EIM Stakeholder Meeting

Nov 14, 2018
1:30-4:30pm
Rates Hearing Room

For our 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 let us know who you represent.
- Please do not put this call on hold OR take other calls while you are dialed into this one.
- If we identify a noisy line, you may be disconnected from the meeting.

Agenda

1:30-1:40	• Welcome, Safety Moment, Introductions • Objectives of Today's Meeting • Review of Previous EIM Stakeholder Meetings
1:40 – 2:50	• Process Map Discussion
2:50 – 3:00	• Break
3:00 – 4:00	• Market Power
4:00 – 4:30	• Next Steps • Question and Answer Session

Objectives For Today's Meeting

- Review of EIM Stakeholder Topics Discussed to Date
- Process Map
- Timeline Review
- Issues that BPA identified at the July 24th EIM Stakeholder meeting that we will be discussing in more depth **today**:

1.Market Power
2.Treatment of Transmission
3.Generation Participation Model (FCRPS, IPP)
4.Governance
5.Relationship of EIM to Other Emerging Markets
6.BA Resource Sufficiency
7.EIM Settlements
8.Carbon Obligation in EIM

Issue we will be discussing today.

Issues discussed at previous EIM Stakeholder meetings.

These issues will be discussed at future meetings.

- Question and Answer Session

Statement of BPA's Principles:

1. Participation is consistent with statutory, regulatory, and contractual obligations.

2. Maintain reliable delivery of power and transmission to our customers.

3. Resource participation in the EIM is and always will be voluntary.

4. BPA's decision to participate in the EIM will be based on a sound business rationale.

Timeline Leading up to the ROD

Agendas for previous and future monthly EIM Stakeholder meetings:

July 24	•Grid Modernization Overview, Connection to Strategic Plan, Intro to the 8 Issues BPA is Reviewing
September 13	•EIM 101
October 11	•Process Plan, Transmission, Generation, Governance
November 14	•Process Plan, Market Power
December 18	•Settlements
January 16	
February 20	
March 13	**Table Tops:** Discussion of Impacts to Customers
April 10	
May 15	
June	
July	•Letter to the Region with a 30 day public comment
August	•BPA drafts Record of Decision (ROD)
September	•Final ROD for signing the EIM Implementation Agreement

These meetings will be full day.

Topics to be Discussed at the monthly EIM Stakeholder mtgs:

1. Resource Sufficiency
2. Non-Fed Generation Participation
3. Power Products Generation Inputs BP-22
4. Cost Benefit Analysis
5. Market Mitigation
6. Settlements
7. Transmission
8. Impacts of Emerging Markets
9. Carbon Issues
10. Governance

Signing of the EIM Implementation Agreement authorizes BPA to begin spending on EIM implementation projects with the CAISO but does not bind BPA to join the EIM.

Previous EIM Stakeholder Meeting Materials are available here: www.bpa.gov/goto/EIM

EIM Table Top Exercises

The EIM Table Top exercises planned for Spring 2019 will describe the process and impact to customer classes if BPA becomes an EIM entity:

- BPA and stakeholders will walk through a "Day and Hour in the Life" of BPA as an EIM Entity and are for our BAA and transmission customers
- Our goal is to identify how common customer and BAA behavior will result in EIM Entity/Market Operator charges and operations
- We will NOT be able to identify how charges will be allocated to customers, but we do believe the workshops will help inform pre rate-case workshops and possible rate designs
- BPA will develop "structure scenarios" that we will walk through in these workshops

BPA encourages customers to provide input on the Table Top structured scenarios.

If there is a scenario that your utility would like BPA to explore that is a realistic scenario and is expected to be a common occurrence (monthly at least) then please send your prioritized scenarios to Tech Forum at techforum@bpa.gov and reference "EIM Prioritized Scenarios" in the subject line due by December 14th.

