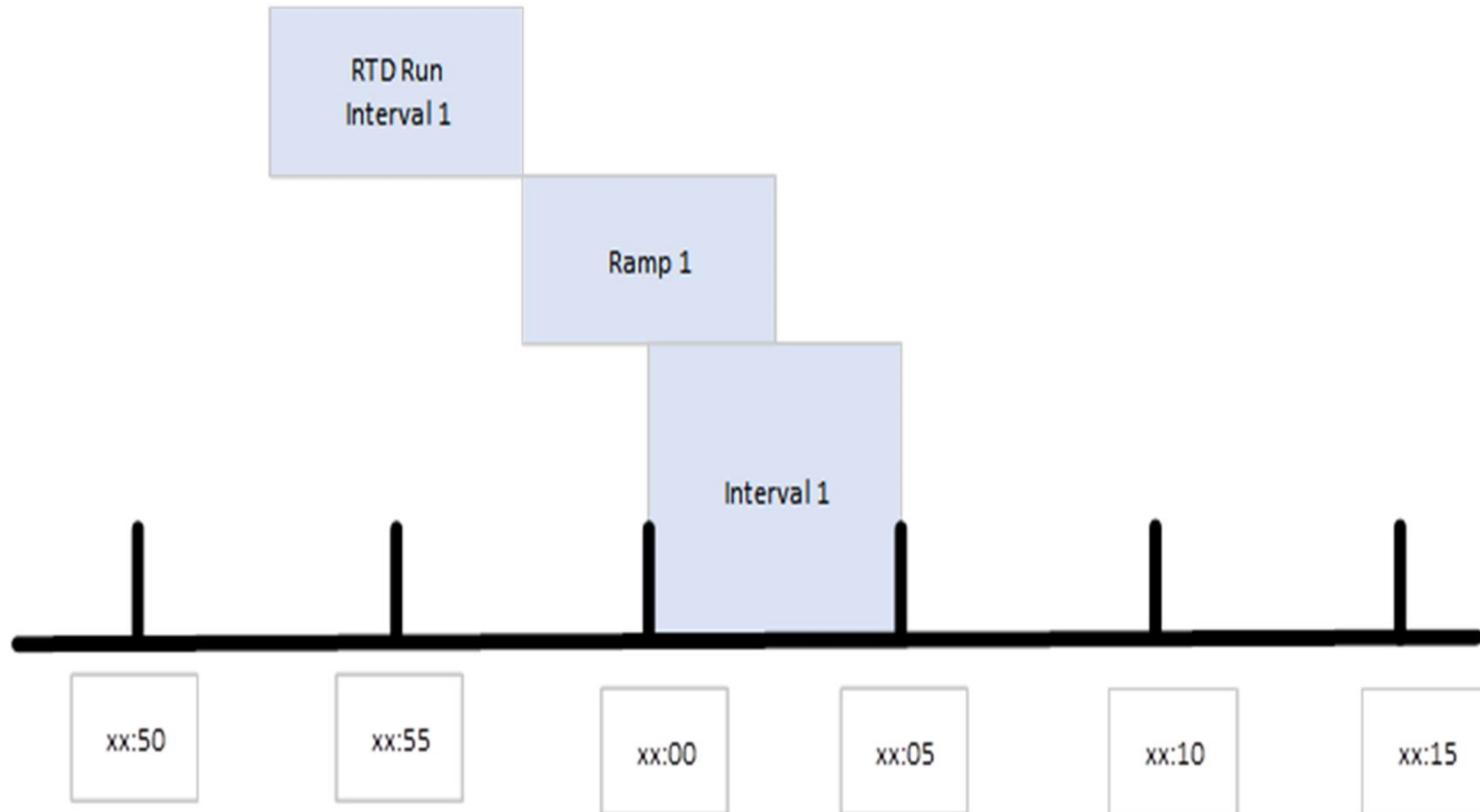
- Bids are locked 75 minutes before the hour
- Participants' Base Schedules deadline is 55 minutes before the hour
- EIM Entity's Base Schedules deadline is 40 minutes before the hour

Used for proof that market is not performing BAL compliance for the Entity BA

Base Schedule Timing

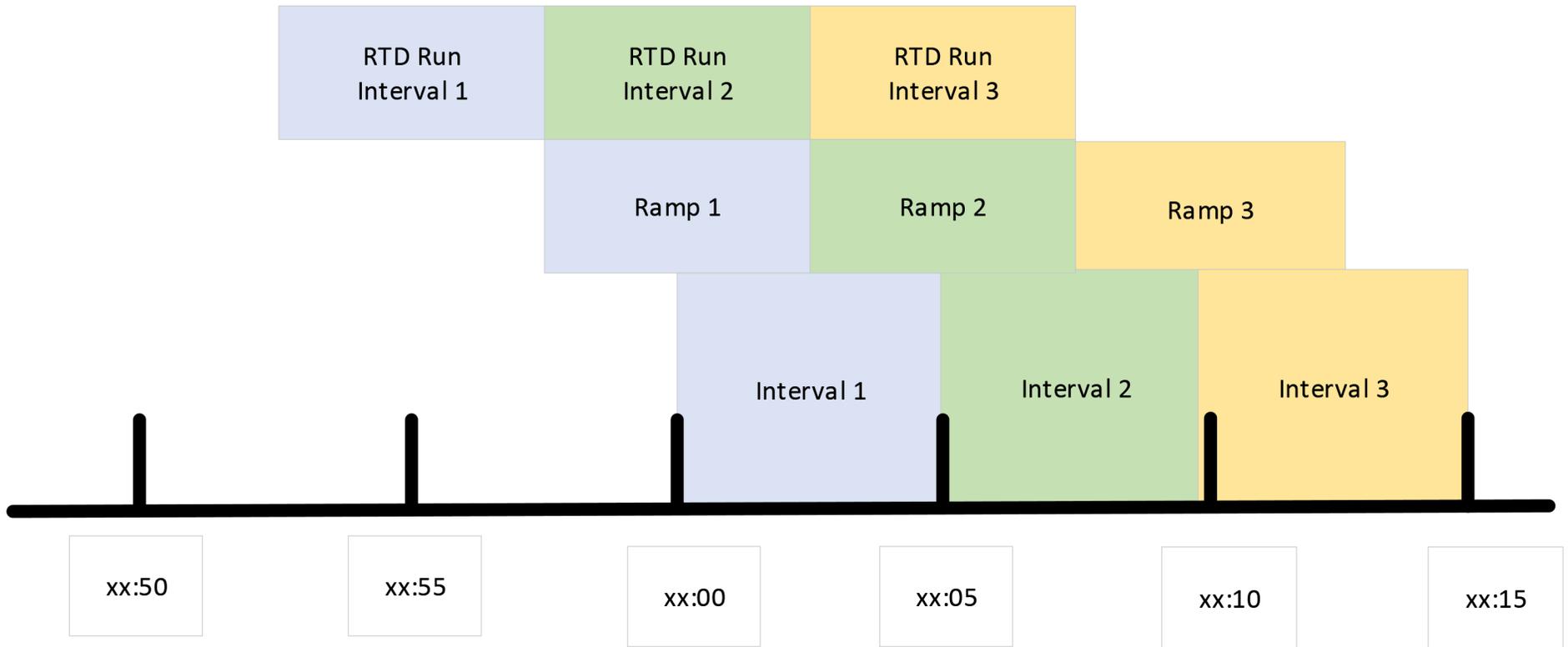


One RTD 5-Minute Run

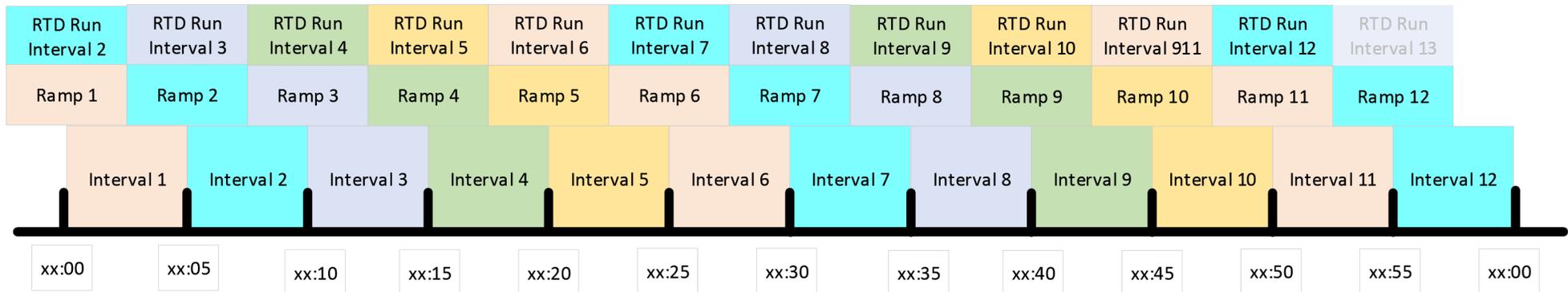
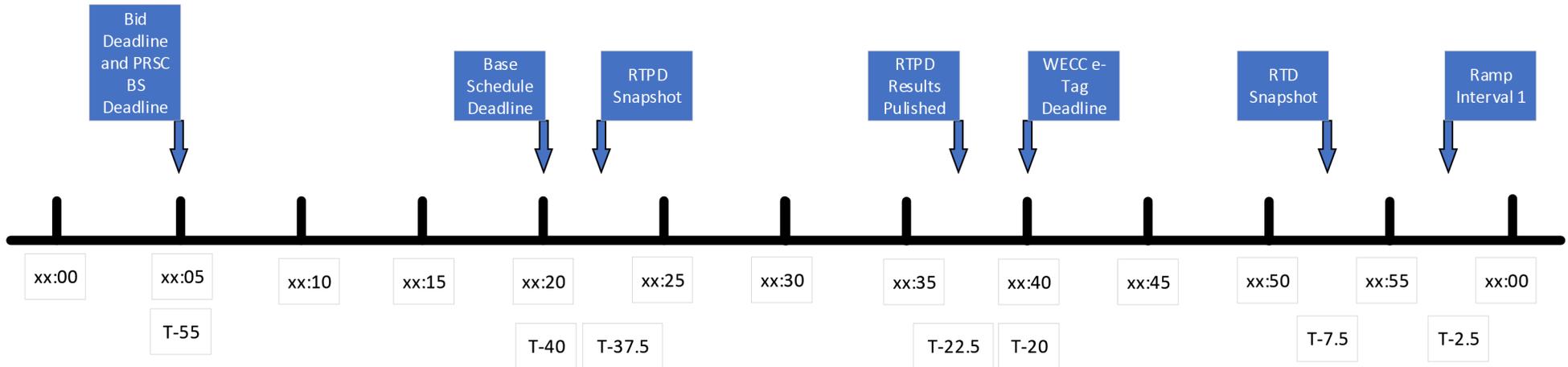


- Market begins calculation 7.5 minutes prior to the 5-minute market interval and publishes results 1-2 minutes prior to ramp
- Solution provides the target for the middle of the interval that resources are expected to ramp to (i.e., Dispatch/Desired Operating Target or DOT)

Continuous RTDs



Within the Hour



Resource Sufficiency



Why Perform Resource Sufficiency Evaluation

- On an hourly basis, the CAISO performs a series of Resource Sufficiency (RS) tests to determine if an EIM Entity is leaning on the EIM for capacity, flexibility or transmission.
- Resource sufficiency helps ensure each EIM Entity can fulfill their own reliability obligations.
- If the EIM Entity passes the RS evaluation, it will have access to other EIM resources to meet its load and uncertainty for the next operating hour.
- If the EIM Entity fails the RS evaluation for the next operating hour, then incremental EIM transfers during the hour will not be allowed in the direction of the failure.
 - The EIM Market will still optimize resources/bids within the EIM Entity's area.

