EIM Stakeholder Meeting

Oct 11, 2018
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

9:00-9:10	• Welcome, Safety Moment, Introductions
9:10 – 9:20	• Review of Previous EIM Stakeholder Meetings • Objectives of Today's Meeting
9:20 – 10:20	• Discussion on Issues BPA is Reviewing
10:20 – 10:30	• Break
10:30 – 11:10	• Continue Discussion on Issues BPA is Reviewing
11:10 – 12:00	• Timeline and Next Steps • Question and Answer Session

Review of BPA's EIM Stakeholder Topics we have Discussed to date:

- How EIM fits into the Grid Modernization effort, and link to BPA's 2018-2023 Strategic Plan
- Initial costs and benefits of joining the EIM
- Overview of Issues BPA is reviewing regarding potentially joining the EIM
- Timeline Review
- EIM 101 Workshop

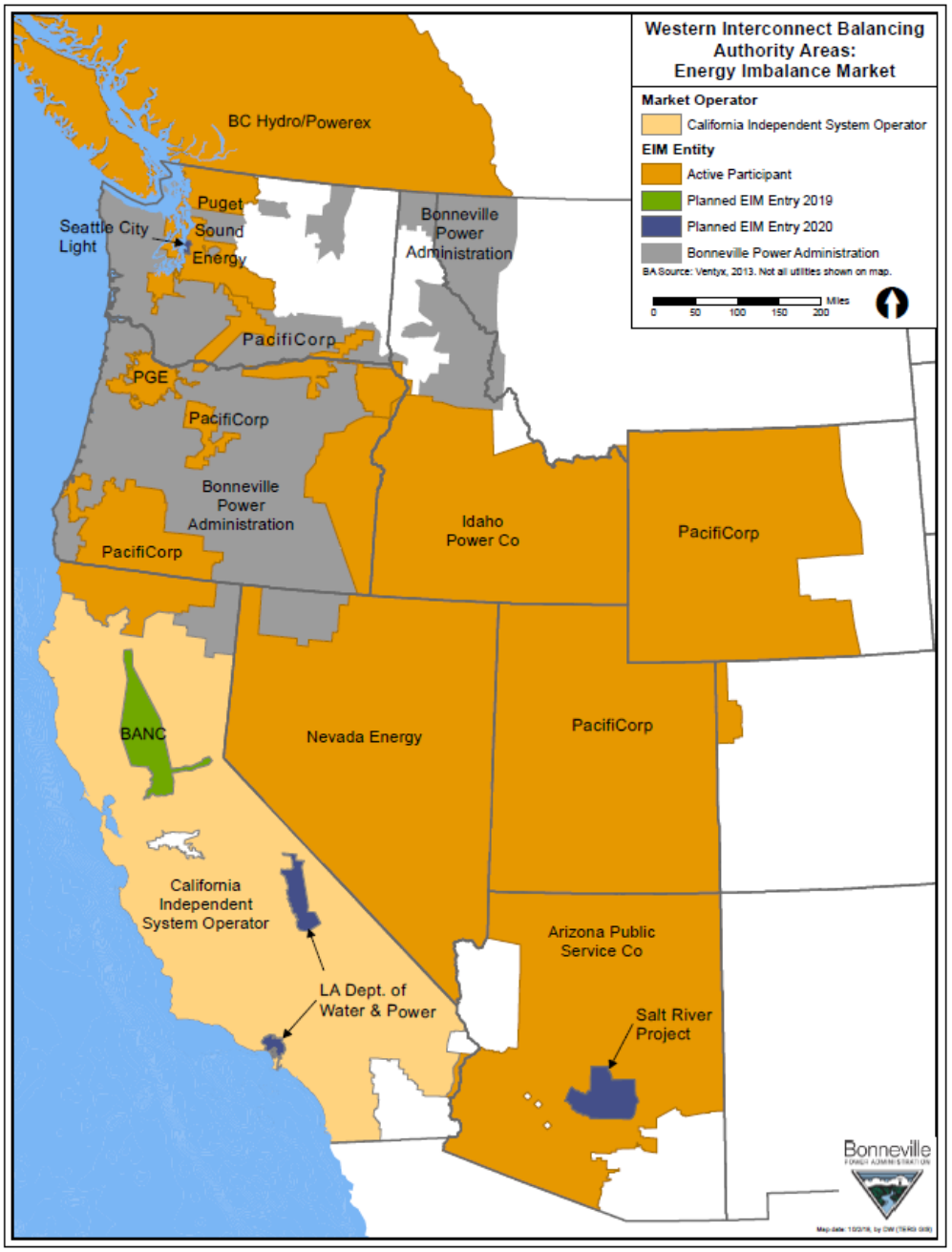
Statement of BPA's Principles:

1. Statutory and regulatory obligations are honored.

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.



EIM Entity Map

- Active and planned EIM participants
  - New addition: Public Service Company of New Mexico
- BPA shown in grey

Objectives For Today's Meeting

- Process Map
- Timeline Review
- Issues that BPA presented at the July 24th meeting that we will be discussing in more depth today:
  1. **Treatment of Transmission**
  2. **Generation Participation Model (FCRPS, IPP)**
  3. **Governance**
  4. Relationship of EIM to Other Emerging Markets
  5. BA Resource Sufficiency
  6. Market Power
  7. EIM Settlements
  8. Carbon Obligation in EIM