For more information on the EIM process: https://www.westerneim.com/

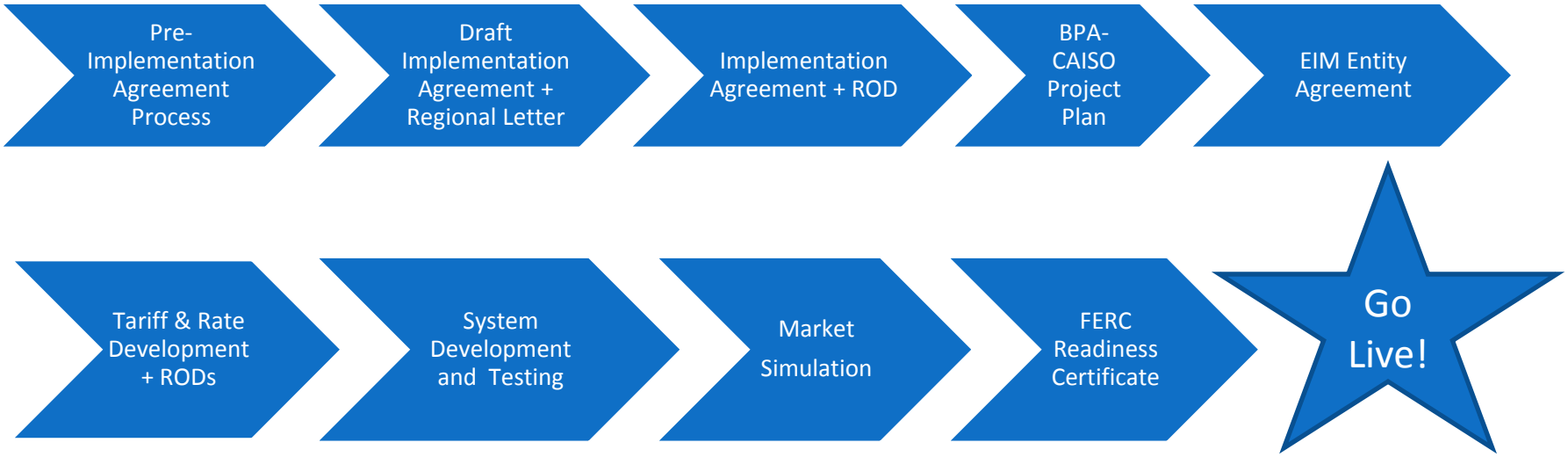
EIM Table Tops

Possible Table Top scenario inputs:

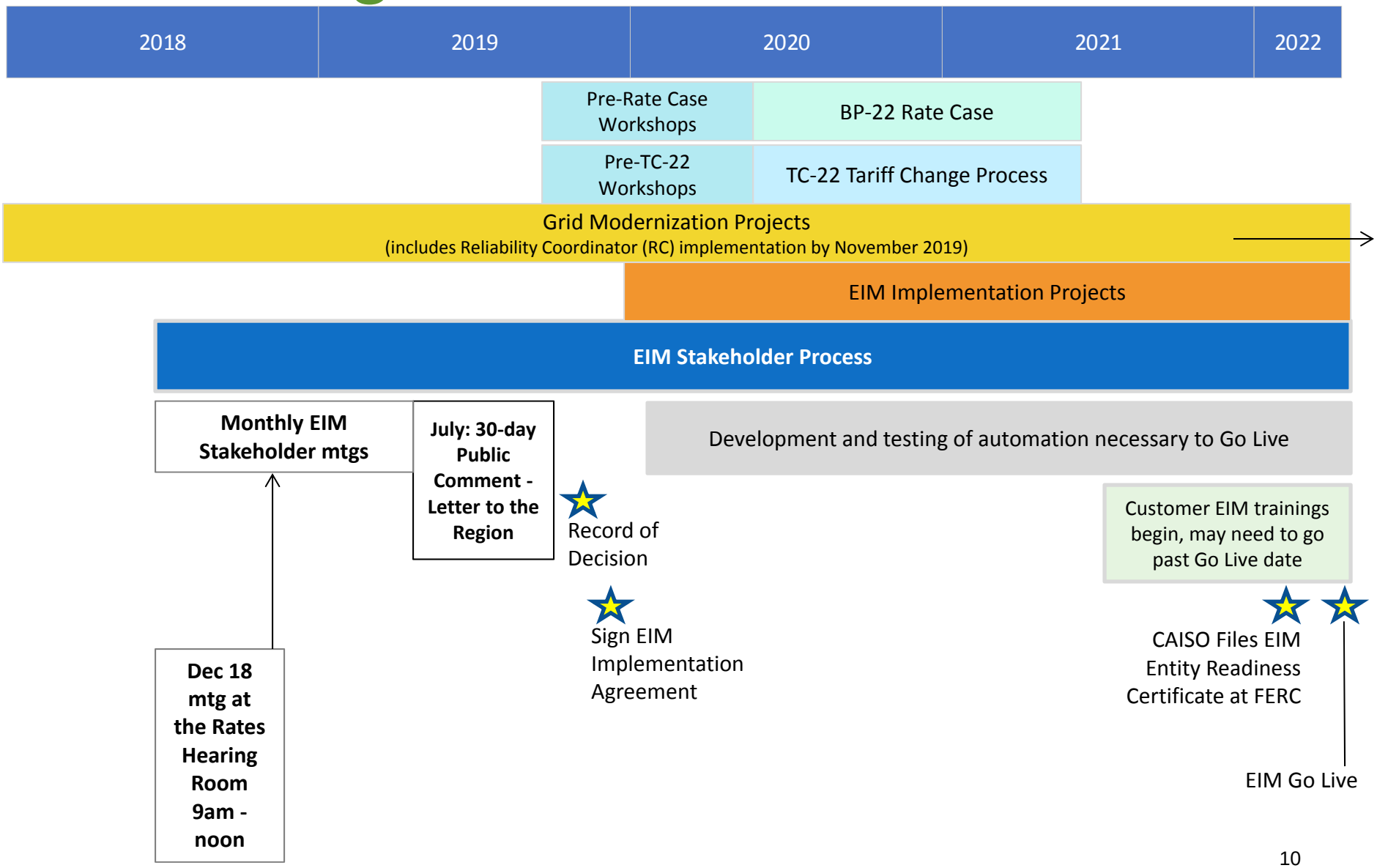
- Variable Energy Resource ("VER") scheduling and forecasting activity
- Intra-hour schedule changes
- Slice or other power product "late-breaking" changes
- EIM Transfer/ETSR Interchange Rights Holder "donations"
- Loads with non-participating resources
  - VER and DER
- Loads with EIM Participating Resources
  - VER and DER
- Other?

