

# Benefits Analysis

## Sensitivity Study



# Potential Sensitivities

Sensitivity	NW Midpoint Assumption	More Optimistic	More Conservative
<b>Success Rate</b>	<ul style="list-style-type: none"> <li>75%</li> </ul>	<ul style="list-style-type: none"> <li>Higher success rate: Better foresight on hydro operations and success in being awarded bids at modeled price</li> </ul>	<ul style="list-style-type: none"> <li>Lower success rate: Hydro is more constrained than expected or bids are not successfully awarded to BPA</li> </ul>
<b>Hydro Flexibility</b>	<ul style="list-style-type: none"> <li>Actual “Big 10” Hydro INC/DEC spinning capability</li> <li>Daily hydro energy balance</li> <li>BPA meets FRST in all hours</li> </ul>	<ul style="list-style-type: none"> <li>Use hydro capability beyond spinning capability on “Big 10” Hydro</li> <li>Optimize FCRPS to increase available capability for EIM transactions</li> <li>Allow hydro to be balanced across multiple days</li> </ul>	<ul style="list-style-type: none"> <li>Limiting available spinning capability for EIM participation e.g. no participation beyond what is required for FRST only</li> </ul>
<b>EIM Price</b>	<ul style="list-style-type: none"> <li>2016-2018 PGE prices</li> </ul>	<ul style="list-style-type: none"> <li>Historical DGAP_BPAT-APND prices are more volatile</li> </ul>	<ul style="list-style-type: none"> <li>PSE prices are on average lower and less volatile</li> <li>NW average prices would decrease overall price volatility</li> </ul>
<b>EIM Intra-Hour Price Volatility</b>	<ul style="list-style-type: none"> <li>Actual volatility of 2016-2018 PGE prices</li> </ul>	<ul style="list-style-type: none"> <li>Price volatility within the hour will stay the same</li> </ul>	<ul style="list-style-type: none"> <li>Price volatility within the hour is reduced due to higher EIM participation</li> </ul>
<b>California GHG Fee</b>	<ul style="list-style-type: none"> <li>No marginal cost of GHG considered in EIM prices</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>	<ul style="list-style-type: none"> <li>EIM prices are reduced when increasing generation during intervals of nonzero marginal cost of GHG</li> </ul>



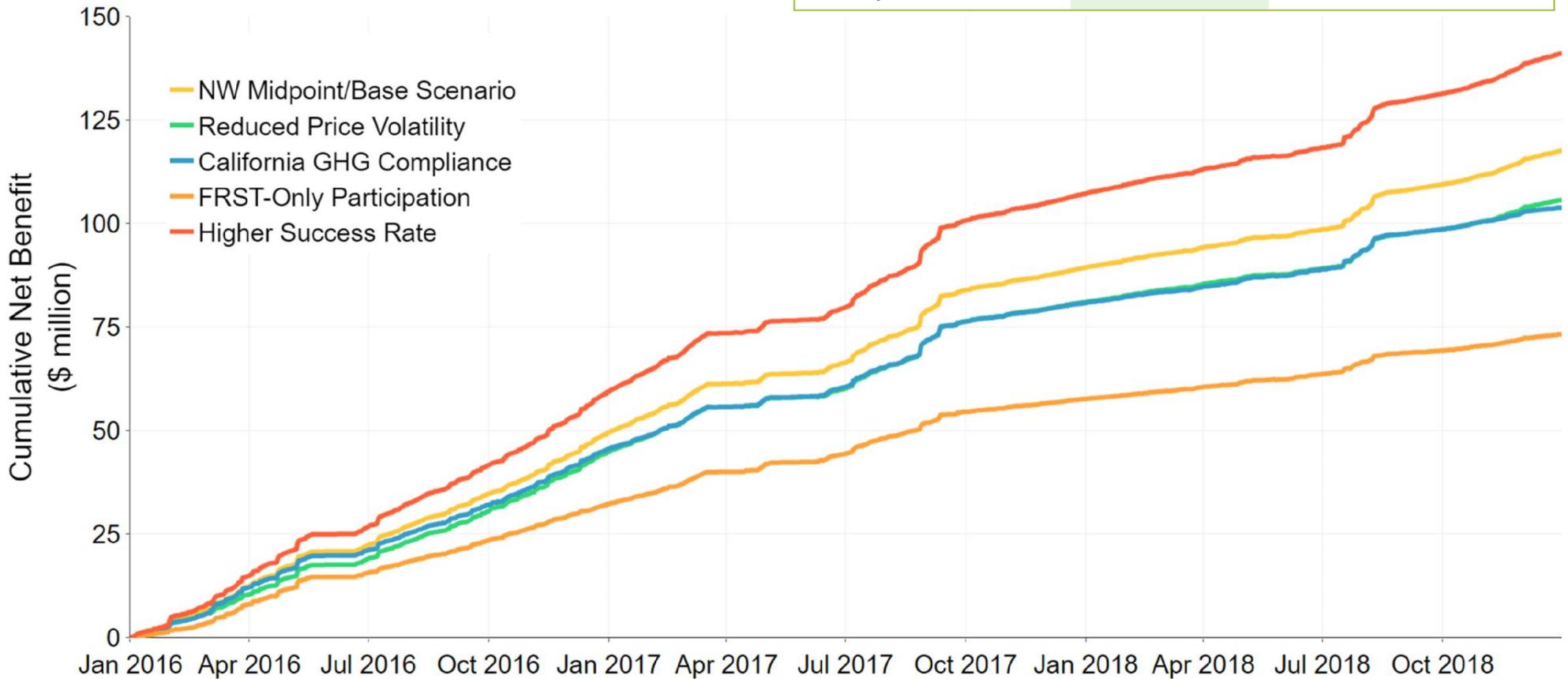
# Sensitivities Presented Today

Sensitivity	Price	BPA Hydro Flexibility	Success Rate
<b>NW Midpoint/ Base</b>	Actual 2016-2018 for DGAP_PGE- APND No marginal GHG applied	Actual 2016-2018 INC/DEC spinning capability with reserves held Daily hydro energy balance	75%
<b>Reduced Price Volatility</b>	DGAP_PGE-APND prices adjusted to be 50% less volatile within each operating hour	Actual 2016-2018 INC/DEC spinning capability with reserves held Daily hydro energy balance	75%
<b>California GHG Compliance</b>	EIM prices are reduced when increasing generation during intervals of nonzero marginal cost of GHG	Actual 2016-2018 INC/DEC spinning capability with reserves held Daily hydro energy balance	75%
<b>FRST-Only Participation</b>	Actual 2016-2018 for DGAP_PGE- APND No marginal GHG applied	Limiting hydro flexibility to what is required to meet FRST only Daily hydro energy balance	75%
<b>Higher Success Rate</b>	Actual 2016-2018 for DGAP_PGE- APND No marginal GHG applied	Actual 2016-2018 INC/DEC spinning capability with reserves held Daily hydro energy balance	90%



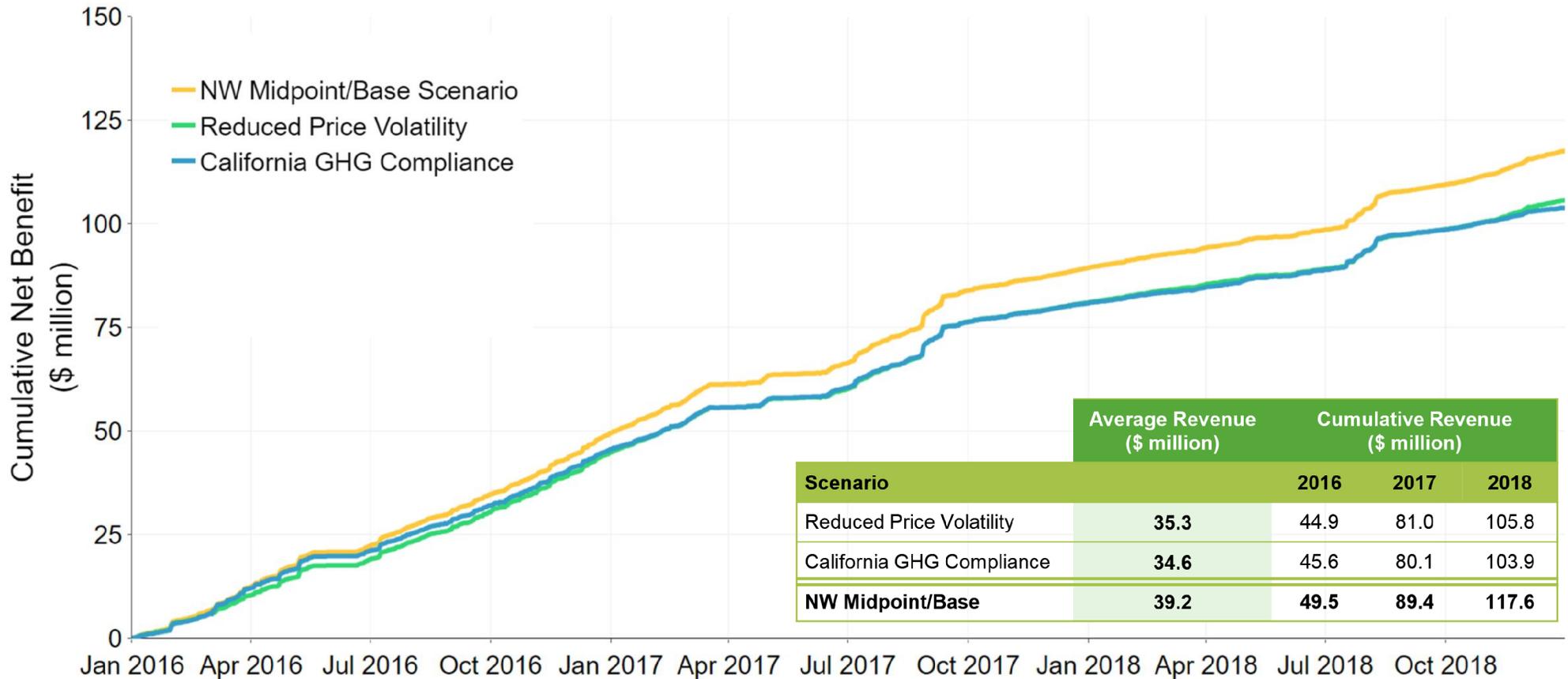
# Sensitivities

Scenario	Average Revenue (\$ million)	Cumulative Revenue (\$ million)		
		2016	2017	2018
Reduced Price Volatility	35.3	44.9	81.0	105.8
California GHG Compliance	34.6	45.6	80.1	103.9
FRST-Only Participation	24.4	32.3	57.7	73.3
Higher Success Rate	47.1	59.4	107.2	141.2
<b>NW Midpoint/Base</b>	<b>39.2</b>	<b>49.5</b>	<b>89.4</b>	<b>117.6</b>



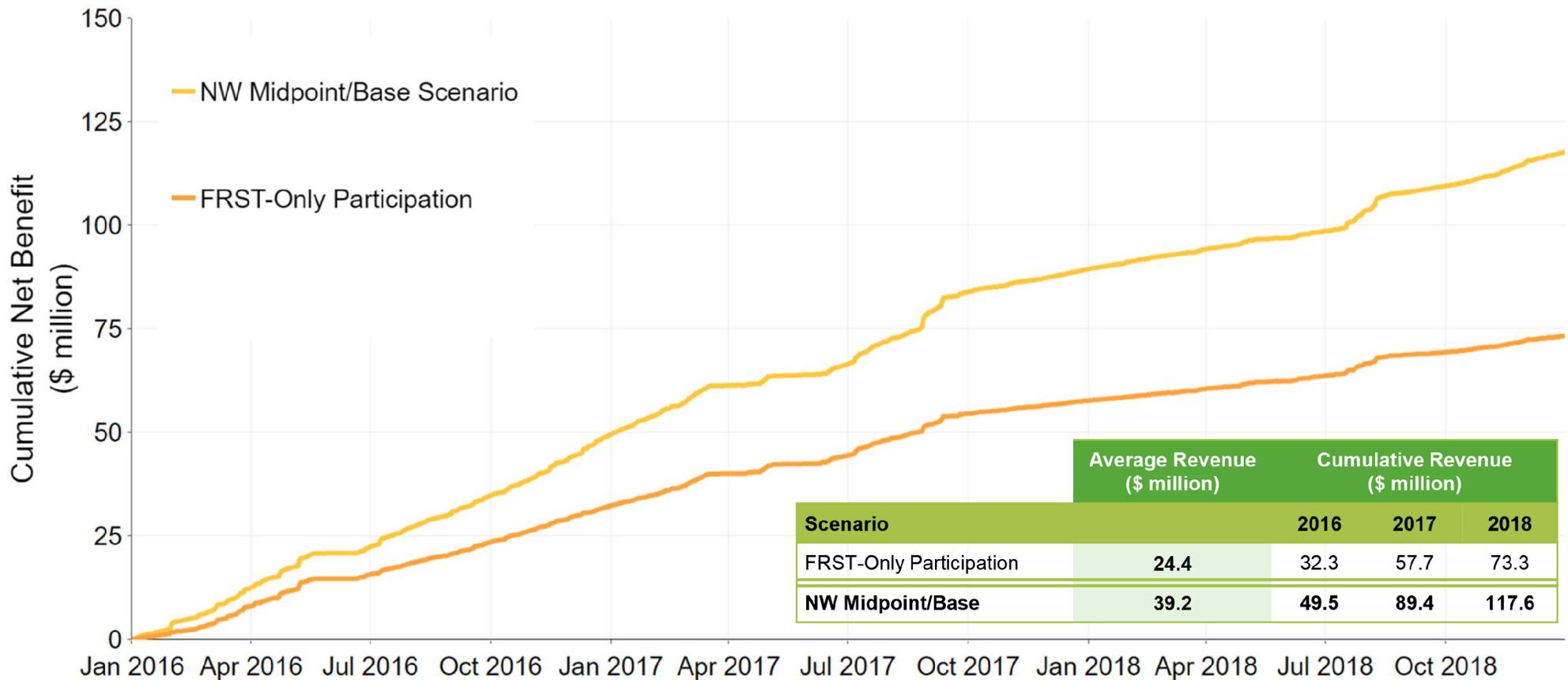
# EIM Price Sensitivities

- Price sensitivities still have a small impact on cumulative benefits relative to NW Midpoint/Base Scenario



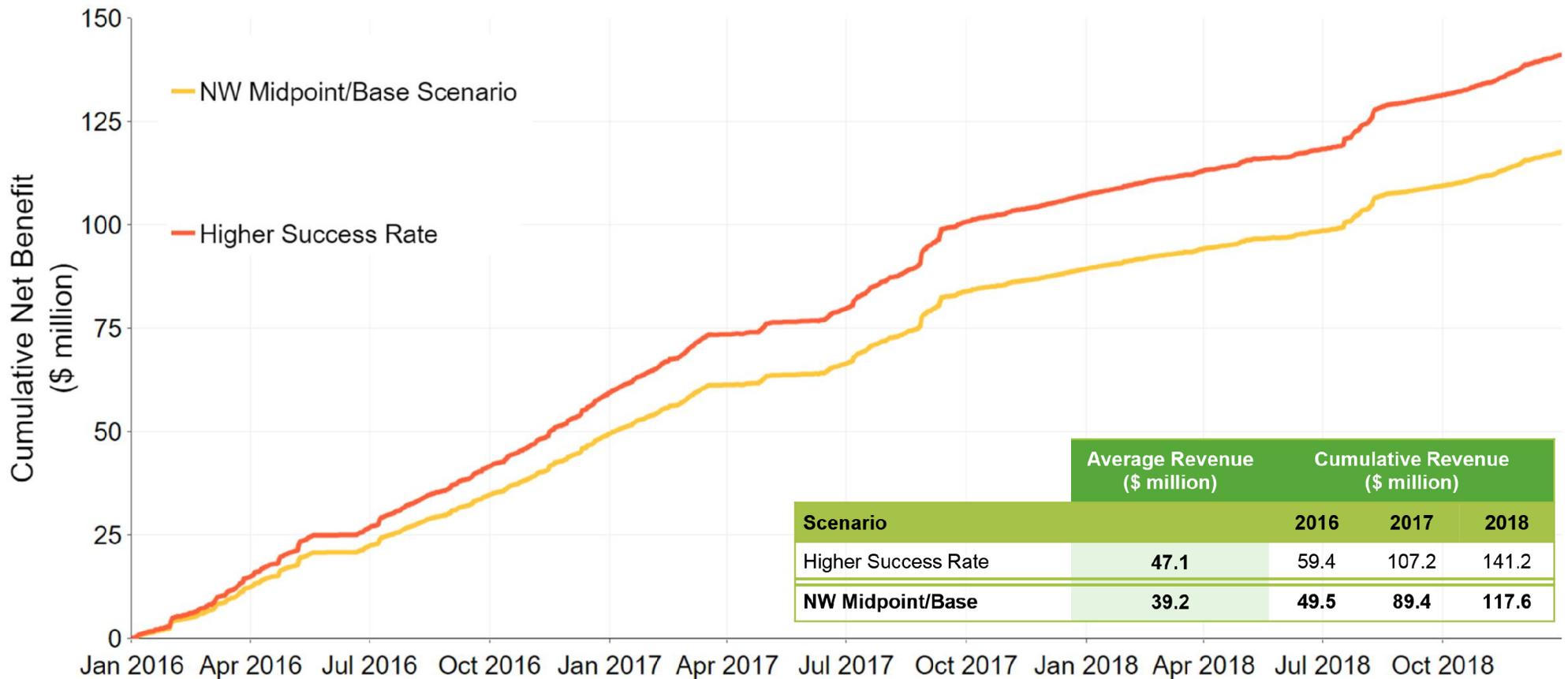
# BPA Hydro Flexibility Sensitivity

- Reduced flexibility (no participation beyond what is required for FRST) to transact in EIM



# Higher Success Rate Sensitivity

- Assumed 90% success rate translates to 20% higher estimated benefits than NW Midpoint/Base Scenario



## Summary of Gross Dispatch Sensitivities

- Considered a wider range of input assumptions, including alternative pricing and available flexibility

Scenario	Cumulative Revenue (\$ million)			Average Revenue (\$ million)
	2016	2017	2018	
<b>Initial Scenario (BPAT Price)</b>	<b>48.0</b>	<b>97.9</b>	<b>146.8</b>	<b>48.9</b>
PSEI Price	43.6	76.6	108.2	<b>36.1</b>
PACW Price	54.7	94.6	121.3	<b>40.4</b>
<b>NW Midpoint/Base Scenario (PGE Price)</b>	<b>49.5</b>	<b>89.4</b>	<b>117.6</b>	<b>39.2</b>
Reduced Volatility	44.9	81.0	105.8	<b>35.3</b>
GHG Compliance	45.6	80.1	103.9	<b>34.6</b>
FRST-Only Participation	32.3	57.7	73.3	<b>24.4</b>
Higher Success Rate	59.4	107.2	141.2	<b>47.1</b>



## Wrap-Up

- E3 modeling suggests that dispatch benefits from EIM participation will quickly pay for itself and result in significant ongoing benefits:
  - No sensitivities that were evaluated changed this conclusion
- E3 modeling suggests that EIM participation is a cost-effective non-wires solution and an effective intra-hour congestion management tool
- EIM participation will also:
  - Result in an efficient dispatch of generation to meet load across the entire EIM footprint
  - Provide increased visibility and discipline in the dispatch and marketing of FCRPS
  - Create additional visibility of conditions across the grid which will enhance reliability
  - Allow BPA to effectively participate in the development of future markets to enhance regional resource adequacy by ensuring that flexible resources are appropriately compensated for the services that they provide

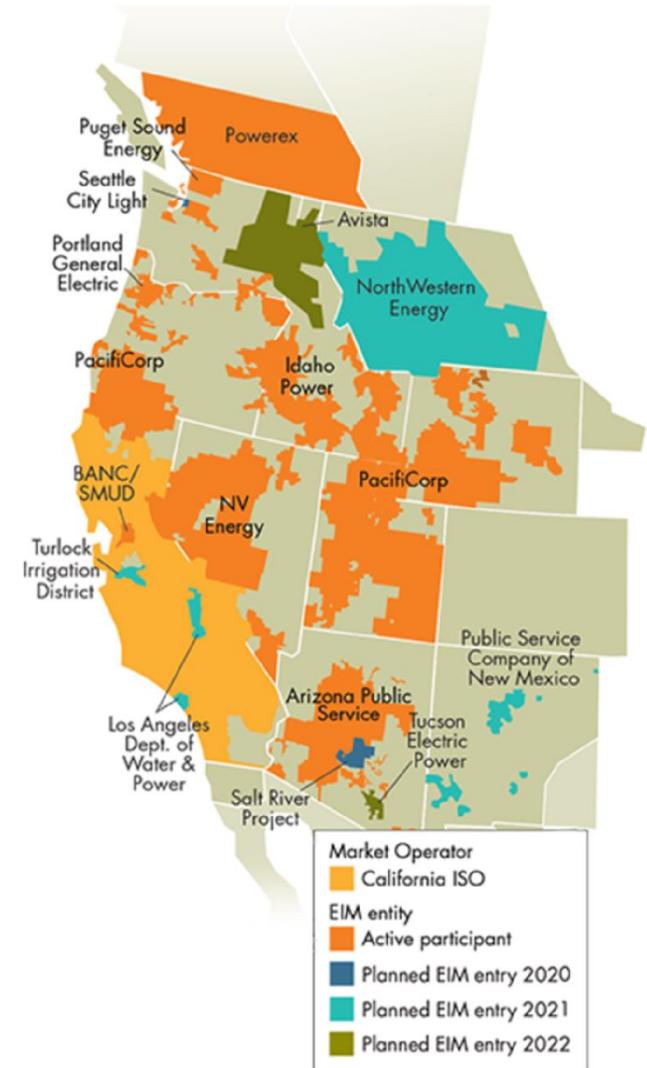
# Letter to the Region: EIM Issues Summary Review



# Drivers for Market Changes

- 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

Western EIM active and pending participants



# Western EIM Evaluation

- Bonneville initiated a formal Stakeholder process in July 2018
- Bonneville began discussion with CA-ISO in September 2018
- Four EIM Principles
  - Consistent with statutory, regulatory, and contractual obligations.
  - Maintain reliability
  - Voluntary participation
  - Sound business rationale

# Evaluation Issues

- Relationship of EIM to Other Emerging Markets
- BA Resource Sufficiency
- EIM Settlements
- Market Power
- Treatment of Transmission
- Generation Participation Model (FCRPS)
- Governance
- Carbon Obligation in EIM

## Relationship of EIM to Other Emerging Markets

- While we are engaged in the development of market opportunities, Bonneville is focused on whether to sign the Implementation Agreement with CAISO and move forward toward joining the EIM.
- There are two examples of CAISO policy initiatives with potential implications for EIM:
  - **Day-Ahead Market Enhancements (DAME)**
    - High-level objective: Manage uncertainty that occurs between the day-ahead and real-time markets
    - Status: CAISO is focusing the scope on a day-ahead Flexible Ramping Product (FRP) and reforming IFM & RUC; June 20<sup>th</sup> workshop to re-launch
  - **Expansion of the Day-Ahead Market to EIM (EDAM)**
    - High-level objective: Enable EIM access to a broader pool of resources by extending the enhanced day-ahead market to some or all EIM Entity BAAs
    - Status: CAISO has not yet launched this policy initiative
- Bonneville will actively participate in the advancement of these stakeholder processes and Bonneville expects that the CAISO will complete the DAME policy initiative and implement the FRP before Bonneville goes live in the EIM.

## BA Resource Sufficiency

- Bonneville's preliminary analysis indicates that it would pass the RS evaluation a significant amount of the time using historical spinning availability
  - BPA has not yet determined how it will make flexibility available for the EIM
- This provides Bonneville with a high level of confidence that it can achieve the benefits described in the business case
- The likelihood of passing the RS evaluation would increase if any additional bid flexibility is made available, whether from Federal or non-Federal Participating Resources

# EIM Settlements

- Bonneville will address settlements issues in the Post-ROD Policy process, subsequent Rate and Tariff Cases, and Business Practice development processes
- Bonneville staff gathered information on settlements via trainings, benchmarking with EIM Entities, reviewing CAISO materials, and internal staff who work with CAISO settlements.
- If Bonneville joins the EIM as an EIM Entity, Bonneville will need to decide whether and how to allocate the CAISO's charge and credits to Bonneville's transmission customers
- If Bonneville decides to allocate some or all of the EIM charge codes to its customers, Bonneville will need to decide how to bill its customers for these charges
- The billing and settlement mechanics policy process will be closely linked with the policy process on allocation of EIM charge codes

# Market Power

- Default Energy Bids
  - If determined to have market power, a market participant may have its EIM bid prices mitigated to a Default Energy Bid (DEB) by CAISO
  - Current construct does not adequately reflect the opportunity costs of use limited hydro resources
  - CAISO worked collaboratively with stakeholders to propose a new Hydro DEB option
  - Approval of this option and subsequent implementation is important for BPA's participation in the EIM

# Treatment of Transmission

- Bonneville is proposing to adopt the Interchange Rights Holder Methodology for making transmission available to the EIM
- Bonneville expects to be a significant “net wheeler” in the EIM
  - This may lead to cost shifts and free riders
- Bonneville believes the Interchange Rights Holder Methodology better balances the need to provide transmission to the EIM with collecting enough revenue to adequately and fairly recover the costs of the FCRTS

# Generation Participation Model (FCRPS)

- Bonneville will initially participate in the EIM with federal hydroelectric dams aggregated into three resource zones:
  - Upper Columbia dams (Grand Coulee, Chief Joseph)
  - Lower Columbia dams (McNary, John Day, The Dalles, Bonneville)
  - Lower Snake dams (Lower Granite, Little Goose, Lower Monumental, Ice Harbor).
- These resource groups will participate in the EIM as separate aggregated participating resources (APR)
  - The amount of generation produced by these resources not bid into the EIM will be treated as an aggregated non-participating resources (ANPR) for purposes of the EIM
  - All other federal resources in the Bonneville balancing authority area will initially be non-participating resources in the 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:
  - Expand the EIM Governing Body’s primary authority,
  - Improve the durability of the current EIM governance structure
  - Allow for ability to adapt to expanded market functions, and
  - A broader role for public power in the EIM governance structure.
- BPA is supporting these improvements in a current stakeholder process that the CAISO has initiated and continues to coordinate regularly with multiple parties.