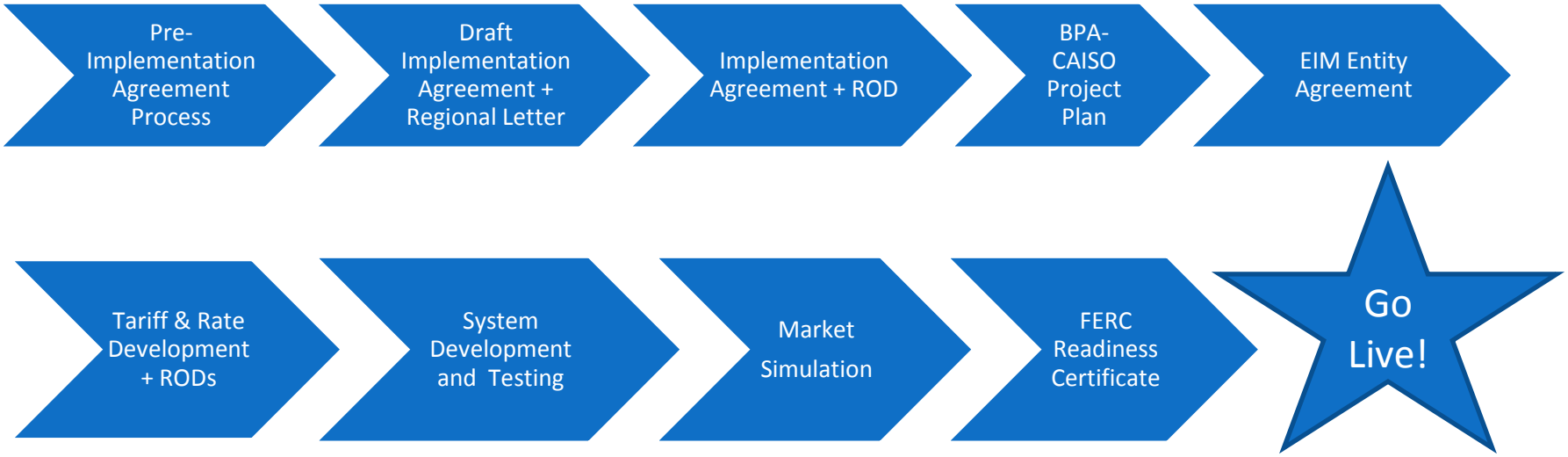
We will be discussing these issues today.

These issues will be discussed at future meetings.

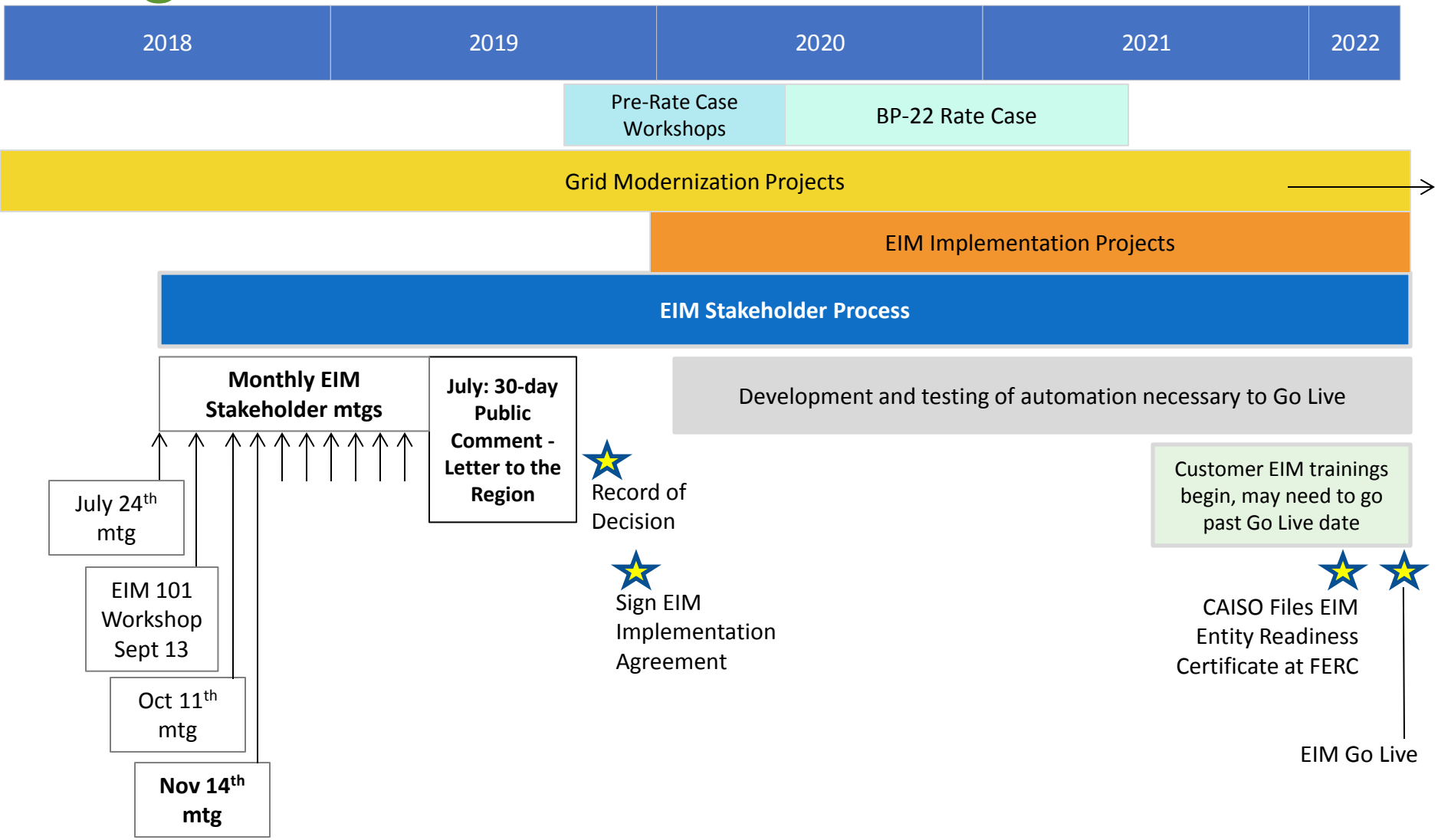
- Question and Answer Session

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.