High Level Process Map

- This high-level visual represents the general steps in the process of BPA joining the EIM.
- BPA can choose to not join the EIM at anytime in the process.
- BPA will engage customers and stakeholders throughout the process.



BPA's High Level EIM Timeline



Previous EIM Stakeholder Meeting Materials are available here: www.bpa.gov/goto/EIM

EIM Process Map: 5 Steps to Joining

The CAISO has identified five steps to joining the EIM:*

	Step	What it is	Where this fits into BPAs process
1	Perform Cost Benefit Analysis	• A key step in deciding to participate as an EIM Entity.	• BPA performed an initial cost benefit analysis and presented it at the July 24th mtg. • An updated cost benefit analysis will be developed in preparation for the letter to the region in July 2019.
2	Negotiate and Execute Implementation Agreement	• Sets forth the terms and conditions between the CAISO and EIM Entity to *prepare* for EIM participation. • Contains a high-level project schedule with milestones and funding schedule.	• Summer/early fall of 2019. • Letter to region at end of July 2019 with 30-day comment period. • Execution at the end of September 2019.

*For more information on the EIM process: https://www.westerneim.com.

EIM Process Map: 5 Steps to Joining

The CAISO has identified five steps to joining the EIM:*

	Step	What it is	Where this fits into BPAs process
3	Train for EIM	• Training to develop core competencies of BPA staff responsible for implementing the EIM into BPA's day-to-day business. • Training for BPA's customers. *The CAISO provides both computer-based and instructor led training. Much of the computer-based training for the EIM is already publicly available at www.westerneim.com.*	• BPA is prioritizing EIM training for its employees and customers. • BPA provided a "EIM 101" training in September 2018 for its customers. • More operationally-oriented, CAISO-led training will start to occur in 2021 as the systems and automation are developed and tested so that BPA and BPA's customers can participate in the EIM.
4	Establish Operating Procedures	• Develop operating procedures prior to implementation to ensure operational readiness.	• 6-9 months before Go-Live

*For more information on the EIM process: https://www.westerneim.com.

EIM Process Map: 5 Steps to Joining

The CAISO has identified five steps to joining the EIM:*

		What it is	Where this fits into BPAs process
5	Complete the Implementation Process	The implementation process includes six tracks, which may run in parallel. 1. Develop a detailed project schedule outlining all the steps leading to the market simulation, parallel operations and full participation; 2. Establish agreements and identify scheduling coordinator and participating resources; 3. Integrate with the ISO full network model; 4. Modify impacted systems, perform system integration, and complete security and functional testing of all impacted systems and processes; 5. Implement metering; and 6. Certify readiness, conduct parallel operations and transition to binding EIM.	• Begins once BPA signs the Implementation Agreement in September of 2019, should it choose to do so, and continue until the EIM is fully implemented. • BPA is currently planning on completing this process by April of 2022, but this date will not be firmed up until the Implementation Agreement is signed.

*For more information on the EIM process: https://www.westerneim.com.

EIM Process Map: Agreements

Agreement	Description
Implementation Agreement	Initial agreement with the CAISO; establishes a project and funding schedule for work necessary to join the EIM; filed with FERC; terminates once EIM entity moves to production (live) state. Funding level based on EIM Entity's portion of total load in the western interconnection. (For BPA, approximately $1.9 million.) For more information, see https://www.westerneim.com/Pages/About/default.aspx#ImplementationDocuments.
EIM Entity Agreement	The enabling agreement that allows a balancing authority to participate in the EIM as an EIM entity; filed with FERC; sets forth the terms and conditions of an EIM Entity's participation, including a commitment to abide by the CAISO's Tariff (particularly, Section 29), modify it's own tariff, and provide for transmission in EIM. For more information see: http://www.caiso.com/Documents/AppendixB17_EIMEntityAgreement_Asof_Jul01_2014.pdf.
EIM Participating Resource Agreement	The enabling agreement that allows a resource to participate in the EIM; filed with FERC; sets forth the terms and conditions of resource participation, including a commitment the resource's owner/operator to abide by the CAISO's Tariff (particularly, Section 29); provides for registration of the resource in the CAISO's master file; allows direct financial settlement between the resource and the CAISO. For more information, see http://www.caiso.com/Documents/AppendixB19_EIMParticipatingResourceAgreement_Asof_Jul01_2014.pdf.