# Carbon Obligation in the EIM

- Energy generated in or imported into California is subject to California's greenhouse gas (GHG) regulations.
- If BPA were to participate in the EIM, any carbon attributed to imports into California would incur a compliance obligation
- BPA currently cannot purchase carbon allowances
  - Carbon allowances are considered a state tax by the U.S. DOE, BPA, and other federal agencies.
  - Federal agencies have sovereign immunity from state taxes and cannot pay them unless Congress specifically authorizes it
- Absent Congressional authorization to purchase allowances, BPA would not be able to directly deliver EIM energy into California

# Next Steps

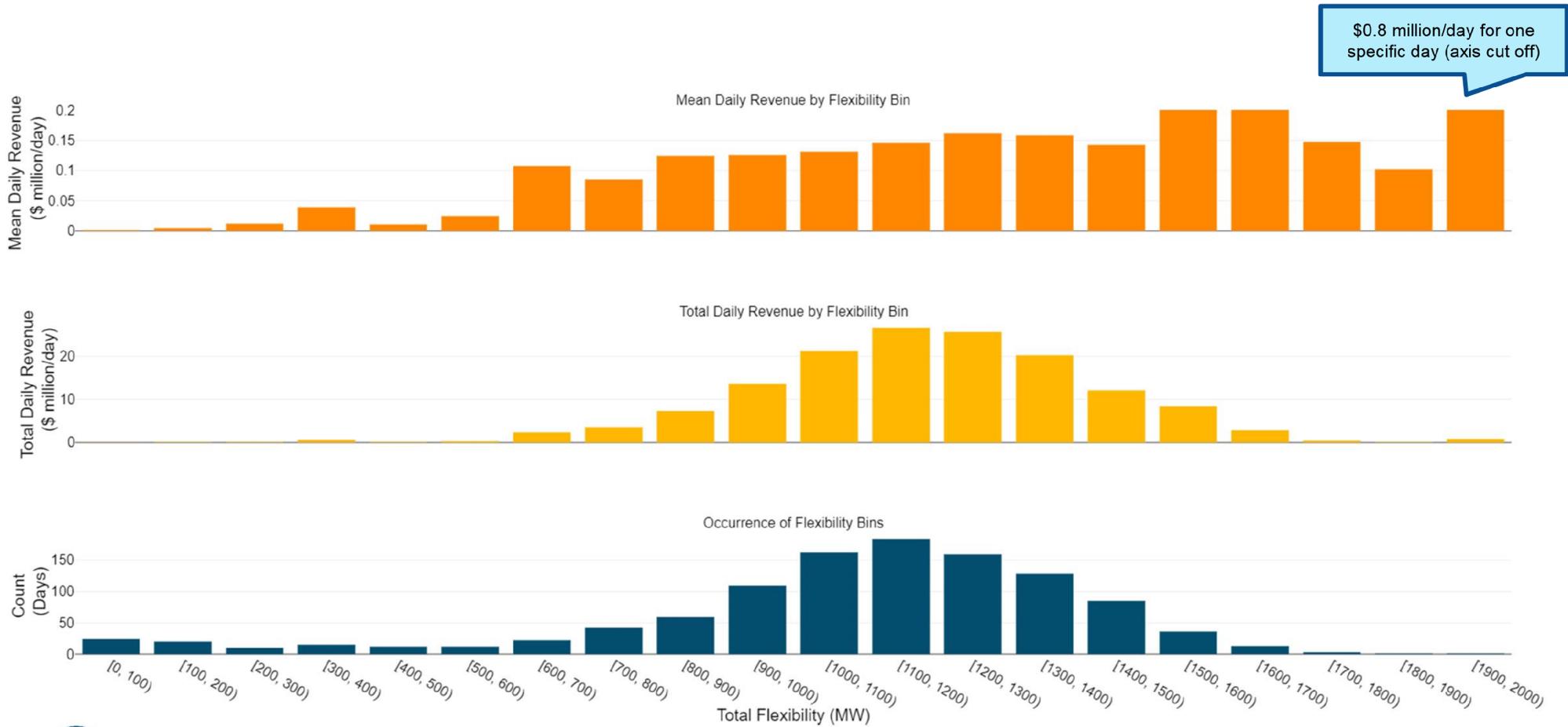
- The 30-day public comment period for the EIM Letter to the Region is planned to start the week of June 17.
- A meeting to answer clarifying questions about the Letter to the Region is scheduled for **Monday July 8<sup>th</sup>** at the Rates Hearing Room, 1-3pm.
  - WebEx and Phone participation will be available
  - A Tech Forum notice will be sent out as a reminder
- 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>
- For more information on BPA's Grid Modernization Initiative please visit:  
<https://www.bpa.gov/goto/GridModernization>

# Appendix A. Benefits Analysis

Additional Material



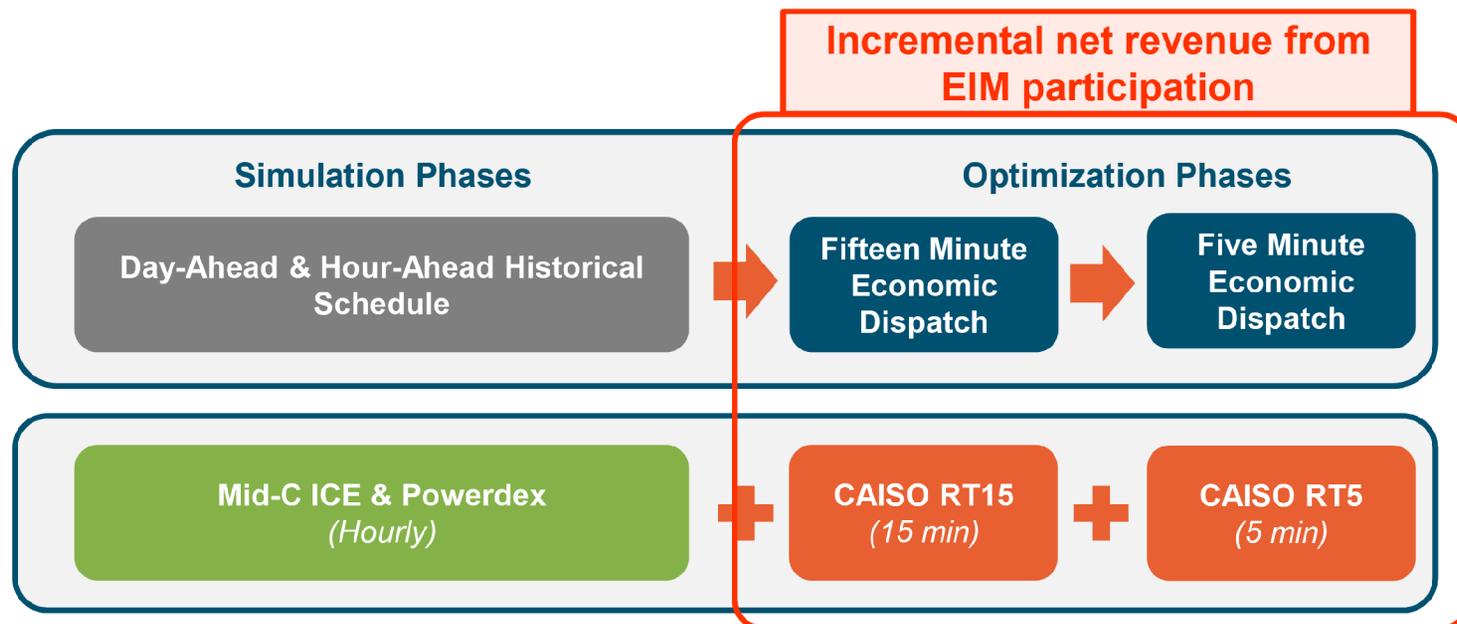
# Base Scenario: Revenue & Flexibility



# Modeling Approach

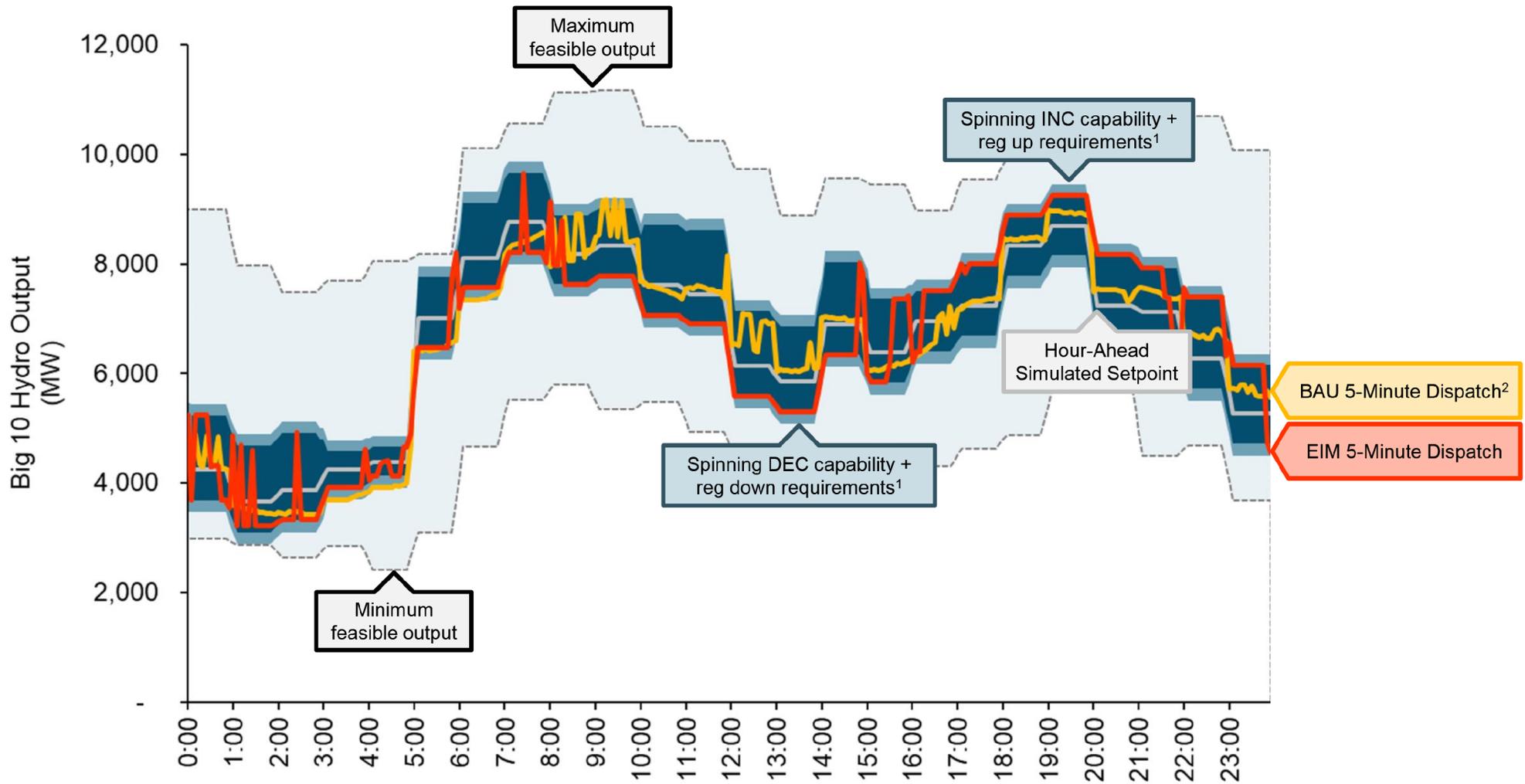
## *Four-Stage PLEXOS Production Cost Model*

- Model quantifies the market value attributed to BPA's resources in four sequential stages:
  - Revenues captured in DA & HA dispatch reflect estimated market value of **all bilateral contracts and other out-of-market transactions**
  - Incremental revenues captured in 15- and 5-minute dispatch reflect **additional value of EIM participation** using BPA's selected hydro resources



# Input Assumptions

## Big 10 Hydro Flexibility Example

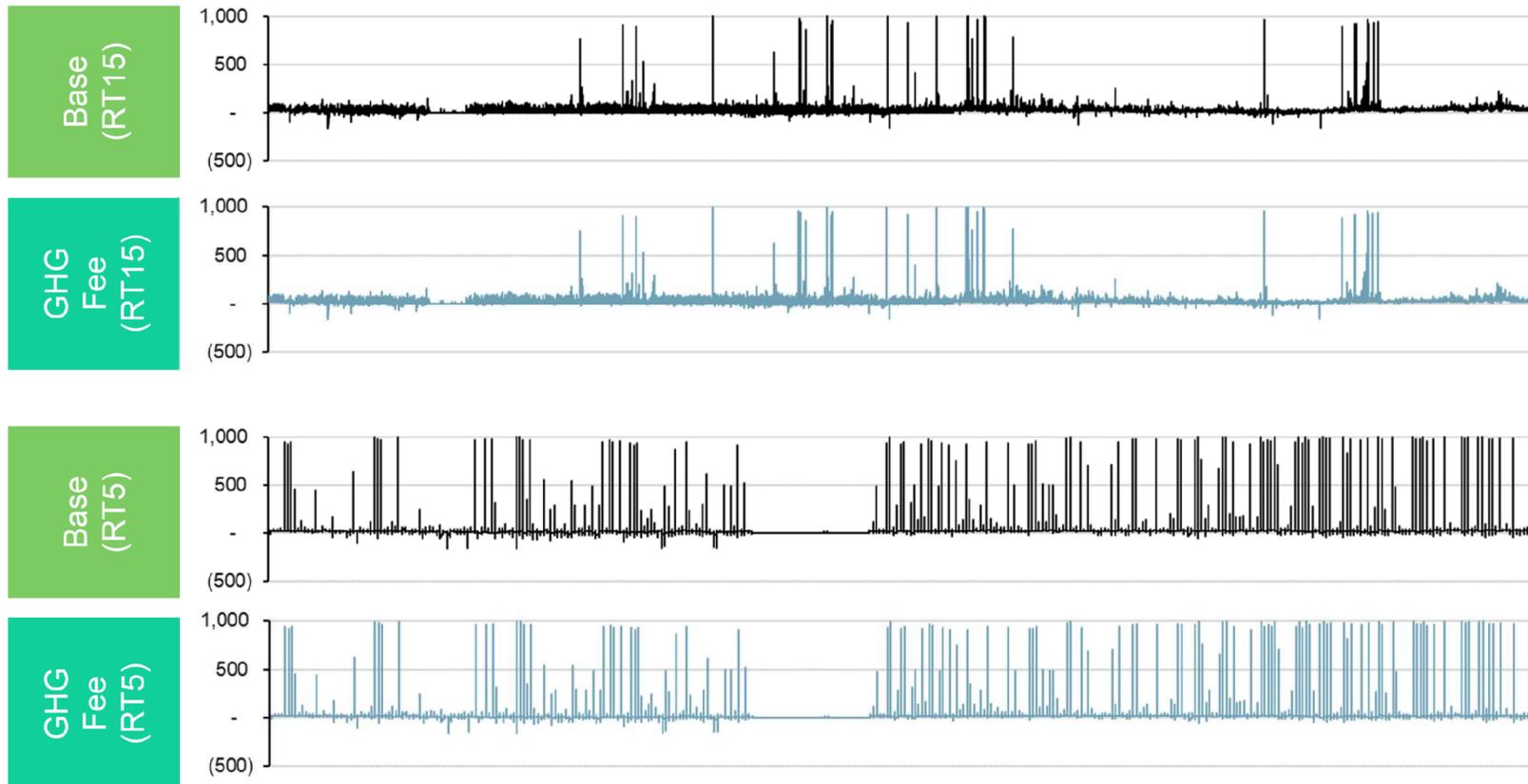


<sup>1</sup> Regulating reserve requirements are larger in EIM case than BAU case, resulting in tighter flexibility bounds

<sup>2</sup> BAU dispatch shows subhourly spikes due to balancing net load (load – wind) variability

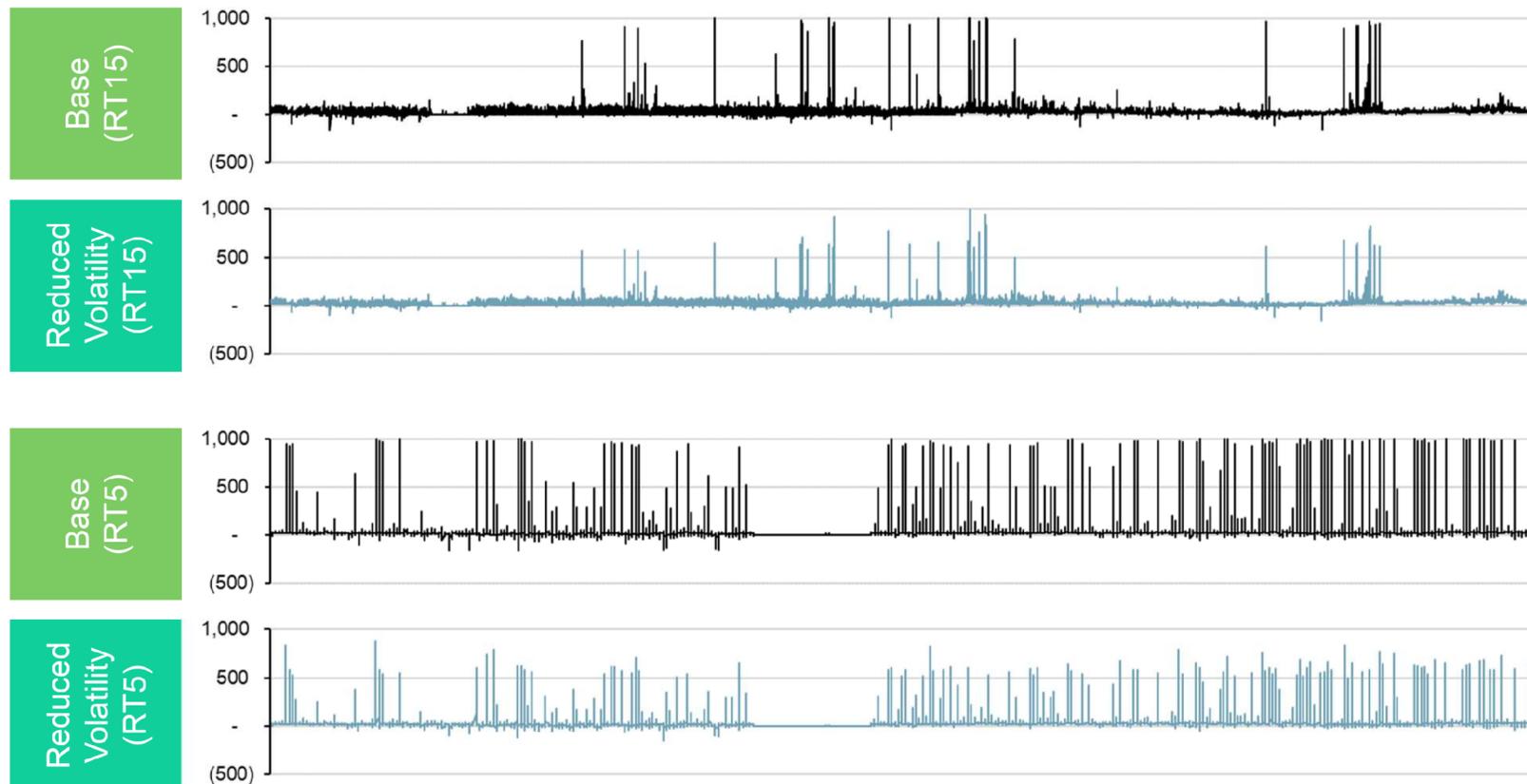
# EIM Price Scenarios: GHG Compliance

- We model CAISO GHG Compliance as only affecting BPA prices when selling into EIM
  - Marginal GHG component is small relative to energy, congestion



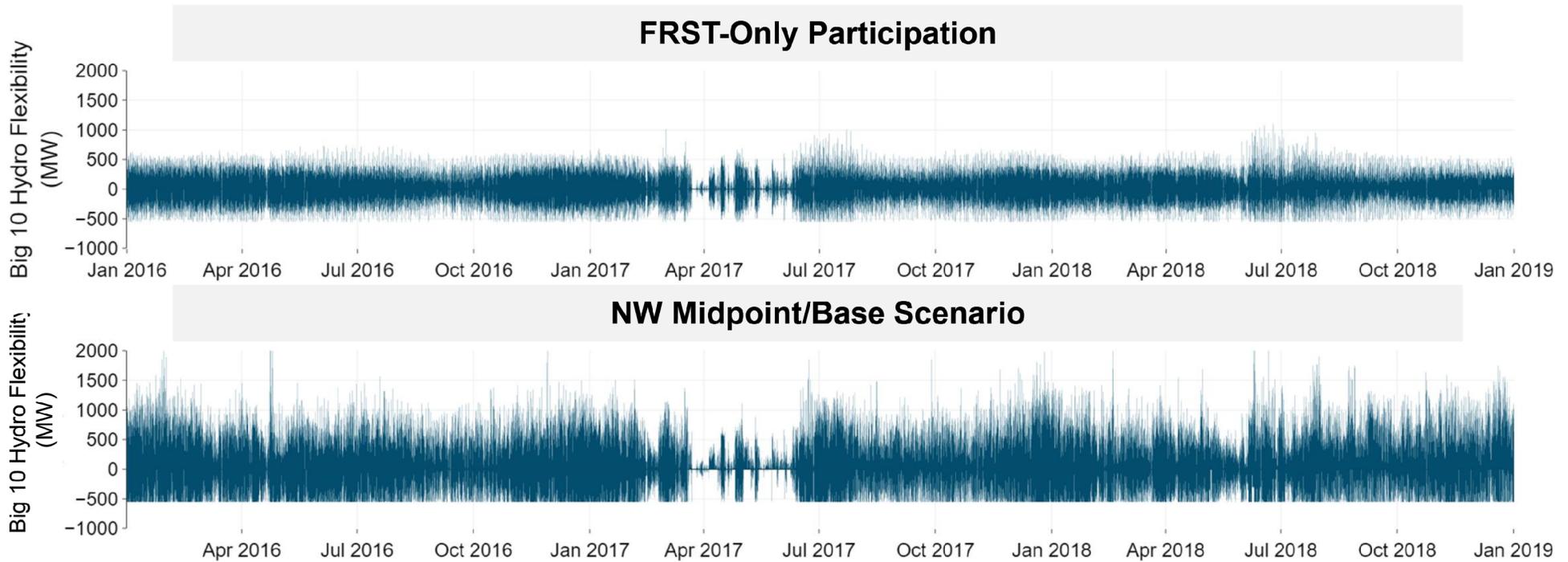
# EIM Price Scenarios: Reduced Volatility

- Reduced intra-hour volatility reduces frequency of extreme prices while retaining overall diurnal price pattern



# BPA Hydro Flexibility Scenarios

- FRST-only participation assumes that BPA only offers flexibility required to pass FRST
- NW Midpoint/Base assumption is that BPA would offer available spinning capability

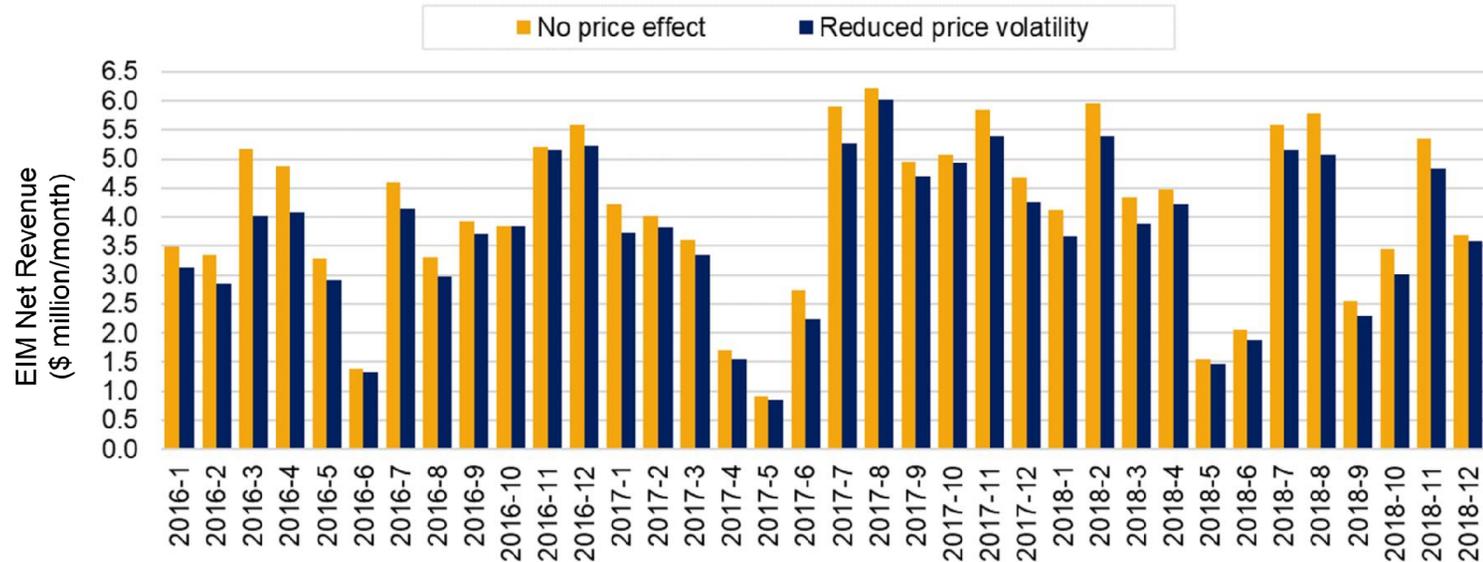


# Scenario Results (From May 15<sup>th</sup> meeting, monthly revenue)

## Net Revenues by Month

- Feb-March have lowest levels of wind, nuclear and thermal gen.
- Summer months have high thermal and wind generation showing positive Net EIM Sales
- Wide EIM spreads (\$20-25/MWh) from 2016-2018 result in positive net EIM sales benefits in all months of the year
- Net EIM sales benefit vary from \$0.9-6.2\* million per month, lowest in May-June and highest in low hydro generation output months

Net EIM Revenues by Month\* (\$M)



\* Reported EIM benefit value includes a 75% "success rate" of BPA bids into EIM



# EIM Stakeholder Meeting

March 13, 2019  
9am – 2:30pm  
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

9:00-9:05

- Welcome, Safety Moment, Introductions

9:05 – 9:10

- Topics for Today's Meeting
- Review of BPAs EIM Principles and Timeline

9:10 – 9:25

- EIM Process and Venues

9:25- 10:00

- Oversupply Management Protocol

10:00 – 10:15

- Break

10:15 – 11:15

- Settlements

11:15 – 12:15

- Lunch

12:15 – 2:15

- Structured Scenario

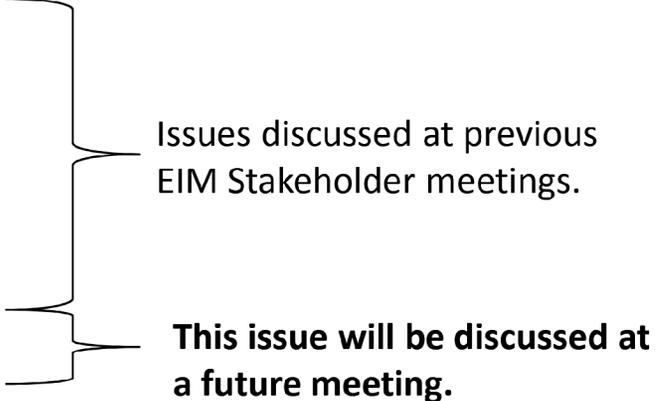
2:15 – 2:30

- Next Steps, Q&A

# Topics For Today's Meeting

- Review of EIM Stakeholder Topics Discussed to Date
- Timeline Review
- Issues that BPA presented at the July 24<sup>th</sup> EIM Stakeholder meeting that we will be discussing in more depth at a future meeting.

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



Issues discussed at previous EIM Stakeholder meetings.

**This issue will be discussed at a future meeting.**

- 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.

If BPA signs the EIM Implementation Agreement it would authorize BPA to begin spending on EIM implementation projects with the CAISO and signals BPA's intent to join the EIM as long as BPA's EIM principles continue to be met. However, it does not bind BPA to join the EIM.

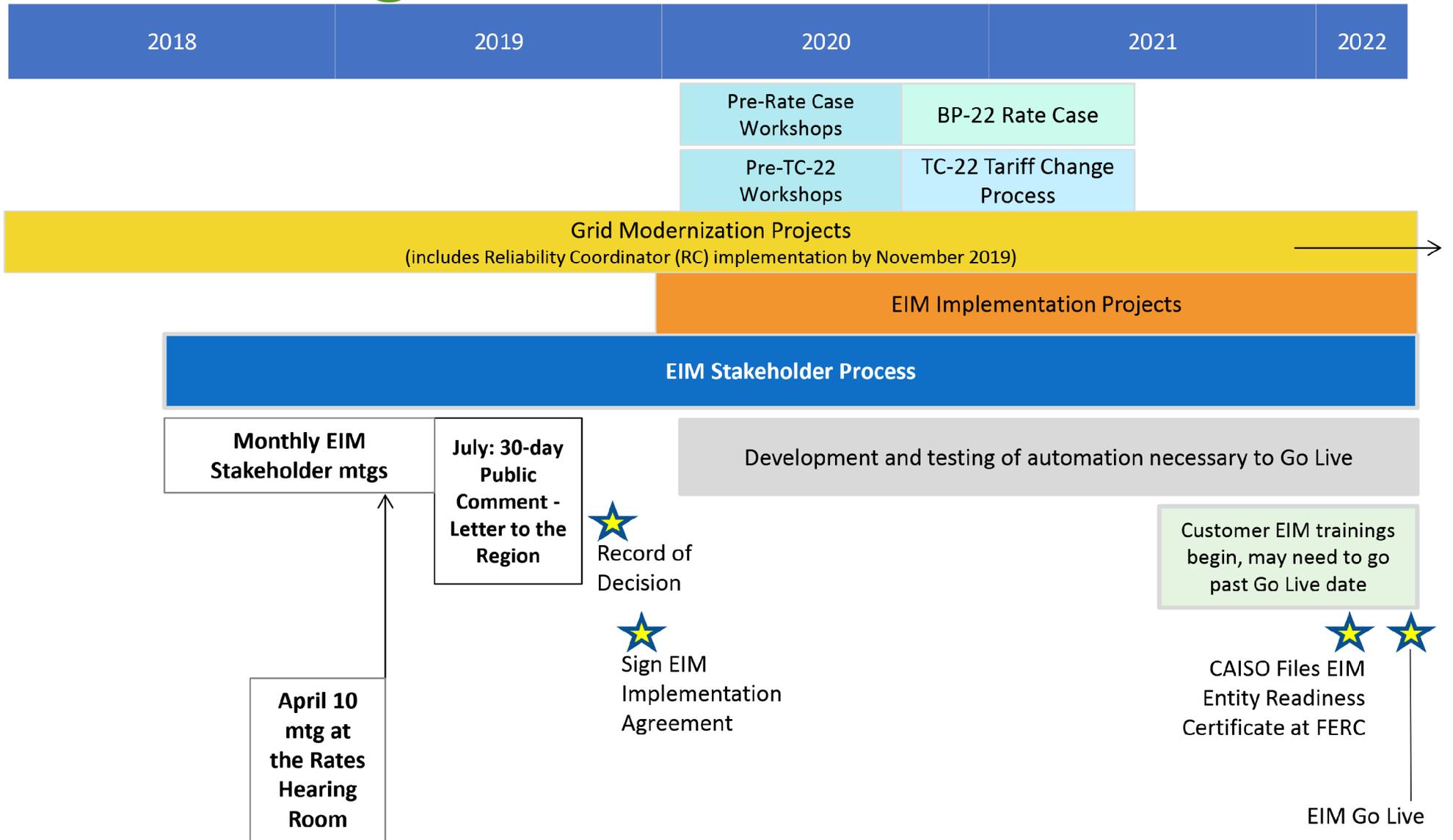
# Timeline Leading up to the ROD

Agendas for previous and future monthly EIM Stakeholder meetings:

July 24	•Grid Modernization Overview, Strategic Plan Connection, Intro to 8 Issues BPA is Reviewing, Initial Cost Benefit Analysis
September 13	•EIM 101
October 11	•Process Plan, Transmission, Generation, Governance
November 14	•Process Plan, Market Power
December 18	•Settlements, Non-Federal Generation Participation
January 16	•Resource Sufficiency, Emerging Markets
February 20	•Base Case Structured Scenario, Market Mitigation
March 13	•EIM Issues and Venues, Oversupply Management Protocol, Settlements, Structured Scenario
April 10	•Carbon in the EIM, Cost Benefit Analysis, Structured Scenario
May 15	<b>Structured Scenarios:</b> Discussion of Impacts to Customers
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.