High Level EIM Timeline



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

EIM Implementation Agreement

- Outlines the terms and conditions for moving forward with formally scoping, system development, testing, and joining the EIM.
- Contains a project plan including a schedule of project milestones and associated payments to the CAISO for costs related to system changes, software licenses, and other configuration activities.
- Requires BPA to create or modify certain systems and processes, as well as make certain organizational changes, necessary to join the EIM.
- Executing an Implementation Agreement does NOT mean that an entity has joined the EIM. As shown in the diagram on slide 8, a significant amount of work remains after an Implementation Agreement is executed. BPA can choose not to proceed with joining the EIM at any time in the process.

Treatment of Transmission

- Today's discussion is intended to provide discussion on the impacts of various methods of providing transmission in the EIM.
- This discussion focuses on EIM Transfers, using ETSR (define).
- In future discussions (e.g. BP-22 and TC-22), BPA will begin going into detail as to similar issues for use of transmission internal to our network.
- At this point in time, we are focused on EIM Transfers to validate that there is a workable solution sufficient for us to move forward with an Implementation Agreement.

Treatment of Transmission

- The EIM 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

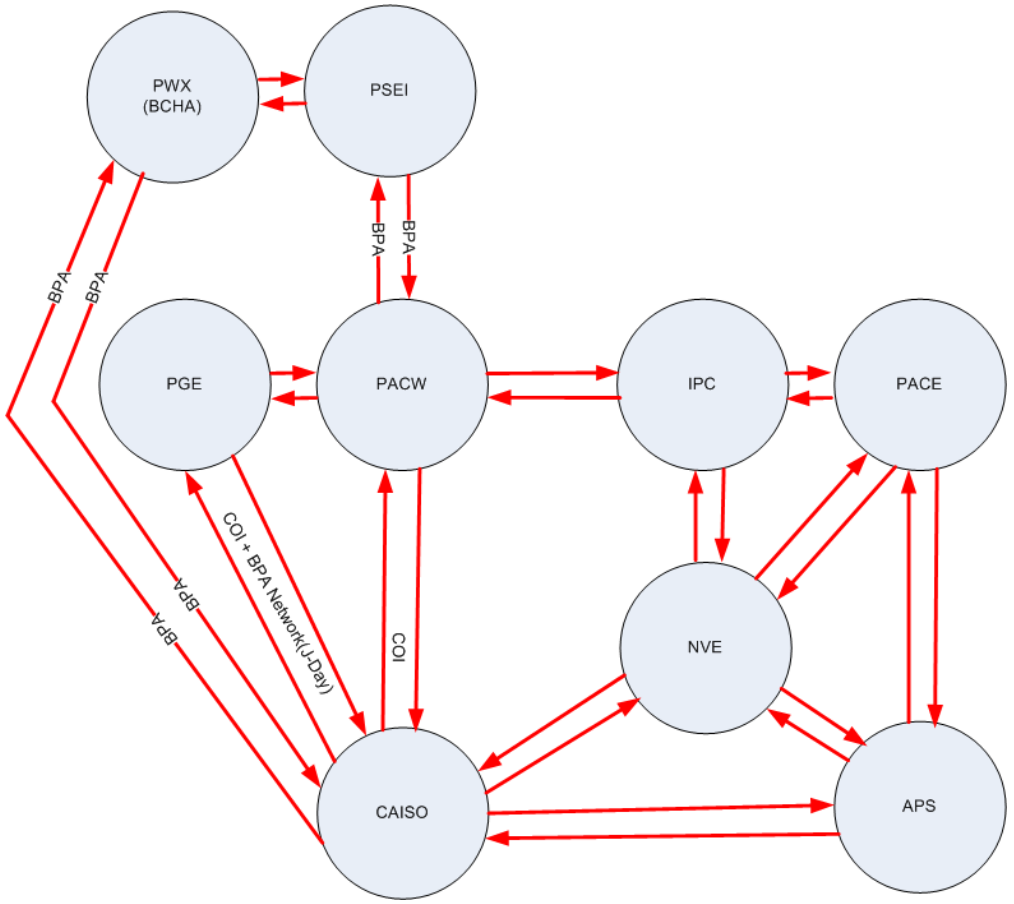
- ETSRs are defined as aggregate resources at the EIM BAA Default Generation Aggregation Point (DGAP), which is an aggregation of all supply resources in the BAA.

- 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) when more efficient transmission paths are constrained