EIM Process Map: Agreements Continued

Agreement	Description
EIM Entity Scheduling Coordinator Agreement	Sets forth the terms and conditions regarding base schedule submission and adjustments as well as financial settlements; also includes a commitment by the EIM Entity to abide by the CAISO's Tariff (particularly, Section 29); filed with FERC. For more information, see http://www.caiso.com/Documents/AppendixB18_EIMEntitySchedulingCoordinatorAgreement_Asof_Jul01_2014.pdf.
EIM Participating Resource Scheduling Coordinator Agreement	Sets forth the terms and conditions regarding resource bid submission as well as financial settlements; includes a commitment to abide by the CAISO's Tariff (particularly, Section 29); filed with FERC. For more information, see http://www.caiso.com/Documents/AppendixB20_EIMParticipatingResourceSchedulingCoordinatorAgreement_Asof_Jul01_2014.pdf.
EIM Meter Service Agreement	Sets forth the terms and conditions regarding the administration of revenue quality data meters to account for imbalance; includes a commitment to abide by the CAISO's Tariff (particularly, Section 10); filed with FERC. For more information, see http://www.caiso.com/Documents/AppendixB7_MeterServiceAgreement_SCs_Asof_Jun12_2013.pdf.

EIM Implementation Process: Six Milestones*

Project Scope and Milestones	Completion Criteria
Detailed Project Management Plan – Develop and initiate a project management plan describing specific tasks, delivery dates, team members, meeting requirements, and a process for approving changes to the plan.	Approval of project plan and schedule by BPA and the CAISO management.
Milestone 1 – This milestone is complete when the Implementation Agreement is been made effective via FERC order accepting the agreement.	FERC order.
Full Network Model Expansion – Full Network Model expansion for BPA and EMS/SCADA, including proof of concept of export/import of EMS data; complete model into the CAISO test environment; complete validation for all SCADA points from BPA; testing of the new market model; and validation of the outage and state estimator applications.	Successful export of BPA network model and import of that model into the CAISO full network model.
Milestone 2 – This milestone is completed upon modeling BPA into the CAISO full network model through the EMS which will be deployed into a non-production test environment using the CAISO's network and resource modeling process.	Validation of network model with no issues and promotion of network model to non-production test environment.

*www.westerneim.com/Documents/EIMEntityImplementationProjectPlan.pdf

EIM Implementation Process: Six Milestones*

Project Scope and Milestones	Completion Criteria
System Implementation Program Improvements – System requirements and software design, the execution of necessary software vendor contracts, technical interface specifications and configuration guides, and other related activities.	BPA software and interfaces are ready to connect to a non-production test system.
Milestone 3 – CAISO to promote market network model including BPA area to non-production system, and allow BPA to connect and exchange data in advance of market simulation. This triggers the start of joint integration testing and functional testing by BPA and the CAISO.	CAISO network model, market model and master file are available in test environment to enable BPA entity integration testing.
Construction, Testing and Training in Preparation for Market Simulation – This task includes IT infrastructure upgrades, security testing, training simulators, and functional testing.	BPA and the CAISO systems ready for structure market simulation.
Milestone 4 – The EIM market simulation will allow BPA and the CAISO to conduct specific market scenarios in a test environment prior to the production deployment to ensure that all system interfaces are functioning as expected and to produce simulated market results. To complete this milestone, the commencement of EIM simulation will signal that BPA and the CAISO have independently completed EIM system design, development and testing.	BPA access to the CAISO MAP-stage environment with all relevant EIM system interfaces for the purpose of market simulation.