# BPA's High Level EIM Timeline



# EIM Issues and Venues

- BPA has been tracking EIM issues that will be resolved in future BPA processes or workshops.
- This is an *example* of the EIM issues and venues matrix that will serve as a Roadmap for stakeholders to track the issues through the various BPA forums.
  - This Roadmap will be included in the Letter to the Region in the summer of 2019.

Letter to Region/ Implementation Agreement ROD	TC-22 Tariff Terms & Conditions Case	BP-22 Rate Case	Business Practices	Other
Joining the EIM is consistent with BPA's statutory authority	Explanation of EIM charges (code)	Cost Allocation – which rates bear which EIM costs		
Business Case / Cost Benefit Analysis	Dispute Resolution process for EIM charges			

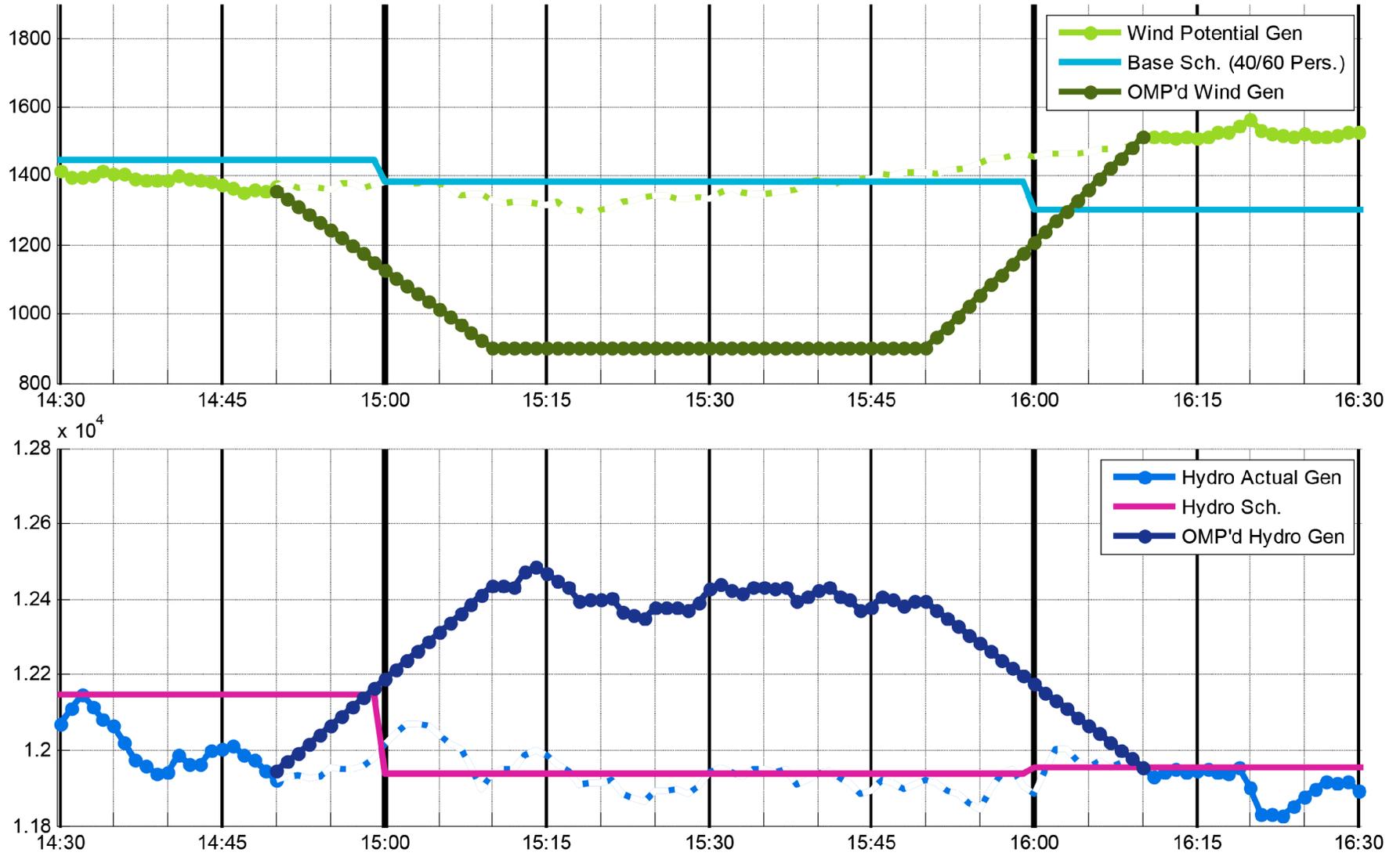
# Oversupply Management Protocol



# Oversupply Management Protocol (OMP)

- During periods of high water, particularly during spring runoff, the Federal hydro system may have more water to be moved through turbines than load. In these extreme cases, OMP may be initiated.
- OMP is a FERC-approved tool that BPA uses to displace and compensate generation in BPA's balancing authority area in order to manage high levels of total dissolved gas (TDG) in the Columbia and Snake Rivers.
- During an OMP event, BPA directs non-Federal generators to move to their minimum generation level. Federal hydro output is increased to fill the generation schedules of the limited generators, allowing for additional water passage through the turbines.
- BPA financially compensates the limited generators for their lost opportunity cost.

# OMP Mechanics



# OMP and EIM Participation

- BPA has discussed OMP with CAISO staff.
- Based on those discussions, it appears that BPA can retain the mechanics of how OMP works while participating in the EIM.
- At this time BPA has not identified the need to change Attachment P.
- BPA will consider other methods of managing over-generation if more effective ways of achieving the goals of OMP are discovered.

# EIM Settlements



# Goals for Today

- Refresh on key concepts from December 2018 EIM Settlements presentation
- Discuss potential customer impacts from EIM Settlements
- Gauge customer preferences on specific settlements decision
- Provide a high level overview of additional EIM Charge Codes
  
- *Reminder:* BPA's overarching goal is to educate on processes and impacts regarding **BPA's relationship with the Market Operator** (CAISO) in order to better prepare you for ongoing EIM stakeholder engagement.
  
- **Disclaimer:** All scoping efforts have been / are being completed under the assumption that BPA will join the Energy Imbalance Market (EIM), although no determination has been made at this time. The remaining slides are reflective of this assumption.

# Long-Term EIM Settlements Objectives

- Establish an EIM Settlements function which
  - Supports BPA's Strategic Plan objectives
  - Supports ease of doing business with BPA for our customers
  - Enables transparency of processes and information with BPA's customers
  - Provides high quality (accurate and timely) outputs for our customers

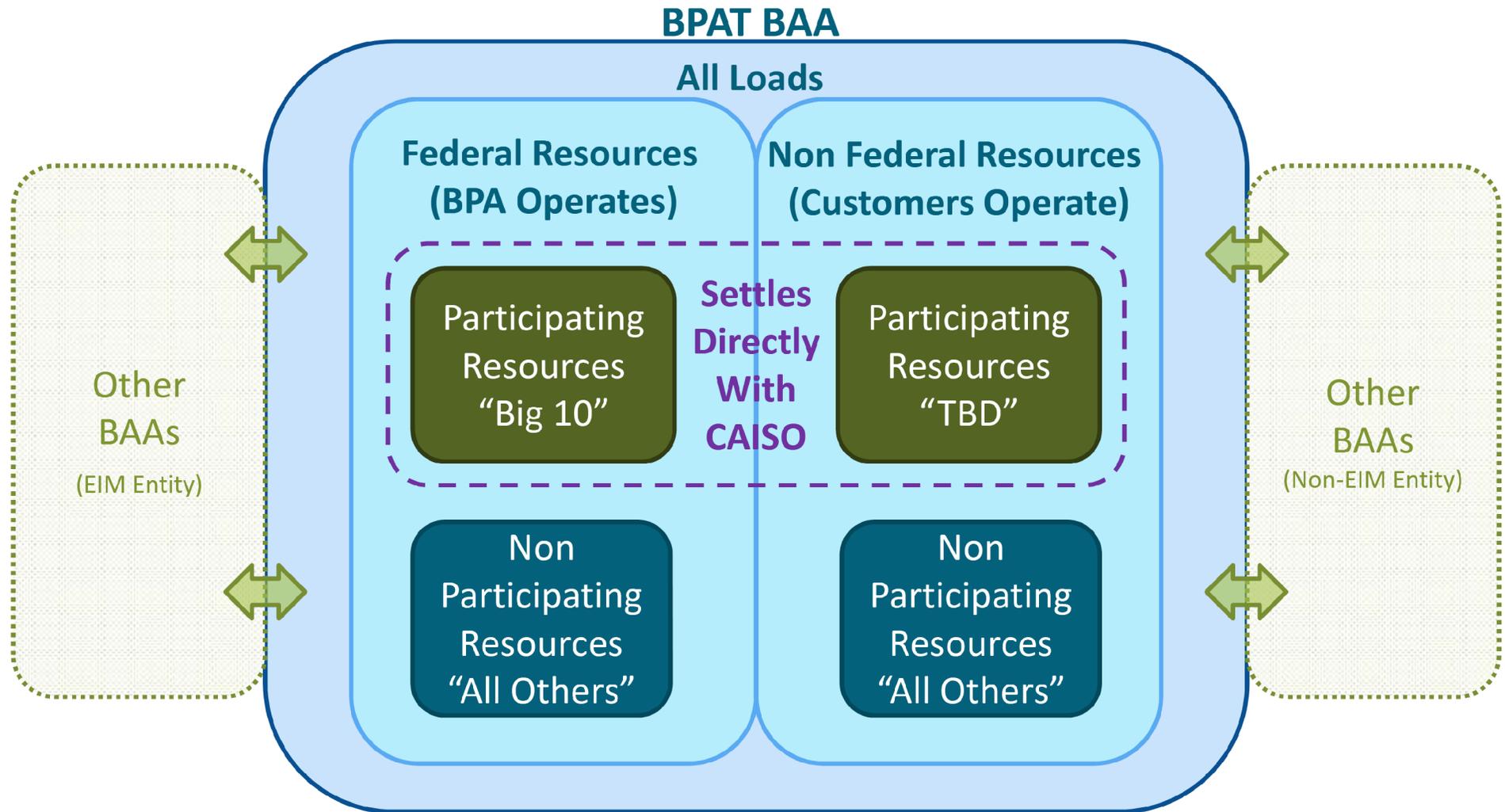
# Refresh on Key EIM Settlement Concepts



# What are EIM Settlements

- Processes related to, and resulting in, the invoicing of charges and credits for EIM activity.
- CAISO settlement allocations apply to the following:
  - Generating Resources
    - Participating
    - Non-Participating
  - Interchange (CAISO calls it Intertie)
  - Load

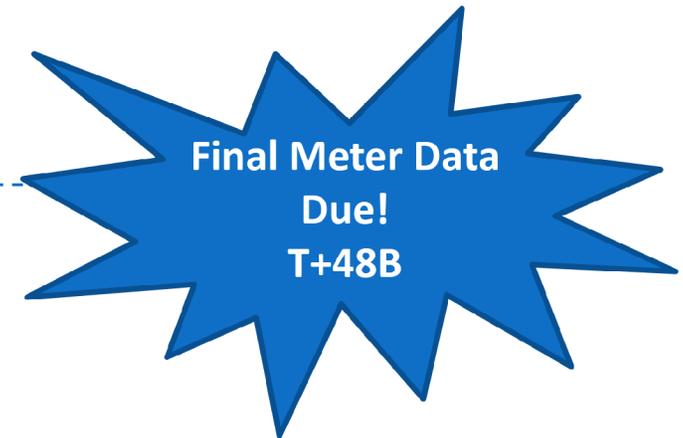
# EIM Settlement Interactions



Everything settles with BPAT except Participating Resources

# EIM Settlements – CAISO Process

- Settlement statements are published 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 publish date
  - T+3B & T+12B invoiced weekly by CAISO
  - T+55B → T+36M invoiced monthly by CAISO



# EIM Settlements – CAISO Process

- CAISO disputes are based on the Settlement Statement (SS)
  - The time allowed to file is based on the SS published date (not the invoice published date)

<u>Settlement Statement</u>	<u>Dispute Deadline</u>	<u>Disputable Content</u>
T + 3B	Not disputable	Not disputable
T + 12B	T +26B	All content except estimated meter data
T + 55B	T + 77B	All statement content
T + 9M (+ 194B)	T + 10M(+ 216B)	Incremental changes from T + 55B
T + 18M (+ 383B)	T + 19M (+ 405B)	Incremental changes from T + 9M
T + 33M (+ 693B)	T + 34M (+ 715B)	Incremental changes from T + 18M
T + 36M (+ 759B)	Not disputable	Not disputable

[CAISO Settlements, Invoicing & Disputes Calendar](#)

# Potential Customer Impacts from EIM Settlements



# EIM Settlements Data Gathering

- BPA has a large and diverse customer base that is unlike other EIM Entities.
- Therefore, it's difficult to baseline:
  - How much we will pay or receive per month with CAISO
  - How many disputes we should expect to file per month
  - What is the dollar volume of disputes
  - Will the majority of the disputes be on the CAISO invoice issued to BPA on the T+12B, T+55B, etc.

# CAISO EIM Settlement Dispute Statistics

- In 2018 – fewer than 150 disputes were filed across all EIM Entity & Participating Resource Scheduling Coordinators and approximately 60% resulted in resettlement
  - Multiple disputes may have been submitted for a single issue.
  - The dollar magnitude of dispute resettlements during 2018 was less than 0.5% of the total gross EIM transactions.
- Common reasons for disputes or data changes
  - Technology
  - Design gap during the policy development or implementation
    - E.g. “missed scenario” in development
  - Pricing updates
  - Meter data changes

# EIM Settlements – Customer Impacts

- BPA is a government entity that sets its rates at cost, so any charges or credits received from EIM participation will be allocated to customers in some manner
- Cost allocations will be determined through a BPA Rate (BP) Case.
  - Any associated terms and conditions will be determined through a BPA Terms and Conditions (TC) Case

# Customer Preferences Inquiry:

## Invoice Timing



# Customer Preferences: Invoice Timing

- Based on how CAISO would allocate EIM Charge Codes to BPA as the EIM Entity Scheduling Coordinator, BPA sees two potential scenarios for allocation to our customers.
  - Invoicing on T+12B settlement statement data
  - Invoicing on T+55B settlement statement data
- BPA would like customers to weigh in on their preferences given pros and cons of each option to inform a decision in the future.
- BPA will select a single option for invoicing customers on EIM allocations & resettlements.

# Pros of BPA invoicing on the T+12B

- For Customers:
  - If BPA is able to submit final meter data to CAISO by T+8B, this invoice is ~95% cleared
  - Quicker turnaround on cash flow compared to T+55B
    - Invoices with charges or credits could potentially be issued from BPA around the 3<sup>rd</sup> week following the close of the Trade month
  - Can notify BPA sooner if you have a dispute
    - Resolution more likely by T+55B resettlement versus T+9M resettlement
- For BPA:
  - Quicker turnaround on cash flow (same as above)

# Cons of BPA invoicing on the T+12B

- For Customers:
  - BPA often does not have final meter data by T+8B, so the extent that the T+12B invoice would be cleared could vary from month to month.
  - Other EIM Entity updates (meter data, disputes, etc.) can impact revisions across the entire market, so the extent that the T+12B invoice would be cleared is partially out of BPA's control.
  - Guaranteed more resettlements to process compared to invoicing on the T+55B settlements.
  - Additional financial transaction costs
    - Customers would receive credits or be expected to pay on the potentially un-cleared settlements.
- For BPA:
  - Given existing processes and resources, it is likely that BPA would have meter data changes to submit to CAISO between T+8B → T+48B when final meter data is due.
  - Guaranteed more resettlements to invoice compared to invoicing beginning with the T+55B settlements.
  - Additional financial transaction costs
    - BPA would pay or receive payments from customers on the potentially un-cleared settlements.

# Pros of BPA invoicing on the T+55B

- For Customers:
  - More accurate initial (“Final”) invoice due to timing of final meter data submissions
    - CAISO considers the T+55B settlement their “Final” version (their goal is to have the market cleared by this settlement).
  - Invoicing on the T+55B eliminates the T+12B invoice for processing by customers
    - More efficient
    - Fewer invoices received overall, so fewer resources needed to process
  - Fewer financial transactions than invoicing on the T+12B (fewer associated costs)
- For BPA:
  - Invoicing on the T+55B eliminates the T+12B invoice for processing and preparing by BPA
    - More efficient
    - Fewer invoices issued overall, so fewer resources needed to process
      - Decreasing the number of staff needed to process additional workload has a positive impact on rates (reduces overall costs)
  - Fewer financial transactions than invoicing on the T+12B (fewer associated costs)

# Cons of BPA invoicing on the T+55B

- For Customers:
  - If BPA bills off the T+55B and a customer files a dispute with BPA against it, BPA will not be reimbursed by CAISO until T+9M at the earliest.
    - Resettlement can take months given the CAISO's resettlement schedule (refer to slide 20).
  - Delayed initial cash flow
    - Invoice will not be received until approximately 3 months after the close of the trade month.
      - E.g. January 2019 T+55B invoice prepared (by CAISO) late April 2019. BPA could allocate to customers late April or early May.
      - Monthly invoices would be on ~3 month lag from when actual operations occurred.
- For BPA:
  - Delayed initial cash flow
    - Invoice cannot be issued until approximately 3 months after the close of the trade month.

# Invoicing Timing – General Considerations

- Generally, the trade-offs can be summarized to cash flow versus processing costs.
- If BPA invoices on the T+12B settlement, it is not automatic that there will be a dollar difference on the T+55B settlement.

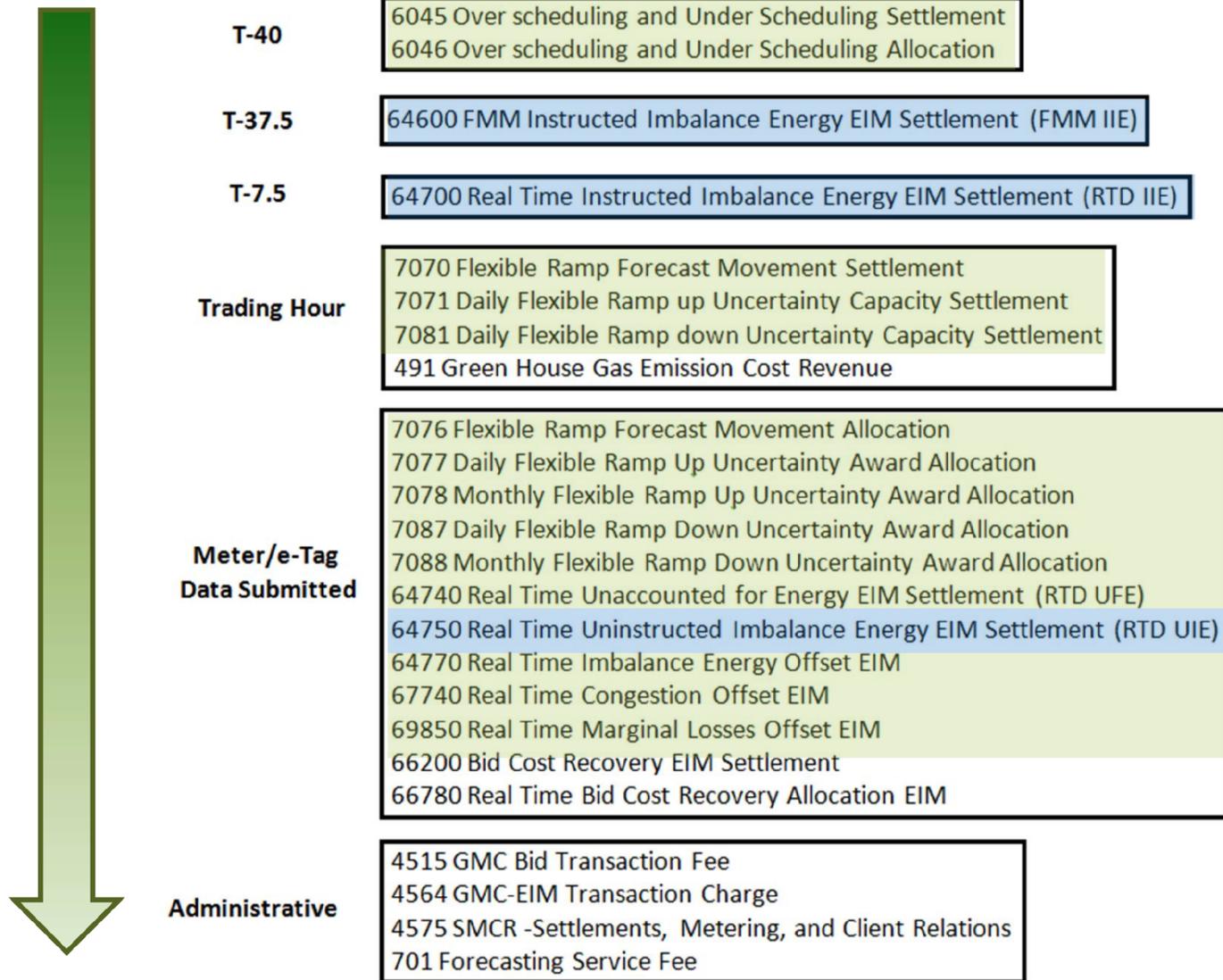
# Provide Feedback

- Send any comments or feedback on this topic to [techforum@bpa.gov](mailto:techforum@bpa.gov) and reference “EIM Invoicing” in the subject line.
  - Provide comments before **Friday April 12<sup>th</sup>**

# Additional EIM Charge Codes



# EIM Charge Codes in Time



# EIM Charge Codes – Over & Under Scheduling

- Over & Under Scheduling Charge Codes are meant to incentivize BAAs to provide balanced load, supply, and interchange base schedules.
  - Over & Under Scheduling Settlement (CC 6045)
  - Penalties only apply if load scheduled v. metered actuals  $\geq 5\%$
- If a BAA does not incur Over or Under Scheduling penalties in a single day, they will be allocated a portion of the penalty money collected from any BAAs which did.
  - Over & Under Scheduling Allocation (CC 6046)
  - If no BAA Over or Under Schedules in a single day, then there will be no allocations for that day.

# EIM Charge Codes – Flexible Ramp

- Flexible Ramping Charge Codes are meant to ensure there is enough flexible ramping capacity to meet forecasted market demand uncertainty.
- Settles in the RTM (5-min)
  - Settlements & Allocations related to the **Forecasted Movement**
    - CC 7070, 7076 (daily)
  - **Settlements** related to Up & Down Uncertainty **Capacity**
    - CC 7071, 7081 (daily)
  - **Allocations** related to Up & Down Uncertainty **Capacity Awards**
    - CC 7077, 7087 (daily)
    - CC 7078, 7088 (monthly: reversal and resettlement of the daily allocations)

# EIM Charge Codes – UFE & Offsets

- Unaccounted for Energy (UFE) ensures all energy in the BAA is accounted for (CC 64740) by comparing supply & demand and adjusting for losses.
- Offset Charge Codes are used to ensure neutrality and are allocated to the EESC (BAA) as charges or credits
  - Real Time **Congestion** Offset (CC 67740)
  - Real Time **Marginal Losses** Offset (CC 69850)
  - Real Time **Imbalance Energy** Offset (CC 64770)

# EIM versus BPA Charge Codes

EIM Charge Code...	Can be likened to BPA's...	Because the intent is to ...
Imbalance Energy (IIE & UIE)	Energy Imbalance (EI) & Generation Imbalance (GI)	settle for generation and load (energy) imbalances
Over & Under Scheduling	Intentional Deviation (ID) & Persistent Deviation (PD)	prevent entities from leaning on the market (or BAA)
Flexible Ramping	DERBS, VERBS, & RFR	ensure there is enough uncertainty capacity to meet unexpected load changes (or load forecast error)

# EIM Settlements Summary

- BPA will continue to scope out the Settlement impacts as an EIM Entity Scheduling Coordinator in order to better understand potential impacts to BPA's customers.
- BPA will continue to engage customers on pertinent updates that arise:
  - Brief on the outcomes of the Invoice Timing customer inquiry (likely in May)
  - Brief on any newly uncovered information which may impact customers
  - Continue to provide settlements outcomes from Structured Scenarios

# Lunch Break



# Structured Scenario



# Structured Scenarios: Overview

- BPA will use structured scenarios, or “table tops”, to walk through EIM mechanics for customers and stakeholders.
- These structured scenarios are intended to provide education and to identify how certain activities would impact EIM operations and settlements.
- These outcomes should help customers and stakeholders begin to understand how BPA’s EIM participation would:
  - Potentially impact their business and operations, and
  - Help them prepare for how EIM issues would be addressed in upcoming Rates and Terms & Conditions Cases.