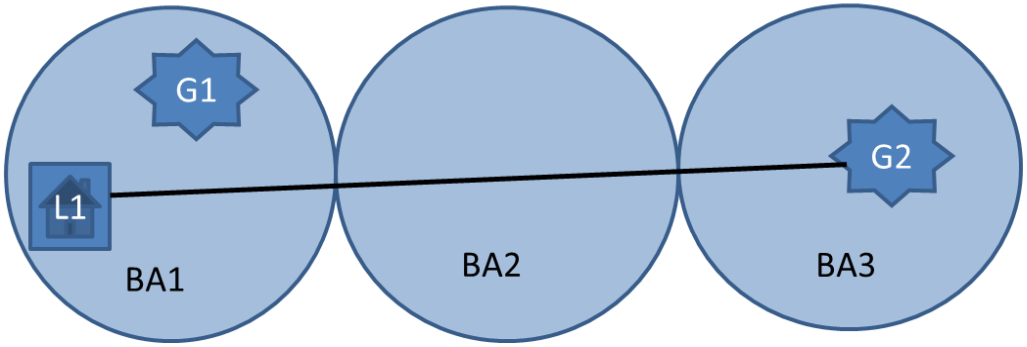


Existing Transmission Methods

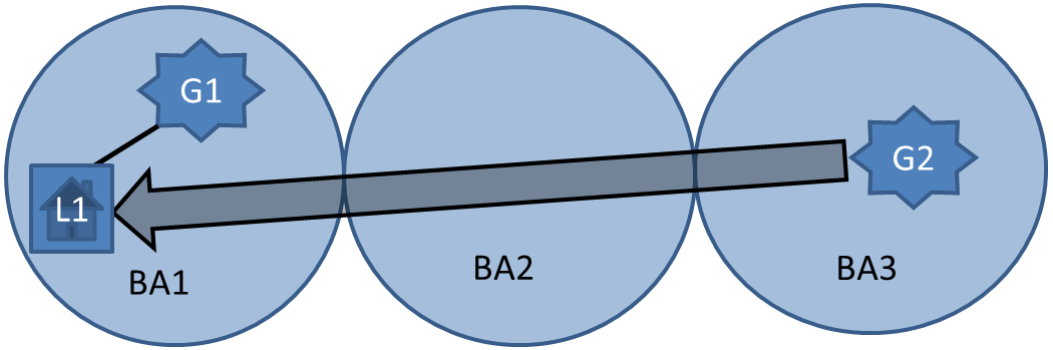
- There are two existing methods of making transmission available for EIM Transfers
  - Direct provision with a 0-NX NERC Designation
    - The EIM Entity receives no direct compensation for this transmission
    - Congestion revenue may be collected if applicable
  - Customer donation of Firm PTP Transmission with a 7-F NERC Designation
    - The EIM Entity (or relevant transmission provider) receives the tariff rate for the transmission
    - There is no compensation collected by the market other than congestion revenue if applicable

Wheel-through Overview

Example 1: Absent EIM – Currently, Transmission Is Purchased Across Each BAA



Example 2: With – Potential for Cost Shifts and Unrecovered Costs via 0-NX EIM Transfer in BA2



Treatment of Transmission

- BPA expects that there is a high likelihood it will be a “net wheeler” in the EIM
  - I.E, we could facilitate more EIM Transfers than generation and load within our EIM BAA
  - As such, BPA has concerns about direct provision of 0-NX transmission under the current no-charge regime because of cost shift and free-ridership concerns

- **Thus BPA has determined that customer donation is the only feasible solution available at this time.**

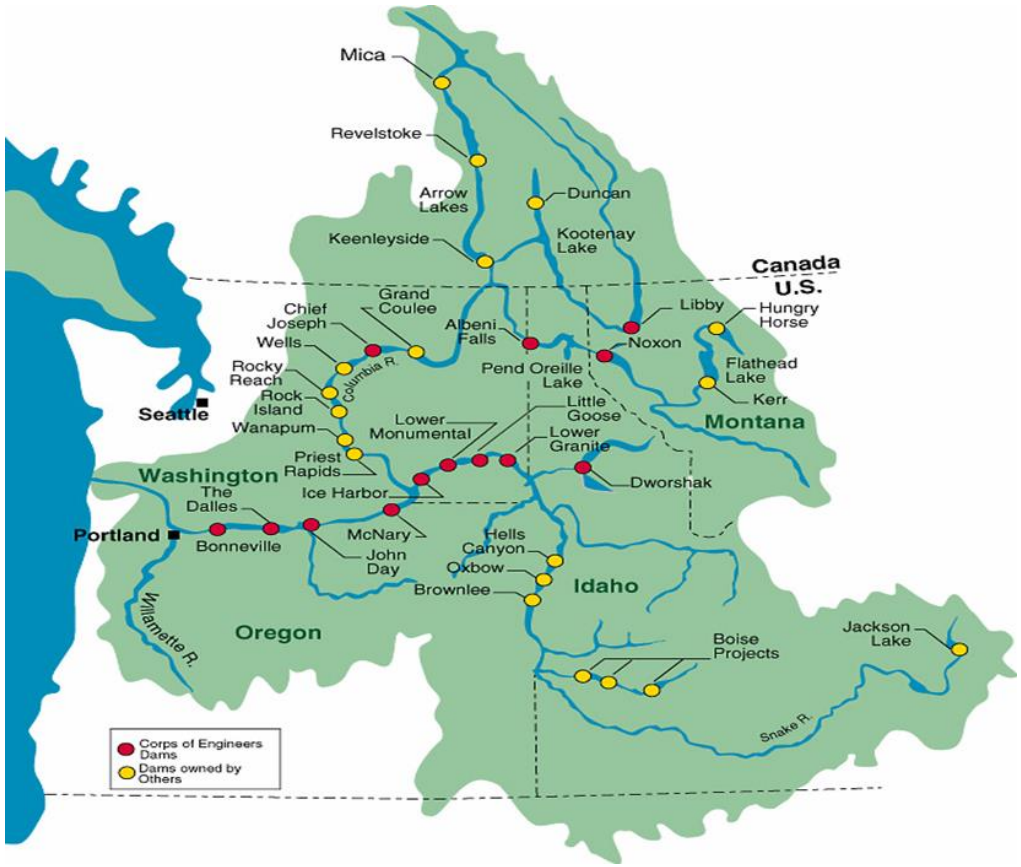
Generation Participation

- Participating Resources are provided a dispatch by the EIM Market Operator at the individual or group level (based on participation model).
- Value of the EIM's congestion management functions for Bonneville increases the more granular Bonneville can make its generation bids.
- Bonneville has historically sold power from only system resources – not individually or by groups.
- Objective is to find a participation model that appropriately balances transmission congestion, hydraulic, operational, and other non-power objectives.