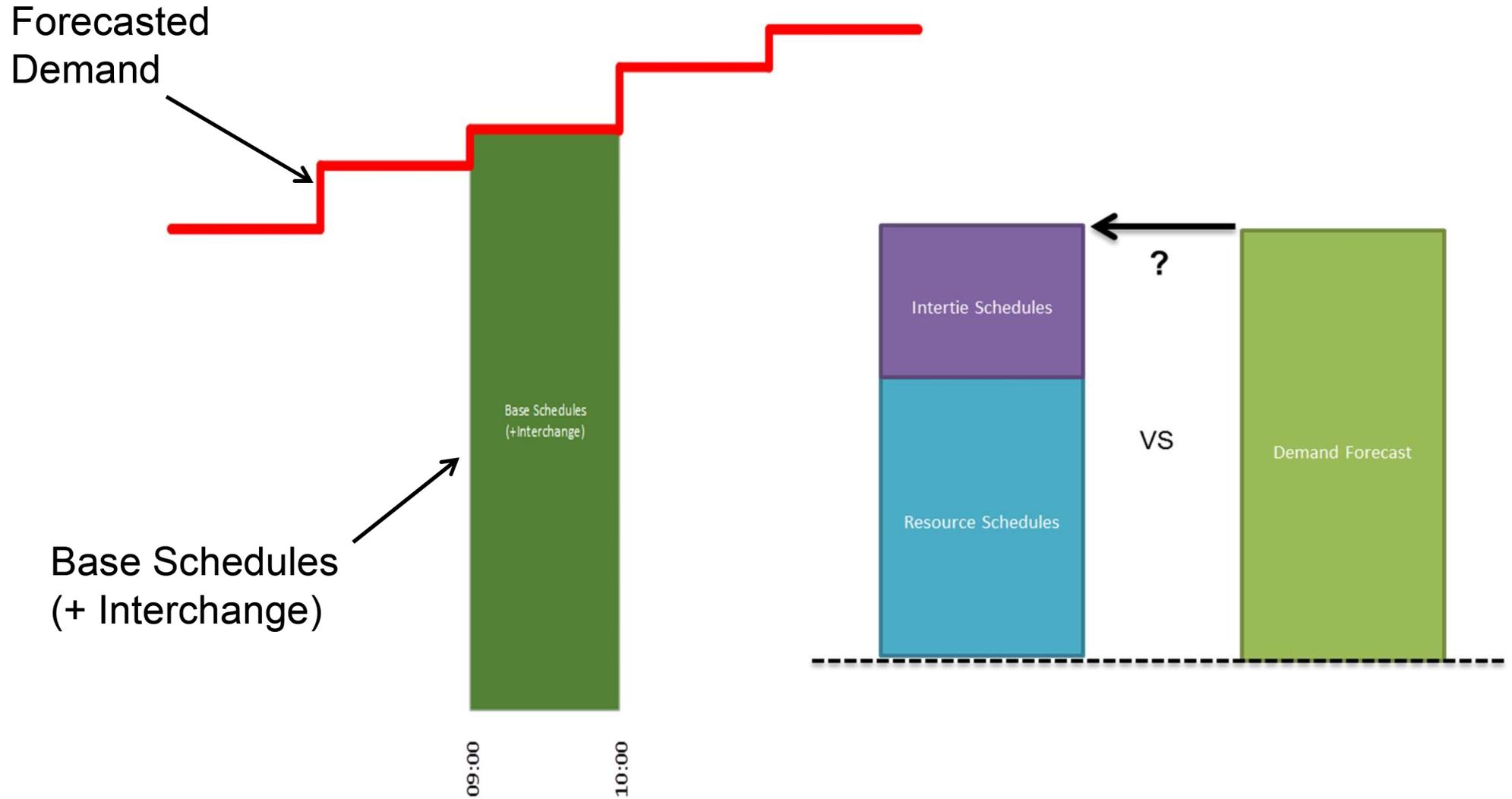
Resource Sufficiency Tests

- Performed for each EIM BAA and the CAISO
 - After $T-75'$ / $T-55'$ / $T-40'$ for the Trading Hour starting at T
- Consist of the following four tests:
 1. Balancing Test
 2. Bid Capacity Test
 3. Flexible Ramping Sufficiency Test
 4. Feasibility Test (*also performed in Day Ahead Market*)

Balancing Test

- Ensures that each EIM Entity is balanced prior to the operating hour
- Compares BAA base schedules (Generation Base Schedules plus Interchange Base Schedules) with hourly demand forecast
- If EIM Entity elects ISO demand forecast option:
 - Pass: BAA imbalance within 1%
 - Fail: BAA imbalance greater than 1%
 - Over-scheduling/under-scheduling penalty applies if actual demands delta is above 5%
- If EIM Entity elects own demand forecast option:
 - Success (always)
 - Over-scheduling/under-scheduling penalty always applies

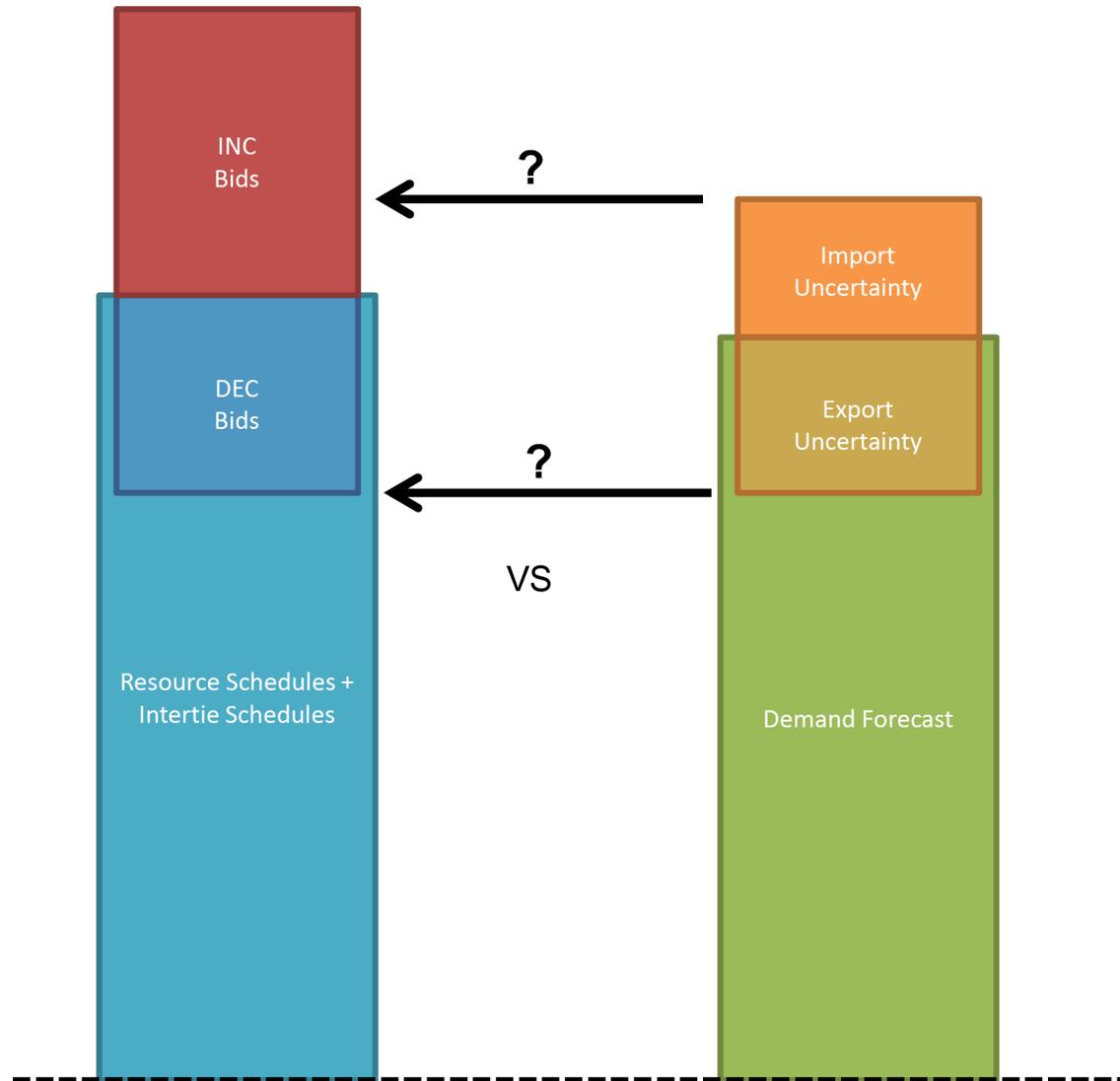
Balancing Test



Bid Capacity Test

- Comparison of aggregate INC/DEC energy bid range from Participating Resources within the BAA on top of Base Schedules versus the demand forecast plus historical inter-tie deviations
 - Pass: sufficient bid capacity
 - Fail: insufficient bid capacity
 - Automatically fails Flexible Ramp Sufficiency test
 - Limited EIM transfers in direction of failure

Bid Capacity Test



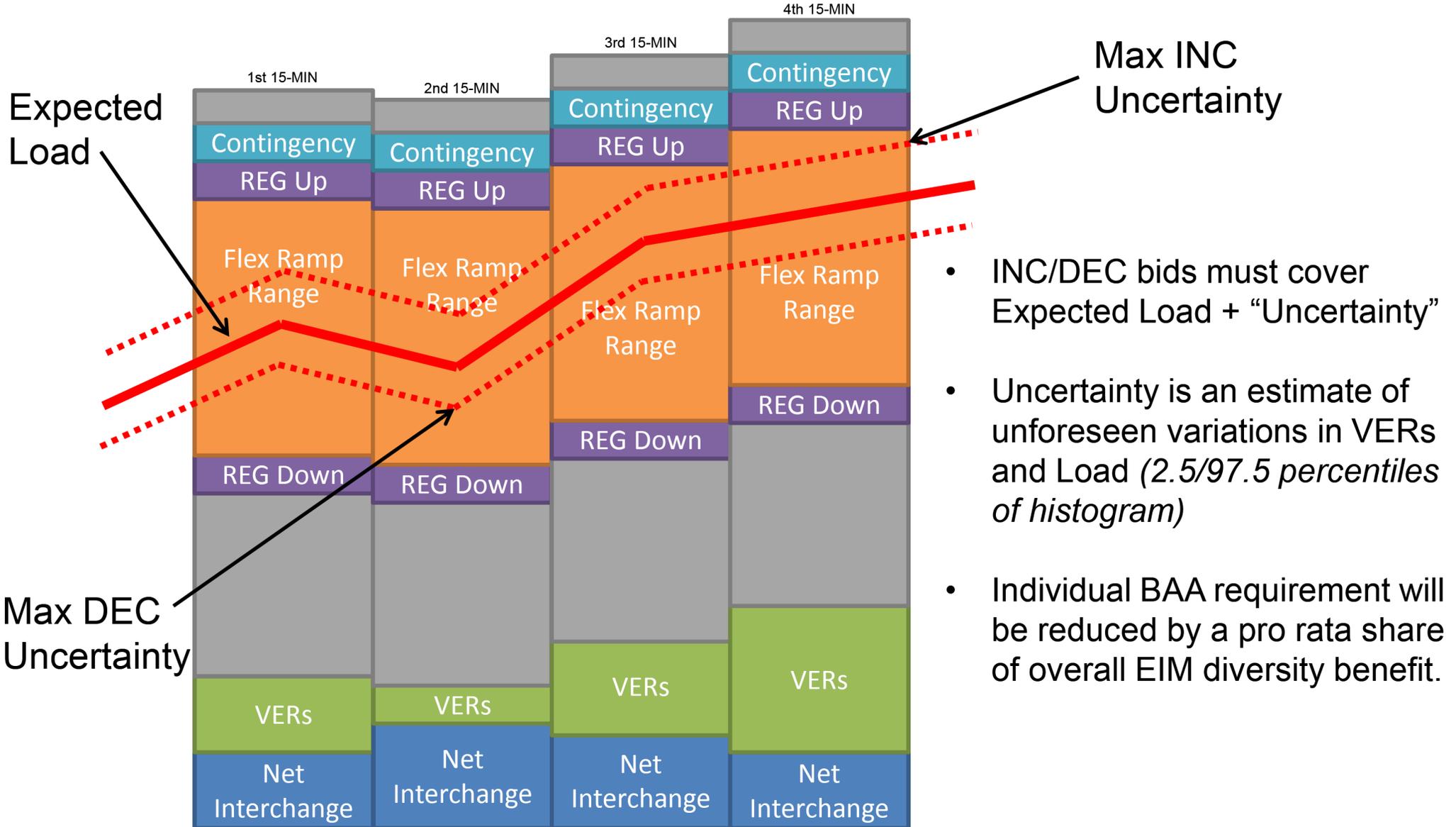
Flexible Ramping Sufficiency Test

- Ensures that each balancing area has enough ramping resources across each hour to meet expected upward and downward ramping needs
- INC and DEC ramping capability are considered separately
- Each 15' interval tested separately
- Formulated for all BAAs in the EIM Area individually and for the entire EIM Area
 - Pass: resource ramp capabilities are above the requirements
 - Requirement is reduced by diversity benefit, limited to the available net import/export capability
 - Fail: resource ramp capabilities are below the requirements
 - EIM Transfer is limited to the net import/export level from the last 15-min schedule before the hour (at $T-7.5'$)
 - Possible to fail in only one direction (INC or DEC), limiting market actions only in that direction.