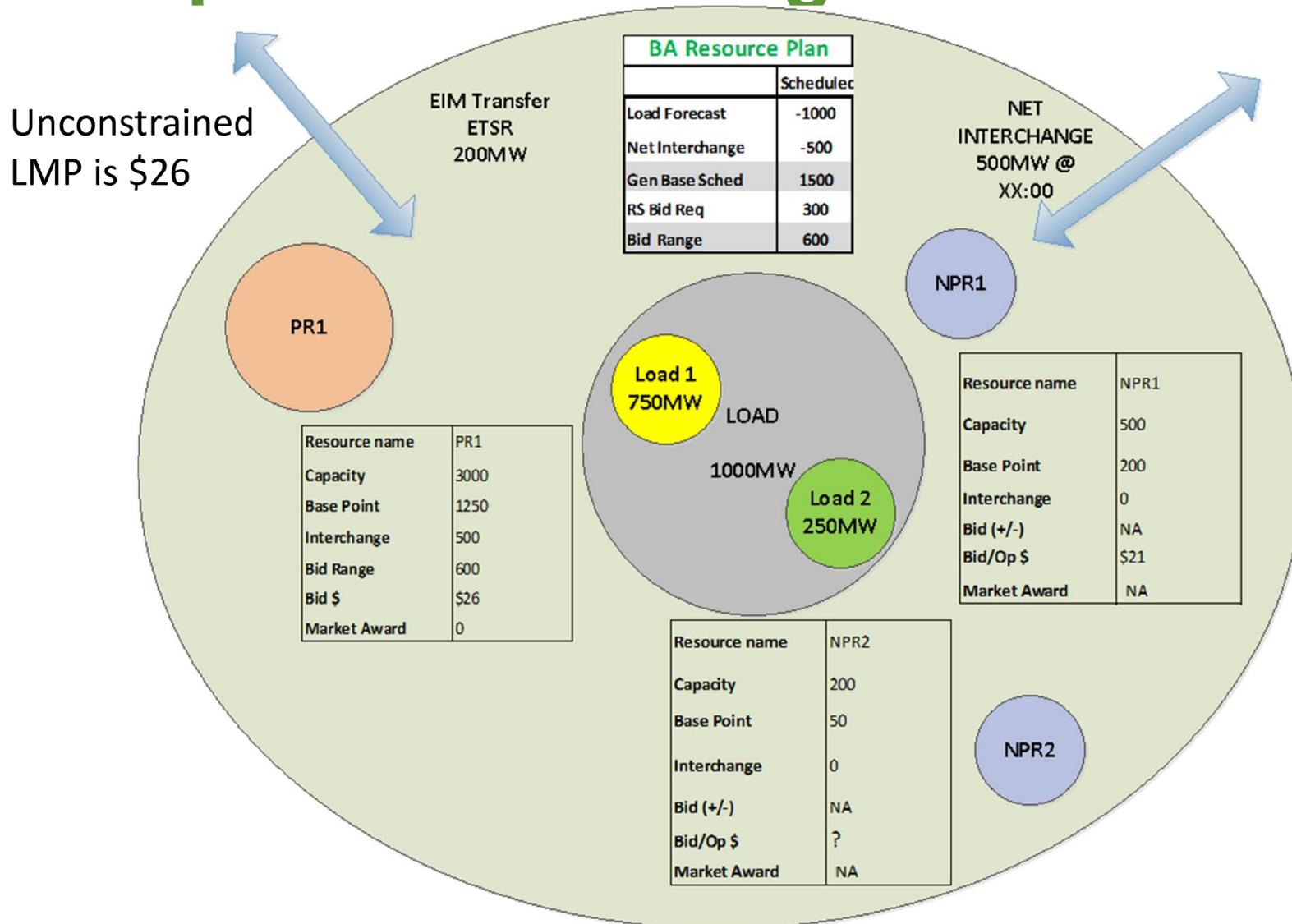
# Structured Scenarios

- Today's scenarios are a simple example of a BAA customer dispatching resources to meet changes in load
- The scenarios address several variations
  - Scenario 2.A: Status quo, Self Supply of Imbalance
  - Scenario 2.B: Non-Participating Resource with no Manual Dispatch provided to the market
  - Scenario 2.C: Non-Participating Resource with Manual Dispatch provided to the market
  - Scenario 2.D: LSE's Participating Resource dispatches economically
  - Scenario 2.E: LSE Participating Resource and 3<sup>rd</sup> Party dispatches economically

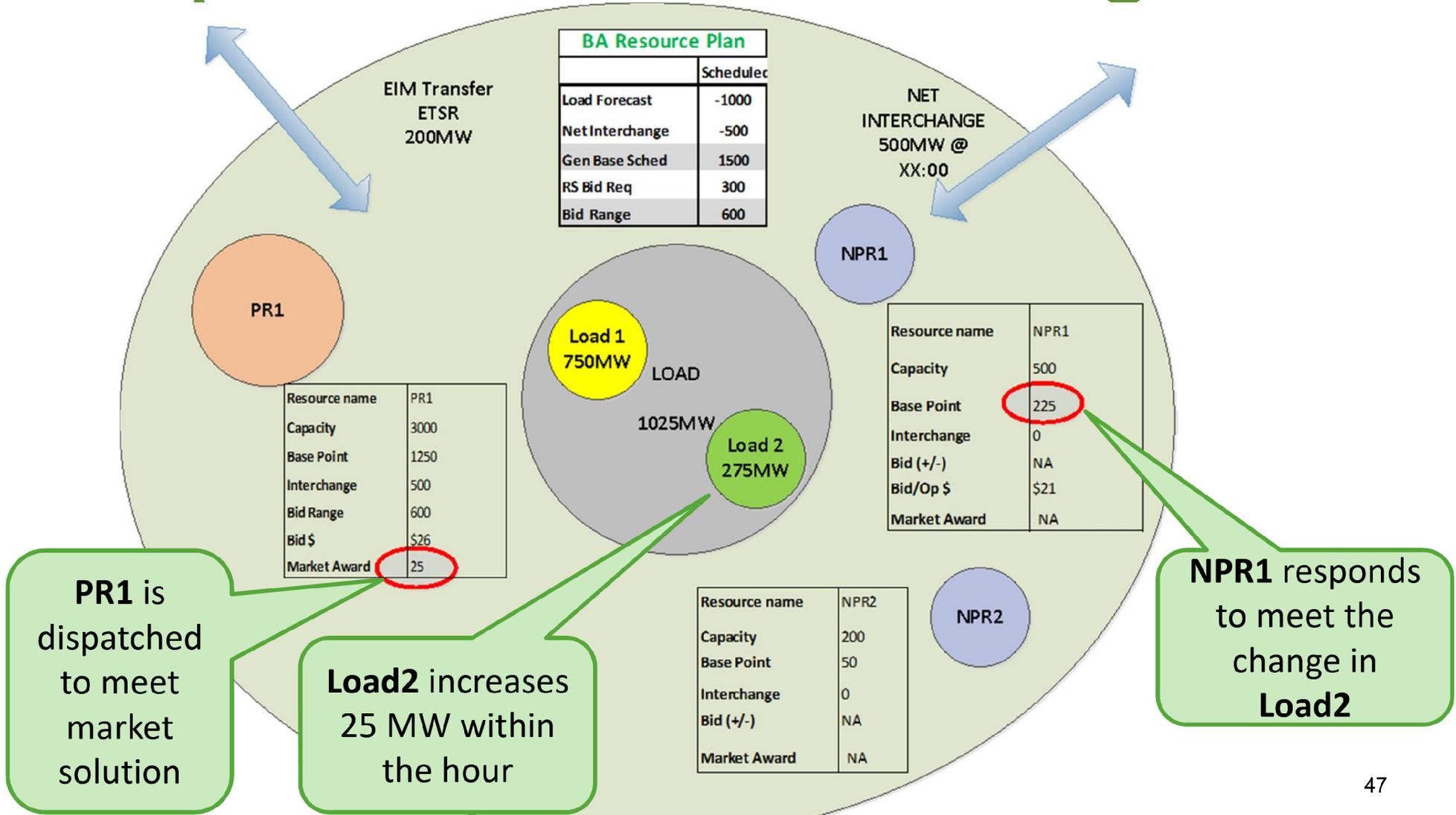
	Transmission Congestion In Market	Participating Resources	Scheduling	Real-Time Actions
<b>Scenario 1: Base Simple</b>	• None – ETSRs and internal constraints are non-binding	• FCRPS aggregated into three zones	• All base schedules (inter and intrachange) completed by T-40 and flat for the hour	• None
• <b>Scenario 1.A: Base with Export Reduction</b>	• “	• “	• All base schedules (inter and intrachange) completed by T-40 with reduction in exports within the hour at XX:10 by 75 MW	• “
• <b>Scenario 2.A – Status Quo, Self Supply of Imbalance</b>	• NA	• NA	• NA	• NA
• <b>Scenario 2.B – Non-Participating with <u>no</u> Manual Dispatch</b>	• “	• “	• All base schedules (inter and intrachange) completed by T-40 and flat for the hour	• LSE dispatch of resource to meet 25MW increase in load
• <b>Scenario 2.C – Non-Participating Resource <u>with</u> Manual Dispatch</b>	• “	• “	• All base schedules (inter and intrachange) completed by T-40 and flat for the hour	• LSE dispatch of resource to meet 25MW increase in load and EESC signals Manual Dispatch to the MO
• <b>Scenario 2.D – LSE’s Participating Resource dispatches economically</b>	• “	• FCRPS aggregated into three zones AND LSE resource	• “	• Market economically dispatches LSE PR
• <b>Scenario 2.E – LSE Participating Resource and 3<sup>rd</sup> Party dispatches economically</b>	• “	• FCRPS aggregated into three zones AND LSE resource	• “	• Market economically dispatches 3 <sup>rd</sup> Party resource (specifically, the FCRPS PR in this example)



# 2.B – Non-Participating/No Manual Dispatch – Entering OH



# 2.B – Non-Participating/No Manual Dispatch – Within Hour Change



# 2.B – Settlements

## NPR1

**NPR1** moves to meet change in load...

	Base	200												÷ 4
		-												
	FMM RTUC (15 min)	200	200	200	200	200	200	200	200	200	200	200	200	
		<b>X</b>												
	FMM LMP	\$26	\$26	\$26	\$26	\$26	\$26	\$26	\$26	\$26	\$26	\$26	\$26	
		<b>=</b>												÷ 12
64600	FMM IIE	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
		-												
	RTD (5 min)	200	200	200	200	200	200	200	200	200	200	200	200	
		-												
	Metered Actuals	200	200	200	220	225	225	225	225	225	225	225	225	
		<b>X</b>												
	RTD LMP	\$26	\$26	\$26	\$26	\$26	\$26	\$26	\$26	\$26	\$26	\$26	\$26	
		<b>=</b>												
64700	RTD IIE	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
64750	RTD UIE	\$0	\$0	\$0	(\$43)	(\$54)	(\$54)	(\$54)	(\$54)	(\$54)	(\$54)	(\$54)	(\$54)	

...creating Uninstructed Imbalance Energy

# 2.B – Settlements Continued

## PR1

**PR1** dispatched to meet market solution...  
 ...because Market Operator was not informed of NPR1's deviation from its Base Schedule

Base	1250												÷ 4
FMM RTUC (15 min)	1250	1250	1250	1250									
FMM LMP	X												
FMM LMP	\$26	\$26	\$26	\$26									
FMM IIE	=												÷ 12
FMM IIE	\$0	\$0	\$0	\$0									
RTD (5 min)	1250	1250	1250	1250	1275	1275	1275	1275	1275	1275	1275	1275	
Metered Actuals	-												
Metered Actuals	1250	1250	1250	1270	1275	1275	1275	1275	1275	1275	1275	1275	
RTD LMP	X												
RTD LMP	\$26	\$26	\$26	\$26	\$26	\$26	\$26	\$26	\$26	\$26	\$26	\$26	
RTD IIE	=												
RTD IIE	\$0	\$0	\$0	\$0	(\$54)	(\$54)	(\$54)	(\$54)	(\$54)	(\$54)	(\$54)	(\$54)	
RTD UIE	\$0	\$0	\$0	(\$43)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	

# 2.B – Settlements Continued

## Load

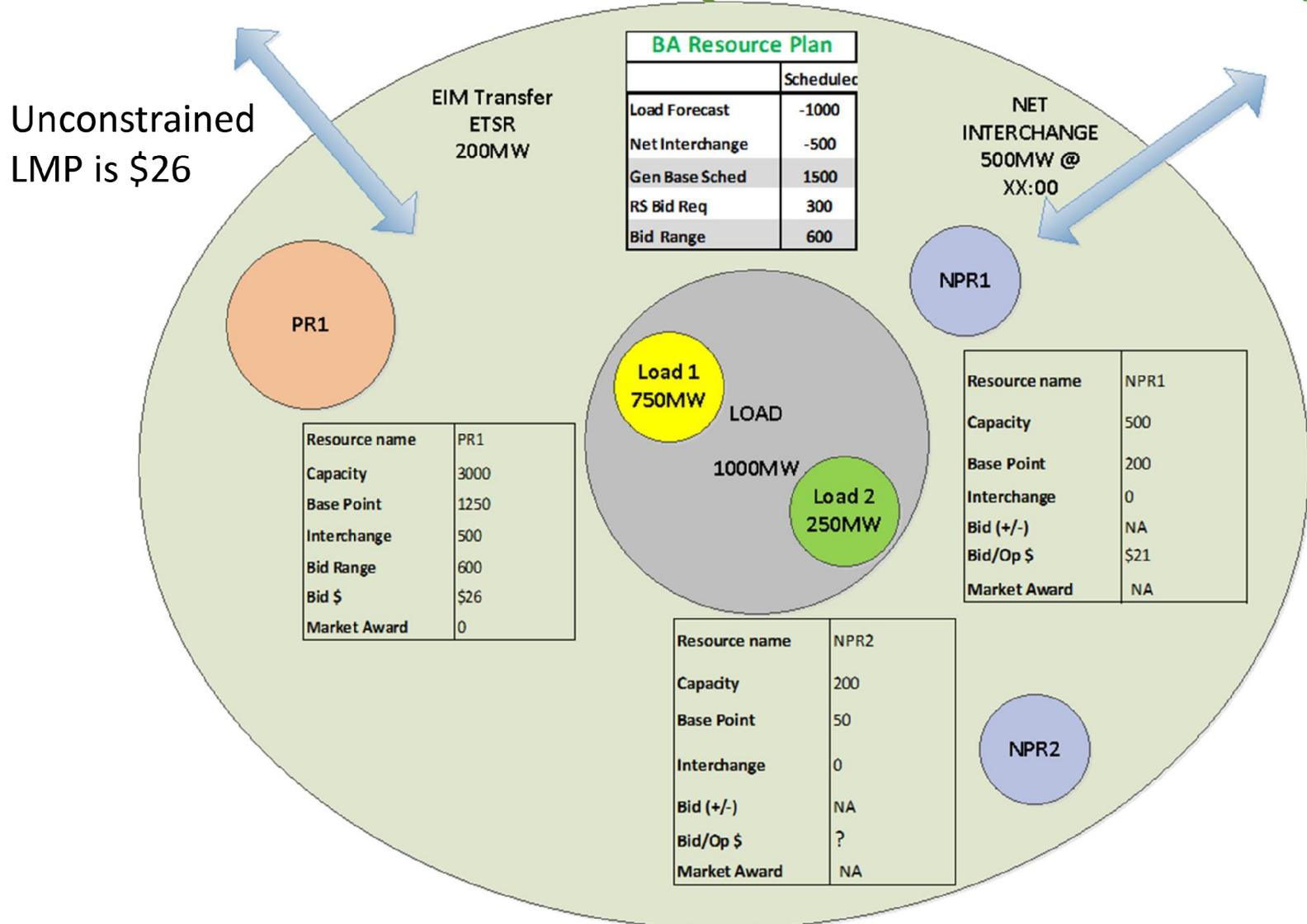
Hourly Load Base Schedule	1000												
Submitted Hourly Load Value	1037												
5-min Load Base Schedule	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	÷ 12
	-												
5 min Load "Metered Actuals"	1037	1037	1037	1037	1037	1037	1037	1037	1037	1037	1037	1037	x (-1)
	x												
LAP	\$26.00	\$26.00	\$26.00	\$26.00	\$26.00	\$26.00	\$26.00	\$26.00	\$26.00	\$26.00	\$26.00	\$26.00	=
	=												
RTD UIE	\$79	\$79	\$79	\$79	\$79	\$79	\$79	\$79	\$79	\$79	\$79	\$79	

## 2.B – Conclusion

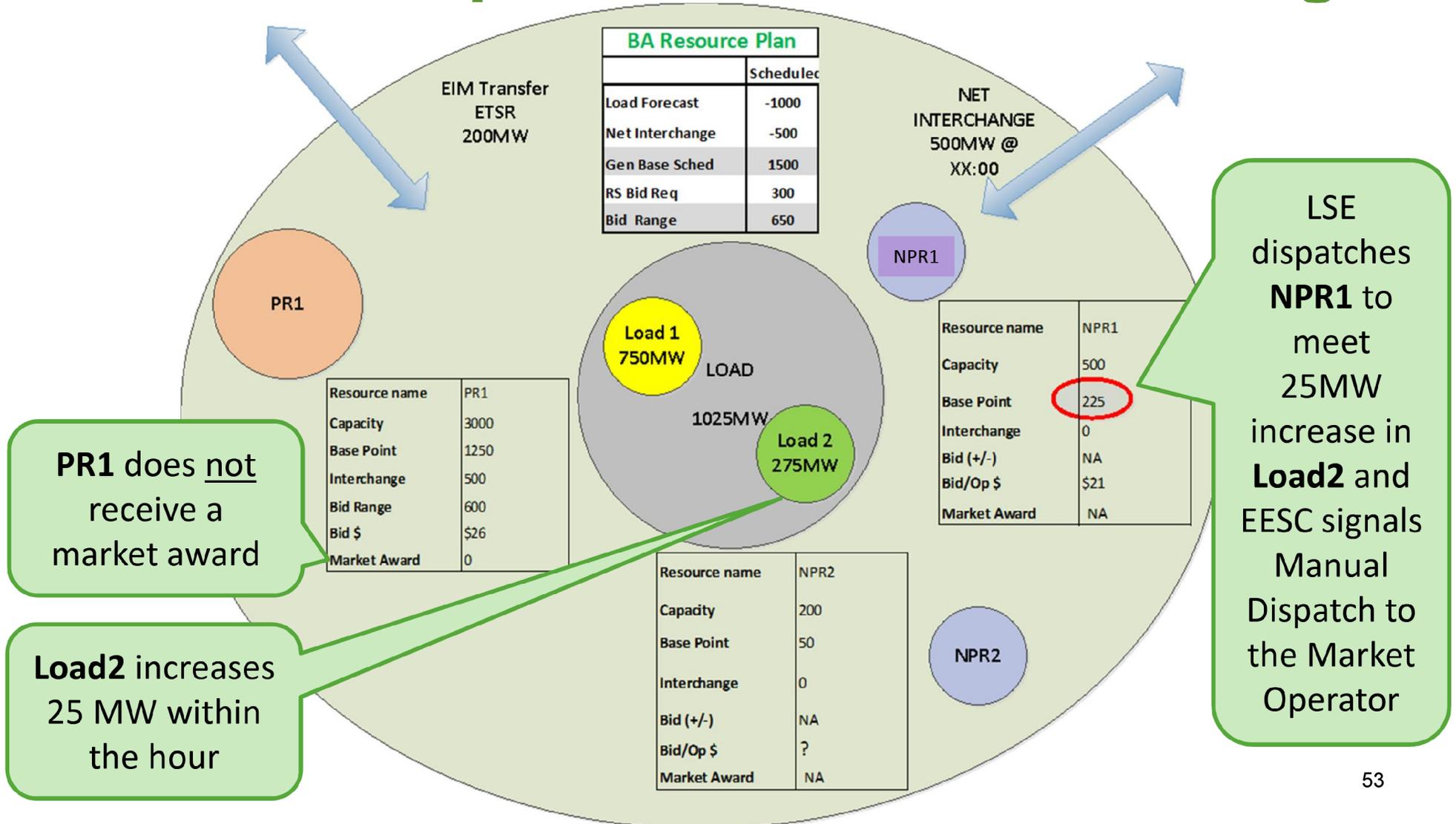
- The BAA ends up having two resources *each* move 25 MW for the *single* 25 MW increase in load
- The BAA collects imbalance for **both** dispatches
- NPR1 “spent” \$385 (using same \$21 per MWh Bid/Op cost) to respond to its change in load
- LSE will incur a portion of the costs in each of the columns below:

Total Load	Total BA Gen	Total PR Gen	Net Leaving	Net Net
\$953	(\$477)	(\$477)	(\$477)	\$0

# 2.C – Non-Participating Resource With Manual Dispatch – Entering OH



# 2.C – Non-Participating Resource w/ Manual Dispatch – w/in Hour Change



# 2.C – Settlements

## NPR1

NPR1 moves to meet change in load...

...creating (mostly) Instructed Imbalance Energy

64600

64700

64750

Base	200												÷ 4
	-												
FMM RTUC (15 min)	200	200	200	200									
	X												
FMM LMP	\$26	\$26	\$26	\$26									
	=												÷ 12
FMM IIE	\$0	\$0	\$0	\$0									
	-												
RTD (5 min)	200	200	200	200	225	225	225	225	225	225	225	225	
	-												
Metered Actuals	200	200	200	220	225	225	225	225	225	225	225	225	
	X												
RTD LMP	\$26	\$26	\$26	\$26	\$26	\$26	\$26	\$26	\$26	\$26	\$26	\$26	
	=												
RTD IIE	\$0	\$0	\$0	\$0	(\$54)	(\$54)	(\$54)	(\$54)	(\$54)	(\$54)	(\$54)	(\$54)	
	-												
RTD UIE	\$0	\$0	\$0	(\$43)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	

# 2.C – Settlements Continued

**PR1** is not dispatched in the market solution...

...because a Manual Dispatch<sup>64600</sup> was submitted to the Market Operator for **NPR1's** deviation from its Base<sup>64700</sup> Schedule<sup>64750</sup>

## PR1

Base	1250												÷ 4
	-												
FMM RTUC (15 min)	1250	1250	1250	1250									
	X												
FMM LMP	\$26	\$26	\$26	\$26									
	=												÷ 12
FMM IIE	\$0	\$0	\$0	\$0									
	-												
RTD (5 min)	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	
	-												
Metered Actuals	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	
	X												
RTD LMP	\$26	\$26	\$26	\$26	\$26	\$26	\$26	\$26	\$26	\$26	\$26	\$26	
	=												
RTD IIE	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
RTD UIE	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	

# 2.C – Settlements Continued

## Load

Hourly Load  
Base Schedule

1000
------

Submitted  
Hourly Load Value

1018
------

5-min Load  
Base Schedule

1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
------	------	------	------	------	------	------	------	------	------	------	------

-

÷ 12

5 min Load  
"Metered Actuals"

1018	1018	1018	1018	1018	1018	1018	1018	1018	1018	1018	1018
------	------	------	------	------	------	------	------	------	------	------	------

X

LAP

\$26.00	\$26.00	\$26.00	\$26.00	\$26.00	\$26.00	\$26.00	\$26.00	\$26.00	\$26.00	\$26.00	\$26.00
---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------

x (-1)

=

RTD UIE

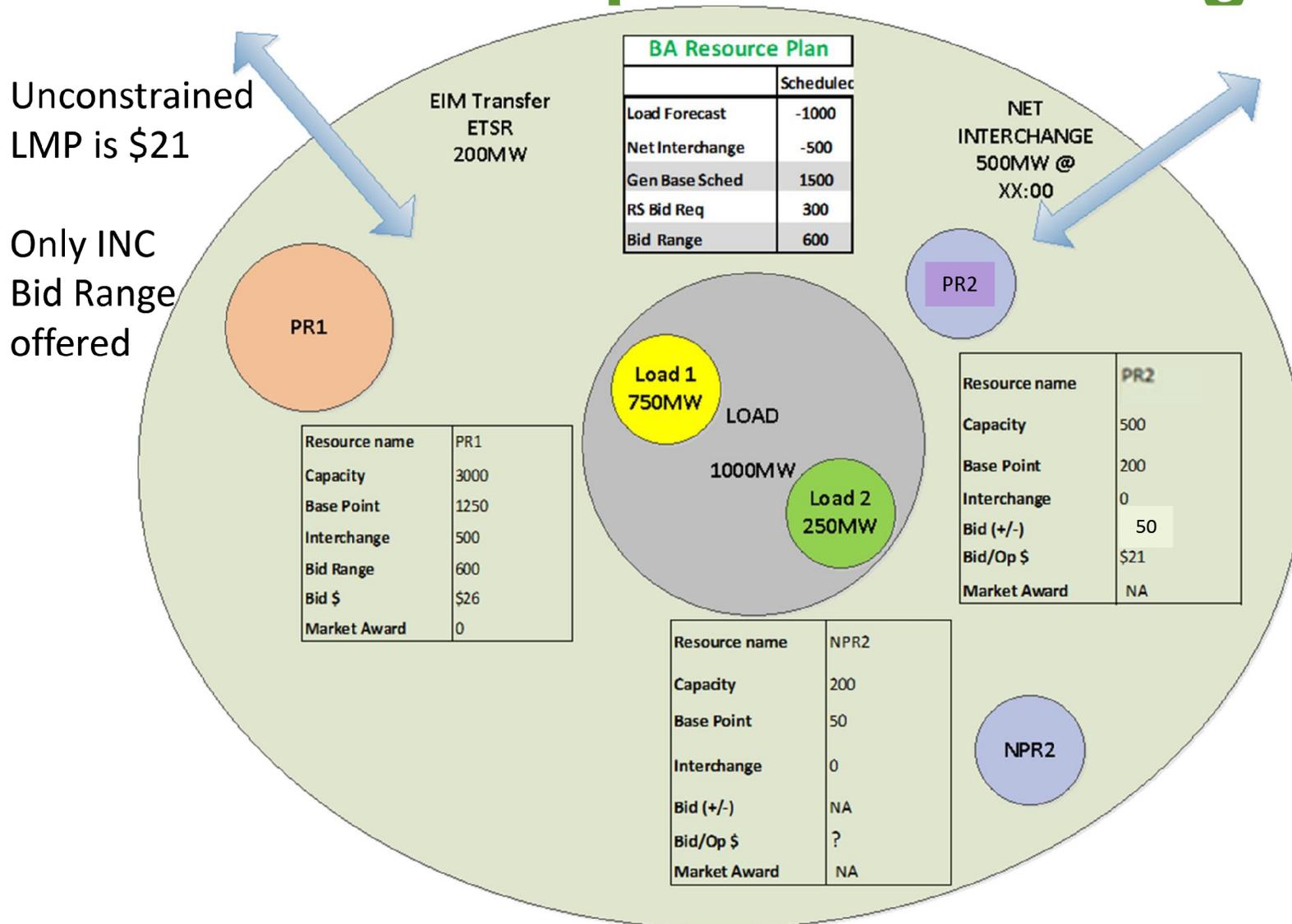
\$40	\$40	\$40	\$40	\$40	\$40	\$40	\$40	\$40	\$40	\$40	\$40
------	------	------	------	------	------	------	------	------	------	------	------

## 2.C – Conclusion

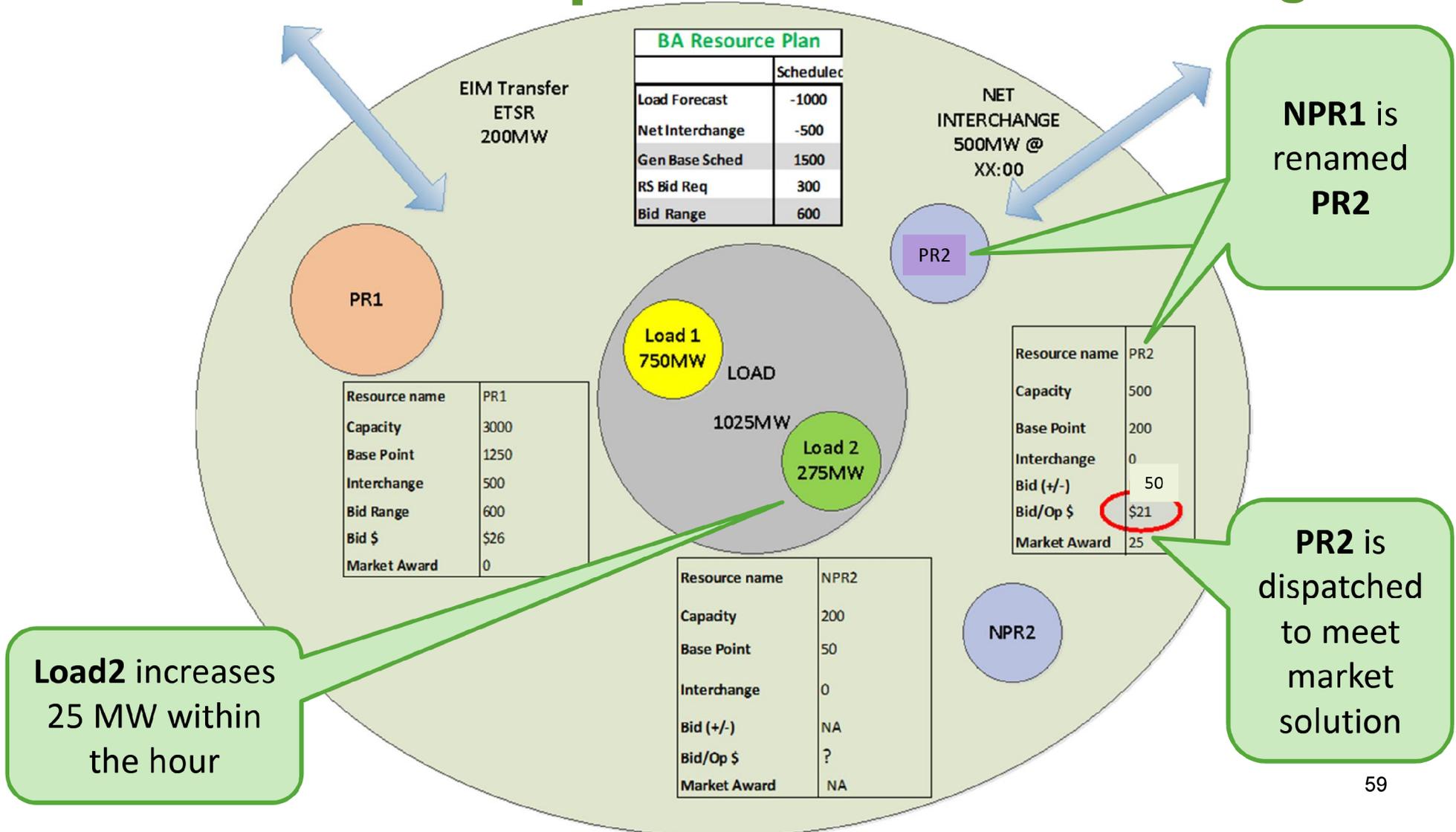
- Only **NPR1** was dispatched because the EESC communicated a Manual Dispatch to the MO
- This was a more efficient dispatch
- NPR1 “spent” \$385 (using same \$21 per MWh Bid/Op cost) to respond to its change in load
- LSE will incur a portion of the costs (now lower than 2.B) in each of the columns below:

Total Load	Total BA Gen	Total PR Gen	Net Leaving	Net Net
\$477	(\$477)	\$0	(\$477)	\$0

# 2.D – LSE Participating Resource Economic Dispatch – Entering OH



# 2.D – LSE Participating Resource Economic Dispatch – w/in Hour Change



# 2.D – Settlements

**PR2** is dispatched in the market solution...  
...because it was the least cost participating resource

## PR2

	Base	200												÷ 4
		-												
	FMM RTUC (15 min)	200	200	200	200									
		<b>X</b>												
	FMM LMP	\$21	\$21	\$21	\$21									
		=												
64600	FMM IIE	\$0	\$0	\$0	\$0									÷ 12
		-												
	RTD (5 min)	200	200	200	200	225	225	225	225	225	225	225	225	
		-												
	Metered Actuals	200	200	200	220	225	225	225	225	225	225	225	225	
		<b>X</b>												
	RTD LMP	\$21	\$21	\$21	\$21	\$21	\$21	\$21	\$21	\$21	\$21	\$21	\$21	
		=												
64700	RTD IIE	\$0	\$0	\$0	\$0	(\$44)	(\$44)	(\$44)	(\$44)	(\$44)	(\$44)	(\$44)	(\$44)	
64750	RTD UIE	\$0	\$0	\$0	(\$35)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	