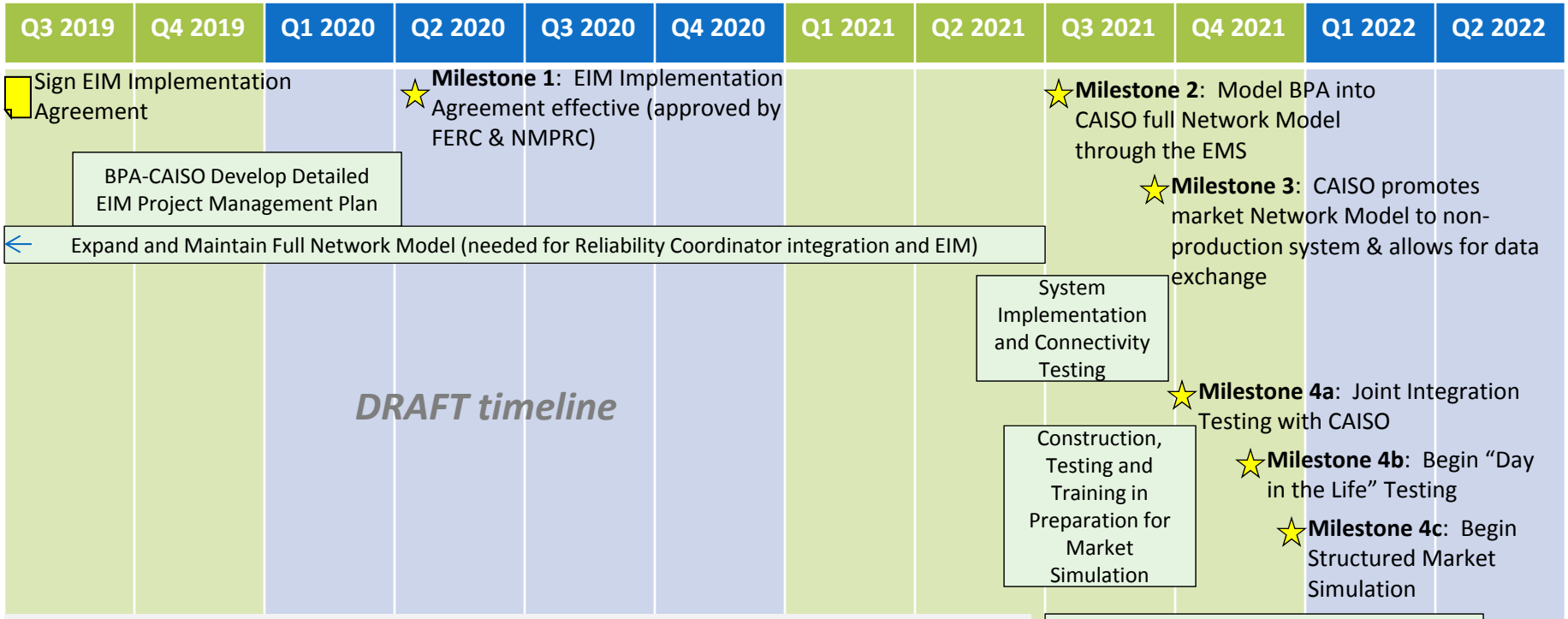
*www.westerneim.com/Documents/EIMEntityImplementationProjectPlan.pdf

EIM Implementation Process: Six Milestones*

Project Scope and Milestones	Completion Criteria
Activate Parallel Operations – The CAISO will activate a parallel operation environment to practice production grade systems integration as well as market processes and operating procedures in anticipation of the impending BPA activation as an EIM Entity and to confirm compliance with the EIM readiness criteria set forth in the CAISO tariff.	Successful export of BPA network model and import of that model into the CAISO full network model.
Milestone 5 – Start of parallel operations	Successful start of parallel operations in the CAISO stage environment
System Deployment and Go Live – Implementing the project and going live will include resource registration, operating procedures and updates, execution of service agreements, completion of BPA's tariff and processes, applicable board approvals, the filing and acceptance of service agreements and any CAISO tariff changes with FERC, and completion and filing of a readiness criteria certification in accordance with the CAISO tariff.	Readiness criteria achieved.
Milestone 6 – This milestone is complete upon the first production BPA EIM trade date.	Completion of first financially binding operating date.

*www.westerneim.com/Documents/EIMEntityImplementationProjectPlan.pdf

CAISO EIM Payment Milestones and Agreements



Payment Milestone **Anticipated Date**

Payment Milestone 1 – FERC Approval of EIM Implementation Agreement: April Year 1
Payment Milestone 2 – Validation of Integrated Full Network Model: July Year 2
Payment Milestone 3 – Begin Joint Integration Testing: September Year 2
Payment Milestone 4 – Begin Structured Market Simulation: December Year 2
Payment Milestone 5 – Begin Parallel Operations: February Year 3
Payment Milestone 6 – EIM Go-Live: April 1, Year 3
TOTAL COST: $1.9 million
Divided into 6 equal payments made upon completion of each milestone