Flexible Ramping Sufficiency Test

- Data used:
 - Initial Participating Resource operating points used as the last FMM for the prior hour (at $T-7.5'$)
 - Advisory solutions from FMM at $T-75'$ and $T-55'$ are used
 - Binding solution from FMM at $T-40'$
 - Participating Resources energy bids and ramp rates
 - VER and Demand Forecasts at 15' intervals
 - 15' Flexible Ramp Uncertainty up/down requirements
 - Historical Load net VER difference from last Advisory 15-min run versus Binding 5-min market runs within that Hour of the Day
 - Reduced by a prorated EIM diversity benefit
 - Reduced by any credit for net outgoing/incoming EIM transfer at $T-7.5'$
 - Reductions limited by the available net import/export capability

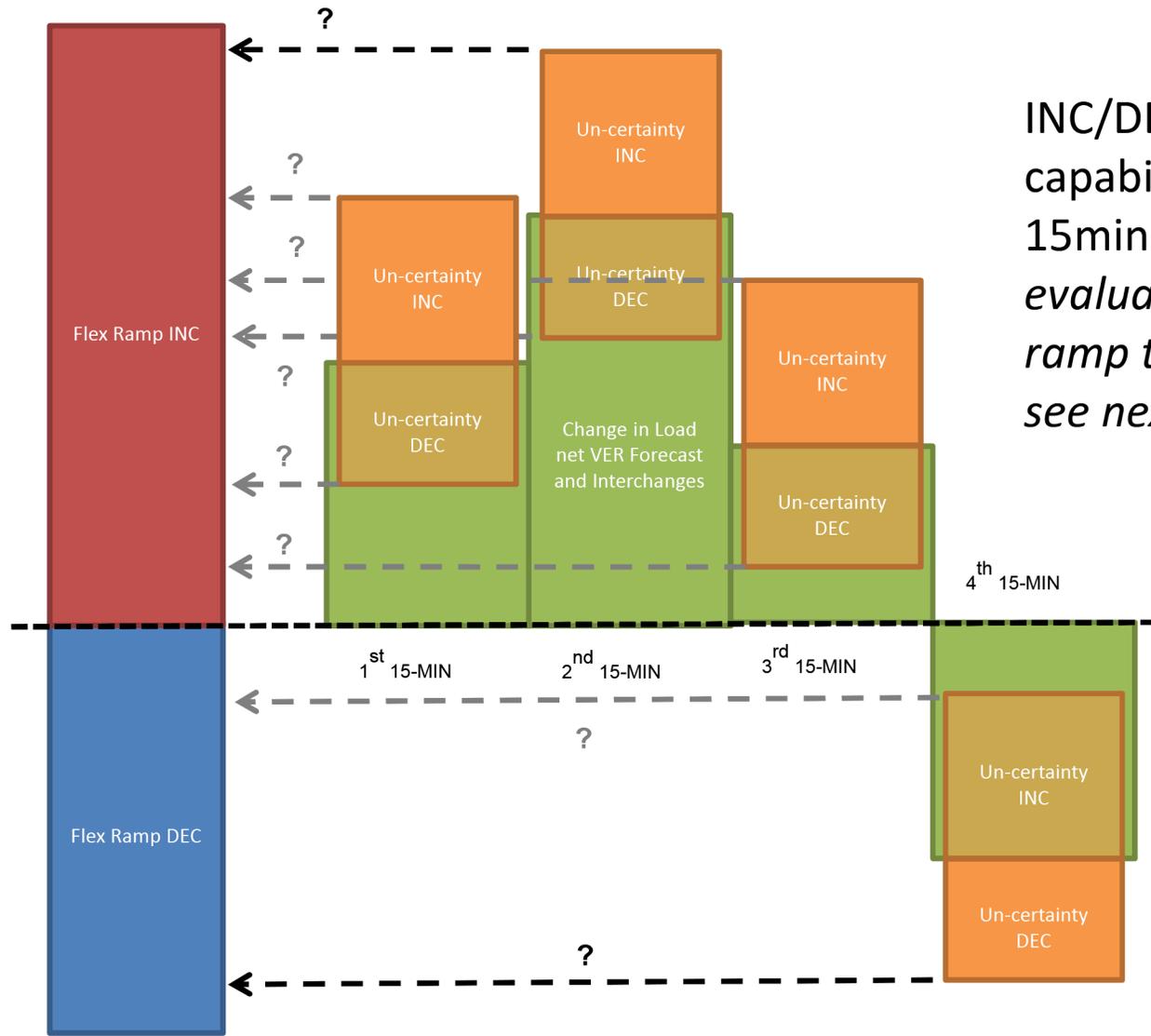
Flexible Ramping Sufficiency Test



- INC/DEC bids must cover Expected Load + “Uncertainty”
- Uncertainty is an estimate of unforeseen variations in VERs and Load (2.5/97.5 percentiles of histogram)
- Individual BAA requirement will be reduced by a pro rata share of overall EIM diversity benefit.

<https://www.caiso.com/Documents/BusinessRequirementsSpecification-FlexibleRampingProduct.pdf>

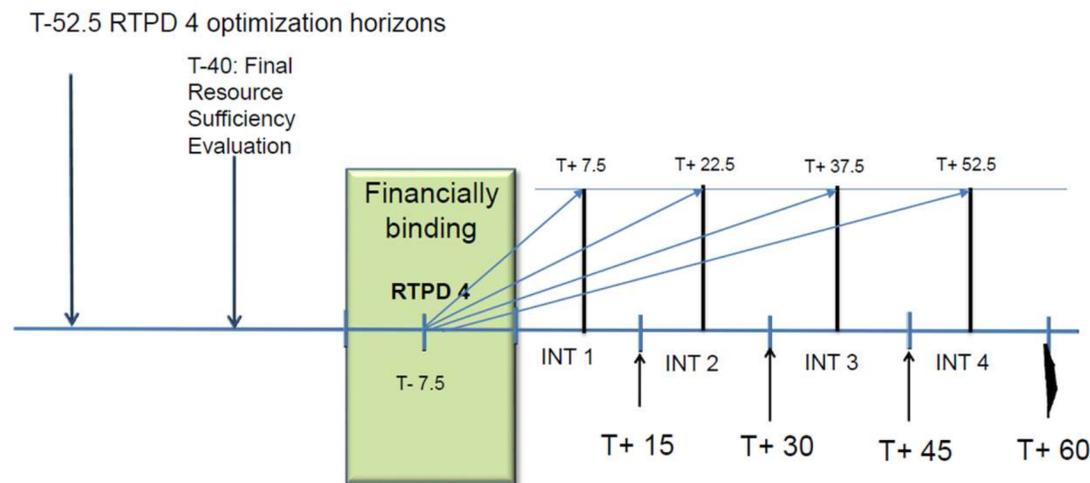
Flexible Ramping Sufficiency Test



INC/DEC flexible ramping capability is the same for all 15min intervals (*it is evaluated separately for each ramp to a 15min interval – see next slide*)

Flexible Ramping Sufficiency Test

- EIM Entity's Participating Resource ramping abilities are subject to a cumulative test for each 15' interval of the hour
 - 15' ramp from $T-7.5'$ to $T+7.5'$ (1st 15' interval)
 - 30' ramp from $T-7.5'$ to $T+22.5'$ (2nd 15' interval)
 - 45' ramp from $T-7.5'$ to $T+37.5'$ (3rd 15' interval)
 - 60' ramp from $T-7.5'$ to $T+52.5'$ (4th 15' interval)



- Test passes if all four cumulative tests pass
- Test fails if any of the four cumulative tests fail

Feasibility Test

- Feasibility test are performed:
 - On the day before the Operating Day using Day Ahead Market (DAM) Base Schedules
 - Prior to each operating hour using the Resource Sufficiency timeline (*T-75'*, *T-55'* and *T-40'*)
 - Uses Base Schedules submitted to the RTM
 - DAM Base Schedules are not used in RTM
 - Pass: no transmission limit violations
 - Fail: transmission limit violations identified
 - Consequences: None – informational only

Available Balancing Capacity

- Reserved capacity up/down on participating and non-participating resources
- Declared as Regulation up/down in base schedules
- Conditionally dispatched by the EIM to avoid a power balance constraint violation within the EIM Entity's BA only when the net EIM Transfer is at its limit
 - Only available to your own BAA
- Does not contribute to Available Flexible Ramping Capacity
- Submitted Energy Bid is used for EIM Participating Resources (EIMPR)
- Default Energy Bid (DEB) is used for EIM Non-Participating Resources (EIMNPR)

Contingency Dispatch

- Contingency in CAISO
 - Suspend RTD; invoke Real-Time Contingency Dispatch(RTCD)
 - Isolate CAISO from the EIM Area
 - Freeze CAISO EIM Transfer at last RTD advisory solution
 - Send previous advisory 5min dispatch for EIMPR
- Contingency in an EIM BAA
 - CAISO does not perform Contingency Dispatch for EIM Entities
 - EIM BAA Operator notifies ISO of contingency status
 - Isolate EIM BAA from the EIM Area
 - Freeze EIM Transfer for EIM BAA at last RTD advisory solution
 - Incorporate Manual Dispatch instructions in RTD

EIM Settlements



What are EIM Settlements?

- Processes related to, and resulting in, the invoicing of charges and credits for participation in the EIM.
 - Pre-Settlements & Market Operations Feedback
 - Settlements-Related Data Submission and Collection
 - Shadow Settlements (validation)
 - Invoicing of EIM Charges/Credit to EESC and PRSC
 - Payment and Receipt of Funds for EIM Charges and Credits
 - Settlements-Related Dispute Management

EIM Settlements Basics

For Transmission Customers transacting within an EIM BAA, the financially binding base schedule, typically at T-57, forms the basis for settlement of imbalance energy charges:

- **Load:** difference between scheduled demand and metered demand is settled at the load aggregation point (LAP) price for period of deviation.
- **Non-participating generators:** difference between base schedule and metered generation is settled at Locational Marginal Price (LMP) for applicable pNode
- **Participating Resources:** settle directly with CAISO at their LMP for awards and deviations from their operating targets
- **Interchange:** The difference between e-Tag, typically at T-57, and any subsequent tag changes before/during hour are settled as instructed imbalance energy (IIE)
 - Auto-matching is a feature that can be used by EIM Entities to self-balance non-dynamic schedule deviations tag changes after T-40 with non-EIM BAAs

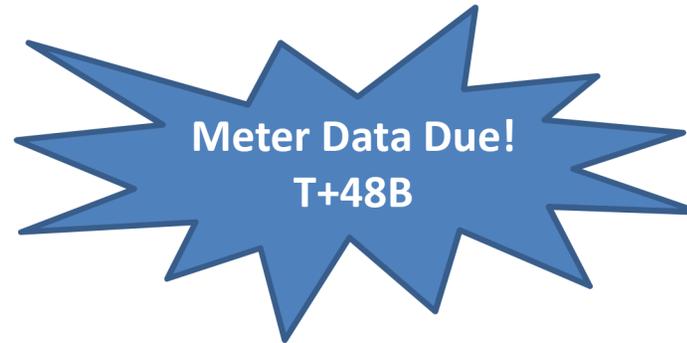
EIM Settlement Basics

- CAISO settles on about 60 billing determinants
 - 26 with the Participating Resource Scheduling Coordinator (PRSC)
 - 34 with the EIM Entity Scheduling Coordinator (EESC)
- Approximately 70-80% of the EIM settlement dollars reside in 3 charge codes (CC)
 - Instructed Imbalance (PRs & NPRs)
 - Difference between Base Schedules and 15-min Market Schedule (FMM IIE)
 - CC 64600
 - Between 15-min Market Schedules (FMM) and 5-min Real Time Market Dispatch (RTD IIE)
 - CC 64700
 - Uninstructed Imbalance (PRs, NPRs, and Loads)
 - Difference between hourly meter and base schedule for EIM non-participating load; between meter and expected energy (i.e., RTD DOT) for other EIM resources (RTD UIE)
 - CC 64750

Charge Code Matrix: <http://www.caiso.com/Documents/ISOMarketChargeCodesMatrix.xls>

EIM Settlements Basics

- Settlement statements are posted daily by CAISO for at least 3, and up to 7, versions
 - Trade Day + 3 Business Days (T+3B)
 - T+12B
 - T+55B ←
 - T+9M (Months)
 - T+18M
 - T+33M
 - T+36M
- Settlement statements are included on the Invoice following the statement posting date
- CAISO has a formal dispute process whenever there are questions or discrepancies with the settlement statements or invoices



Other Settlement Categories

- **Under / Over Scheduling Load:** assigned to EIM entity
 - Could be charges or payments
 - Typically allocated by EIM Entity
 - Not charged if using CAISO load forecast
- **EIM Uplifts:** Typically allocated by EIM entities to load on basis of measured demand (metered demand plus interchange exports)
 - Market neutrality
 - Congestion offset
 - Marginal losses offset
 - Neutrality Adjustments
 - Bid Cost Recovery

Questions?