# 2.D – Settlements Continued

## PR1

	Base	1250												÷ 4
		-												
	FMM RTUC (15 min)	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	
		X												
	FMM LMP	\$21	\$21	\$21	\$21	\$21	\$21	\$21	\$21	\$21	\$21	\$21	\$21	÷ 12
		=												
64600	FMM IIE	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
		-												
	RTD (5 min)	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	
		-												
	Metered Actuals	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	
		X												
	RTD LMP	\$21	\$21	\$21	\$21	\$21	\$21	\$21	\$21	\$21	\$21	\$21	\$21	
		=												
64700	RTD IIE	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
64750	RTD UIE	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	

**PR1 is not dispatched in the market solution.**

# 2.D – Settlements Continued

## Load

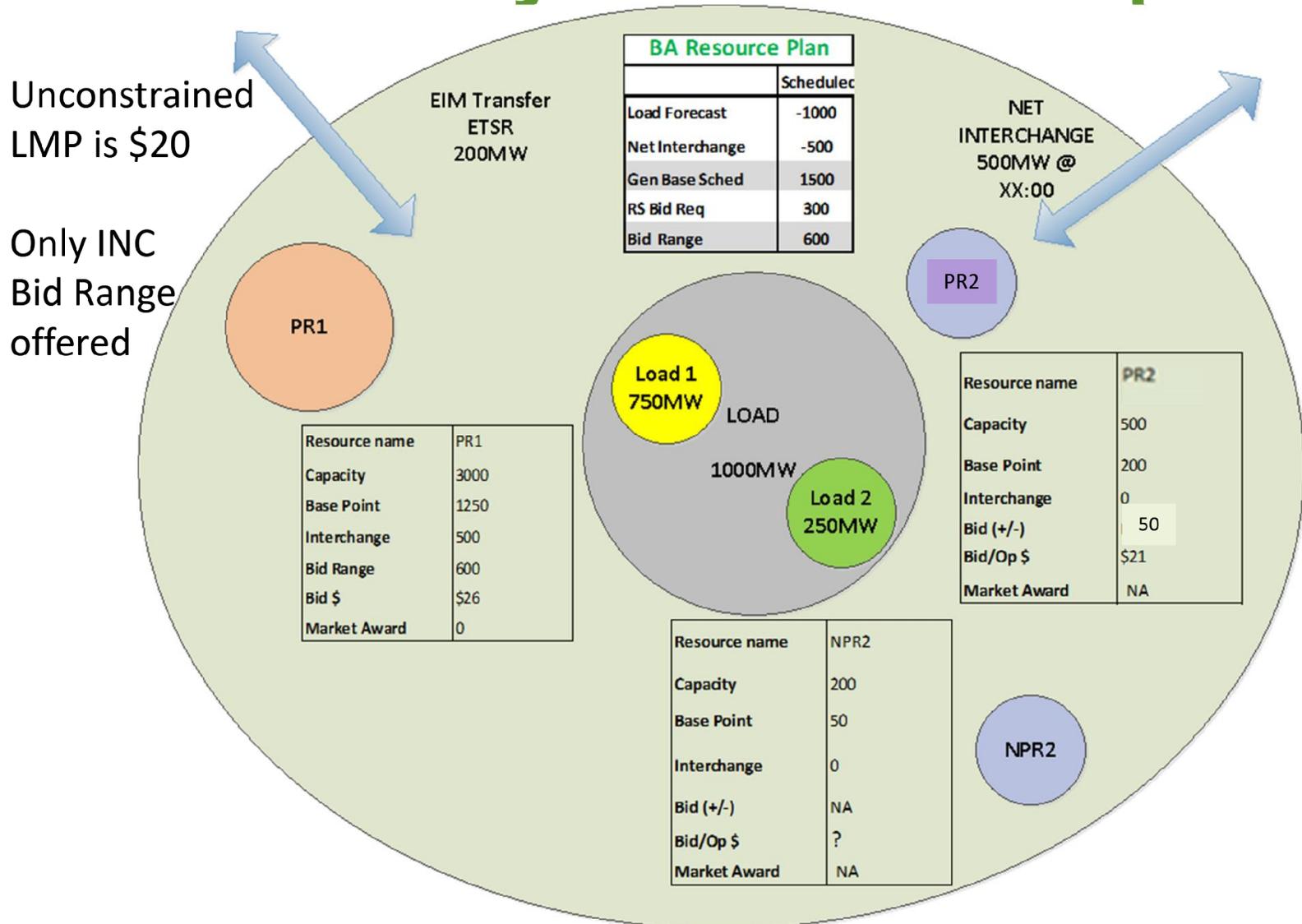
Hourly Load Base Schedule	1000												
Submitted Hourly Load Value	1018												
5-min Load Base Schedule	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
	-												÷ 12
5 min Load "Metered Actuals"	1018	1018	1018	1018	1018	1018	1018	1018	1018	1018	1018	1018	
	X												
LAP	\$21.00	\$21.00	\$21.00	\$21.00	\$21.00	\$21.00	\$21.00	\$21.00	\$21.00	\$21.00	\$21.00	\$21.00	x (-1)
	=												
RTD UIE	\$32	\$32	\$32	\$32	\$32	\$32	\$32	\$32	\$32	\$32	\$32	\$32	

## 2.D – Conclusions

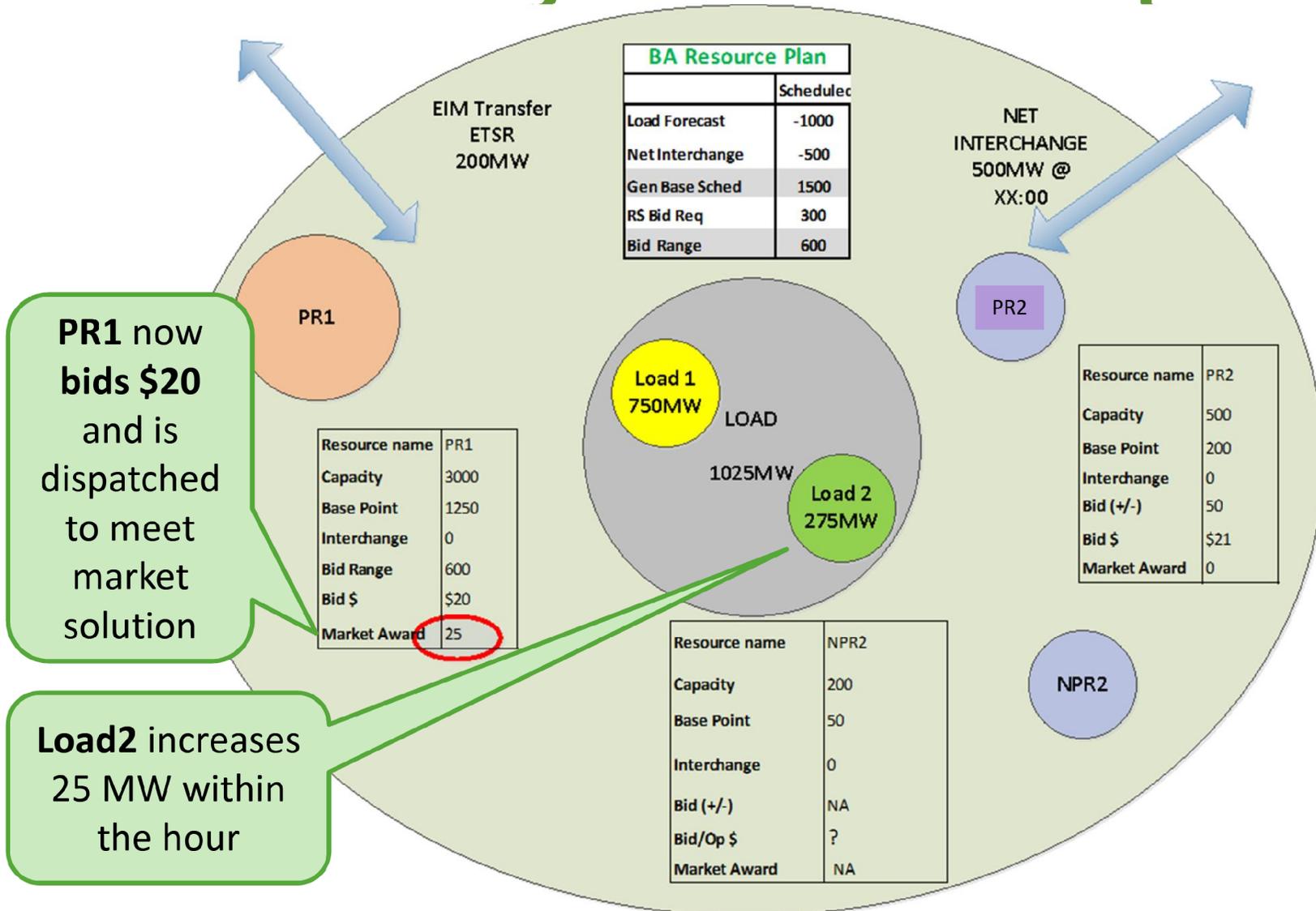
- Same efficient dispatch
- Price for imbalance set by **PR2**, which was lower than PR1
- NPR1 “spent” \$385 (using same \$21 per MWh Bid/Op cost) to respond to its change in load
- LSE will incur a portion of the costs (now lower than 2.C) in each of the columns below:

Total Load	Total BA Gen	Total PR Gen	Net Leaving	Net Net
\$385	(\$385)	\$0	(\$385)	\$0

# 2.E – LSE Participating Resource and 3<sup>rd</sup> Party Economic Dispatch



# 2.E – LSE Participating Resource and 3<sup>rd</sup> Party Economic Dispatch



# 2.E – Settlements

## PR2

Base	200												÷ 4
	-												
FMM RTUC (15 min)	200	200	200	200									
	X												
FMM LMP	\$20	\$20	\$20	\$20									
	=												
64600 FMM IIE	\$0	\$0	\$0	\$0									÷ 12
	-												
RTD (5 min)	200	200	200	200	200	200	200	200	200	200	200	200	
	-												
Metered Actuals	200	200	200	200	200	200	200	200	200	200	200	200	
	X												
RTD LMP	\$20	\$20	\$20	\$20	\$20	\$20	\$20	\$20	\$20	\$20	\$20	\$20	
	=												
64700 RTD IIE	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
64750 RTD UIE	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	

**PR2 is not dispatched in the market solution.**

# 2.E – Settlements Continued

## PR1

Base	1250												÷ 4
FMM RTUC (15 min)	1250	1250	1250	1250									
FMM LMP	<b>X</b>												
64600 FMM IIE	\$20	\$20	\$20	\$20									÷ 12
RTD (5 min)	<b>=</b>												
Metered Actuals	1250	1250	1250	1250	1275	1275	1275	1275	1275	1275	1275	1275	
RTD LMP	<b>X</b>												
64700 RTD IIE	\$20	\$20	\$20	\$20	\$20	\$20	\$20	\$20	\$20	\$20	\$20	\$20	
64750 RTD UIE	<b>=</b>												
	\$0	\$0	\$0	\$0	(\$42)	(\$42)	(\$42)	(\$42)	(\$42)	(\$42)	(\$42)	(\$42)	
	\$0	\$0	\$0	(\$33)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	

**PR1 is dispatched in the market solution...**

**...because it was the least cost participating resource**

# 2.E – Settlements Continued

## Load

Hourly Load Base Schedule	1000												
Submitted Hourly Load Value	1018												
5-min Load Base Schedule	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	<div style="text-align: right;">÷ 12</div>
	-												
5 min Load "Metered Actuals"	1018	1018	1018	1018	1018	1018	1018	1018	1018	1018	1018	1018	
	X												<div style="text-align: right;">x (-1)</div>
LAP	\$20.00	\$20.00	\$20.00	\$20.00	\$20.00	\$20.00	\$20.00	\$20.00	\$20.00	\$20.00	\$20.00	\$20.00	
	=												
RTD UIE	\$31	\$31	\$31	\$31	\$31	\$31	\$31	\$31	\$31	\$31	\$31	\$31	

## 2.E – Conclusions

- More efficient dispatch
- Price for imbalance set by **PR1**, which was lower than PR2
- LSE saves cost of dispatching its own resource
- LSE will incur a portion of the costs (now lower than 2.D) in each of the columns below:

Total Load	Total BA Gen	Total PR Gen	Net Leaving	Net Net
\$367	\$0	(\$367)	\$0	\$0

# Net Conclusions

- This is a progression of increasingly efficient scenarios:
  - 2.E provides a more efficient dispatch than any of these scenarios
  - 2.E provides the lowest cost to serve **Load2** in these scenarios
- Market solutions are more robust in 2.C, 2.D and 2.E
  - 2.B illustrates two generators being moved for the same load
- There are more scenarios beyond 2.E that would continue to be increasingly efficient:
  - PR1 and/or PR2 could INC to support exports to other EIM Entities which would lower LMPs and LAPs
  - If DEC range were offered on one or both resources, PR1 and/or PR2 would be dispatched to fuel “swap”

# Future Structured Scenarios

Scheduled for April and May will include:

- Slice Customers
- VERs (participating / non-participating)

# Next Steps



# Next Steps

- Next meeting scheduled for **Wednesday April 10<sup>th</sup>** at the Rates Hearing Room. This will be an all-day meeting to discuss our next structured scenario.
  - 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](mailto:techforum@bpa.gov) and reference “EIM Stakeholder Meeting” in the subject. Comments are due by April 24<sup>th</sup> Wednesday.
- 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>
- For more information on BPA’s Grid Modernization Initiative please visit:  
<https://www.bpa.gov/goto/GridModernization>

# Question and Answer Session



# EIM Stakeholder Meeting: Appendix Slides

Oct 11, 2018  
Rates Hearing Room



## Appendix – Electrically Similar Analysis

- A set of Generation Shift Factors (GSFs) were calculated to determine resources’ electric similarities relative to BPA’s internal flowgates.

Assumptions used are:

- 2019 planning case – all lines in service
- 10% threshold – the difference between two GSFs < 10% → the resources are considered electrically similar.
- No outages

- Result:

ELECTRICALLY SIMILAR @ 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%

UPPER = Upper Columbia; LOWER = Lower Columbia; SNAKE = Snake River

# Appendix – Congestion Risk Analysis 1

For the flowgates where the aggregations considered do not allow the market to dispatch around congestion, a statistical analysis for curtailment events in 2008 – 2017 was performed. The total event count and the 10-year frequency were calculated for each flowgate.

CURTAILMENT EVENTS - ALL PRIORITIES (1,2,6,7)												
Flowgate	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Grand Total	Frequency (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%

CURTAILMENT EVENTS - FIRM (7)												
Flowgate	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Grand Total	Frequency (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%

# Appendix – Congestion Risk Analysis 2

- Conclusions:
  - 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 low on most flowgates
  - These trends may or may not continue – hard to predict the future!
  - Very few N-1 contingencies have occurred recently – curtailments may be higher when they occur since we are running the system at higher loading than we have historically
  - As of November, 2014, 15-minute intervals are curtailed – they used to be hourly

# 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

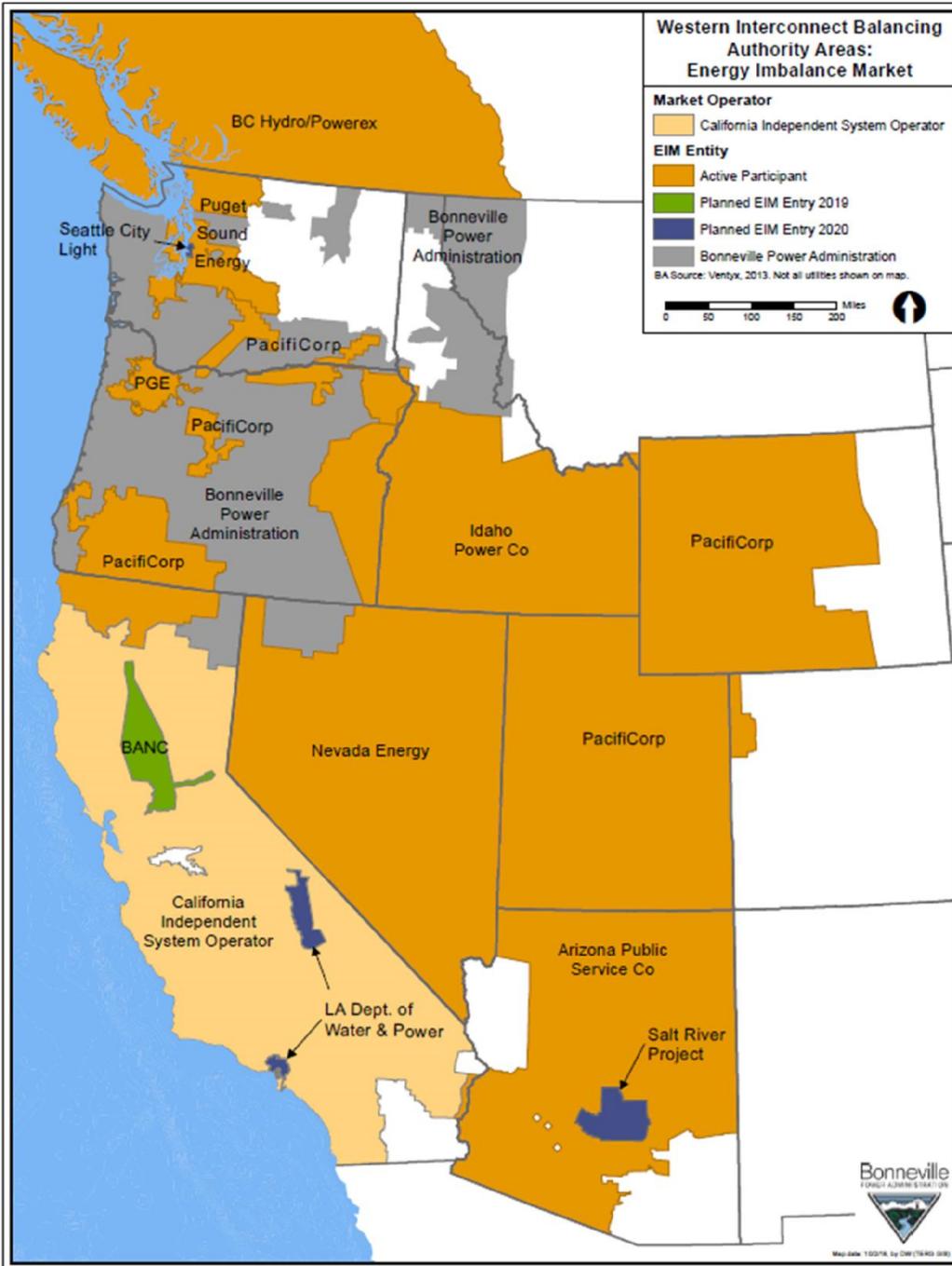
- Timeline and Next Steps
- Question and Answer Session

# 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 24<sup>th</sup> 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

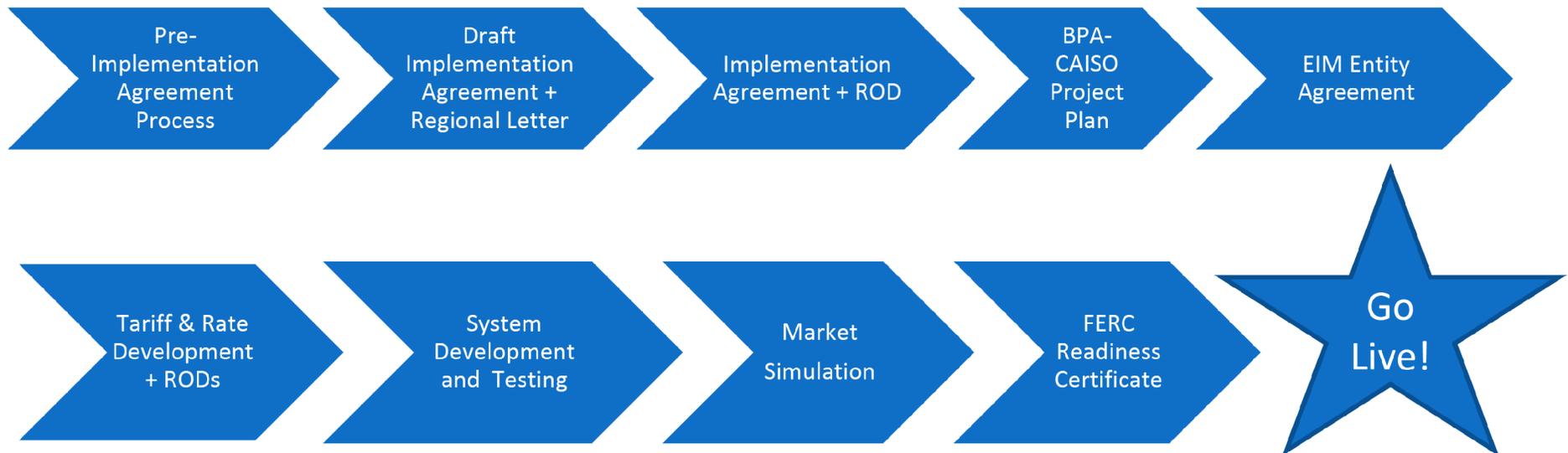
We will be discussing these issues today.

These issues will be discussed at future meetings.

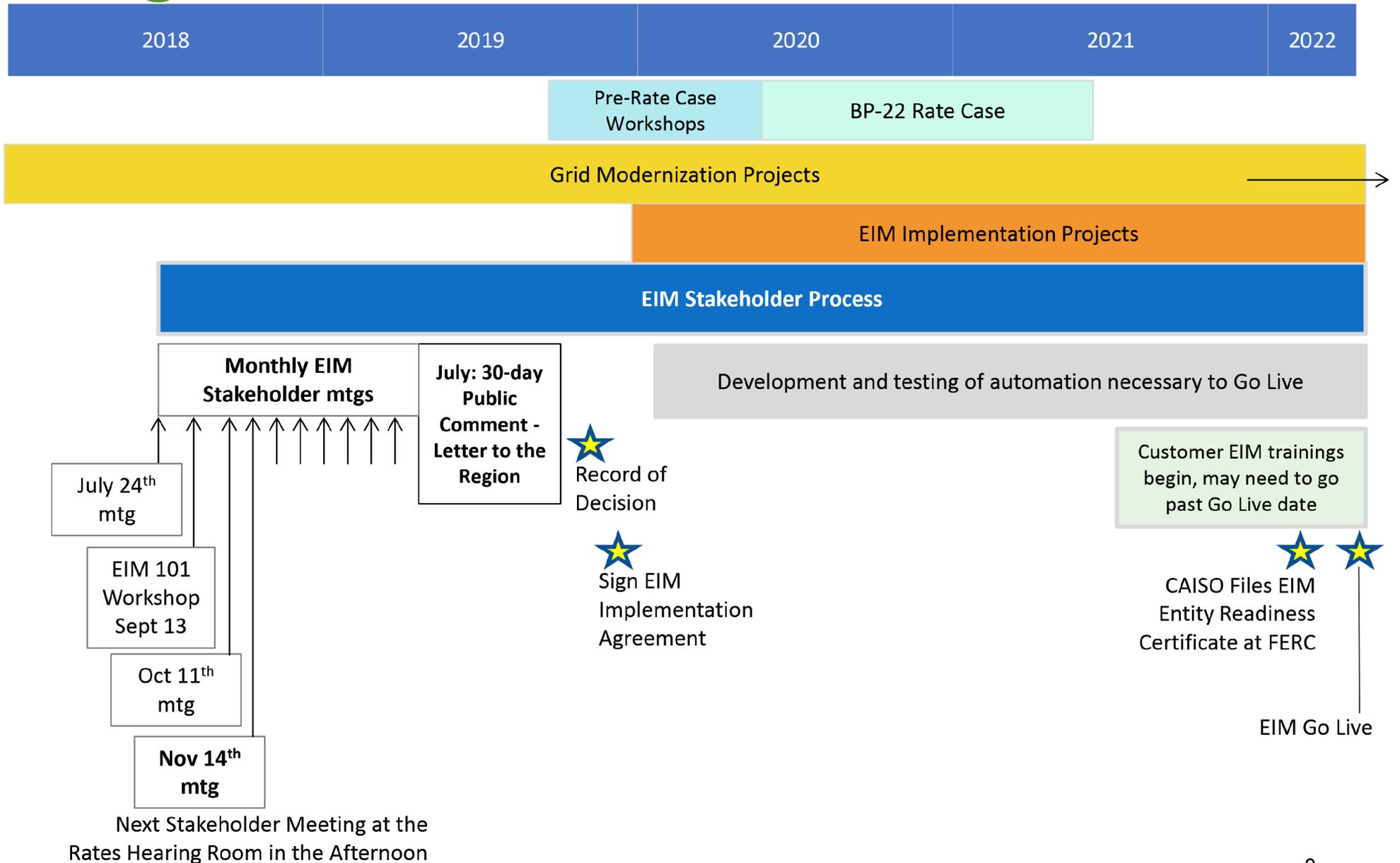
- Question and Answer Session

# 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



# 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

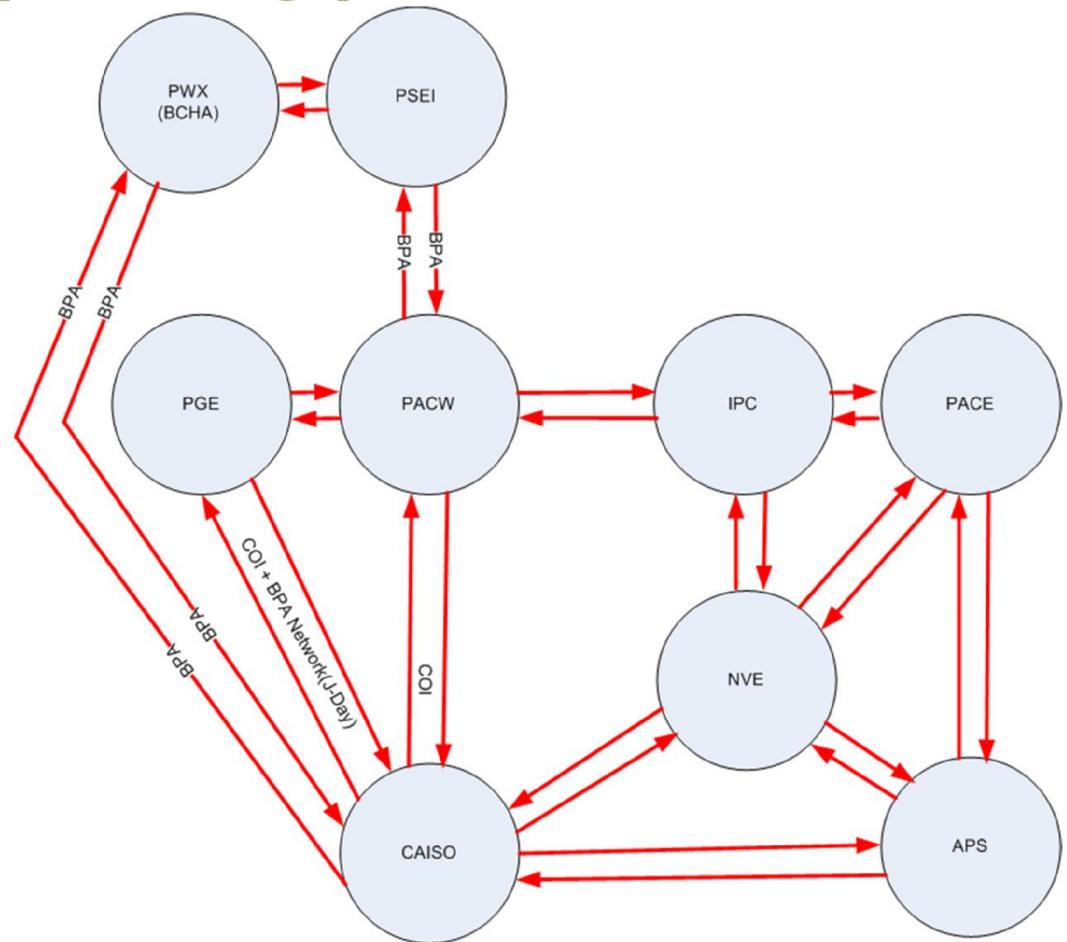
<https://www.caiso.com/Documents/TechnicalPaper-EnergyImbalanceMarket-EnergyTransferScheduling.pdf>