Generation Participation

- Bidding individual or groups of Federal resources into EIM is possible, but must follow statutory limitations.
  - Bids will be consistent with FCRPS's operational and environmental restrictions.
  - Bids will be consistent with integrating FCRPS as a system. (Will enhance optimization; not de-optimize the FCRPS).
  - Bids will not jeopardize Firm power obligations.
  - Bids will aim to ensure Bonneville recovers its costs.

Generation Participation



- **Participating Resources**: Grand Coulee, Chief Joseph, McNary, John Day, The Dalles, Bonneville, Lower Granite, Little Goose, Lower Monumental, and Ice Harbor (aka the Big 10).

- **Non-Participating Resources**: Non-Big 10 projects, which include headwater projects, Willamette projects, Palisades, Upper Snake projects, and CGS.

Generation Participation

- The goal is to preserve and enhance the value of Northwest hydropower and transmission operations for our customers and the region by making more efficient use of the FCRPS and FCRTS.

- Efficient use of the system means having the ability to:
  - Enhance the optimization of the FCRPS.
  - Maximize transmission congestion management benefits.
  - Capture revenue benefits from joining the CAISO EIM.

- FCRPS Participation Alternatives Evaluated:
  - One Aggregate: all “Big 10” projects will be aggregated into one resource.
  - Three Aggregates: “Big 10” projects will be aggregated into three resources each corresponding to a subset of the Big10 (Upper Columbia, Lower Columbia, and Lower Snake).
  - Project level: each “Big 10” project will be a participating resource at the project level, no aggregation.

Generation Participation

Comparison of FCRPS Participation Alternatives :

Participation Alternative	Pro	Con
One Aggregate	• Most similar to current way of optimizing FCRPS	• The least efficient congestion relief • Lack of additional revenue associated with differential LMPs
Three Aggregates	• More efficient congestion relief • Additional revenue associated with differential LMPs	• May not fully realize congestion relief and revenue benefits
Project Level	• Most efficient congestion relief • Additional revenue associated with differential LMPs	• More complexity, which increases the risk that BPA may, through its bids, operate the FCRPS less efficiently.

Generation Participation

- **Based on BPA's analysis, using three (3) aggregates (i.e., Upper Columbia, Lower Columbia, and Lower Snake) is how the FCRPS will initially plan to participate in the EIM**
- This model is subject to change based on further analysis and approval by the CAISO
- We will consider shifting to project level participation after Go Live if we determine the benefits outweigh the costs and risks
- These aggregations provide the best current real-time adjustment process and new market tools in order to ensure optimization between projects while providing incremental congestion relief
- Aggregations of Non-Federal resources will be considered as long as they are similarly situated and approved by both BPA and the CAISO
  - Other generators in Bonneville's BA should reach out to their Transmission Account Executives to discuss how they could participate