Upcoming EIM Stakeholder Meetings

- Oct. 11, 2018, 9 a.m.-12 noon, BPA Rates Hearing Room and by WebEx
- Nov. 20, 2018, time TBD, BPA Rates Hearing Room and by WebEx
- For more information please visit www.bpa.gov/goto/EIM

Thank You

- We welcome feedback on the workshop
- please send any to techforum@bpa.gov and reference “EIM 101 Workshop” in the subject

Appendix



On-line Resources

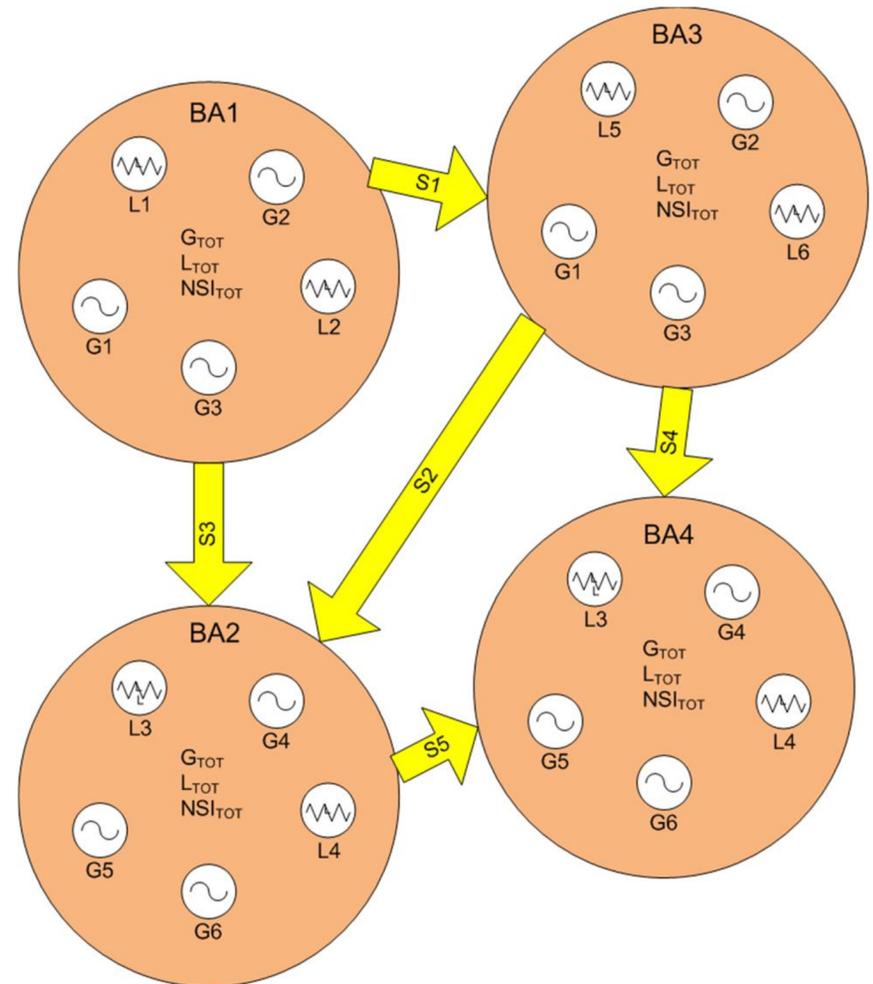
- [Western EIM Website](#)
- [Western EIM online training](#)
 - [Introduction to EIM \(CBT\)](#)
 - [How EIM Works \(CBT\)](#)
 - [Base Scheduling \(CBT\)](#)
 - [Metering \(CBT\)](#)
 - [Settlements \(CBT\)](#)
- [EIM Resource Sufficiency](#)
- [EIM Business Practice Manual](#)

With & Without an EIM



Without an EIM

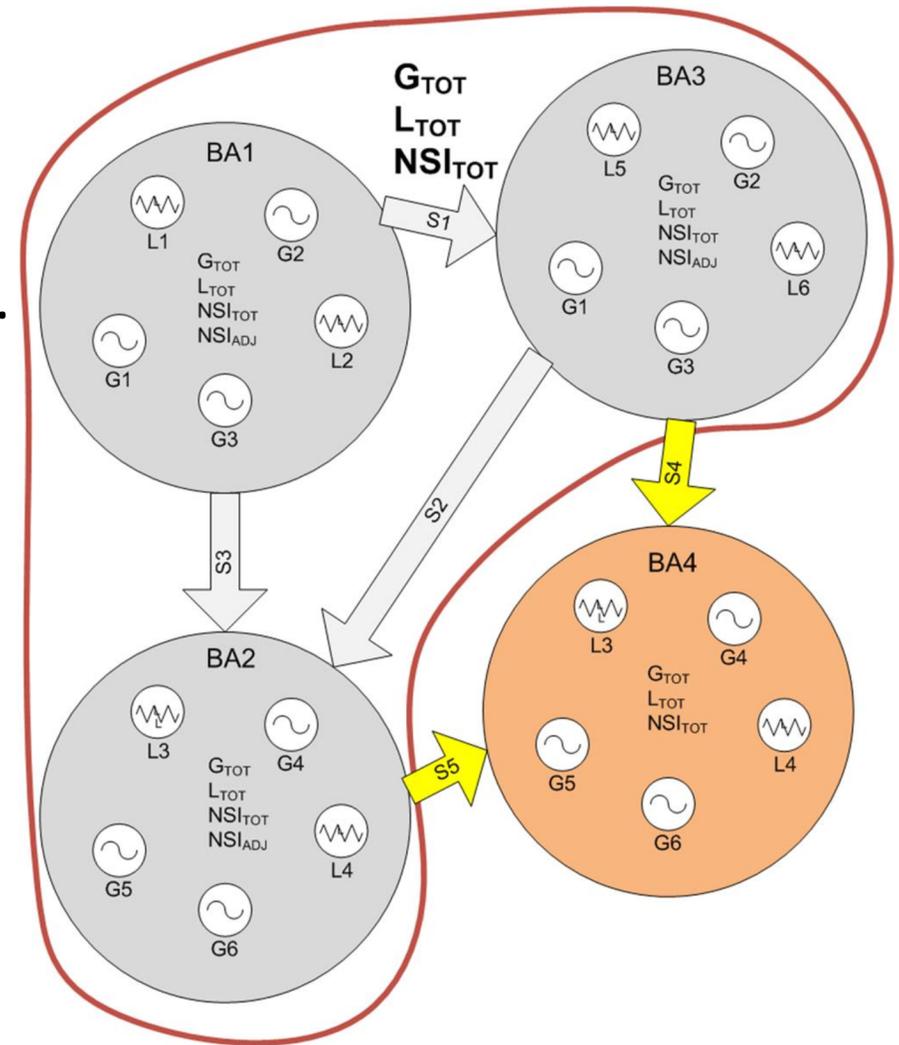
- Outside of emergency situations, each BA must balance their own area and cannot use resources and load in another area to balance or manage congestion unless pre-arranged bi-laterally ahead of time.
- *Example:* BA1 must serve its internal load (L1+L2) and scheduled export obligation (S1+S2)



BA = Balancing Authority
 L = Load
 G = Generator
 NSI = Net Scheduled Interchange
 S = Schedule

With an EIM

- The EIM economically and securely redispatches participating resources every 5 minutes across the entire market footprint (BA1+BA2+BA3) sufficient to serve the total market load and net market exports ($S4+S5$).
- Net Scheduled Interchange (NSI) for each Balancing Authority is dynamically adjusted to account for dispatches from the EIM and the resulting EIM Transfers.
- The dispatch of participating resources honors transmission limits and EIM energy transfers between BAAs are constrained to the amount of transmission made available to the market via dynamic schedules



What are Locational Marginal Prices?



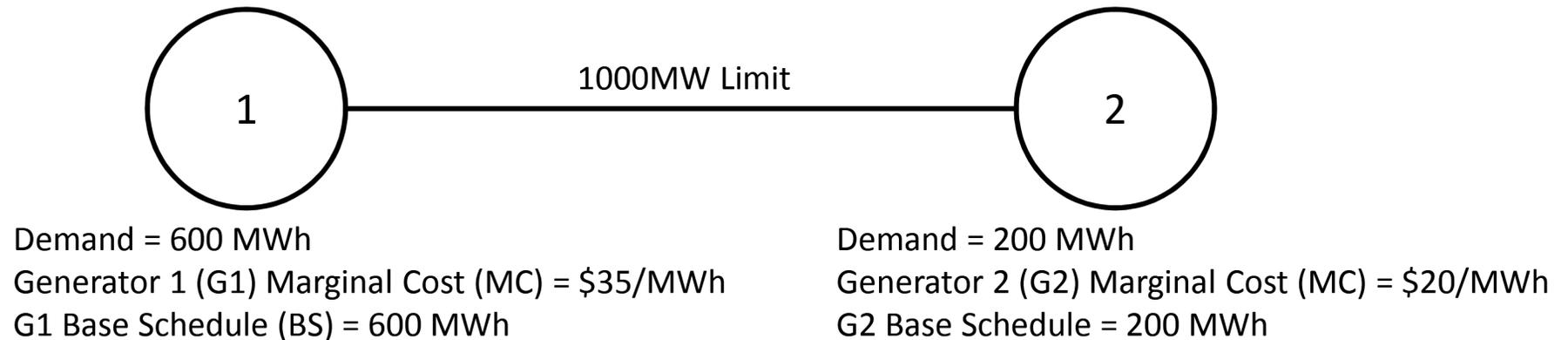
LMP

- Locational Marginal Pricing (LMP) are the result of the EIM optimization and represent the marginal cost of providing the next increment of energy demand (i.e., cost to serve the next MW of load) at thousands of pricing points, or pNodes, within the EIM Area.
- LMPs provide price signals that account for the additional costs of electricity caused by 1) congestion and 2) line loss at various points on the electricity grid and 3) Green House Gas (GHG) compliance for serving California load.
- LMPs allow the EIM to efficiently determine the interaction of energy supply and energy demand

LMPs & GHG

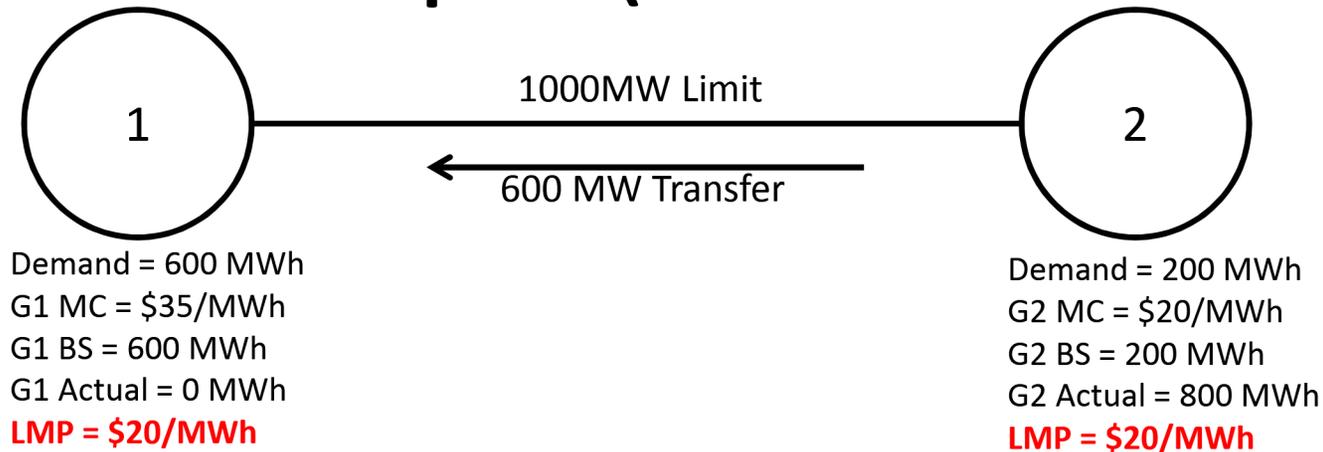
- GHG compliance cost component of the LMP is the rate the market uses to calculate a payment to each generator in an EIM BAA for its output that is determined to serve ISO imbalances. This payment is funded through the price paid within the ISO for imbalance energy embedded in the system marginal cost of energy.
- For resources in an EIM entity's BAA, there are no GHG compliance costs when the resources serve load outside of the ISO. The EIM design allows EIM participating resources to submit two bids: (1) an energy bid and (2) a GHG bid adder.
- To avoid charging EIM entities for GHG compliance outside of California, the LMP of nodes in the EIM footprint outside of the ISO balancing authority area will include a negative GHG component if there is an EIM transfer into the ISO; otherwise, the value is zero.