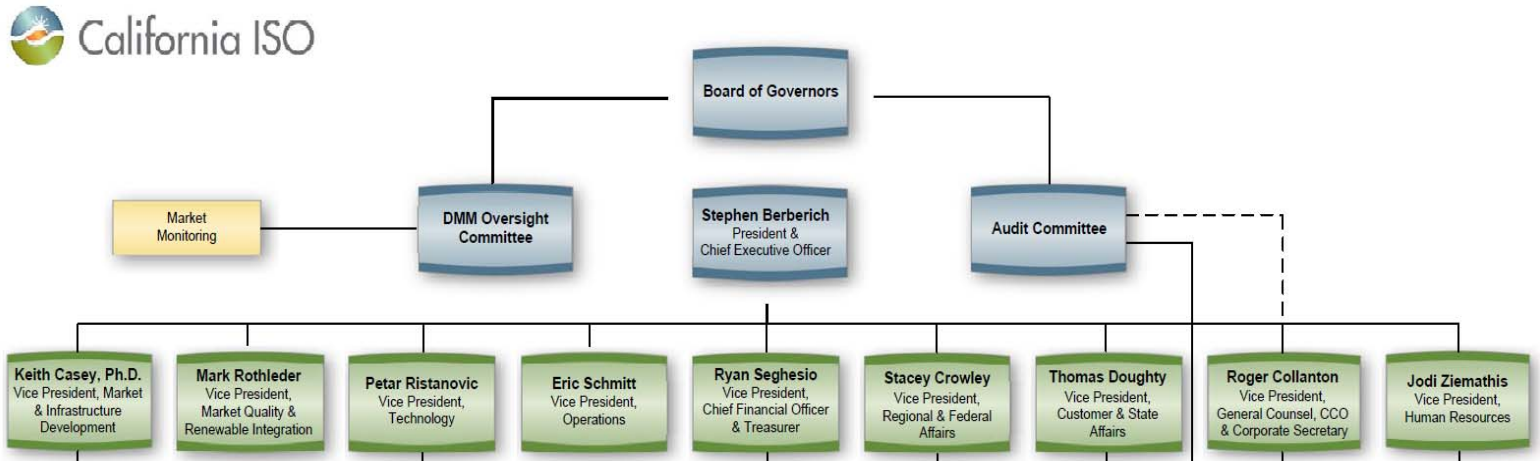
Local Market Power Mitigation

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

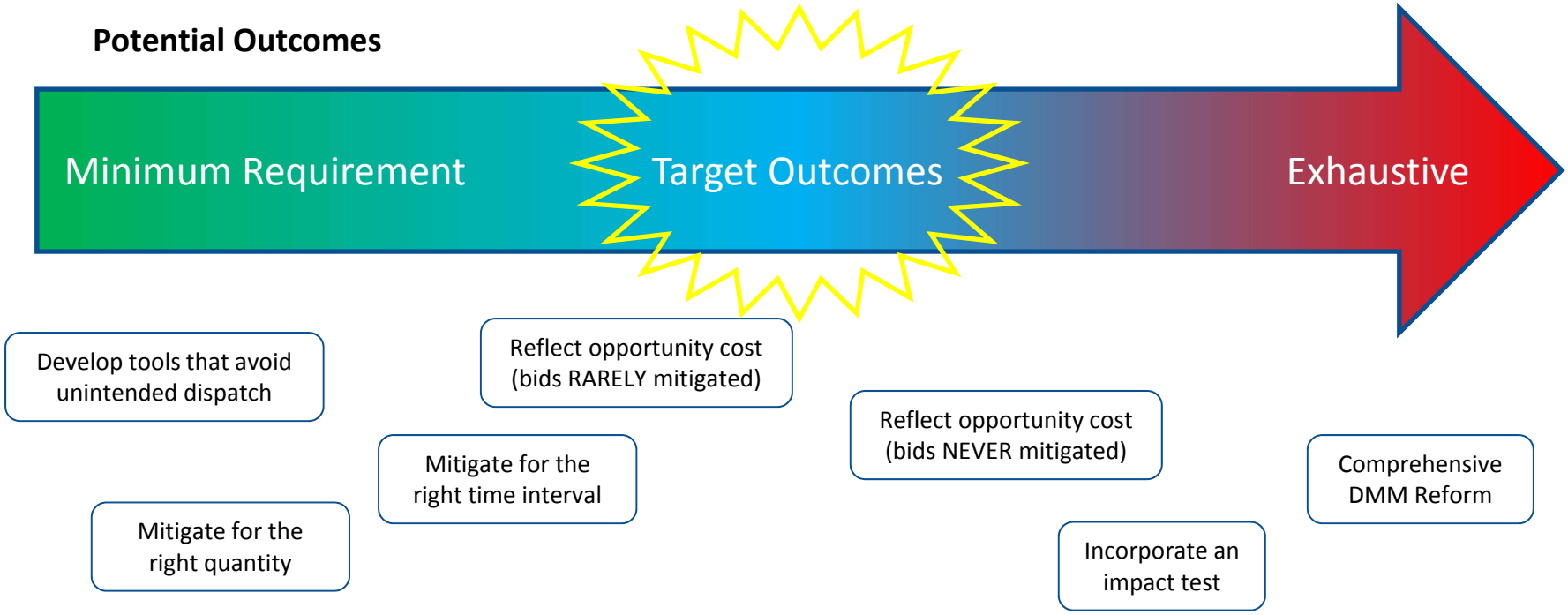
- Distinguishing between the potential versus exercise of market power (impact test)
- Specific parameters that determine opportunity cost