# 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

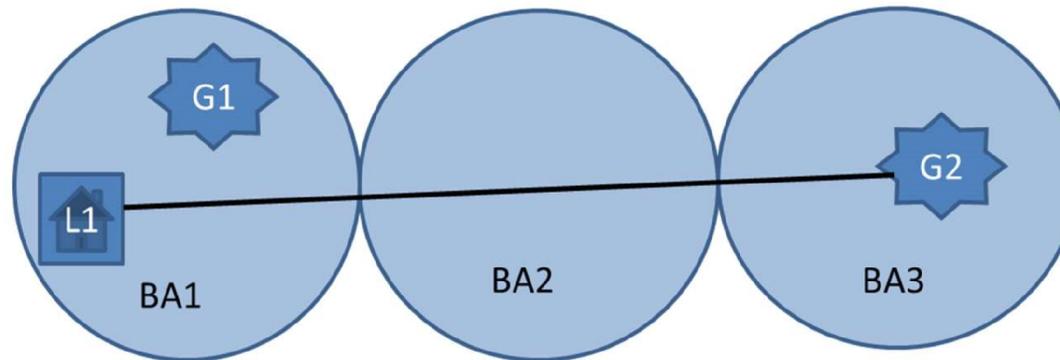


## Existing Transmission Methods

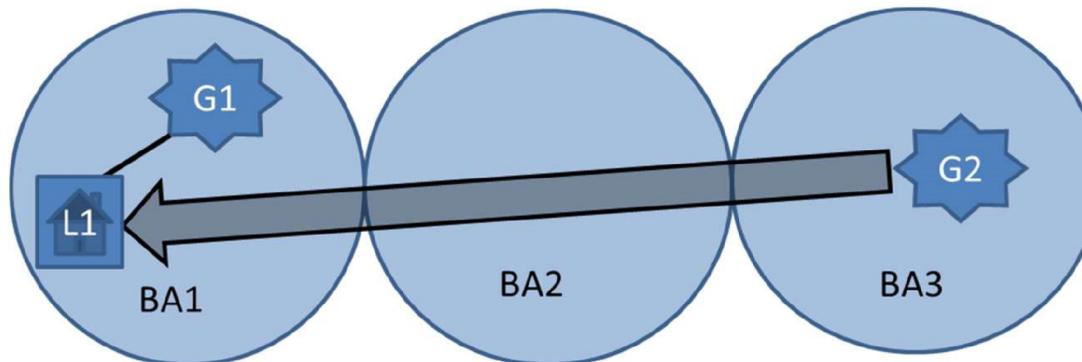
- There are two existing methods of making transmission available for EIM Transfers
  - Direct provision with a 0-NX NERC Designation
    - The EIM Entity receives no direct compensation for this transmission
    - Congestion revenue may be collected if applicable
  - Customer donation of Firm PTP Transmission 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 O-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	<ul style="list-style-type: none"> <li>• Most similar to current way of optimizing FCRPS</li> </ul>	<ul style="list-style-type: none"> <li>• The least efficient congestion relief</li> <li>• Lack of additional revenue associated with differential LMPs</li> </ul>
Three Aggregates	<ul style="list-style-type: none"> <li>• More efficient congestion relief</li> <li>• Additional revenue associated with differential LMPs</li> </ul>	<ul style="list-style-type: none"> <li>• May not fully realize congestion relief and revenue benefits</li> </ul>
Project Level	<ul style="list-style-type: none"> <li>• Most efficient congestion relief</li> <li>• Additional revenue associated with differential LMPs</li> </ul>	<ul style="list-style-type: none"> <li>• More complexity, which increases the risk that BPA may, through its bids, operate the FCRPS less efficiently.</li> </ul>

# 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



# 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

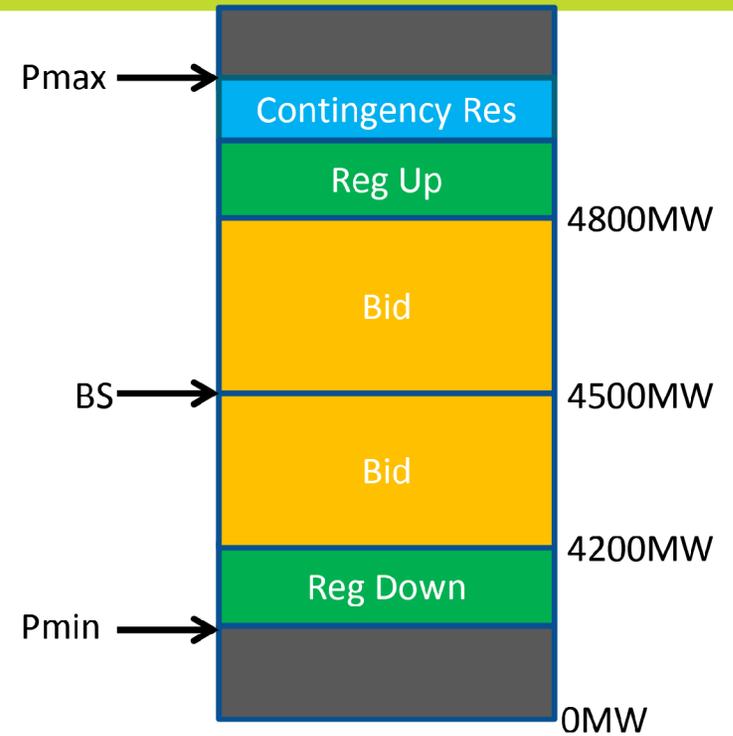
- Evaluated using an APR and ANPR participation model.
- Using this model each aggregation is defined twice:
  1. Aggregate Participating Resource (APR) to respond to the EIM bids/offers
  2. Aggregate Non-Participating Resource (ANPR) for base schedules, regulations, and contingency reserves.
- Separate 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:

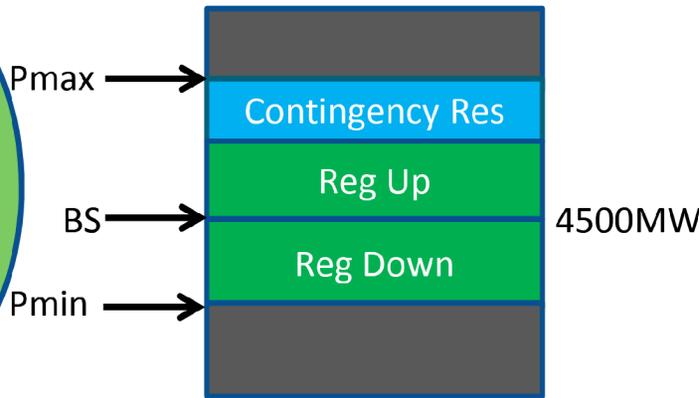
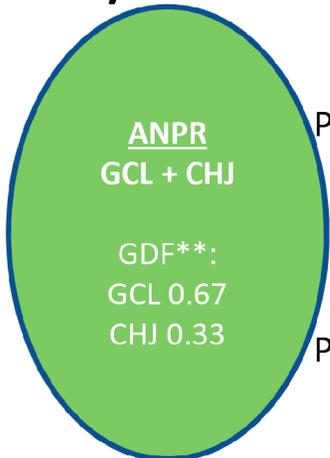


\*GDF is calculated based on Base Point. GDF controls the distribution of MW for both BS and bid range.

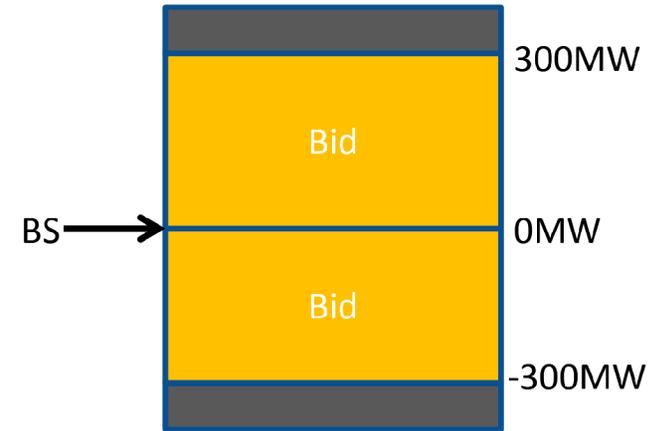
	BP (MW)	GDF
GCL	3000	3000/4500 = 0.67
CHJ	1500	1500/4500 = 0.33
SUM	4500	1



### APR/ANPR Setup:



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



\*\*\*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%
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Grand Total	14	17	9	16	28	19	31	22	38	5	199	0.227%

# Congestion Risk and Trends

CURTAILMENT EVENTS - FIRM (7)												
<u>Flowgate</u>	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Grand Total	Risk (10yr)
NJD							5				5	0.006%
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R-P				2					4		6	0.007%
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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										0.0%	2.6%	4.2%	80.6%			
SNK2	LGS										2.6%	0.0%	1.6%	83.2%			
SNK3	LMN										4.2%	1.6%	0.0%	84.7%			
SNK4	IHR										80.6%	83.2%	84.7%	0.0%			
UP1	GCL														0.0%	0.6%	
UP2	CHJ														0.6%	0.0%	

Lower Columbia

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%

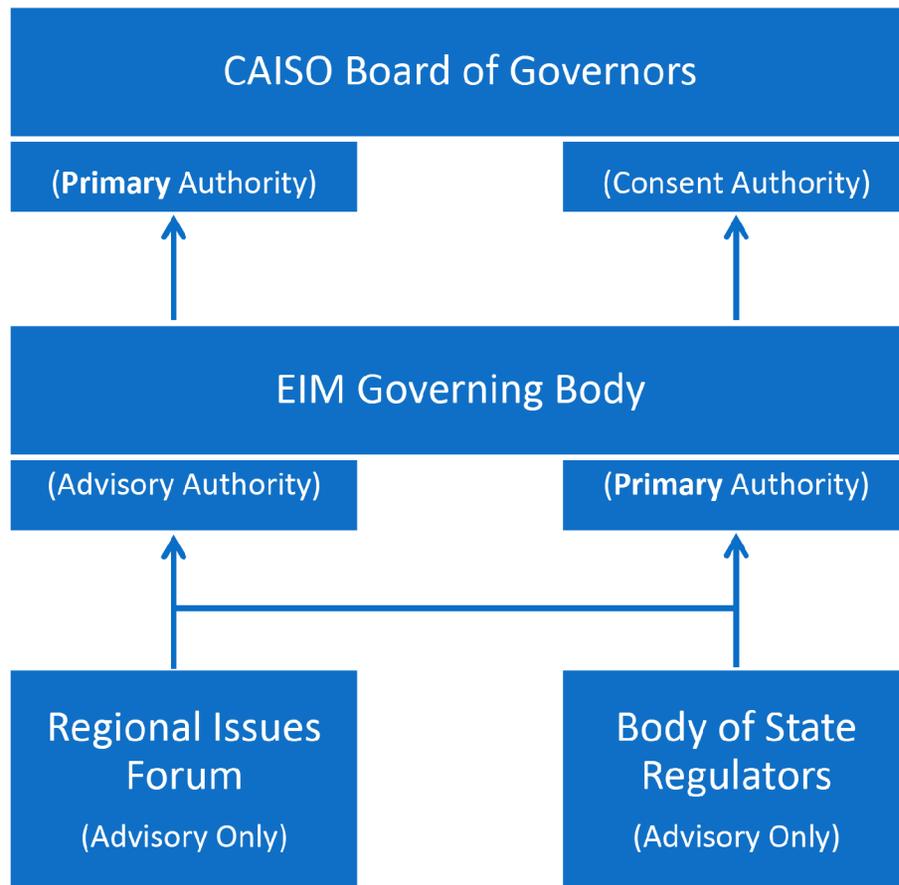
# Electrical Similarity Summary

- 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 14<sup>th</sup> 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](mailto:techforum@bpa.gov) and reference “EIM Stakeholder Meeting” in the subject. Comments are due by October 25<sup>th</sup> .
- 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



# California ISO and Energy Imbalance Markets

Power Up Academy  
November, 2018



Marcus Elkenberry 2002

# Objectives of Today's Meeting

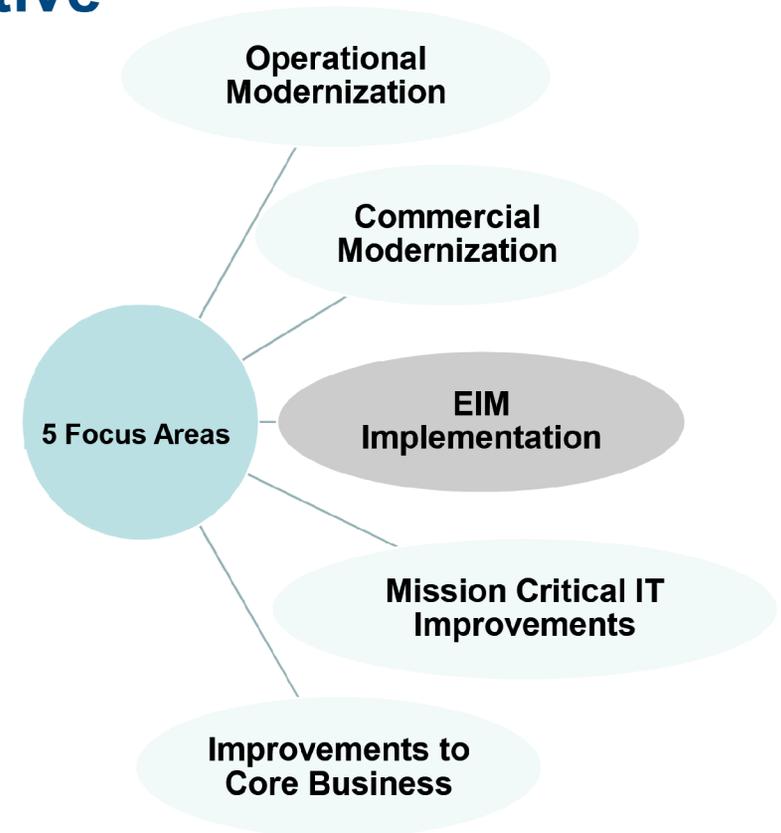
- How EIM fits into the Grid Modernization effort
- Market Opportunities and the EIM
- Who the CAISO is
- What is the EIM
- Initial look at costs and benefits of joining the EIM

# Grid Modernization Initiative

- Strengthens our ability to manage our commercial business through efficiencies and improved operational capabilities.
- Focus on modernizing federal power and transmission system operations.
- Grid modernization projects provide independent value to bring systems, processes and skills up to date.
- Reliance on legacy systems and nonstandard commercial practices have led us to be overly conservative in our power and transmission operations, planning and marketing and are costly to maintain.
- Strategic and prioritized investments:
  - support a more reliable, flexible and efficient system,
  - help reduce future costs and
  - create new market opportunities.
- Grid Modernization projects bring value to BPA and its customers independent of the EIM.
- If BPA chooses not to participate in the EIM, then the EIM Implementation projects will not be pursued.



[www.bpa.gov/StrategicPlan/Pages/Strategic-Plan.aspx](http://www.bpa.gov/StrategicPlan/Pages/Strategic-Plan.aspx)



# Grid Modernization Initiative

## Internal Resources:

- <https://internal.bud.bpa.gov/Agency/Pages/Grid-Modernization.aspx>
- You can also send your Grid Modernization questions to: [gridmod@bpa.gov](mailto:gridmod@bpa.gov)

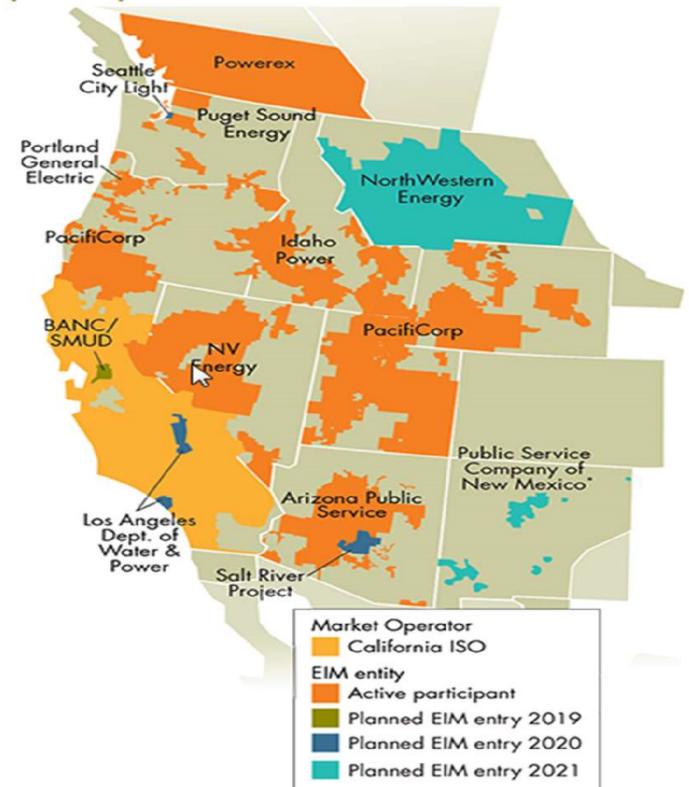
The screenshot shows the internal BPA website at <https://internal.bud.bpa.gov/Agency/Pages/Grid-Modernization.aspx>. The page features a navigation menu with categories like Home, Employee Center, Policy & Guidance, Services, The Agency, News, and People & Places. A search bar is located at the top right. The main content area is titled 'Grid Modernization' and includes a sub-header 'More than 30 distinct projects in Transmission, Power, and Distribution are being implemented to drive commercial success while maintaining reliability and meeting power and nonpower needs.' Below this, there are sections for 'What is Grid Modernization?' and 'How does grid modernization help BPA meet its strategic goals?'. A sidebar menu is open, showing a list of internal resources with 'Grid Modernization' highlighted. On the right side, there is a 'Need more information' section with links to various resources and a 'Public Outreach' section.

# Opportunities from Market Engagement

- Variable energy resources are increasing in the West creating opportunities to capture valuable flexibility and capacity services that clean hydropower resources can provide.
- Customer transmission use and system operations are undergoing significant changes in response to market developments and new tools are needed to respond optimally.
- Bonneville has discussed lessons learned from Northwest utilities who are evaluating market changes, modernizing their systems to take advantage of opportunities, and that have or are planning on joining the Western EIM.
- Need to find ways to fully realize the value of sub-hourly dispatch, flexible, and carbon-free hydro attributes.
- The pace of evolving markets continue, recent efforts such as day ahead market enhancements highlight the need for active monitoring.
- Bonneville has begun to study and determine *how and under what conditions Bonneville could join the Western EIM.*

Power Up Academy, Nov 2018

Western EIM active and pending participants

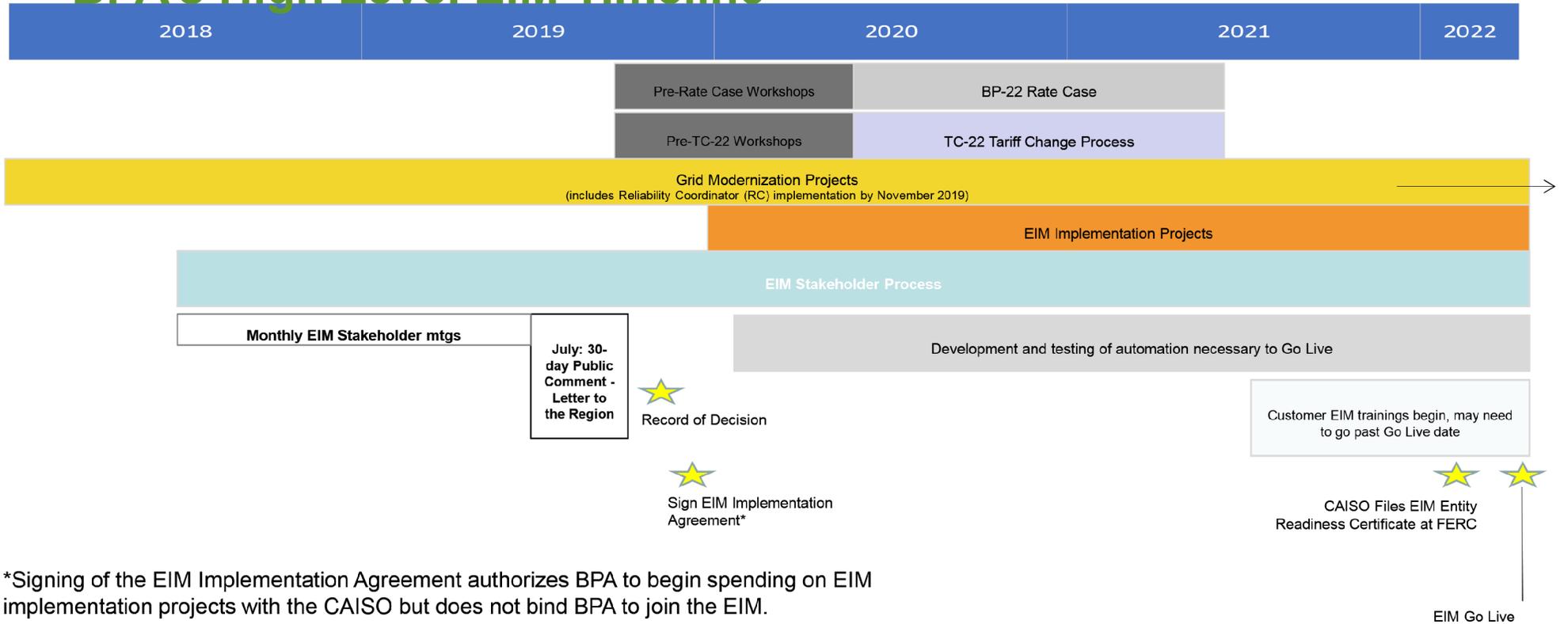


\*Pending state commission approval

## Statement of BPA's Principles for EIM Evaluation:

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.

# BPA's High Level EIM Timeline



\*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.

# EIM 101 Training

- As part of our ongoing EIM Stakeholder Meeting series, BPA produced and delivered EIM 101 training to our stakeholders. The presentation was recorded and the is available from these links:

[Workshop slide deck - Sept. 13, 2018](#)

[Workshop WebEx \(YouTube\)](#)

[Workshop Transcript](#)

- BPA's EIM Stakeholder Material is posted at [www.bpa.gov/goto/EIM](http://www.bpa.gov/goto/EIM)

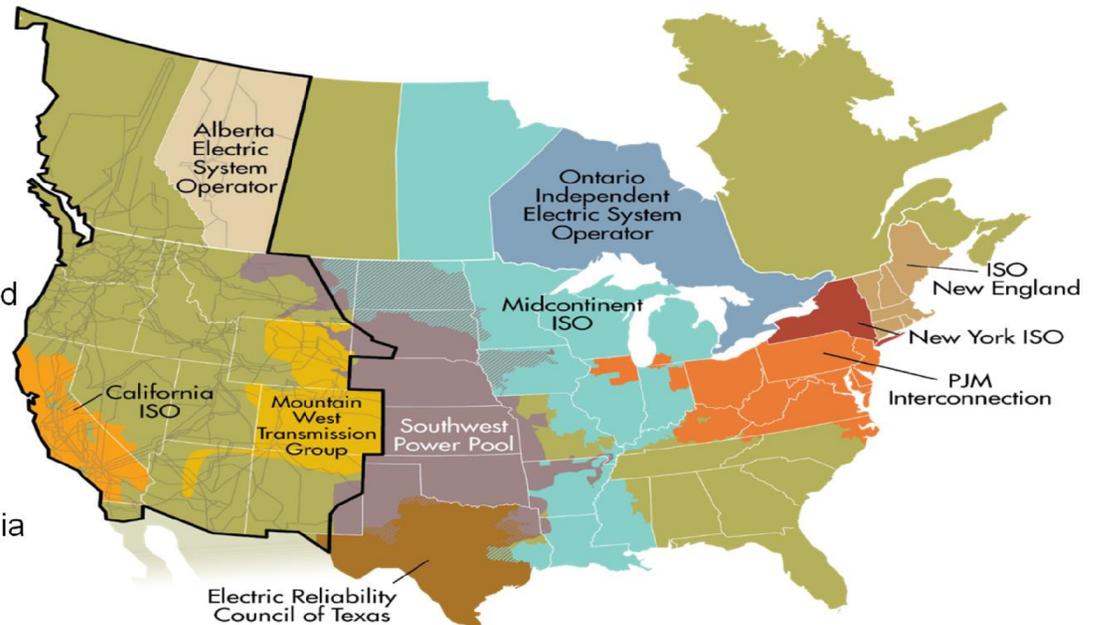
# High Level Process Map

- 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.



## 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)



## 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

## 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

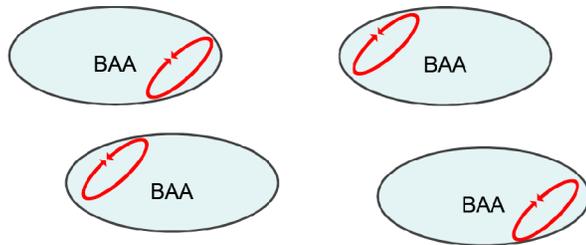
# What is the EIM?

- 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 Summary

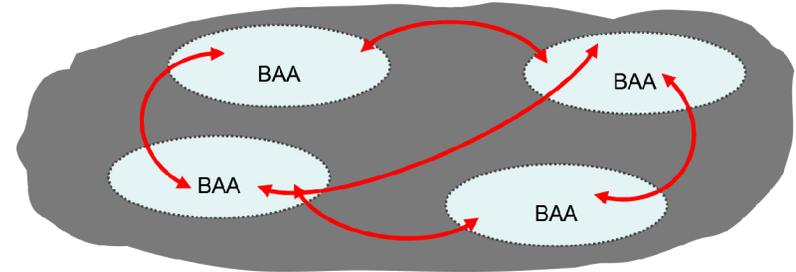
## Without EIM:

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:

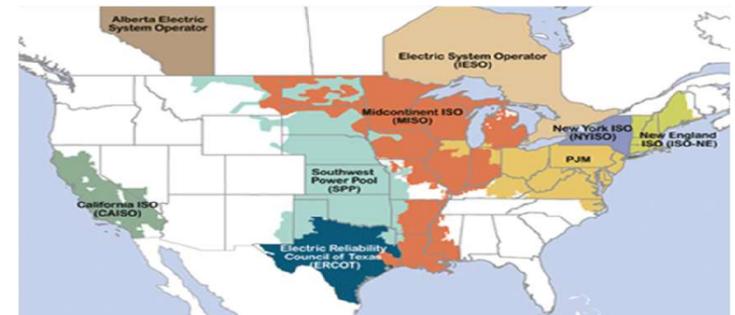
- An intra-hour **real-time** energy market to serve load and imbalance across participating Balancing Authorities (EIM Entities) and the CAISO (a.k.a. the EIM Area)
- A tool for centralized 5-minute dispatch of generators that have been **voluntarily** offered to the market (at a price)
- **Economically 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)



## Transmission Qualitative Benefits

### Benefits accessible through EIM membership:

- Congestion management functions that are more economically efficient than present curtailment and bilateral redispatch capabilities.
- Optimized day to day operation of the power system.

#### Improved Controls:

- Proactive congestion management
- Reactive congestion management
- Proactive voltage control

#### Improved State Awareness:

- Increase accuracy and frequency of operational information
- Create new visual displays of real-time or near real-time data, allowing operators to better predict operational issues.
- Access to CAISO EIM dispatchers tools

#### Modeling & Coordination:

- Improved network modeling
- Improved outage modelling & coordination
- Improved Power & Transmission coordination

## Transmission Qualitative Benefits

### Benefits accessible through EIM membership:

- A tool used to delay or avoid transmission expansion investment decisions to address congestion issues.