LMP Example



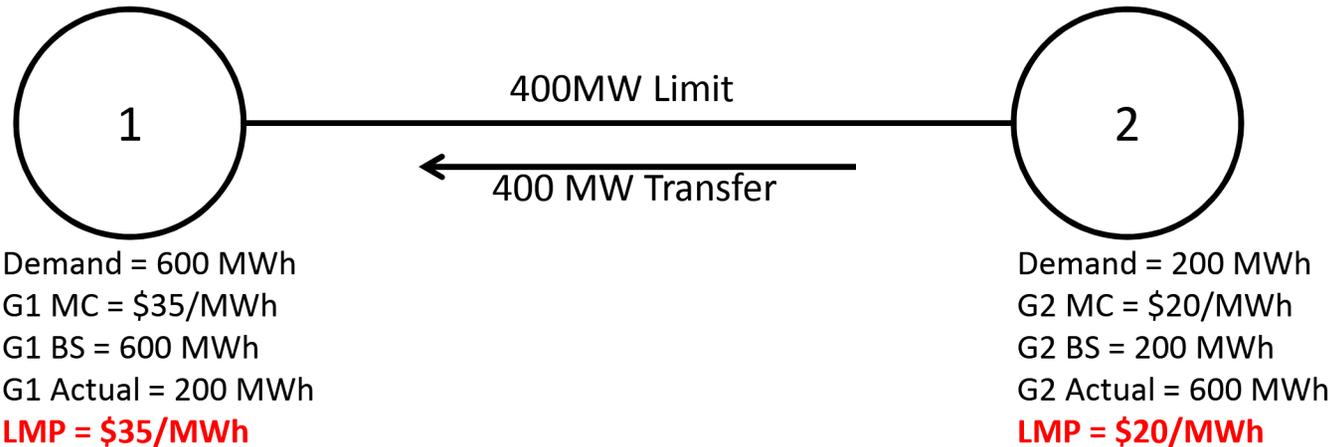
- The marginal cost of energy in zone 1 is higher (\$35) than in zone 2 (\$20).
- Demand is higher in zone 1 (600 MWh) than in zone 2 (200 MWh)
- There is a transmission line between the two zones & we are ignoring losses
- Assume each generator is serving their local demand
- Assume each generator, G1 and G2, has sufficient capacity to serve the total demand (800 MWh)

LMP Example (unconstrained)



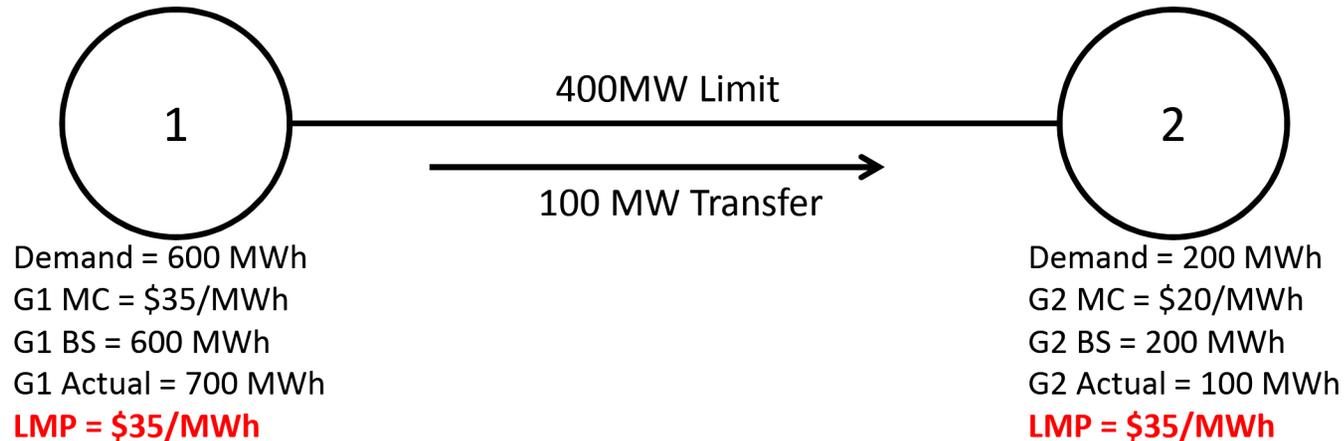
- If the transfer of energy between the two zones is unconstrained
 - G2 would serve the local 200 MWh of demand and the 600 MWh of demand in zone 1
 - There would be a transfer of 600 MWh from zone 2 to zone 1
- The LMP (i.e., cost to serve the next increment of demand) at both zone 1 and zone 2 would be \$20/MWh
- G1 would pay \$20/MWh for the replacement energy from G2, saving \$15/MWh
- G2 would be paid \$20/MWh for the additional 600 MWh of energy produced to serve zone 1's demand

LMP Example (constrained)



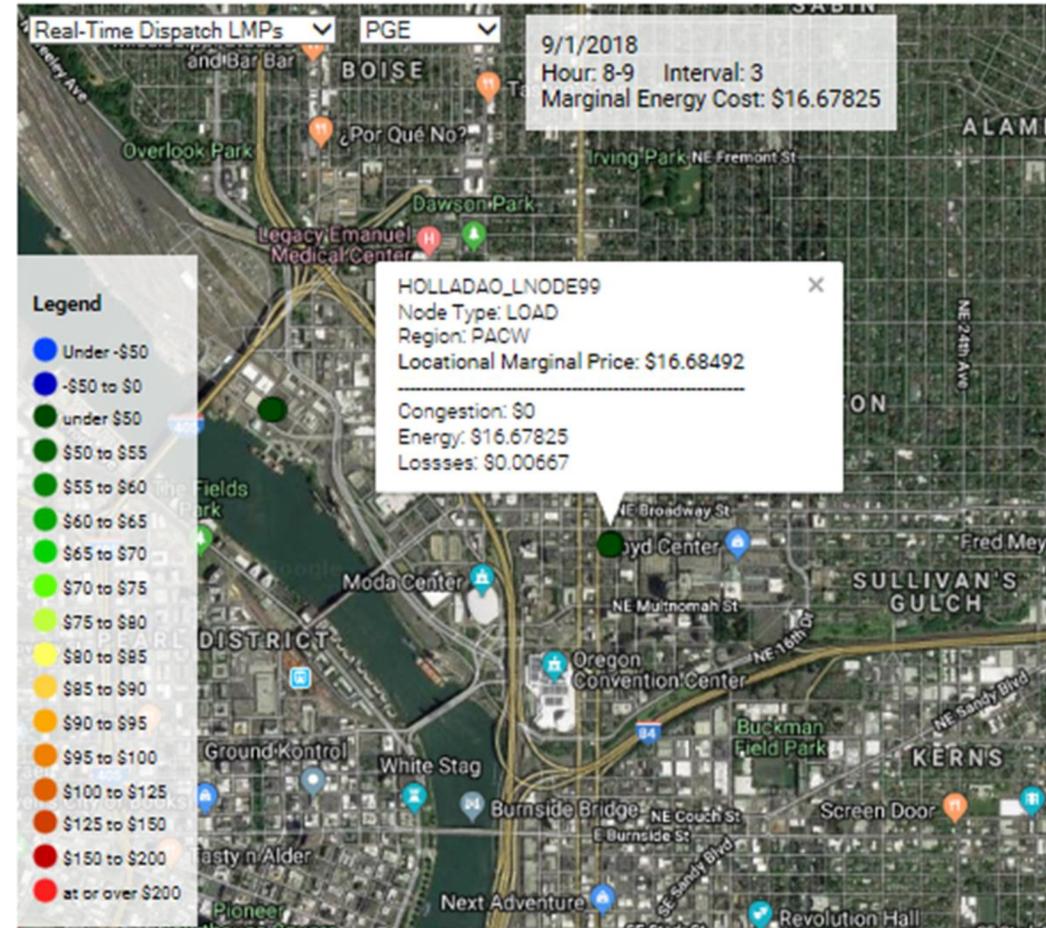
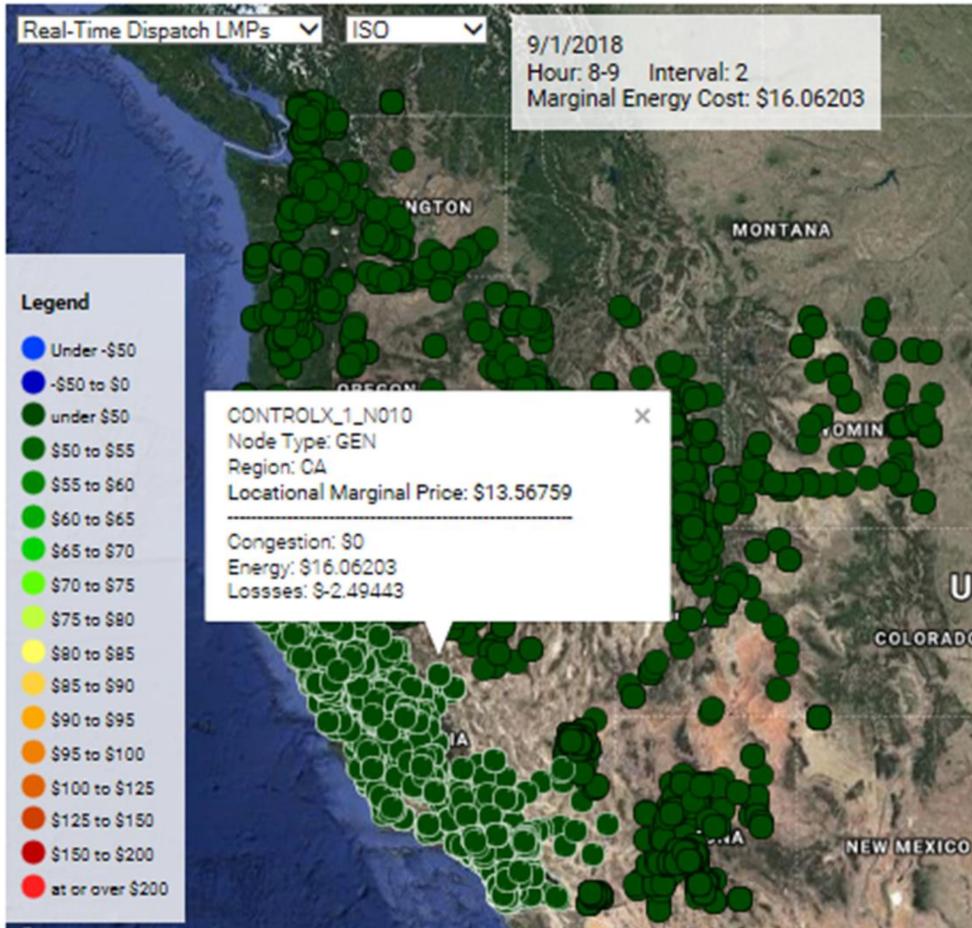
- If the transfer of energy between the two zones was limited to 400 MW
 - G2 would serve the local 200 MWh of demand, but could only transfer 400 MWh to zone 1 due to the constraint
 - G1 would have to service the remaining 200 MWh of demand in zone 1
 - The marginal cost of energy (LMP) in zone 2 would be \$20/MWh
 - The marginal cost of energy (LMP) in zone 1 would be \$35/MWh
- G1 would pay \$35/MWh for the 400 MWh energy from G2
- G2 would be paid \$20/MWh for the additional 400 MWh of energy produced to serve zone 1's demand
- EIM would collect from G1 \$14,000 ($\35×400)
- EIM would pay G2 \$8,000 ($\20×400)
- EIM collected excess revenue of \$6000 ($\$14,000 - \$8,000$) - this excess revenue is called "congestion revenue."

LMP Example (G2 Derate)



- What if G2 could only generate 100 MWh due to a real-time derate?
 - G1 would need to serve the last 100 MWh or load in zone 2
 - The marginal cost of energy (LMP) in zone 2 would be \$35/MWh
 - The marginal cost of energy (LMP) in zone 1 would be \$35/MWh
- G2 would pay \$35/MWh for the 100 MWh energy from G1
- G1 would be paid \$35/MWh for the additional 100 MWh of energy produced to serve zone 2's demand
- EIM would pay G1 \$3,500 (\$35 x 100)
- EIM would collect from G2 \$3,500 (\$35 x 100)
- EIM is revenue neutral (\$3,500 - \$3,500) – No Congestion Revenue

LMP Price Map



<http://www.caiso.com/PriceMap/Pages/default.aspx>

EIM Settlement Example (Participating Resource)



Settlement Example for PR (one 15-minute interval)

- Scenario:
 - Resource has an hourly Base Schedule of **350 MWh** and an hourly bid of **\$20.00/MWh**
 - Resource receives an **FMM** Schedule/Award of 385 MW (**INC of 35**) for FMM interval 2 (XX:15-XX:30) with an **LMP of \$22.50**
 - Resource receives an **RTD** 5-minute market dispatch of:
 - 400 MW (**INC of 15 MW**) for RTD interval 4 (XX:15-XX:20)
 - LMP of \$23.50
 - 355 MW (**DEC of 30 MW**) for RTD interval 5 (XX:20-XX:25)
 - LMP of \$20.75
 - 320 MW (**DEC of 65 MW**) for RTD interval 6 (XX:25-XX:30)
 - LMP of \$17.50
 - Resource **Meter** Actuals:
 - 405 MW (**INC of 5 MW**) for RTD interval 4 (XX:15-XX:20)
 - 360 MW (**INC of 5 MW**) for RTD interval 5 (XX:20-XX:25)
 - 310 MW (**DEC of 10 MW**) for RTD interval 6 (XX:25-XX:30)

Settlement Example for PR (one 15-minute interval)

- Credits & Debits:
 - FMM 15-30 (Interval 2)
 - Credit of **\$196.88** $(35 \text{ MW} \times \$22.50)/4$ ← FMM IIE 64600
 - RTD 15-20 (Interval 4)
 - Credit of **\$29.38** $(15 \text{ MW} \times \$23.50)/12$ ← RTD IIE 64700
 - RTD 20-25 (Interval 5)
 - Debit of **\$51.88** $(30 \text{ MW} \times \$20.75)/12$ ← RTD IIE 64700
 - RTD 25-30 (Interval 6)
 - Debit of **\$94.79** $(65 \times \$17.50)/12$ ← RTD IIE 64700
 - Meter 15-20 (Interval 4)
 - Credit of **\$9.79** $(5 \text{ MW} \times \$23.50)/12$ ← RTD UIE 64750
 - Meter 20-25 (Interval 5)
 - Credit of **\$8.65** $(5 \text{ MW} \times \$20.75)/12$ ← RTD UIE 64750
 - Meter 25-30 (Interval 6)
 - Debit of **\$14.58** $(10 \times \$17.50)/12$ ← RTD UIE 64750
- Total Settlement: **\$83.45** $(\$196.88 + \$29.38 - \$51.88 - \$94.79 + \$9.79 + \$8.65 - \$14.58)$



GRID Modernization

Three-Agency Coordination Plan

The three-agency coordination plan covers how Bonneville Power Administration, U.S. Army Corps of Engineers and Bureau of Reclamation will communicate and execute the implementation of BPA's grid modernization program. This plan identifies the grid modernization projects that will require interagency support and establishes guidelines for coordination across respective project teams and between federal agencies to implement projects on time.