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*

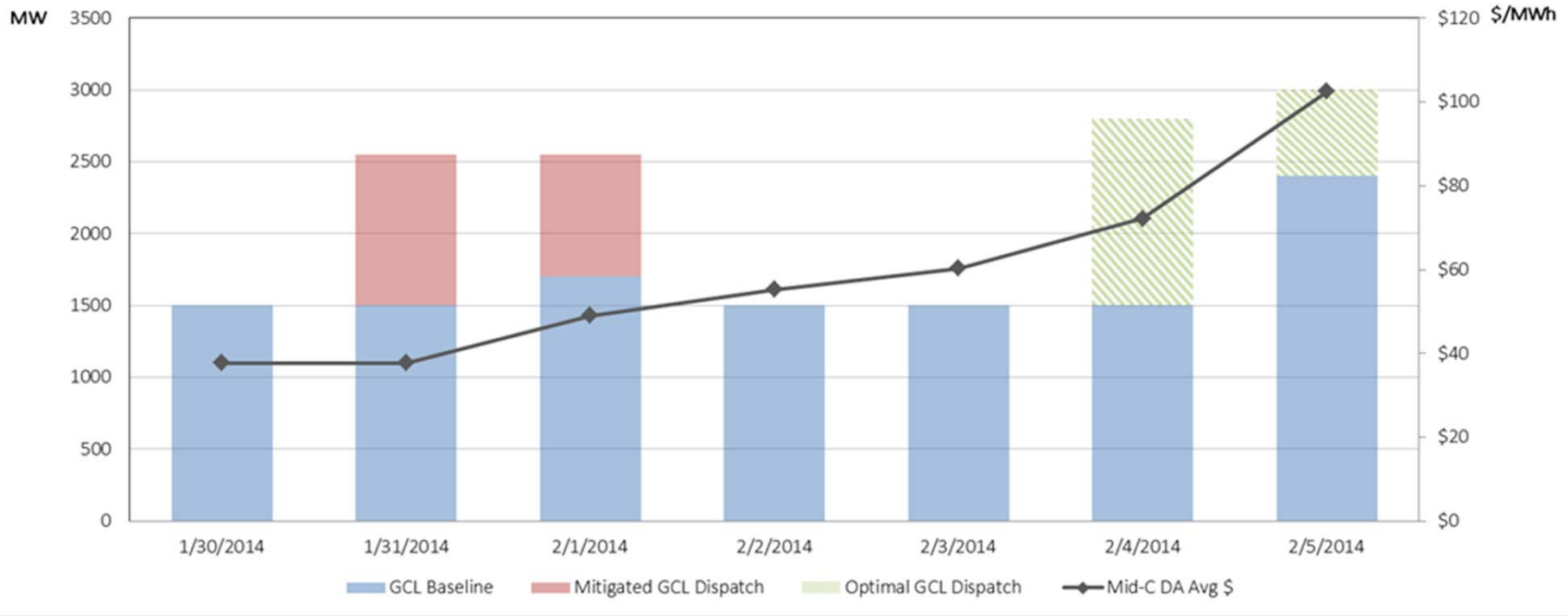
The current trend of the CAISO stakeholder process indicates that certain issues are resolvable, and BPA is targeting its focus accordingly

Topic	Focus Level*	Rationale
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:

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

  - 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 ($\propto$) acknowledges:
    - Intraday price variation
    - Within-month price variation around the average that is indicated by the index
    - Risk preferences of the bidder