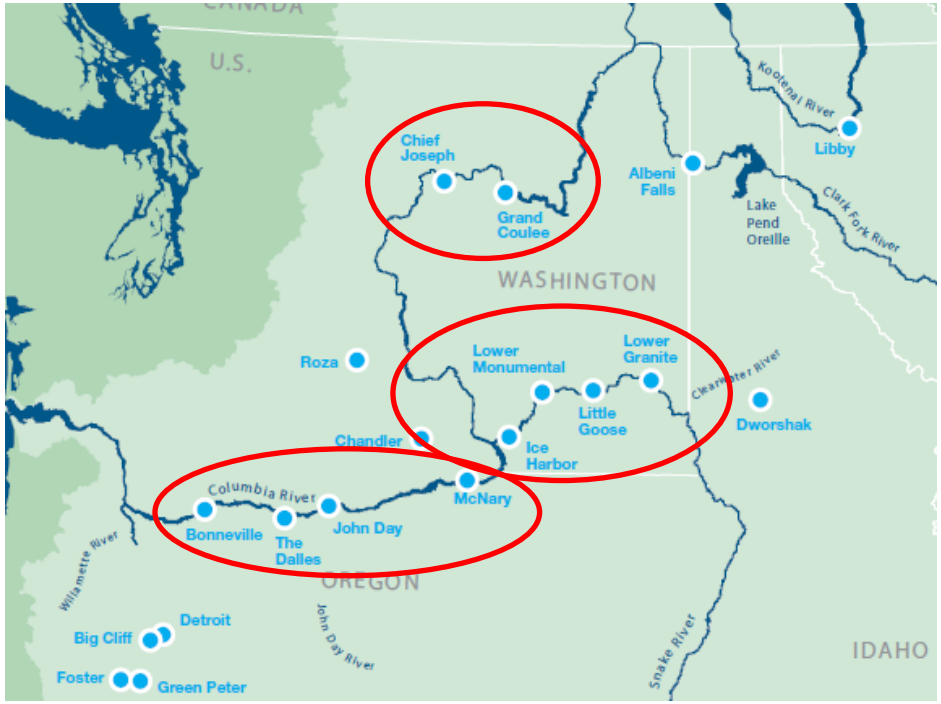
Generation Aggregation Analysis

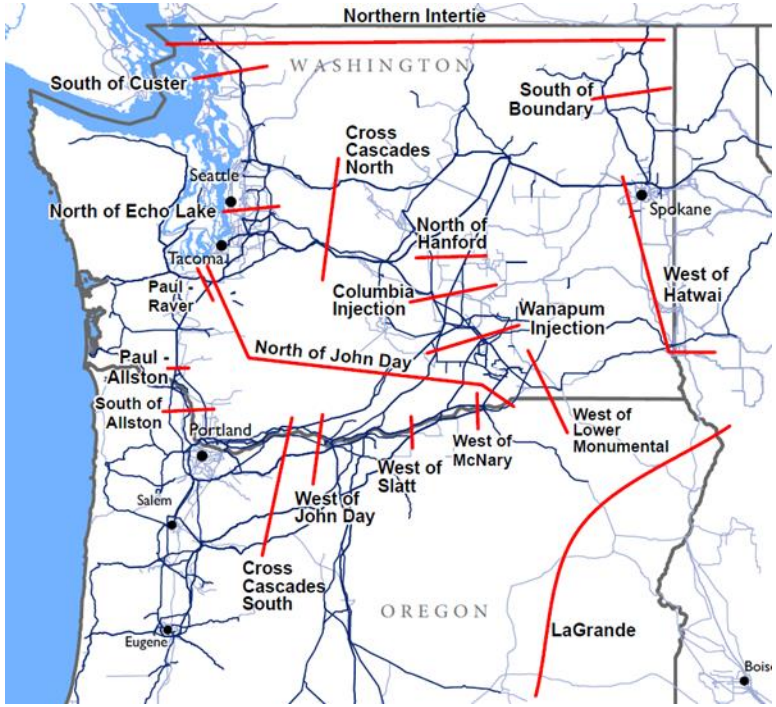
- BPA analyzed the feasibility of aggregating participating resources into three groups:
  - Upper Columbia (Chief and Coulee)
  - Lower Columbia (Bonneville, The Dalles, John Day, McNary)
  - Snake River (Ice Harbor, Low Mo, Little Goose, Lower Granite)

- We evaluated:
  - Where BPA typically holds intra-hour flexibility
  - Aggregation model(s) supported by the EIM
  - Congestion risk and trends
  - Electrical similarity of groupings relative to internal flowgates

Generation Aggregation Analysis

- Aggregations & Flowgates





Flexible Resources

- BPA generally has the most intra-hour flexibility at the following resources:
  - Grand Coulee
  - Chief Joe
  - John Day
  - The Dalles
- Depending on the time of the year, water conditions, and operational objectives, the Snake River projects, Bonneville, and McNary have flexibility as well

Generation Aggregation Model

- Evaluated using an APR and ANPR participation model.
- Using this model each aggregation is defined twice:
  1. Aggregate Participating Resource (APR) to respond to the EIM bids/offers
  2. Aggregate Non-Participating Resource (ANPR) for base schedules, regulations, and contingency reserves.
- Separate sets of hourly Generation Distribution Factors (GDFs) are submitted to define the proportions of energy distribution among the resources within the aggregation (one set for APR, one set for ANPR)
- The use of APR/ANPR with separate GDFs enables the separation of market bids/dispatches from load/ACS obligations for transparency and effective usages of system flexibility
- The use of GDFs allow the EIM to accurately model the physical impacts of the APR/ANPR on the transmission system

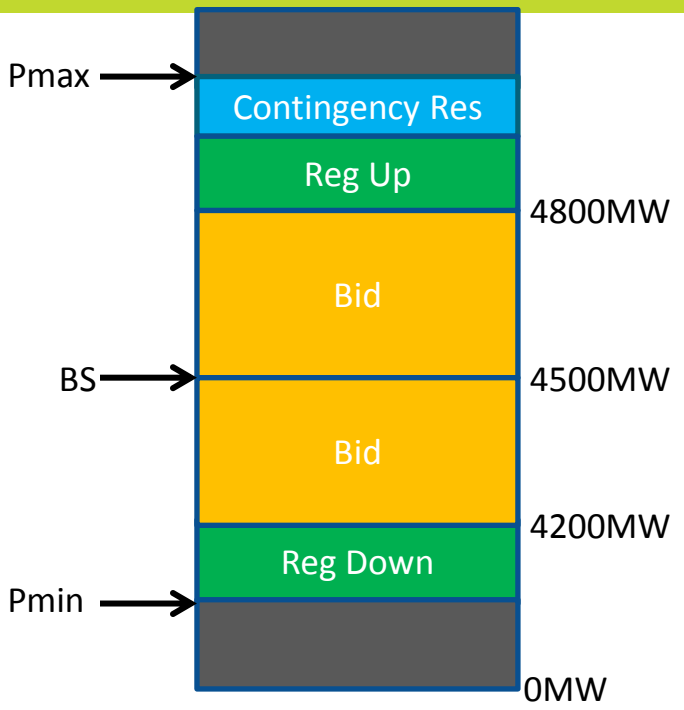
Traditional APR Setup:

APR
GCL + CHJ

GDF*:
GCL 0.67
CHJ 0.33

*GDF is calculated based on Base Point. GDF controls the distribution of MW for both BS and bid range.

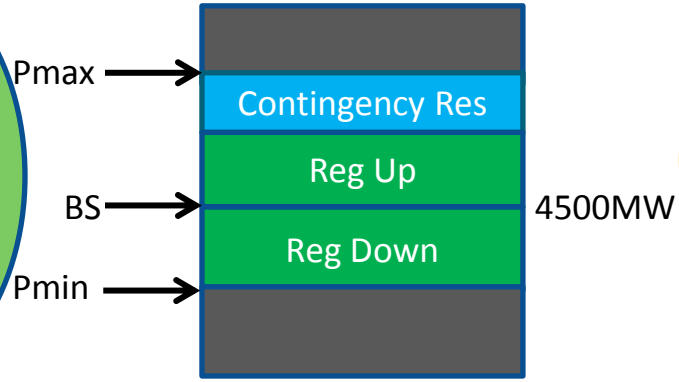
	BP (MW)	GDF
GCL	3000	3000/4500 = 0.67
CHJ	1500	1500/4500 = 0.33
SUM	4500	1



APR/ANPR Setup:

ANPR
GCL + CHJ

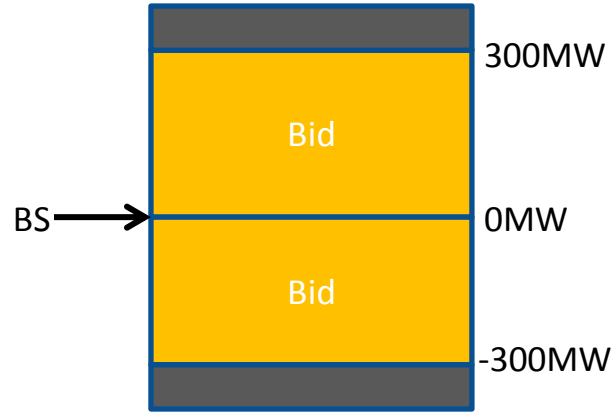
GDF**:
GCL 0.67
CHJ 0.33



**Controls the distribution of MW for BS (input to EIM network model)

APR (NGR)
GCL + CHJ

GDF***:
GCL 0.3
CHJ 0.7



***Controls the distribution of MW for bid range

Congestion Risk and Trends

- Analyzed historical in-hour curtailments events between 2008 and ~3/2018
- Discretionary Redispatch events were not analyzed
- SOL Methodology changed 4/2017 where curtailments no longer occur when actual flows exceed the TTC
  - SOL must be exceeded on an element (thermal)
  - RTCA used as a real-time tool
- As of November, 2014, 15-minute intervals are curtailed – they used to be hourly

Congestion Risk and Trends

CURTAILMENT EVENTS - ALL PRIORITIES (1,2,6,7)												
Flowgate	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Grand Total	Risk (10yr)
NJD			4	4	11		21		2	2	44	0.050%
NOEL						12	5	17		3	37	0.042%
NOH				3							3	0.003%
NOH_SN		11		1	7	1					20	0.023%
P-A		2									2	0.002%
R-P			1	4	1				7		13	0.015%
SOA	11	1		3		2	2				19	0.022%
SOA_SN	3	2		1		3					9	0.010%
SOC								1	21		22	0.025%
WOCN		1	4			1					6	0.007%
WOJD					4				6		10	0.011%
WOM					5		3				8	0.009%
WOM - MAIN-GRID									2		2	0.002%
WOMSG								4			4	0.005%
Grand Total	14	17	9	16	28	19	31	22	38	5	199	0.227%

Congestion Risk and Trends

CURTAILMENT EVENTS - FIRM (7)												
Flowgate	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Grand Total	Risk (10yr)
NJD							5				5	0.006%
NOEL						4	1	2		1	8	0.009%
NOH												0.000%
NOH_SN					2						2	0.002%
P-A												0.000%
R-P				2					4		6	0.007%
SOA												0.000%
SOA_SN												0.000%
SOC												0.000%
WOCN			2			1					3	0.003%
WOJD									4		4	0.005%
WOM					5		1				6	0.007%
WOM - MAIN-GRID									2		2	0.002%
WOMSG								1			1	0.001%
Grand Total			2	2	7	5	7	3	10	1	37	0.042%

Congestion Risk and Trends (Summary)

- The number and duration of actual flows exceeding TTC has been increasing
- The number curtailments has been decreasing
- Trends are likely due to new SOL methodology that went into effect on 4/1/2017
- Overall risk of curtailments is very low
- These trends may or may not continue – *hard to predict the future!*

Electrical Similarity

- In order to determine if the resources within each aggregation are electrically similar to one another relative to BPA's internal flowgates, a set of Generation Shift Factors (GSFs) were calculated from a 2019 planning case (all lines in service)

- In the context of any specific flowgate, resources that have very similar GSFs are considered to be electrically similar for that flowgate
  - If the difference between any two GSFs are less than 10%, the resources were considered to be electrically similar
  - Outages were not evaluated.

Electrical Similarity
(Example for North of John Day)

FLOWGATE:	NORTH OF JOHN DAY N>S														
PERCENT:	10.0%														
		LOW1	LOW2	LOW3	LOW4	OTH	OTH	OTH	OTH	OTH	SNK1	SNK2	SNK3	SNK4	UP1	UP2
		MCN	JDA	TDA	BON	ALF	DWR	HGH	LIB	BLK	LWG	LGS	LMN	IHR	GCL	CHJ
LOW1	MCN	0.0%	4.4%	1.2%	4.4%											
LOW2	JDA	4.4%	0.0%	3.2%	8.8%											
LOW3	TDA	1.2%	3.2%	0.0%	5.6%											
LOW4	BON	4.4%	8.8%	5.6%	0.0%											
OTH	ALF															
OTH	DWR															
OTH	HGH															
OTH	LIB															
OTH	BLK															
SNK1	LWG															
SNK2	LGS															
SNK3	LMN															
SNK4	IHR															
UP1	GCL															
UP2	CHJ															

Lower Columbia

0.0%	2.6%	4.2%	80.6%
2.6%	0.0%	1.6%	83.2%
4.2%	1.6%	0.0%	84.7%
80.6%	83.2%	84.7%	0.0%

0.0%	0.6%
0.6%	0.0%

Lower Snake

Upper Columbia

Electrical Similarity Summary

ELECTRICALLY SIMMILAR @ 10%				
FLOWGATE	UPPER	LOWER	SNAKE	NOTES
CCN	YES	MAYBE	YES	Bonneville slightly above 10% in Lower
CCS	YES	NO	YES	Bonneville much higher than 10% in Lower
NOEL	YES	YES	YES	
NOH	YES	MAYBE	YES	Bonneville slightly above 10% in Lower
NJD	YES	YES	NO	Ice Harbor much higher than 10%
PA	YES	MAYBE	YES	Bonneville slightly above 10% in Lower
RP	YES	MAYBE	YES	Bonneville slightly above 10% in Lower
SOA	YES	MAYBE	YES	Bonneville slightly above 10% in Lower
SOC	YES	YES	YES	
WOJD	YES	NO	YES	
WOLM	YES	YES	NO	Ice Harbor has a large impact (>80%)
WOM	YES	NO	MAYBE	Ice Harbor a little less than 20%
WOS	YES	MAYBE	YES	Impacts range from 5-32%