#### Categories of capital projects that the EIM could help defer or avoid:

- Network Congestion driven projects that could be remediated with security constrained economic dispatch, *for example*:
  - I-5 Corridor Reinforcement

#### Categories of capital projects that are driven by other needs that the EIM would **NOT** be expected to displace:

- Sustain Program projects for safe and reliable operation of existing facilities, *for example*:
  - wood pole replacement or transformers that have reached end of life
- Generation Interconnection, Line & Load Interconnection projects that are driven by requests from customers, *for example*:
  - data center loads
- Load Service Area Reinforcement projects required to mitigate reliability criteria violations, *for example*:
  - Hooper Springs project in SE Idaho

# Estimated Initial EIM Scenario Costs

EIM scenario costs were estimated based on Utilicast analysis and input:

- All costs estimates are assumption-driven and subject to change as more becomes known
- Although costs are grouped by business line, actual cost allocation may vary

Scenario Costs (\$millions)			
		Modernize	EIM
<b>Startup Costs</b>			
	Power	-	(5.0)
	Transmission	-	(14.2)
	Power & Transmission	-	(15.1)
	CAISO Administrative	-	(1.1)
	<b>Total Startup Costs</b>	-	<b>(35.3)</b>
<b>Annual Ongoing Costs</b>			
	Power Costs	-	(3.2)
	Transmission Costs	-	(2.2)
	CAISO Administrative	-	(0.7)
	<b>Total Annual Costs</b>	-	<b>(6.1)</b>

## Estimated Initial EIM Scenario Benefits – Power

Power Services’ benefits from EIM result from more optimal intra-hour dispatch of the FCRPS:

- Benefits are based on monetizing surplus FCRPS flexibility
- Estimated EIM benefits are netted against traditional load factoring, which is the primary way BPA monetizes surplus flexibility today
- BPA analysis is consistent with that of other regional hydro-centric utilities

Power Services' Scenario Benefits (\$millions)			
		Modernize	EIM
<b>Annual Benefits</b>			
	EIM Market	-	20.1
	Load Factoring	3.6	-
	<b>Total Annual Benefits</b>	<b>3.6</b>	<b>20.1</b>
<b>Annual Net Benefits</b>		<b>3.6</b>	<b>14.0</b>
<b>Annual EIM Net Benefits</b>		<b>10.4</b>	

## 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

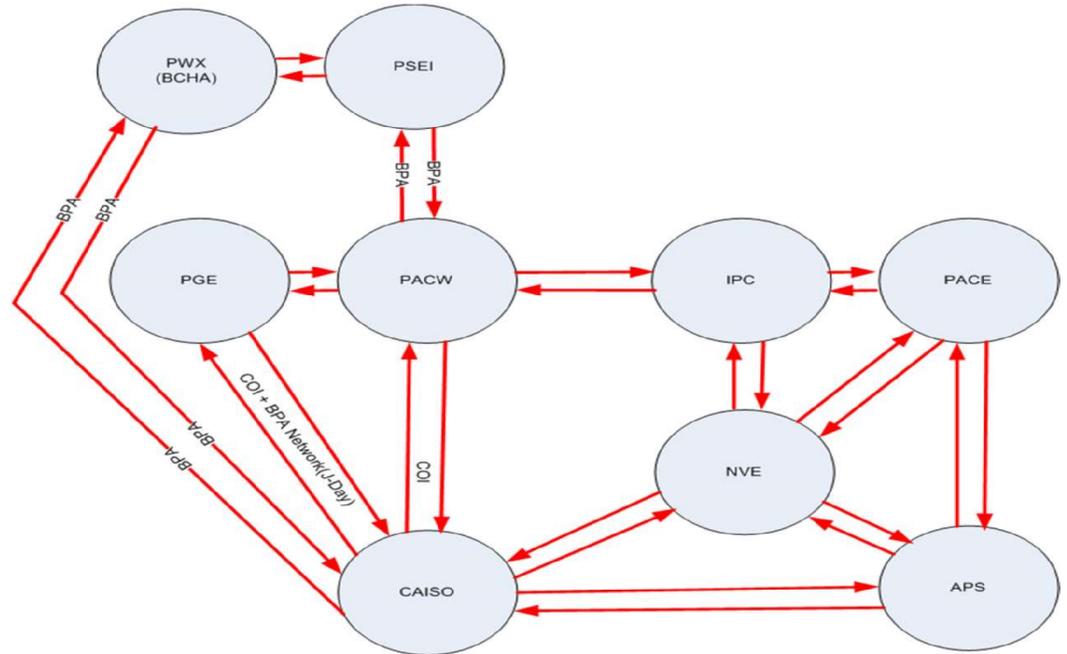
<https://www.caiso.com/Documents/TechnicalPaper-EnergyImbalanceMarket-EnergyTransferScheduling.pdf>

## 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

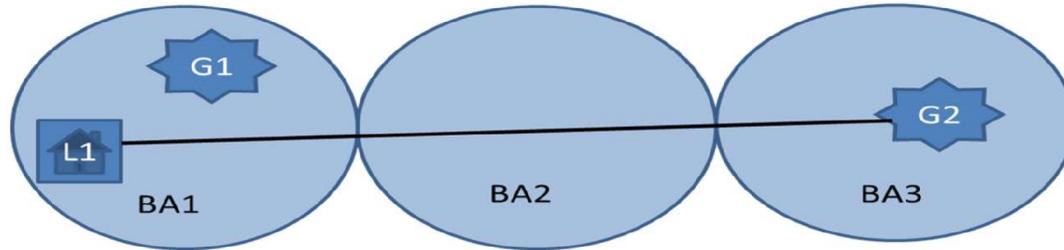


## Existing Transmission Methods

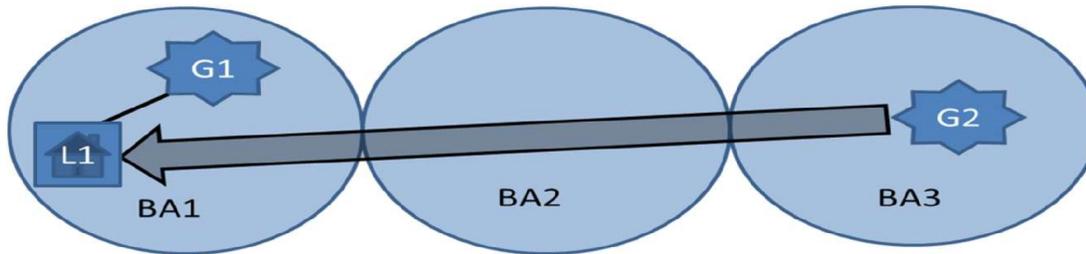
- There are two existing methods of making transmission available for EIM Transfers
  - Direct provision with a 0-NX NERC Designation
    - The EIM Entity receives no direct compensation for this transmission
    - Congestion revenue may be collected if applicable
  - Customer donation of Firm PTP Transmission 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	<ul style="list-style-type: none"> <li>• Most similar to current way of optimizing FCRPS</li> </ul>	<ul style="list-style-type: none"> <li>• The least efficient congestion relief</li> <li>• Lack of additional revenue associated with differential LMPs</li> </ul>
Three Aggregates	<ul style="list-style-type: none"> <li>• More efficient congestion relief</li> <li>• Additional revenue associated with differential LMPs</li> </ul>	<ul style="list-style-type: none"> <li>• May not fully realize congestion relief and revenue benefits</li> </ul>
Project Level	<ul style="list-style-type: none"> <li>• Most efficient congestion relief</li> <li>• Additional revenue associated with differential LMPs</li> </ul>	<ul style="list-style-type: none"> <li>• More complexity, which increases the risk that BPA may, through its bids, operate the FCRPS less efficiently.</li> </ul>

## Generation Participation

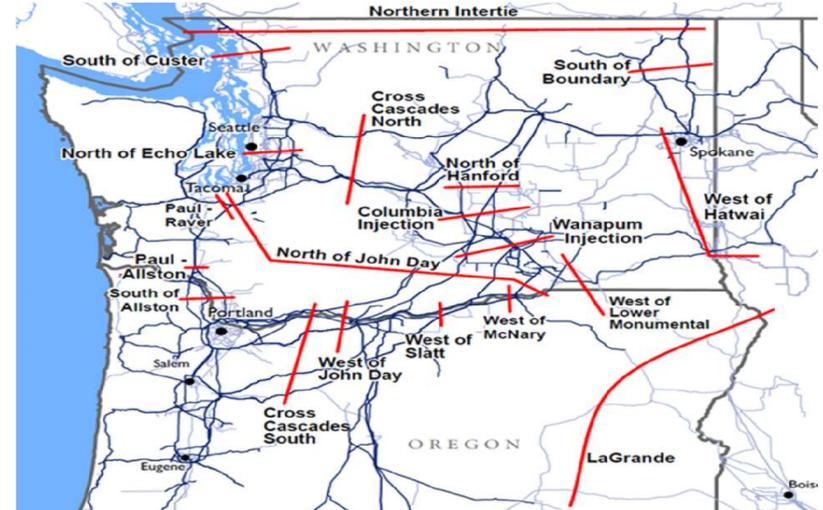
- **Based on BPA's analysis, using three (3) aggregates (i.e., Upper Columbia, Lower Columbia, and Lower Snake) is how the FCRPS will initially plan to participate in the EIM.**
- This model is subject to change based on further analysis and approval by the CAISO.
- We will consider shifting to project 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



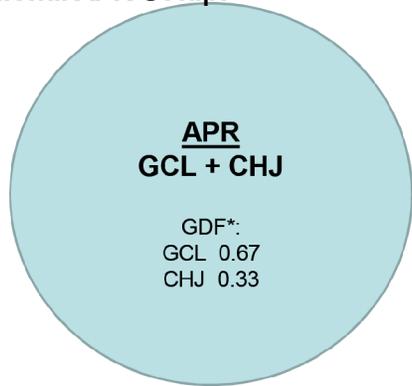
## Flexible Resources

- 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

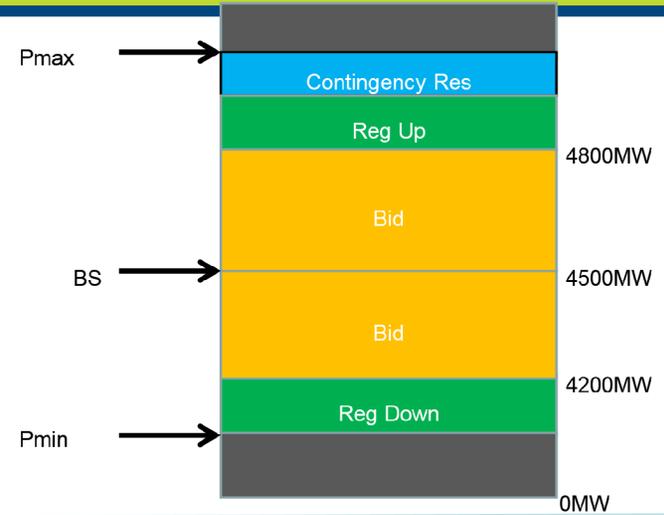
- Evaluated using an APR and ANPR participation model.
- Using this model each aggregation is defined twice:
  1. Aggregate Participating Resource (APR) to respond to the EIM bids/offers
  2. Aggregate Non-Participating Resource (ANPR) for base schedules, regulations, and contingency reserves.
- Separate 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:**

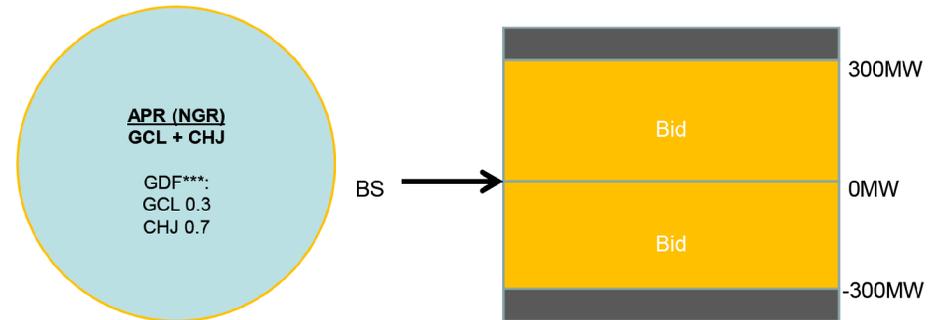
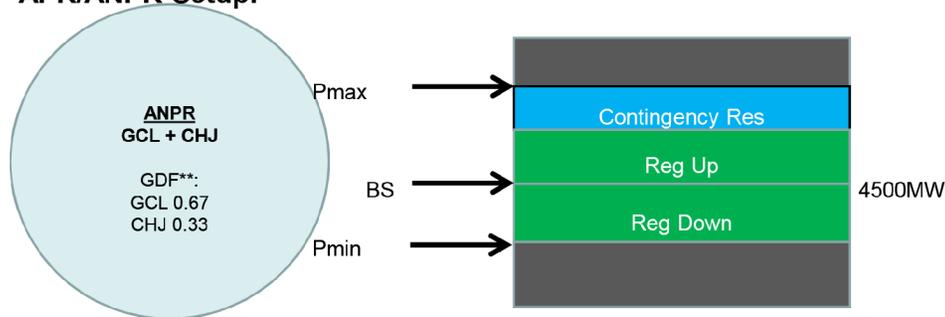


\*GDF is calculated based on Base Point. GDF controls the distribution of MW for both BS and bid range.

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



**APR/ANPR Setup:**



\*\*Controls the distribution of MW for BS (input to EIM network model)  
Power Up Academy, Nov 2018

\*\*\*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 (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 Summary

ELECTRICALLY SIMILAR @ 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 101 Training

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[Workshop Transcript](#)

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# Appendix Material



# On-line Resources

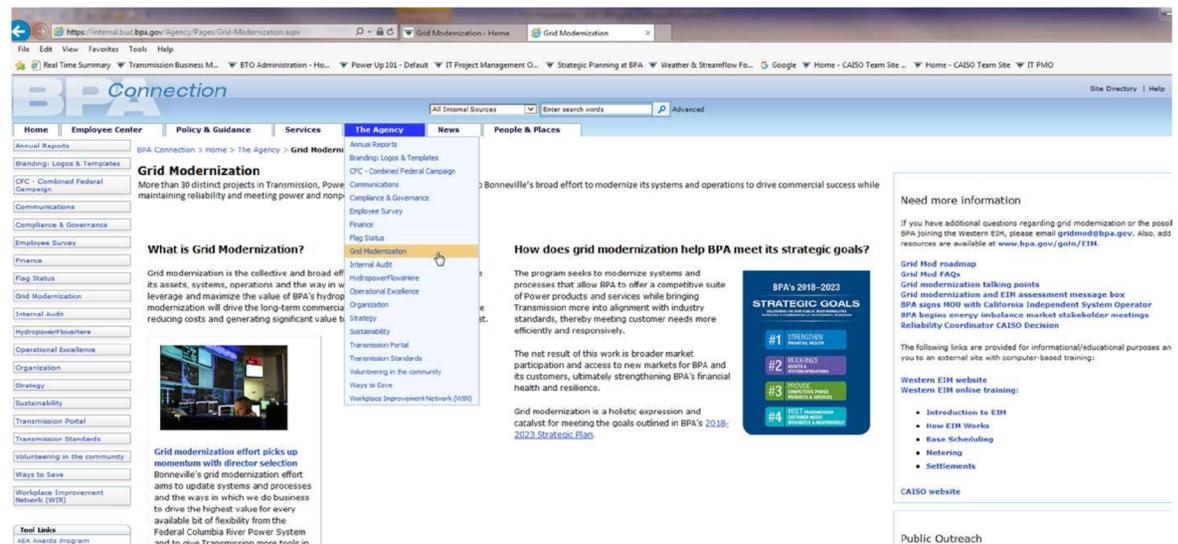
## External Resources:

The internal Grid Modernization website has these links.

- [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](#)

## Internal Resources:

- [www.bpa.gov/goto/EIM](http://www.bpa.gov/goto/EIM)
- <https://internal.bud.bpa.gov/Agency/Pages/Grid-Modernization.aspx>



## 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

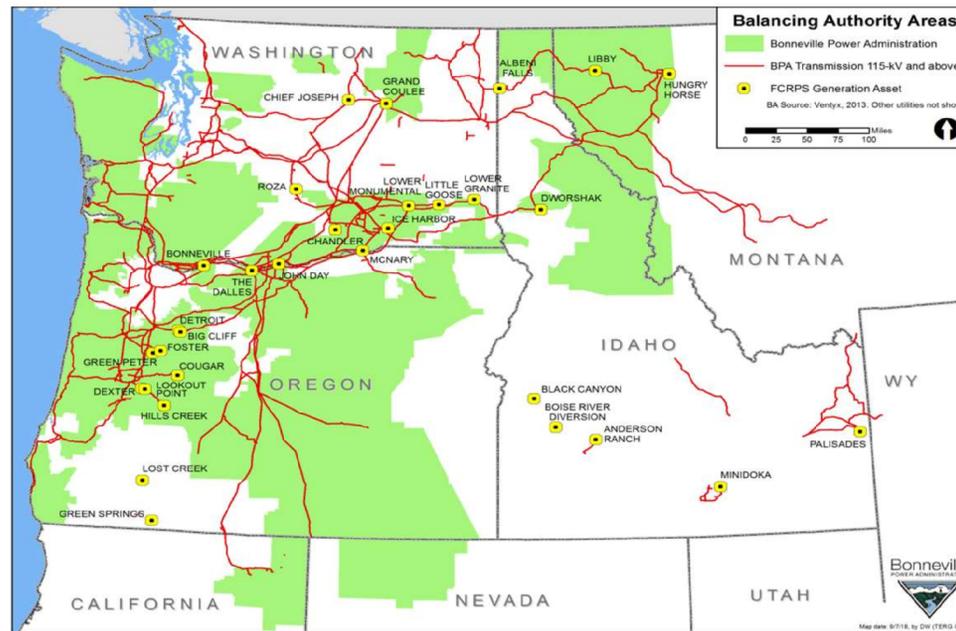
- Automatic Generation Control (AGC) is used to manage the BAA's Area Control Error (ACE) per the following basic equation (deemphasizing tie-line meter error, and ATEC):

$$\text{ACE} = (\text{NIA} - \text{NIS}) - 10\text{B} (\text{FA} - \text{FS}) - \text{IME} + \text{IATEC}$$

Where:

- **NIA** = 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
- **NIS** = 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.
- **IME** = Interchange Meter Error.
- **IATEC** = Automatic Time Error Correction

# BPA's Balancing Authority Area



BPA Has 253 points of interchange (tie-lines) with 18 adjacent BAAs  
 Power Up Academy, Nov 2018

BPA EIM 101 Workshop

50

9/13/201  
8

**From:** Winner, Scott W (BPA) - PGS-5  
**Sent:** Tue Dec 10 11:01:27 2019  
**To:** Van Calcar, Pamela M (BPA) - PGS-5; Kerns, Steven R (BPA) - B-3  
**Cc:** Burczak, Sarah E (BPA) - BD-3; Petross, Dennis W (BPA) - BD-3; Simpson, Mark C (BPA) - PGSD-5; Johnson, Kimberly O (BPA) - PGAF-6  
**Subject:** RE: EIM presentation outline  
**Importance:** Normal  
**Attachments:** EIM slides for JOC, 6 slides (v1).pptx

Pam,

Updated slides attached.

Kind regards,

**Scott Winner**

Bonneville Power Administration  
PO Box 3621 / PGS-5  
Portland, OR 97208  
Ph 503.230.3378  
swwinner@bpa.gov

**From:** Van Calcar, Pamela M (BPA) - PGS-5 <pmvancalcar@bpa.gov>  
**Sent:** Tuesday, December 10, 2019 7:54 AM  
**To:** Winner, Scott W (BPA) - PGS-5 <swwinner@bpa.gov>; Kerns, Steven R (BPA) - B-3 <srkerns@bpa.gov>  
**Cc:** Burczak, Sarah E (BPA) - BD-3 <seburczak@bpa.gov>; Petross, Dennis W (BPA) - BD-3 <dwpetross@bpa.gov>; Simpson, Mark C (BPA) - PGSD-5 <mcsimpson@bpa.gov>; Johnson, Kimberly O (BPA) - PGAF-6 <kojohnson@bpa.gov>  
**Subject:** RE: EIM presentation outline

Hi Scott and Sarah –

There is one piece missing that I feel is important enough to add a 6<sup>th</sup> slide. Something that summarized this information:

What will EIM likely change that will affect our Federal Partners:

1 – Outage processes –

Timeliness of outage reporting in the operations timeframe will have financial implications  
As the EIM focused Grid Mod projects get started “outage submission to the market” will likely uncover new processes and may make some current practices cumbersome.

Outages may be used for more than units being out of service.

Tied to Grid Mod projects: OMS, EIM Bid and Base Schedule, EIM Real Time Ops

2 – Long term goal – more visibility of forecasted operations available to plant operators, hydro gets visibility to forecasted units on line

Tied to Grid Mod projects: FDGDM/AGC Mod

3 – Others?

Steve – do you have what you want in this presentation for this afternoon?

Thanks,  
Pam

**From:** Winner,Scott W (BPA) - PGS-5 <swwinner@bpa.gov>  
**Sent:** Monday, December 9, 2019 11:56 AM  
**To:** Van Calcar, Pamela M (BPA) - PGS-5 <pmvancalcar@bpa.gov>  
**Cc:** Burczak,Sarah E (BPA) - BD-3 <seburczak@bpa.gov>; Petross,Dennis W (BPA) - BD-3 <dwpetross@bpa.gov>; Simpson,Mark C (BPA) - PGSD-5 <mcsimpson@bpa.gov>; Johnson,Kimberly O (BPA) - PGAF-6 <kojohnson@bpa.gov>  
**Subject:** FW: EIM presentation outline

Pam, I adjusted the Snake oval, per Kim's request. Update attached.

Kind regards,

**Scott Winner**  
Bonneville Power Administration  
PO Box 3621 / PGS-5  
Portland, OR 97208  
Ph 503.230.3378

swwinner@bpa.gov

**From:** Johnson,Kimberly O (BPA) - PGAF-6 <kojohnson@bpa.gov>  
**Sent:** Sunday, December 8, 2019 9:31 PM  
**To:** Winner,Scott W (BPA) - PGS-5 <swwinner@bpa.gov>  
**Subject:** RE: EIM presentation outline

HI Scott – One little nit pick, can you move or make the lower snake oval a little smaller so it doesn't include Chandler?

Thank you,

Kim

**From:** Winner,Scott W (BPA) - PGS-5 <swwinner@bpa.gov>  
**Sent:** Friday, December 6, 2019 1:26 PM  
**To:** Burczak,Sarah E (BPA) - BD-3 <seburczak@bpa.gov>; Simpson,Mark C (BPA) - PGSD-5 <mcsimpson@bpa.gov>; Johnson,Kimberly O (BPA) - PGAF-6 <kojohnson@bpa.gov>; Petross,Dennis W (BPA) - BD-3 <dwpetross@bpa.gov>  
**Subject:** RE: EIM presentation outline

Here is the current draft, approved by Pam. We are still trying to track down one more slide on EIM systems. But the 5 slides are good to go to share with Steve.

Kind regards,

**Scott Winner**

Bonneville Power Administration  
PO Box 3621 / PGS-5  
Portland, OR 97208  
Ph 503.230.3378  
swwinner@bpa.gov

**From:** Burczak,Sarah E (BPA) - BD-3 <seburczak@bpa.gov>  
**Sent:** Friday, December 6, 2019 8:01 AM  
**To:** Winner,Scott W (BPA) - PGS-5 <swwinner@bpa.gov>; Simpson,Mark C (BPA) - PGSD-5 <mcsimpson@bpa.gov>; Johnson,Kimberly O (BPA) - PGAF-6 <kojohnson@bpa.gov>; Petross,Dennis W (BPA) - BD-3 <dwpetross@bpa.gov>  
**Subject:** RE: EIM presentation outline

I am sorry because I have not had the time to spend on this or really digest this week like I thought. We can send this on to Pam and Steve and see their thoughts. I think Steve will want something even higher level than this though but I am also not the expert and don't know where we should cut.

Once concern I have is about putting orgs on the EIM outage chart. We haven't officially made those decisions yet.

**From:** Winner,Scott W (BPA) - PGS-5 <swwinner@bpa.gov>  
**Sent:** Wednesday, December 4, 2019 12:24 PM  
**To:** Simpson,Mark C (BPA) - PGSD-5 <mcsimpson@bpa.gov>; Johnson,Kimberly O (BPA) - PGAF-6 <kojohnson@bpa.gov>; Petross,Dennis W (BPA) - BD-3 <dwpetross@bpa.gov>; Burczak,Sarah E (BPA) - BD-3 <seburczak@bpa.gov>  
**Subject:** RE: EIM presentation outline

I like slide 12 and 13 as well. It very simply shows that the GO will still get generation instructions from the Dispatcher. I think driving home that message will ease a lot of Federal Partner anxiety.

The revenue slide can use a second draft, but I think it is very important. It explains the "why". The estimates that I have heard were \$30M for EIM and \$300M for EDAM. But this is really a **water** slide. Because we are estimating to increase the agency revenue by \$330M while meeting all existing non-power objectives AND moving the same amount of water.

As for outages, it is OK if we don't know the final end state. We can just say that, and update once we know.

For switching, I like that PGSD will still have a hand in within hour project movement, like today. So

today, the Big 10 are all aggregated and PGSD assigns response. If the EIM we will have three aggregations and PHGSD will still assign response. This is a super important message. The Snake projects for example are going to know the scope of their participation and risks of deployment. BON also has many non-power objectives that limit its ability to provide balancing. Providing assurances that PGSD will still be looking after them will go a long way.

Kind regards,

**Scott Winner**

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PO Box 3621 / PGST-5  
Portland, OR 97208  
Ph 503.230.3378

[swwinner@bpa.gov](mailto:swwinner@bpa.gov)

[www.bpa.gov/go/windsocks](http://www.bpa.gov/go/windsocks)

**From:** Simpson,Mark C (BPA) - PGSD-5

**Sent:** Tuesday, December 03, 2019 3:20 PM

**To:** Johnson,Kimberly O (BPA) - PGAF-6; Winner,Scott W (BPA) - PGS-5; Petross,Dennis W (BPA) - BD-3; Burczak,Sarah E (BPA) - BD-3

**Subject:** RE: EIM presentation outline

Kim, I won't be available next Thursday but Scott may be. Attached includes my additions to Scott's draft presentation. I have a few additional comments as well:

- I really like slides 12 and 13 so I would try to keep those slides in.
- The forecasted revenue slide could go
- The PGS "As" slides all look accurate to me
- The outage slides were a challenge since some of the "To Be" still needs to be decided. In particular it is looking like a review of upcoming outages may be needed inside the 48 hour timeframe. It needs to be decided who will complete the review and how the review process will occur. I expect some of these issues to be addressed by the Realtime OPS project as well as the OMS projects.
- On the outage slides I tried to show that the outages will be originated in OTS by Corps/Reclamation just how they are today. In EIM PGSD will also need the ability to enter and update outages in OMS similar to how TORD/M does that today in DART.
- On the switching slide I reference that for aggregated plants, PGSD will decide how to divide up awards from EIM across the aggregate. Also I mention base schedules. It might be useful to add an earlier slide showing the Powerex model for APRs and explain how aggregates and base schedules will work in EIM. (I have a slide showing that if needed)

**From:** Johnson,Kimberly O (BPA) - PGAF-6

**Sent:** Tuesday, December 03, 2019 1:10 PM

**To:** Winner,Scott W (BPA) - PGS-5; Petross,Dennis W (BPA) - BD-3; Burczak,Sarah E (BPA) - BD-3

**Cc:** Simpson,Mark C (BPA) - PGSD-5

**Subject:** RE: EIM presentation outline

Would this be available next Thursday for the Reclamation JOC?

Kim

**Kim Johnson, P.E.**

Federal Hydro Manager (PGAF-6)

**Bonneville Power Administration**

bpa.gov | P 503-230-3902 | C (b)(6) kojohanson@bpa.gov

*Please consider the environment before printing this email.*

**From:** Winner,Scott W (BPA) - PGS-5 <swwinner@bpa.gov>

**Sent:** Tuesday, December 3, 2019 12:41 PM

**To:** Petross,Dennis W (BPA) - BD-3 <dwpetross@bpa.gov>; Burczak,Sarah E (BPA) - BD-3 <seburczak@bpa.gov>

**Cc:** Simpson,Mark C (BPA) - PGSD-5 <mcsimpson@bpa.gov>; Johnson,Kimberly O (BPA) - PGAF-6 <kojohanson@bpa.gov>

**Subject:** RE: EIM presentation outline

Mark can you review my slides to make sure I captured the AS Is correctly. Also any steps missing? I am not an expert on Outages now and to be, so can you draft that out.

We need to address the question of switching and wear and tear.

Mark can you also pull a picture of the reserves deployed graph from the 8am spreadsheet? I would like talk to what we see currently. I don't think we need to pull slides from 2010 when things were crazy and we saw 10,000 MWh of monthly accumulated imbalance. Things are so much better now with Committed and Uncommitted Scheduling, so I don't think we will see that in the EIM.

My goal is to keep it under 30 slides. I am off the CAISO for a few days. I'll be back in the office in Thursday.

Kind regards,

**Scott Winner**

Bonneville Power Administration

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Portland, OR 97208

Ph 503.230.3378

swwinner@bpa.gov

[www.bpa.gov/go/windsocks](http://www.bpa.gov/go/windsocks)

**From:** Winner,Scott W (BPA) - PGS-5

**Sent:** Saturday, November 30, 2019 9:33 AM

**To:** Petross,Dennis W (BPA) - BD-3; Burczak,Sarah E (BPA) - BD-3

**Cc:** Simpson,Mark C (BPA) - PGSD-5; Johnson,Kimberly O (BPA) - PGAF-6

**Subject:** RE: EIM presentation outline

BPA-2020-00700-F0707

I don't think we need a meeting. If you can, please send me 5-10 slides on how GO/GOP participating and non-participating resource generation scheduling will change in the EIM. The title of my presentation is 'Water Management and Generation Scheduling in the EIM'.

I am really looking for tasks and process that will change for the GO/GOP not the BAA.

Mark and I are pretty sure outages are going to change for everyone.

One thing I don't know is how BPA will communicate with the Big Ten operators on capacity bid into the EIM and the probability of deployment. You see, we set base points based on water management and market to balance loads. Once balancing reserves are deployed, the projects are off their hydraulic objectives. Today, the INCs and DECcS tend to balance out. In a future EIM how will the water balancing happen? Will it be balanced through reserves deployment or basepoint adjustments?

Thanks!

Kind regards,

**Scott Winner**

Bonneville Power Administration

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Portland, OR 97208

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[www.bpa.gov/go/windsocks](http://www.bpa.gov/go/windsocks)

**From:** Petross,Dennis W (BPA) - BD-3

**Sent:** Wednesday, November 27, 2019 7:15 AM

**To:** Winner,Scott W (BPA) - PGS-5; Burczak,Sarah E (BPA) - BD-3

**Subject:** RE: EIM presentation outline

I looked on calendars to schedule a meeting. There doesn't appear to be a good time to meet before the 12.10 deadline.

How should we get these completed?

Scott do you plan to use the attached slide?