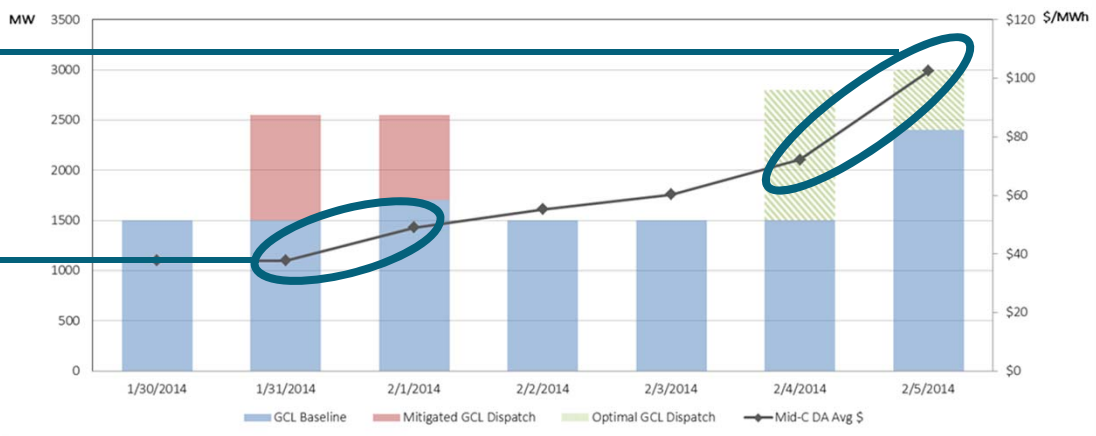
- Other considerations raised
  - Within-month index
  - Multiple locations
  - Location-specific multipliers
  - Minimum adder to maximum index

BPA Focus Area on DEB

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

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

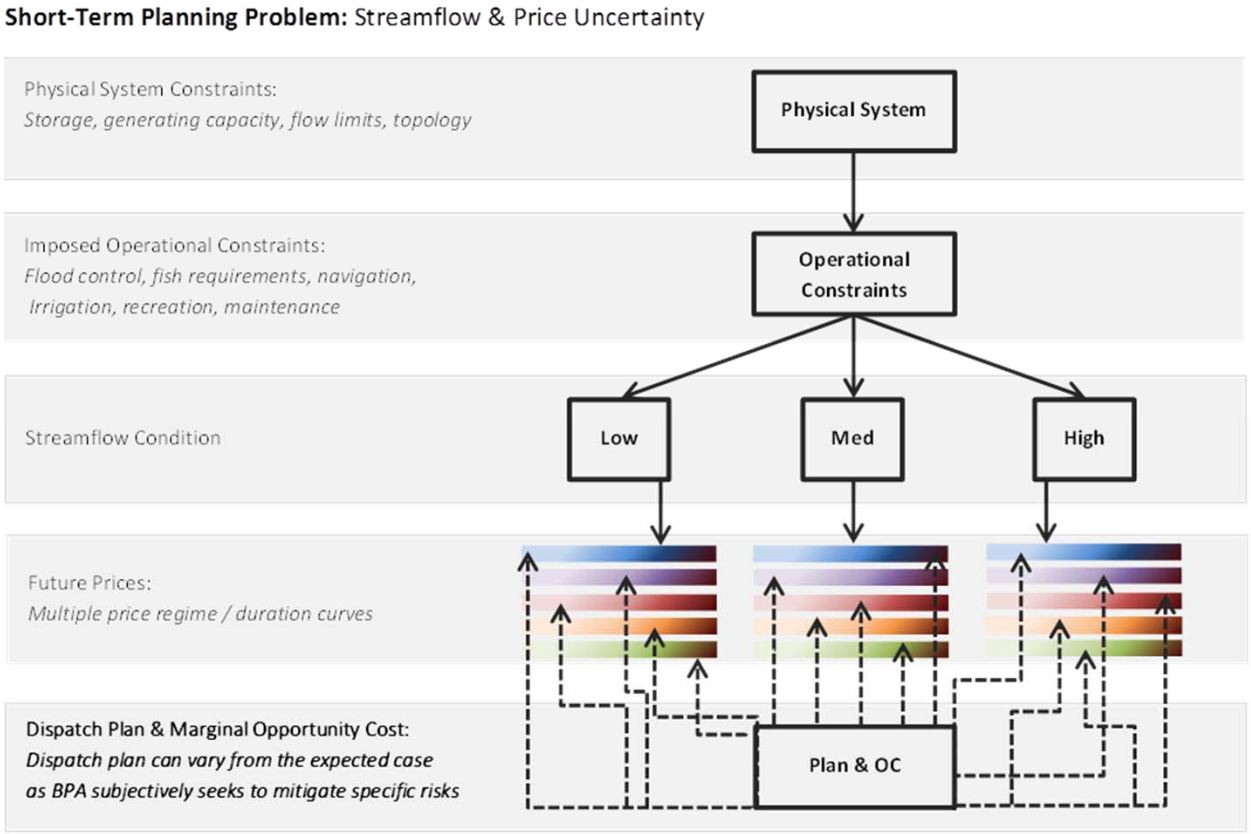
- We welcome feedback on this meeting. Your comments will help shape future EIM Stakeholder Meetings, please email us at techforum@bpa.gov and reference "EIM Stakeholder Meeting" in the subject. Comments are due by November 28th.

- 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



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