Background

In January 2018, BPA released its 2018-2023 Strategic Plan. One of the strategic goals identified in that plan is to modernize federal power and transmission system assets and operations to leverage and enable industry change, objective 2b, by implementing the grid modernization program. Grid modernization enhances systems by automating grid operations and marketing functions; improves accuracy of IT systems that support automation; and enhances visibility of real-time data on the federal power and transmission systems.

Grid modernization enables BPA's participation in new market opportunities, like the Western Energy Imbalance Market operated by the California Independent System Operator. BPA is moving toward joining the Western EIM with an expected go-live date of March 1, 2022. Projects that will enable BPA's participation in the Western EIM are underway and have been added to the grid modernization portfolio.

Projects covered under coordination plan

Several projects within the grid modernization portfolio require collaboration amongst the three agencies in order to deliver on the projects and ensure successful outcomes. The projects listed below are the current projects that require three agency involvement.

Automatic Generation Control Modernization

Automatic generation control is how power is regulated from generators within BPA's control area in real time. This project will improve the control, accuracy and performance of AGC to achieve better unit dispatch and better calculations for both unit and plant level capacity and reserve capabilities. The greater the AGC capability, the greater the ability to maximize the deployment and value of the power system.

Fed Data

The project optimizes hydro system coordination decisions made based on data from federal projects through improving the timeliness, accuracy, and dependability of project data shared between BPA, USACE and Reclamation. The project will reduce station control error which will

improve grid reliability and system flexibility as well as support BPA's ability to participate in the Western EIM and other energy markets.

Metering

The MRU team is coordinating the inventory and analysis of every interchange, generation and load meter that BPA uses for operations and billing. One component of the project focuses on metering the hydro facilities within the Federal Columbia River Power System. The new high-side meters will tell us how much power actually enters our system. The project will help improve the reliable operation of the FCRPS via AGC.

Future projects

BPA signed an implementation agreement with the California ISO on Sept. 26, 2019, signaling its intent to move forward toward joining the EIM. Work has officially started on an implementation plan which includes new grid modernization projects that need to be stood up along with process and system changes that will need to be complete before go-live. To-date, BPA has only identified the need to collaborate on the development of Generation Resource Data Templates which will supply CAISO with necessary data to define the attributes of federal hydro facilities. However, it is possible additional efforts will require three-agency collaboration, and this plan will be updated as necessary as more information becomes available.

Principles

BPA, USACE and Reclamation will work collaboratively on the implementation of grid modernization projects where cross-agency participation is required. Principles of this coordination include:

- Aim to deliver projects early.
- Provide top-down communications with strong leadership and staff ownership.
- Offer project-specific training for grid modernization projects and high-level training available for EIM.
- Create change management plans as necessary.
- Reach out to embedded or affected third parties early in the program.
- Facilitate meetings to provide all participants/stakeholders with an overview of the project scope, expected activities, timeline and staff roles and responsibilities.
- Share early and often the scoping documents covering planning, preparation and implementation.
- Provide external stakeholder support as needed.
- Discuss agency funding and prioritization.

Project Coordination

Executive Coordination

1. Role

Executives are key to ensure that grid modernization remains a top priority and ensure that projects are delivered on time to enable new market participation. The executives will rely on the grid modernization task force minutes as ways to see work is progressing in a timely manner and that issues are being resolved.

2. Forums

Grid modernization updates will be shared at regularly scheduled leadership forums which will include three-agency and two-agency planned executive meetings. If more frequent updates or decisions are required, members of the grid modernization task force, described below, will be responsible for coordinating with executives.

3. Contacts

| BPA | USACE | Reclamation |
|---|---|---|
| Senior VP of Power Services Joel Cook jdcook@bpa.gov 503-230-7640 | Beth Coffey Frances.E.Coffey@usace.army.mil 503-808-3731 | Rob Skordas rskordas@usbr.gov 208-378-5084 |

Grid Modernization Task Force

1. Role

The task force will be made up of leaders from the three-agencies. These leaders will be expected to represent their organization and make decisions on the direction of projects across all levels of the organization. The grid modernization task force will:

- Ensure consistent communications and that upcoming activities, requirements and project schedules are well communicated and understood.
- Resolve issues or decisions that are referred to the task force from specific projects.
- Review decisions made at the project-level that were not referred to the task force to ensure they are aligned with grid modernization priorities.
- Determine prioritization of grid modernization projects with consideration for importance of the project to ensure timely completion of projects.
- Articulate funding requests or reprioritization of existing funding to executives.
- Communicate priorities and decisions to their internal staff at all levels.
- Provide high-level update on EIM implementation as it pertains to changes or requirements on the federal power system.

BPA's grid modernization director will be the chair of the task force. BPA's asset manager will be responsible for setting the agenda and coordinating with for task force meetings.

2. Forum

The task force will have monthly meetings no longer than 90 minutes long. Meetings will be based in Portland but a phone-bridge and WebEx will be available for those participating remotely. Face-to-face meetings will be scheduled as they align with other forums. If a task force member is unable to attend, they may send a proxy who is informed on the effort being topics being discussed to serve in their place.

Agendas will be provided by BPA's asset manager five days in advance along with any materials required for review prior to attending the meeting. The expectation will be to start with a high-level review of project status and upcoming work milestones. The remaining time will be to get project-specific discussions or resolve issues that have been flagged for the task force to resolve.

Decisions will be documented and notes will be shared by BPA’s asset manager with the task force, coordination and project teams identified in this document after the meeting.

3. Contacts

| BPA | USACE | Reclamation |
|---|--|---|
| Grid Modernization Director Allie Mace armace@bpa.gov 503-230-5871 | Operations and Regulatory Tony Kirk Tony.R.Kirk@usace.army.mil | Rob Skordas rskordas@usbr.gov 208-378-5084 |
| Asset Manager Bill Leady wjleady@bpa.gov 503-230-4270 | Senior Hydro PM Scott Thoren Scott.D.Thoren@usace.army.mil | Joe Summers jsummers@usbr.gov 208-378-5290 |
| Stakeholder Engagement Lead Sarah Burczak seburczak@bpa.gov 503-230-3264 | Asset Management Shawn Worthington Shawn.M.Worthington@usace.army.mil 503-808-3743 | Coleman Smith cwsmith@usbr.gov 509-633-9501 |
| BTO Program Manager Dennis Petross dwpetross@bpa.gov 503-230-4718 | GM Project Manager Jason Williams Jason.C.Williams@usace.army.mil | |
| PG Policy Lead Glen Smith gasmith@bpa.gov | Steve Miles District reps/project leads Invited as needed. | |

Grid Modernization Coordination

1. Roles

The grid modernization coordination team will be made up of members from the three agencies who are involved in the grid modernization effort. These team members may also serve on the task force or on a project-specific team. The team will also review the coordination amongst the three agencies and provide updates to the coordination plan as needed.

2. Forum

The group will coordinate weekly on a conference call. The meeting will address any questions that have been asked, provide answers to any follow-ups that were requested or provide any updates on public meetings BPA may have held or participated in that impact the three-agency coordination. It will also be an opportunity to discuss areas for concerns or if there are areas where there is a desire for greater detail or education on topics. Every week the team will hear an update from the product owner on a grid modernization project. The projects will rotate through allowing monthly updates from each group.

BPA's stakeholder lead will lead meetings and set agendas as needed. Agendas will reflect questions that are sent to the lead in advance and leave time open to discuss any emerging issues. Action items that come out of the stakeholder meeting will be distributed to both the task force and coordination team.

In addition, issues or concerns brought to the weekly coordination meetings may result in a broader three-agency meeting being scheduled as need to address specific questions or to provide updates as new project information or plans are known that should be shared beyond the project working groups, described below. Depending on the pace of projects, BPA may adjust the frequency of these meetings if needed.

3. Contacts

Grid Modernization Coordination

| BPA | USACE | Reclamation |
|---|--|---|
| <p>Stakeholder Engagement Lead Sarah Burczak seburczak@bpa.gov 503-230-3264</p> <p>Grid Modernization Director Allie Mace armace@bpa.gov 503-230-5871</p> <p>Program Manager for projects Dennis Petross dwpetross@bpa.gov 503-230-4718</p> <p>PG Policy Lead Glen Smith gasmith@bpa.gov</p> <p>PGA Rep Kim Johnson kojohnson@bpa.gov 503-230-3902</p> <p>PGS Rep Clarisse Messemer cmmessemer@bpa.gov 503-230-3324</p> | <p>Asset Management Shawn Worthington Shawn.M.Worthington@usace.army.mil 503-808-3743</p> <p>Senior Hydro PM Scott Thoren Scott.D.Thoren@usace.army.mil</p> | <p>Florence Webster fwebster@usbr.gov 208-378-5332</p> <p>Mark Pfeifer Mpfeifer@usbr.gov 208-378-5042</p> <p>Cliff Foster cfoster@usbr.gov 509-633-9145</p> |

Product owners to provide rotating weekly updates

| AGC | Fed Data | MRU | EIM |
|------------|----------|---------------|-------------|
| Dave Brown | Kari Hay | Kelly Gardner | Roger Bentz |

| | | | |
|--|--|--|--|
| drbrown@bpa.gov 360-418-2909 | kchay@bpa.gov 503-230-5051 | kigardner@bpa.gov 360-619-6615 | rebentz@bpa.gov 503-230-4338 |
|--|--|--|--|

Project Work and Coordination

1. Roles

BPA product owners and the Business Transformation Office program managers will be responsible for providing regular updates to the grid modernization task force and grid modernization coordination group on project milestones as well as any identified risks.

The BTO program manager serves as BPA's Business Transformation Office's main point of contact. They oversee a group of projects and provide extensive project support, including guiding projects through the project process and coordinating BTO support and resources as well as engage and communicate with IT. Product owners represent business requirements in epic and feature development and prioritization. They makes day-to-day workload/resource decisions for the business on assigning work within the bounds of defined scope, schedule and budget. The product owner ensures the requirements of the customers and end-users are understood by the business, technology and procurement teams.

Project roles from USACE and Reclamation will require the following:

- Support from subject matter experts on projects to identify issues and review solutions
- Facilitate access to facilities for metering enhancements and participate in prioritization of metering enhancements
- Identify conflicting priorities for both staff and dollars
- Collaboration amongst the three agencies on solutions including:
 - BPA's AGC team, the USACE GDACs team and Reclamation
 - Plant operators and hydro duty schedulers

Each project's program manager/product owner is responsible for:

- Making sure that each project is following and implementing BPA's BTO grid modernization program requirements using BPA's portfolio management process – IDID (identify, define, integrate, and deliver).
- Developing BPA project plans as per BTO grid modernization program requirements for each project and communicate that to federal partners.
- Reporting out at forums as requested on each projects progress and risks to meet deliverable dates.
- Informing and communicating to the grid modernization task force on each projects progress and risks.
- Informing each team of the project's expectations, schedules and requirements and how they relate to the bigger grid modernization program.
- Communicate and work collaboratively together between projects to meet grid modernization deliverables on time.
- Coordinate in person collaboration with USACE and Reclamation for the three already identified grid modernization projects. Meetings will be scheduled on a regular cadence and when possible will coincide with other forums to allow for in-person meetings. The listed representative for each team will travel to the division or regional office to discuss progress and answer questions as required.
- Coordinate the sharing of information among the identified projects.

2. Forum

Project liaisons from USACE and Reclamation, identified below, will be attendees for sponsor team meetings. Sponsor team meetings are typically with BPA management and are regularly scheduled. Cadence may vary by project and need to meet. BPA will notify USACE and Reclamation in advance if the meeting is expected to cover BPA-only project elements. If USACE/Reclamation staff are unable to attend, it will be their responsibility to check-in with product owner and BTO program manager to see if there is something important they missed.

Working group meetings will be held as needed to facilitate working through complex issues and evaluating solutions. These working groups will provide an opportunity for greater collaboration amongst the three agencies than may be provided in the sponsor team meetings. BPA's product owners and project managers will be in charge of scheduling meetings either by identifying milestones or setting a regular cadence as needed by each project. USACE and Reclamation will ensure the correct staff are invited and available for the working group based on the purpose of the meeting provided by BPA.

Additional project-specific plans are being developed to provide additional level of detail on points of contact for specific project elements, timelines and any additional information as required by the project. These will be attached or linked to this document as they are developed.