Electrical Similarity Summary

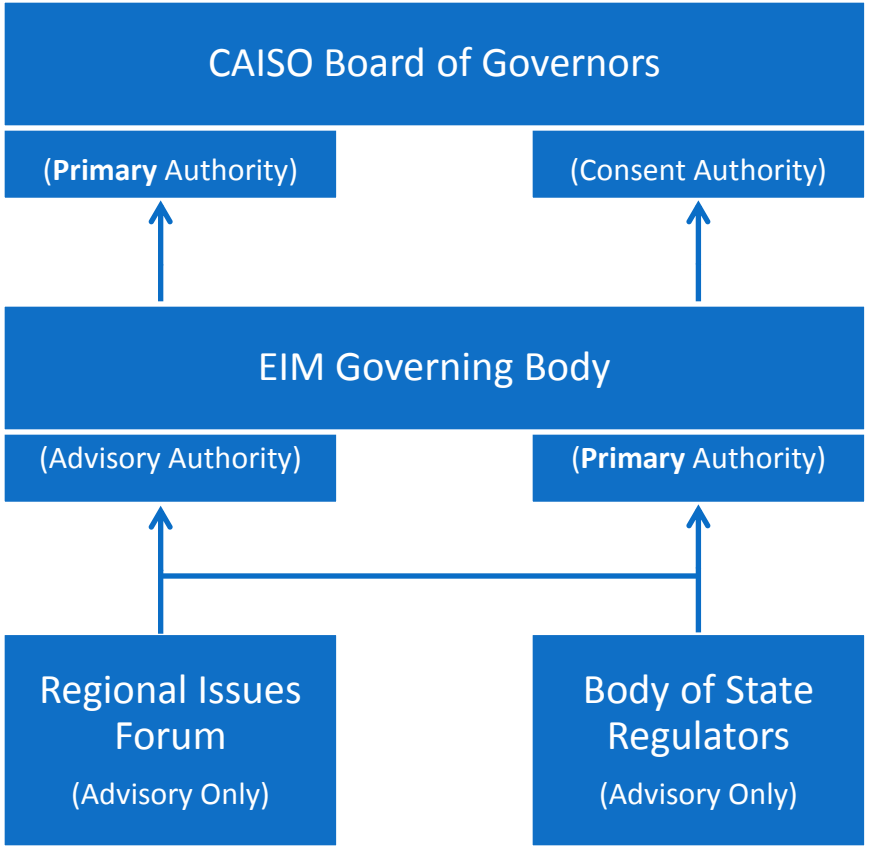
- Ice Harbor and Bonneville have significantly less intra-hour flexibility relative to other aggregated resources most of the year and will likely have very low GDFs most hours

- Congestion impacts can be mitigated using GDF adjustments that are informed by advisory dispatches, high flows, outages, dispatcher directives, or observed shadow prices

Generation Aggregation Analysis Summary

- The three aggregations maximize benefits while balancing transmission congestion, hydraulic, operational, and other non-power objectives and constraints
- GDFs within the aggregations provide a flexible operational tool to manage hydraulic objectives and congestion impacts
- Provides the potential to enhance the optimization of the FCRPS
- Ability to capture incremental revenue benefits
- Provides a simple and effective initial participation model consistent with current operations
- Ability to adjust the participation model based on operational experience

EIM Governance Structure



CAISO Board of Governors
Five members
Staggered three-year terms
Appointed by California Governor
http://www.caiso.com/about/Pages/OurLeadership/Default.aspx

EIM Governing Body
Five members
Staggered three-year terms
Appointed by CAISO Board of Governors
https://www.westerneim.com/Pages/Governance/default.aspx

Regional Issues Forum
10 self-selected sector liaisons
Open forum format
https://www.westerneim.com/Pages/Governance/RegionalIssuesForum.aspx

Body of State Regulators
One PUC/PSC representative from each state in the EIM footprint
https://westernenergyboard.org/eim-bosr/what-we-do/

EIM Governance – Who Makes Decisions

- Both the CAISO Board of Governors and EIM Governing Body have decision-making roles.
- The EIM Governing Body generally has “primary” authority on matters that only impact the EIM market and “advisory” authority on matters that impact the EIM market and the larger CAISO market.
- The Board of Governors has decision-making authority on matters that impact the larger CAISO market.
- On certain matters, the Board of Governors and Governing Body can share authority for decision making (aka hybrid initiatives).
- The Body of State Regulators and Regional Issues Forum are “advisory only” bodies.
- For more information on decision-making authorities, see https://www.westerneim.com/Documents/GuidanceforHandlingPolicyInitiatives-EIMGoverningBody.pdf.

BPA's Position on EIM Governance

- **BPA has determined that the current EIM governance structure does not contain any "showstoppers" to joining the EIM.**
- However, BPA would like to see some improvements to the current governance structure, including:
  - A clearer delineation between the decision-making responsibilities of the CAISO Board of Governors and the EIM Governing Body.
  - The development of a higher standard for dissolution of the EIM Governing Body.
  - A broader role for public power in the EIM governance structure.
- BPA will support these improvements in an upcoming stakeholder process that the CAISO will initiate no later than September 2020.
- BPA will continue to monitor governance and regionalization issues as they progress.

Next Steps

- Next meeting scheduled for Wednesday November 14th at the Rates Hearing Room in the afternoon.
  - 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 October 25th .

- 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