3. Contacts

| Project | BPA | USACE | Reclamation |
|--|---|---|--|
| AGC Modernization | <p>Product Owner Dave Brown drbrown@bpa.gov 360-418-2909</p> <p>BTO Program Mgr Dennis Petross dwpetross@bpa.gov v 503-230-4718</p> | <p>Jason Williams Jason.C.Williams@usace.army.mil</p> | <p>Matt Elder melder@usbr.gov 509-633-9221</p> |
| Fed Data and Generation Dispatch Modernization | <p>Product Owner Kari Hay kchay@bpa.gov 503-230-5051</p> <p>BTO Program Mgr Dennis Petross dwpetross@bpa.gov v 503-230-4718</p> | <p>Shawn Worthington Shawn.M.Worthington@usace.army.mil il 503-808-3743</p> | <p>Cliff Foster cfoster@usbr.gov 509-633-9145</p> |
| Metering Review and Update | <p>Product Owner Kelly Gardner kigardner@bpa.gov 360-619-6615</p> <p>BTO Program Mgr Dennis Petross</p> | <p>Shawn Worthington Shawn.M.Worthington@usace.army.mil il 503-808-3743</p> | <p>Israel Reyes Negrón ireyesnegrón@usbr.gov v 509-633-9658</p> <p>Juan Landin jlandin@usbr.gov</p> |

| | | | |
|--------------------|--|--|--|
| | dwpetross@bpa.gov v 503-230-4718 | | 509-633-6192 |
| GRDT Configuration | Product Owner TBD BTO Program Mgr Roger Bentz rebentz@bpa.gov 503-230-4338 | | Cliff Foster cfoster@usbr.gov 509-633-9145 Mark Pfeifer Mpfeifer@usbr.gov 208-378-5042 |

Impacts on existing coordination

The coordination plan outlined here only pertains to grid modernization projects or work related to EIM implementation. Any existing coordination between three agencies outside of the projects outlined here is not impacted by this coordination plan and should continue as supported in other areas.

Project funding

In regards to funding, the grid modernization dollars that have been allocated are for expense only. Expense projects may need to be reprioritized to reflect the needs of the grid modernization program.

To the extent that capital work is necessary, those dollars will need to come from existing USACE and Reclamation capital funding pools. In the 2018 Integrated Program Review, no incremental capital funding was proposed for grid modernization. Instead existing Transmission and Power capital portfolios were re-prioritized to absorb the financial impacts of these projects.

From: Greene, Richard A (BPA) - LP-7

Sent: Fri Mar 16 16:33:51 2018

To: Johnson, Tim A (BPA) - LP-7 (tajohnson@bpa.gov)

Subject: ADF- Federal Resource Participation

Importance: Normal

Attachments: Pages from 2018.01.24 Proposal For Grid Modernization and EIM Participat....pdf

(b)(5)

From: Truong,Mai N (BPA) - PGST-5
Sent: Thu Mar 15 14:37:58 2018
To: Pettinger,Rebekah S (BPA) - LP-7; Greene,Richard A (BPA) - LP-7
Cc: Messemer,Clarisse M (BPA) - PGST-5
Subject: FW: ADF on the number of generation points bid into the EIM
Importance: Normal

(b)(5)

From: Truong,Mai N (BPA) - PGST-5
Sent: Thursday, March 15, 2018 2:29 PM
To: Messemer,Clarisse M (BPA) - PGST-5; Chang,Elsa (BPA) - PGST-5; Polsky,Cynthia H (BPA) - PGST-5; Will,Garland L (BPA) - PGST-5; Siewert,Christopher W (BPA) - PGSD-5; Van Calcar, Pamela M (BPA) - PGSP-5; Kerns,Steven R (BPA) - PGS-5; King,Eric V (BPA) - TSPP-TPP-2; Mantifel,Russell (BPA) - TS-DITT-2; Puyleart, Frank R (BPA) - TOOC-DITT-2; Sanford,Chris T (BPA) - TOR-DITT-1; Gaube,Stephen J (BPA) - PTF-5; Haraguchi,Kelii H (BPA) - PTM-5; Federovitch, Eric C (BPA) - PTM-5; Davis,Thomas E (BPA) - LT-7; Simpson,Troy D (BPA) - TOI-DITT-2; Kochheiser,Todd W (BPA) - TOI-DITT-2; Dernovsek,David K (BPA) - PTKP-5; Greene,Richard A (BPA) - LP-7; Pettinger,Rebekah S (BPA) - LP-7; Symonds,Mark C (BPA) - BD-3; Hawkins,Robert E (BPA) - PGSD-5; Pedersen Mainzer,Margaret E (BPA) - PTL-5; Kitchen,Larry (BPA) - PTL-5; Stermer,Anna M (BPA) - PGSP-5; Eaton,Sara L (BPA) - PTM-5; Bermejo,Juergen M (BPA) - PGST-5; Kirsch,David J (BPA) - TOOC-DITT-2
Cc: (b)(6)
Subject: RE: ADF on the number of generation points bid into the EIM
Sensitivity: Private

The ADF is in decent shape so the 3/16 meeting is going to be canceled.

It's not over yet - We discovered some of ratings didn't match the narratives so please pay attention to the revised risks/analyze/recommendation sections (page 10-14). Please review the ADF (including the parking lot in the appendix) by noon on Friday 3/16. We plan on sending the draft to the executives by COB Friday.

[Sharepoint Link](#)

Thank you everyone for your contributions!

-----Original Appointment-----

From: Messemer,Clarisse M (BPA) - PGST-5

Sent: Thursday, February 08, 2018 12:57 PM

To: Messemer, Clarisse M (BPA) - PGST-5; Chang, Elsa (BPA) - PGST-5; Truong, Mai N (BPA) - PGST-5; Polsky, Cynthia H (BPA) - PGST-5; Will, Garland L (BPA) - PGST-5; Siewert, Christopher W (BPA) - PGSD-5; Van Calcar, Pamela M (BPA) - PGSP-5; Kerns, Steven R (BPA) - PGS-5; King, Eric V (BPA) - TSPP-TPP-2; Mantifel, Russell (BPA) - TS-DITT-2; Puyleart, Frank R (BPA) - TOOC-DITT-2; Sanford, Chris T (BPA) - TOR-DITT-1; Gaube, Stephen J (BPA) - PTF-5; Haraguchi, Kelii H (BPA) - PTM-5; Federovitch, Eric C (BPA) - PTM-5; Davis, Thomas E (BPA) - LT-7; Simpson, Troy D (BPA) - TOI-DITT-2; Kochheiser, Todd W (BPA) - TOI-DITT-2; Dernovsek, David K (BPA) - PTKP-5; Greene, Richard A (BPA) - LP-7; Pettinger, Rebekah S (BPA) - LP-7; Symonds, Mark C (BPA) - BD-3; Hawkins, Robert E (BPA) - PGSD-5; Pedersen Mainzer, Margaret E (BPA) - PTL-5; Kitchen, Larry (BPA) - PTL-5; Stermer, Anna M (BPA) - PGSP-5

Cc: (b)(6)

Subject: ADF on the number of generation points bid into the EIM

When: Friday, March 16, 2018 9:00 AM-10:00 AM (UTC-08:00) Pacific Time (US & Canada).

Where: HQ 418 x4000 ID: (b)(2)

Sensitivity: Private

From: Messemer, Clarisse M (BPA) - PGST-5

Sent: Fri Mar 16 15:25:12 2018

To: Truong, Mai N (BPA) - PGST-5; Chang, Elsa (BPA) - PGST-5; Polsky, Cynthia H (BPA) - PGST-5; Will, Garland L (BPA) - PGST-5; Siewert, Christopher W (BPA) - PGSD-5; Van Calcar, Pamela M (BPA) - PGSP-5; Kerns, Steven R (BPA) - PGS-5; King, Eric V (BPA) - TSPP-TPP-2; Mantifel, Russell (BPA) - TS-DITT-2; Puyleart, Frank R (BPA) - TOOC-DITT-2; Sanford, Chris T (BPA) - TOR-DITT-1; Gaube, Stephen J (BPA) - PTF-5; Haraguchi, Kelii H (BPA) - PTM-5; Federovitch, Eric C (BPA) - PTM-5; Davis, Thomas E (BPA) - LT-7; Simpson, Troy D (BPA) - TOI-DITT-2; Kochheiser, Todd W (BPA) - TOI-DITT-2; Dernovsek, David K (BPA) - PTKP-5; Greene, Richard A (BPA) - LP-7; Pettinger, Rebekah S (BPA) - LP-7; Symonds, Mark C (BPA) - BD-3; Hawkins, Robert E (BPA) - PGSD-5; Pedersen Mainzer, Margaret E (BPA) - PTL-5; Kitchen, Larry (BPA) - PTL-5; Stermer, Anna M (BPA) - PGSP-5; Eaton, Sara L (BPA) - PTM-5; Bermejo, Juergen M (BPA) - PGST-5; Kirsch, David J (BPA) - TOOC-DITT-2; Truong, Mai N (BPA) - PGST-5; Miller, Todd E (BPA) - LP-7

Subject: FW: ADF- Federal Resource Participation

Importance: Normal

Attachments: Pages from 2018.01.24 Proposal For Grid Modernization and EIM Participat....pdf

Team,

I delivered the email below to the BTO this afternoon and cc'd the execs. My understanding (Todd M. please confirm) that this ADF will be decided on March 30th by Joel, Richard, and Janet. Please gather feedback from your execs ASAP so that decision meeting runs as smoothly as possible.

We have two meetings scheduled for next week. If there are no further edits, I will cancel the meetings.

Otherwise we'll use the meetings to go through the edits.

Have a good weekend,

Clarisse

From: Messemer, Clarisse M (BPA) - PGST-5

Sent: Friday, March 16, 2018 3:21 PM

To: Miller, Todd E (BPA) - LP-7; Davis, Thomas E (BPA) - LT-7; Lut, Agnes (BPA) - SR-3 (axlut@bpa.gov); Bentz, Roger E (BPA) - BE-3; Symonds, Mark C (BPA) - BD-3

Cc: Connolly, Kieran P (BPA) - PG-5; Manary, Michelle L (BPA) - TS-DITT-2; Cathcart, Michelle M (BPA) - TO-DITT-2; Cooper, Suzanne B (BPA) - PT-5

Subject: ADF- Federal Resource Participation

(b)(5)



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May be exempt from public release under the Freedom of Information Act (5 U.S.C. 552), exemption number and category: Pursuant to 433-1; FOIA Exemption 5

Bonneville review required before public release.

Name/Org: /s/ Tom Davis, LT-7 Date: October 25, 2017

LEGAL ANALYSIS

WESTERN ENERGY IMBALANCE MARKET DECISION FRAMEWORK

BONNEVILLE POWER ADMINISTRATION OFFICE OF GENERAL COUNSEL

OCTOBER 2017

*Attorney-Client Communication that may be protected from disclosure.
Please contact the Office of General Counsel prior to sending this communication outside of Bonneville.*

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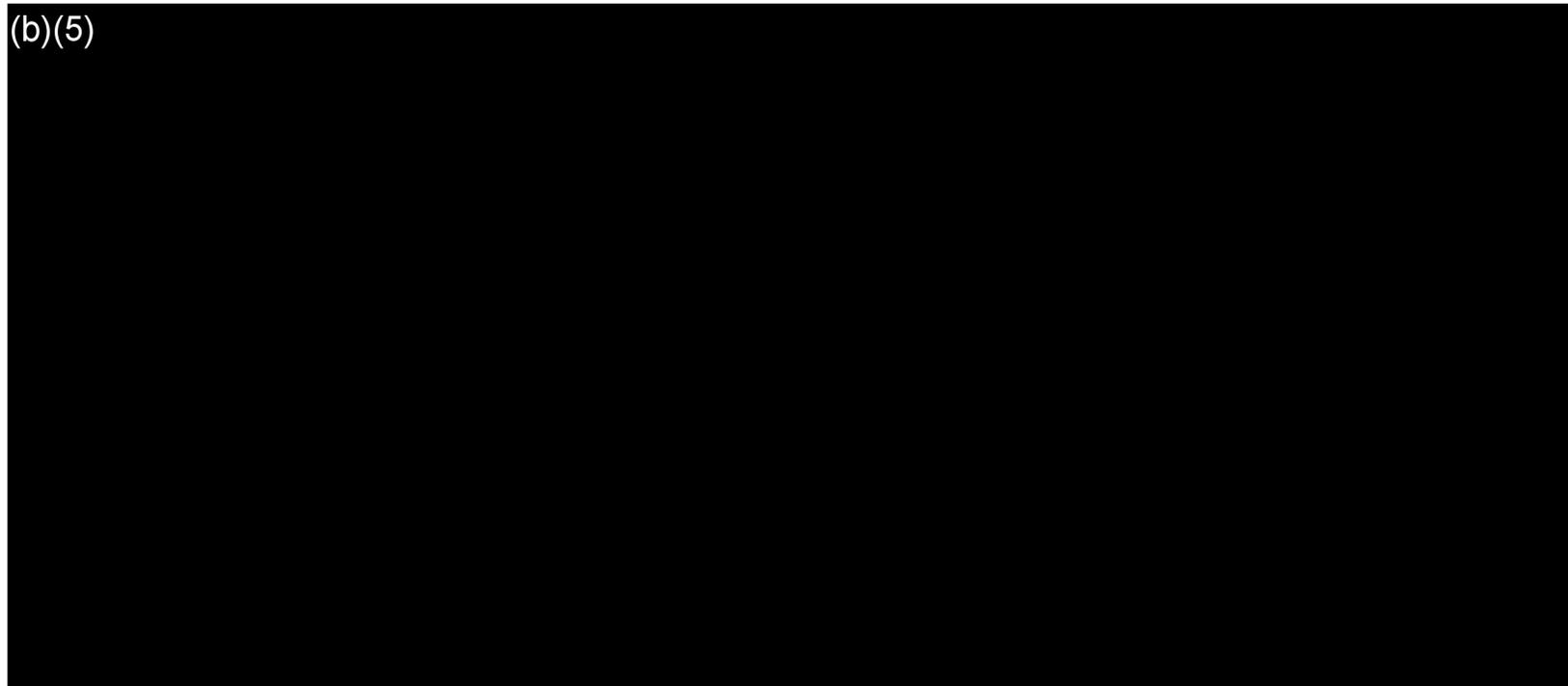
(b)(5)



Official Legal Advice
Office of General Counsel

(b)(5)

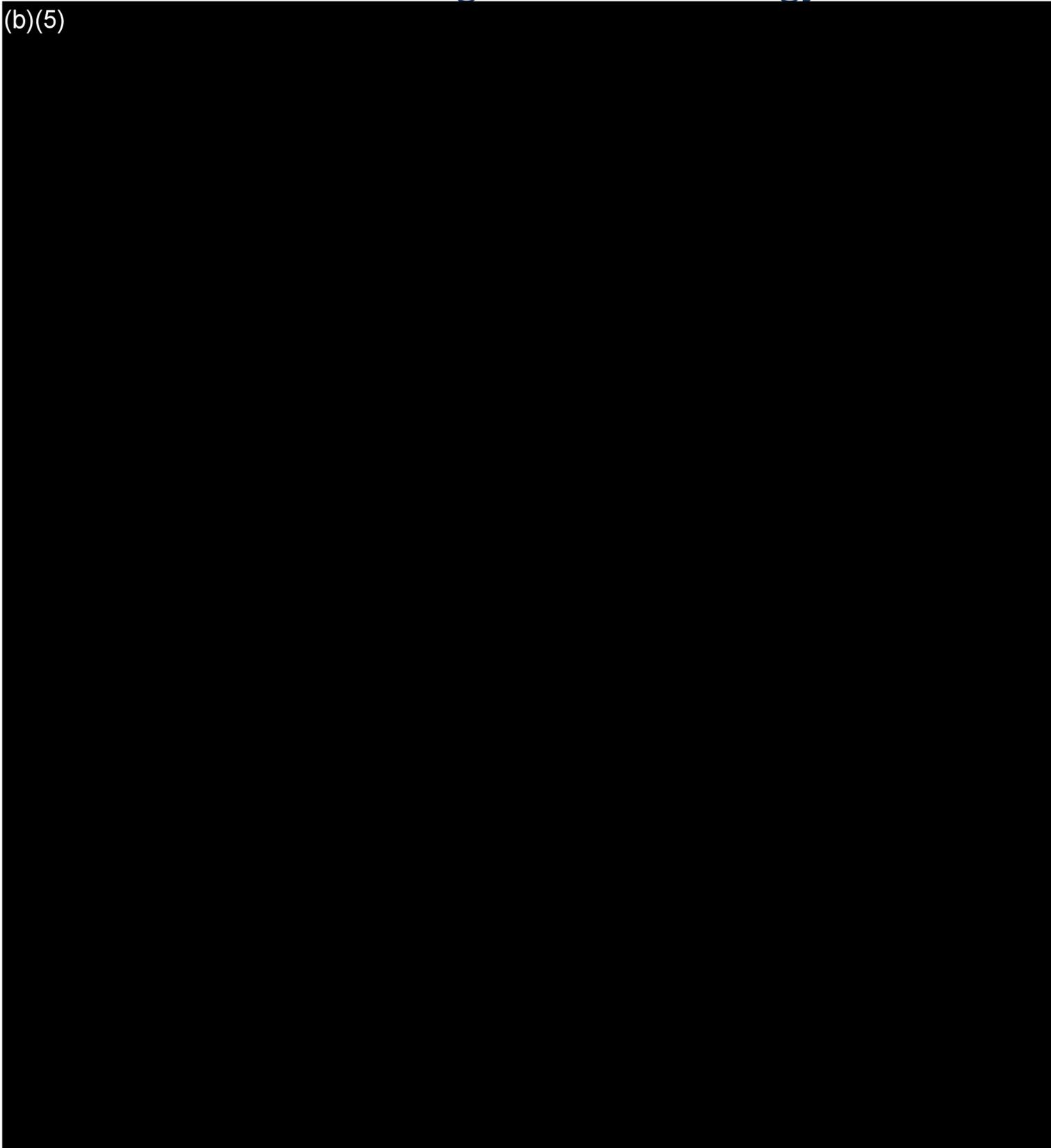
From: Pettinger,Rebekah S (BPA) - LP-7
Sent: Saturday, March 10, 2018 11:59 AM
To: Greene,Richard A (BPA) - LP-7
Subject: Fed resource legal memo
Attachments: MEMORANDUM--ADF on Gen.docx



(b)(5)

EIM Issues and Negotiation Strategy

(b)(5)



MEMORANDUM

FROM:

TO:

DATE: Tuesday, March 06, 2018

RE: Legal Analysis on Federal Resource Participation ADF

(b)(5)

From: Kochheiser, Todd W (BPA) - TOI-DITT-2

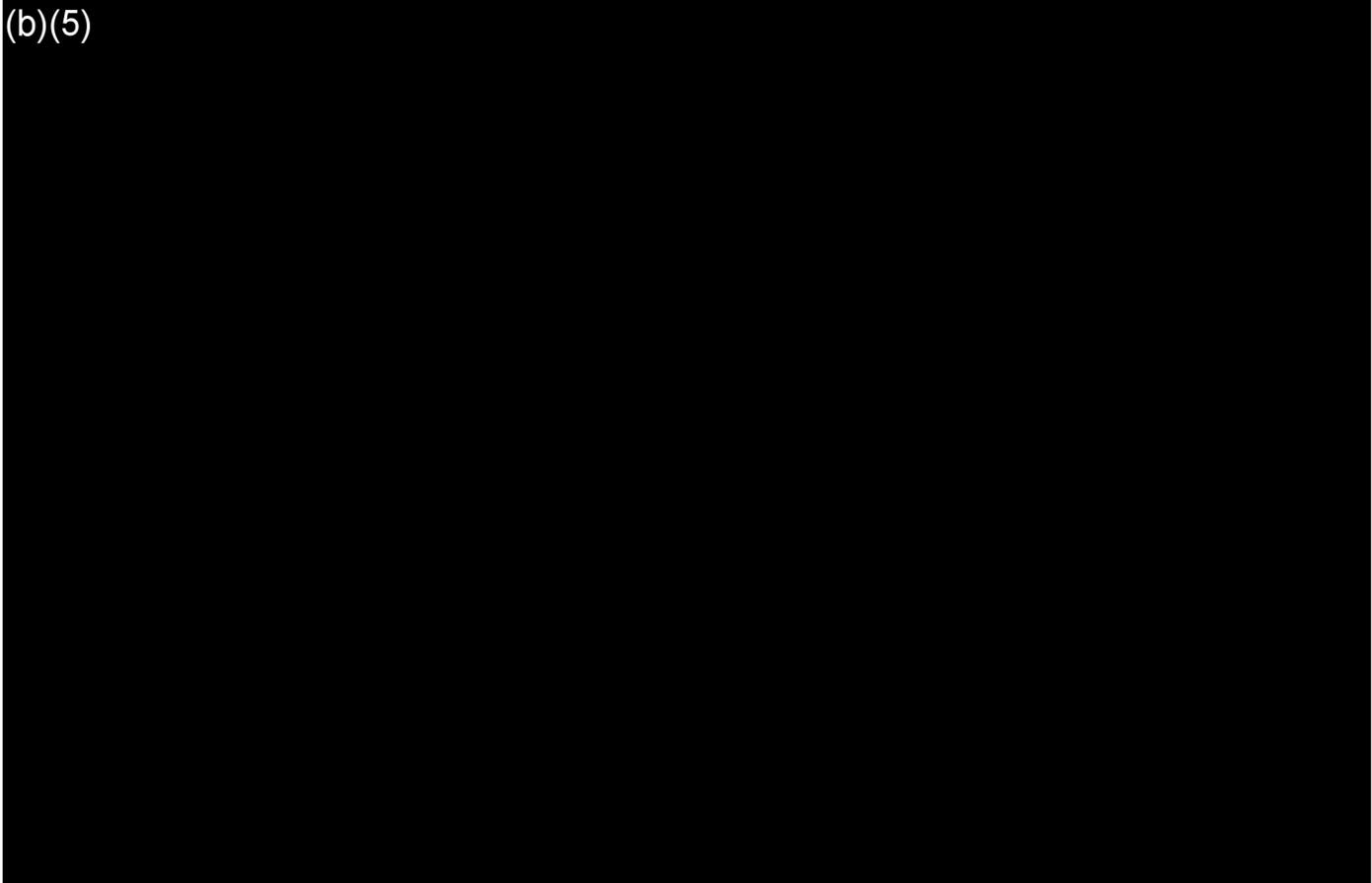
Sent: Thu Mar 08 13:09:11 2018

To: Messemer, Clarisse M (BPA) - PGST-5; Chang, Elsa (BPA) - PGST-5; Truong, Mai N (BPA) - PGST-5; Polsky, Cynthia H (BPA) - PGST-5; Siewert, Christopher W (BPA) - PGSD-5; Van Calcar, Pamela M (BPA) - PGSP-5; Kerns, Steven R (BPA) - PGS-5; King, Eric V (BPA) - TSPP-TPP-2; Mantifel, Russell (BPA) - TS-DITT-2; Puyleart, Frank R (BPA) - TOOC-DITT-2; Sanford, Chris T (BPA) - TOR-DITT-1; Gaube, Stephen J (BPA) - PTF-5; Haraguchi, Kelii H (BPA) - PTM-5; Federovitch, Eric C (BPA) - PTM-5; Davis, Thomas E (BPA) - LT-7; Simpson, Troy D (BPA) - TOI-DITT-2; Dernovsek, David K (BPA) - PTKP-5; Greene, Richard A (BPA) - LP-7; Pettinger, Rebekah S (BPA) - LP-7; Symonds, Mark C (BPA) - BD-3; Will, Garland L (BPA) - PGST-5; Schaffroth, John T (CONTR) - PGL-5; Pedersen Mainzer, Margaret E (BPA) - PTL-5; Kitchen, Larry (BPA) - PTL-5

Subject: Generation ADF: Conversation with CAISO Regarding GDFs

Importance: Normal

(b)(5)



-----Original Appointment-----

From: Messemer, Clarisse M (BPA) - PGST-5

Sent: Thursday, February 08, 2018 12:22 PM

To: Messemer, Clarisse M (BPA) - PGST-5; Chang, Elsa (BPA) - PGST-5; Truong, Mai N (BPA) - PGST-5; Polsky, Cynthia H (BPA) - PGST-5; Siewert, Christopher W (BPA) - PGSD-5; Van Calcar, Pamela M (BPA) - PGSP-5; Kerns, Steven R (BPA) - PGS-5; King, Eric V (BPA) - TSPP-TPP-2; Mantifel, Russell (BPA) - TS-DITT-2; Puyleart, Frank R (BPA) - TOOC-DITT-2; Sanford, Chris T (BPA) - TOR-DITT-1; Gaube, Stephen J (BPA) - PTF-5; Haraguchi, Kelii H (BPA) - PTM-5; Federovitch, Eric C (BPA) - PTM-5; Davis, Thomas E (BPA) - LT-7;

Simpson,Troy D (BPA) - TOI-DITT-2; Kochheiser,Todd W (BPA) - TOI-DITT-2; Dernovsek,David K (BPA) - PTKP-5; Greene,Richard A (BPA) - LP-7; Pettinger,Rebekah S (BPA) - LP-7; Symonds,Mark C (BPA) - BD-3; Will,Garland L (BPA) - PGST-5; Schaffroth,John T (CONTR) - PGL-5; Pedersen Mainzer,Margaret E (BPA) - PTL-5; Kitchen,Larry (BPA) - PTL-5

Subject: ADF on the number of generation points bid into the EIM

When: Wednesday, March 07, 2018 3:00 PM-4:00 PM (UTC-08:00) Pacific Time (US & Canada).

Where: HQ 470EW(40) x4000 ID: (b)(2)

Sensitivity: Private

(b)(5)

MEMORANDUM

FROM:
TO:
DATE: Tuesday, March 06, 2018
RE:

(b)(5)



Official Legal Advice
Office of General Counsel

(b)(5)



Official Legal Advice
Office of General Counsel

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Official Legal Advice
Office of General Counsel

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