Thanks,

V/R,

Dennis Petross

Program Manager|BD-3

BONNEVILLE POWER ADMINISTRATION

**From:** Van Calcar, Pamela M (BPA) - PGS-5 <pmvancalcar@bpa.gov>

**Sent:** Friday, November 22, 2019 2:20 PM

**To:** Winner, Scott W (BPA) - PGS-5 <swwinner@bpa.gov>; Burczak, Sarah E (BPA) - BD-3 <seburczak@bpa.gov>; Petross, Dennis W (BPA) - BD-3 <dwpetross@bpa.gov>

**Cc:** Kerns, Steven R (BPA) - B-3 <srkerns@bpa.gov>

**Subject:** EIM presentation outline

Scott, Sarah and Dennis,

Here is an outline for a PowerPoint Steve and I will need by 12/10. The purpose is to explain what will be changing for water management and operations for the Federal Partners as BPA joins the EIM.

When Steve and I spoke this morning, we thought Scott should take the lead on slides for describing the world today, Sarah and Dennis the slides describing the EIM world. The last section needs some more brain storming. It is trying to lay out what will change for our partners and connect those items to the projects that will deliver the changes.

Steve may have some other items to add to this outline, especially for the EIM part.

Let me know if you have any questions or want to talk through this.

Thanks,  
Pam

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Pamela M. Van Calcar  
Manager Generation Scheduling  
Bonneville Power Administration  
905 NE 11<sup>th</sup> Ave, PGSP-5  
Portland, OR 97232  
503-230-3834

# Water Management and Generation Scheduling in the Western EIM

Pam Van Calcar BPA

Power Generation Scheduling

December 10, 2019



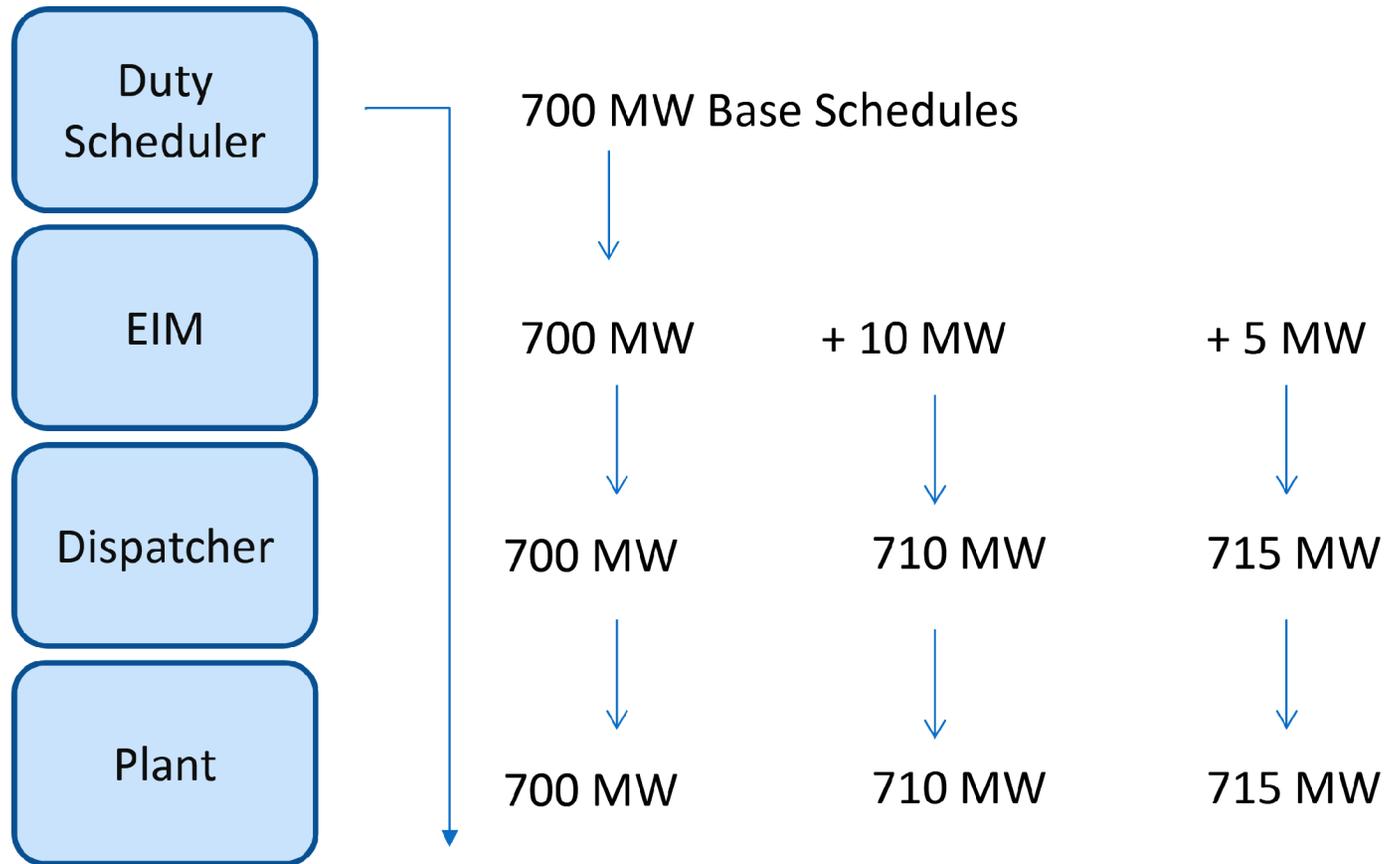
# Base Schedules (basepoints)

- Today (basepoints)
  - Big 10 sets basepoints to
    - ensure all non power objectives are met and
    - meet hydraulic objectives
  - BPA uses the day ahead and real-time market to balance Load
    - Selling surplus and purchase shortfalls relative to hydraulic objectives
- In the EIM (base schedules)
  - Same as today, sent earlier in the hour

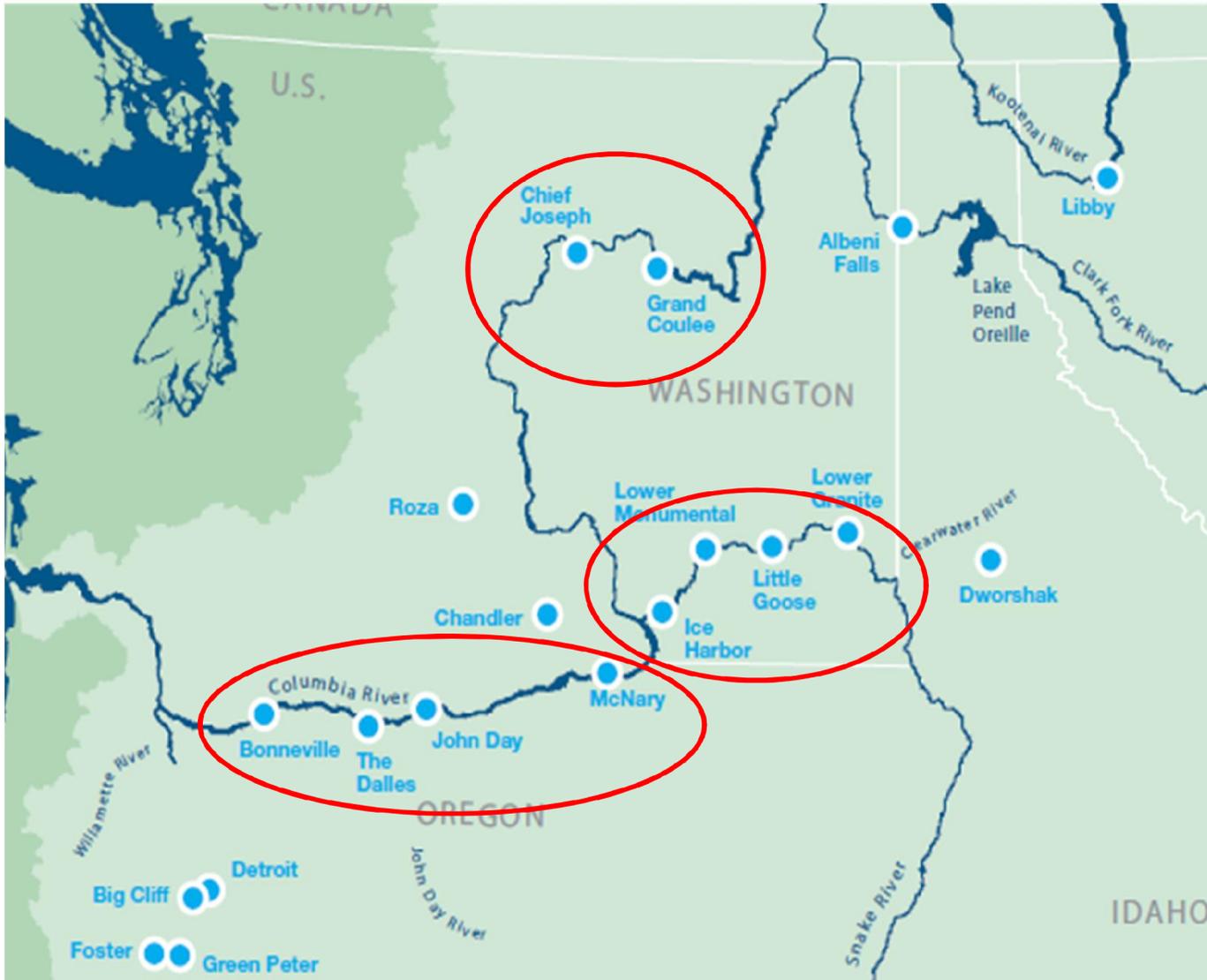
# System Balancing

- Today
  - BPA holds 681 INC and -861 DEC capacity
    - The system moves on an AGC cycle every 4 sec
  - Assume the INC and DEC balance to be water neutral
- In the EIM
  - BPA will hold INC and DEC capacity to meet Resource Sufficiency requirements at a minimum
  - Capacities will have price curves
  - BPA may be awarded to deploy or other generator may be awarded to deploy for the netted EIM imbalance

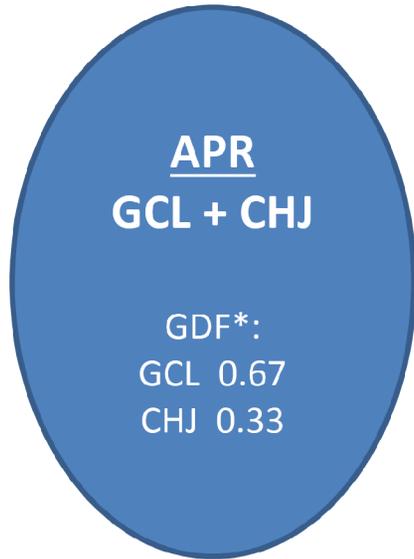
# Communication tree



# Aggregation Nodes

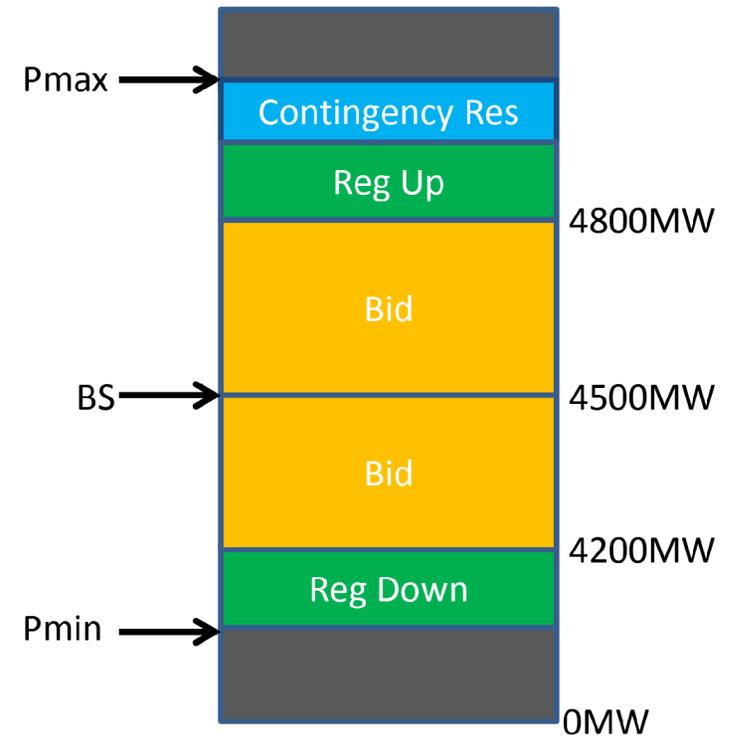


## Traditional Setup:

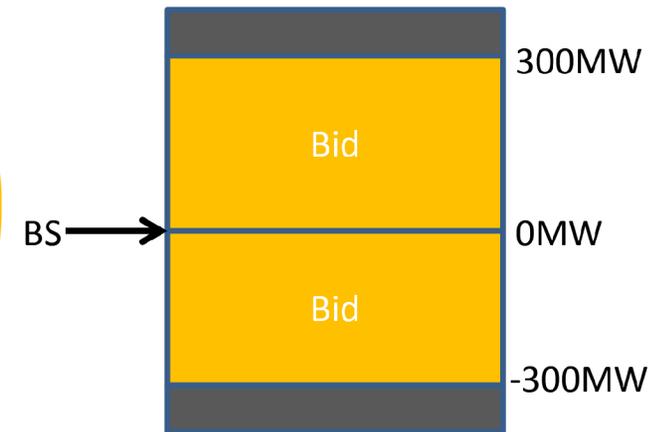
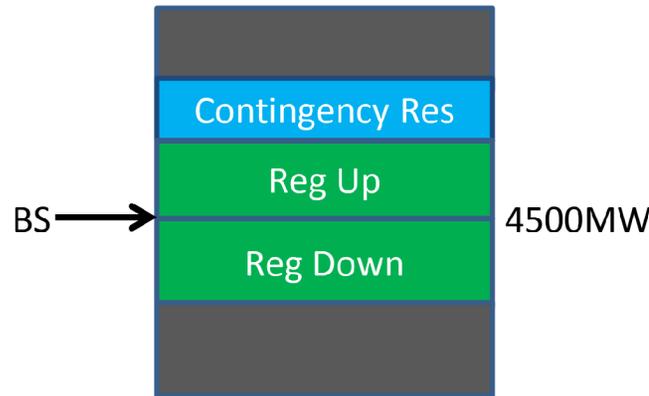
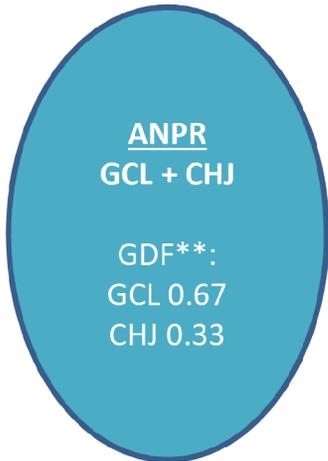


\*GDF is calculated based on BP set by hydro scheduler. GDF here controls the distribution of MW for both BS and bid range.

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



## Powerex's Setup:



\*\*Controls the distribution of MW for BS (input to CAISO's EIM network model)

\*\*\*Controls the distribution of MW for bid range

# Outages and visibility

- The timings for planned outages may change as we work through some issues with the Wester EIM
- Actual and scheduled *ins* and *outs* of service need to be tightly aligned. Schedules updated as soon as changes are known.
- Western EIM Outage Cards
  - Physical Unit outages
  - Limiting plant capacity to align with hydrology (BPA)
    - OMS/EIM Bid and Base Schedules/EIM Real-time ops
- Visibility
  - Projects will have visibility to forecasted Base Schedules
  - BPA will have visibility to forecasted unit commitment
    - FDGDM/AGC Mod

**Background:** BPA’s existing Regional Dialogue power sales contracts establish the lens through which many customers are evaluating BPA’s potential participation in the Western EIM. Compared to BPA’s other power preference customers who receive a BPA secondary sales credit and have little or no imbalance costs, Slice customers have more questions about whether and how BPA’s potential participation in a Western EIM would yield benefits for them. Specifically, they see the potential for a whole new set of imbalance costs without also seeing a clear path to getting a share of the power revenue through rates or a transmission benefits.

**About this document:** The purpose of this document is to create a common set of messages for engaging with Slice customers regarding the Western EIM. This is a living document. More information will be added as it becomes publically available. Information is sourced from BPA external material for consistent messaging.

### **Questions and Answers:**

#### **1. Where is BPA in its decision process?**

BPA is in the early stages of its decision-making process to join the Western EIM. Since signing an MOU/NDA with the CAISO in August (see talking points), BPA has been engaging the CAISO on technical matters and working through issues that would impact how we could participate in the market.

Over the coming months, BPA will be revising its cost benefit analysis and determining how and under what conditions BPA could join the EIM. Specifically, BPA is evaluating the following categories of issues: the treatment of transmission, generation participation model, governance, relationship of the EIM to other emerging markets, BPA’s resource sufficiency, market power, EIM settlements and the carbon obligation in the EIM. As BPA develops adequate information on issues and alternatives in each of these areas, BPA will discuss them in depth through EIM stakeholder meetings that began in July of 2018. For more information on these stakeholder meetings please go to Energy Imbalance Market “Initiatives” page on BPA.<sup>1</sup> By July 2019, BPA expects to have either resolved the issues under each of these 8 categories or be comfortable with the path to resolution.

If BPA determines that the business case for Power is positive (and there are qualitative benefits to transmission), that we could operate in a way that meets our statutory and regulatory obligations and RD Contract Obligations, BPA would initiate a 30 day public comment process in July with a letter to the region. This comment period will allow stakeholders to comment on the proposal for BPA signing the EIM Implementation Agreement with a Record of Decision in September.

Signing the EIM Implementation Agreement would be the first in many steps to becoming an EIM Entity. The EIM stakeholder process will continue until Go Live,

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<sup>1</sup>

(b)(2)

which is currently anticipated to be in April of 2022, and stakeholder engagement will continue beyond that to include customer EIM training.

## **2. What is an EIM Implementation Agreement?**

An EIM Implementation Agreement outlines the terms and conditions of moving forward with scoping and joining the EIM. It contains a multi-year 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. The agreement also triggers BPA and the CAISO commitments to begin spending money on systems and processes, as well as making certain organizational changes, specific to joining the EIM.

Executing an Implementation Agreement represents a conditional decision to join the EIM. BPA will be continuing to engage with stakeholders and work through a number of issues with the Western EIM. If that work reveals that joining the EIM is not in BPA's or the region's best interest, BPA can withdraw its decision to join the EIM with minimal stranded cost exposure. However, we will continue to focus on grid modernization projects to achieve the objectives of the strategic plan.

For more information on the Western EIM and CAISO's process, including examples of other EIM Implementation Agreements signed by other EIM entities, can be found on the CAISO website at: [www.westerneim.com](http://www.westerneim.com)

## **3. What does BPA need to resolve prior to signing an EIM Implementation Agreement?**

BPA's decision to sign an EIM Implementation agreement will be based on two primary factors: the business case and our ability to continue meeting our statutory and regulatory obligations. BPA is also evaluating issues within eight topical categories: the treatment of transmission, generation participation model, governance, relationship of the EIM to other emerging markets, BPA resource sufficiency, market power, the administration of EIM settlements and the carbon obligation in the EIM. These issues need to be resolved or have a path to resolution prior to signing an EIM Implementation Agreement. Each of these eight categories will be addressed in depth at the monthly public EIM Stakeholder meetings, first of which took place on July 24<sup>th</sup> 2018. For more information on these stakeholder meetings please go to the Energy Imbalance Market "Initiatives" page on [BPA.gov](http://BPA.gov).<sup>2</sup>

## **4. How will BPA make the decision to sign the EIM Implementation Agreement?**

*The answer is same as for Question 3:*

BPA will make the decision to sign an EIM Implementation agreement based on two primary factors: the business case and our ability to continue meeting our statutory and regulatory

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<sup>2</sup>

(b)(2)

obligations. BPA is also evaluating issues within eight topical categories: the treatment of transmission, generation participation model, governance, relationship of the EIM to other emerging markets, BPA resource sufficiency, market power, the administration of EIM settlements and the carbon obligation in the EIM. These issues need to be resolved or have a path to resolution prior to signing an EIM Implementation Agreement. Each of these eight categories will be addressed in depth at the monthly public EIM Stakeholder meetings, first of which took place on July 24<sup>th</sup> 2018. For more information on these stakeholder meetings please go to the Energy Imbalance Market “Initiatives” page on BPA.gov.

**5. How can customers provide input on the key questions?**

Customers and stakeholders will have multiple opportunities to engage with BPA in the EIM effort and to understand BPA’s determination on how and under what conditions we could join the EIM. Specifically, customers are encouraged to participate in the monthly EIM Stakeholder meetings happening monthly through July 2019 and beyond. The next EIM stakeholder meeting is on November 14<sup>th</sup>, 2018.

**6. Are there issues that will be handled outside of the EIM stakeholder process?**

The Stakeholder process leading up to the potential signing of the EIM Implementation Agreement is focused on questions related to how and under what conditions BPA could join the Western EIM. We recognize that, should BPA decide to join the EIM, there will be a myriad of very important implementation details to work out. BPA is working to identify where and when these issues should be addressed. For example, questions of who should pay for which imbalance charges would likely be resolved in the FY 2022 rate case.

**7. How will BPA deliver the value of joining an EIM to customers?**

As a federal power marketing agency that provides service at cost, the net benefits of joining the Western EIM will flow to our customers consistent with BPA rate designs and its contracts. While future rate cases will likely be the forum for decisions about how these costs and benefits are treated for customers, the 2009 Tiered Rates Methodology, together with [Regional Dialogue Policy](#) (page 26) establishes product and rate design principles that will continue to apply throughout the EIM stakeholder process. Among other things, these principles provide guidance for avoiding unintended cost shifts between power products and for the equitable sharing of benefits. For example, “Slice purchasers bear an allocation of the FCRPS costs and risks and receive a commensurate amount of applicable FCRPS resource energy, hourly scheduling flexibility and specific BPA power revenues,” including a proportional share of net gen inputs revenues.

**8. How is BPA addressing the imbalance implications of load and resource uncertainty within our BA, including Slice?**

Through bi-lateral discussions with the CAISO, BPA is exploring opportunities to reduce imbalance cost that is attributed to our BA due to EIM participation. Further discussions will be needed to determine what BPA can do on its own to manage that imbalance and how its impacts will be attributed to customers, including Slice customers.



## Slice Customer Questions & Draft Response [basis for Oct. 31 discussion]

1. Explain any initial analysis to assess/identify the compatibility of the terms of the Slice Contract (an hourly product) with the sub-hourly transactions under an EIM construct. Examples of specific topics of interest include: settlements, metering exhibits, resource sufficiency and base scheduling.

BPA has formed a cross-agency Stakeholder team to evaluate impacts on stakeholders, including Slice customers. This team has evaluated certain issue areas, such as the timing of Slice tagging deadlines against EIM Base Schedule submissions. Slice is an hourly prescheduled product, and participation in the EIM posits within hour bids after hourly load obligations are set as base points. BPA has not identified any areas of incompatibility between the Slice contract and BPA's potential participation in the Western EIM. In an EIM, BPA would continue using the federal system's flexibility to meet contractual load obligations (including Slice) and then to generate secondary revenue opportunities. Operating flexibility for an hour available to Slice customers under their contracts should not be impacted by BPA joining the EIM. Further discussions will be needed to determine how the exercise of the Slice hourly flexibility interacts with the EIM and other BPA customers.

- **Settlements:** BPA is currently working to understand how settlements could work between BPA as a potential EIM entity and the Western EIM. Specific decisions about how BPA would allocate settlements costs and credits to our customers would be a future rate case issue and based on existing RD Contracts and assuring avoidance of unintended cost shifts between power products and equitable sharing of benefits..
- **Metering exhibits:** While BPA expects to improve metering at FCRPS resources, Slice metering exhibits are expected to be adequate to meet Slice contract obligations. Customer decisions about whether to offer participating resources would be distinct from their Slice contract and thus any metering differences would be reflected in that contract.
- **Resource sufficiency and base schedules:** Under an EIM, BPA's resource sufficiency would continue to be BPA's responsibility for its BA. Just as BPA does today, BPA will need to forecast slice loads for the purpose of establishing base schedules. While the accuracy of these forecasts will have more significant implications in an EIM, and it is possible that slice customers could help us increase the accuracy, BPA expects that we could address resource sufficiency and base scheduling requirements without contract changes. Customers with their own BA's will be responsible for their own resource sufficiency.

2. Explain general thinking on the range of potential impacts (e.g., operational, financial) between customers within the BPA balancing authority, those outside of the BPA balancing authority, and those with their own balancing authority.

We have noted a few possible areas of concern above but are still identifying issues. BPA expects that these impacts should not be significantly different from those among existing EIM Entity and non-EIM Entity BAAs. BPA expects to dive deeper into these issues in table top exercises this coming Spring.

**3. Detail how impacts could vary for customers with their own non-federal resources versus those with limited or no non-federal resources.**

Customers that own physical resources may have the opportunity to offer their dispatchable resources into the EIM market consistent with their contract obligations to BPA and with their resource adequacy obligations, as any other resource owners in any EIM Entity BAA, while those with limited or no resources would be less likely or unable to do so. In addition, under the Slice contract, customers have responsibility for meeting their own loads. Customers with non-federal resources have the ability to dispatch their own resources in response to changes in loads whereas those without resources likely rely more heavily on the market or on varying their right to power from BPA.

**4. To the extent possible, please explain how or if the Grid Modernization work planned for the BA, and/or development of EIM supporting tools will modify the type or timing of data inputs to the existing Slice Computer Application, as well as any changes to the Slice Computer Application itself.**

The Grid Mod projects as currently scoped do not include plans to change the type or timing of inputs to the existing Slice Computer Application (SCA) or the SCA itself. However, several projects are expected to improve the quality or reliability of SCA data. Specifically:

- The Outage Tracking System is expected to improve the quality of outage data available in the SCA through improved coordination and business processes.
- The Columbia Basin Data Modernization project is expected to improve the availability and reliability of hourly project data. It could also enable BPA to source information from a data system rather than relying on manual entry from the Columbia Basin Teletype.

**5. Explain how the evaluation of direct, product-specific effects (power contracts and transmission services) and indirect effects is being coordinated within the Agency for Power and Transmission.**

BPA has formed several cross-agency teams to evaluate impacts of joining the EIM. BPA's main focus is to examine the conditions under which our BA could participate in the Western EIM and to understand the costs and benefits from a BPA perspective, as that information will be the basis for our decision on whether or not to sign an EIM implementation agreement. If BPA decides to sign an EIM implementation agreement, we would then begin putting the systems, processes, and policies in place to move toward implementation. Analysis around product specific impacts would begin at that time and would likely culminate in future rate case proposals for decisions.

6. Our understanding is that BPA would join the EIM as a Balancing Authority therefore establishing a transmission-centric engagement. Please explain what role Power Services has in informing the decision to join the EIM, how resources might be aggregated to bid into the market, and what changes in Power Services scheduling, etc., might be necessary to conform to EIM requirements.

BPA is evaluating EIM participation as one entity, with involvement from both Power and Transmission employees, as both entities are invested and will be impacted by EIM participation. For example, Power employees were highly involved in the Cost/Benefit analysis and assisted in developing the EIM 101 document shared at the September 13 Stakeholder meeting. As described in the Oct. 11, 2018 EIM Stakeholder engagement meeting, if BPA joins the EIM we expect that we would have the big 10 projects participate in three aggregates, namely, Coulee/Chief, the Lower Columbia, and the Lower Snake projects. The remaining BOS resources would be non-participating. The evaluation that led to this decision was headed by Power employees. Because the Slice product is prescheduled hourly and BPA's Slice load obligations would be set before the hour, BPA does not anticipate the need to change scheduling requirements under the Slice contract.

7. Explain how BPA is assessing the implications of Default Energy Bids for hydro resources and governance.

This is one of 8 topic areas to be discussed at the monthly EIM stakeholder meetings leading up to a letter to the region in July 2019 and a record of decision on signing the EIM Implementation Agreement in September.

8. Identify when BPA expects to tackle the topic of the potential for negative pricing (i.e., during this business case analysis or post EIM decision).

This is one of 8 topic areas to be discussed at the monthly EIM stakeholder meetings leading up to a letter to the region in July 2019 and a record of decision on signing the EIM Implementation Agreement in September.

9. Explain changes, if any, to BPA's documented fuel mix and associated emissions reporting.

Carbon issues are one of 8 topic areas to be discussed at the monthly EIM stakeholder meetings leading up to a letter to the region in July 2019 and a record of decision on signing the EIM Implementation Agreement in September.

10. Please provide some sample scenarios of the typical types of EIM charge codes (costs and revenues, including exit charges) and how they would likely be allocated across customer

groups/cost buckets or contract types. For example, what types of costs and revenues might would flow through to the Composite cost pool, to reserves, etc.

- At the Sept. 13<sup>th</sup> EIM 101 meeting, BPA shared that 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

For more information on settlement codes, see the Charge Code Matrix at:  
<http://www.caiso.com/Documents/ISOMarketChargeCodesMatrix.xls>

- BPA is beginning to evaluate scenarios for how these costs and revenues could flow through reserves and rates. That work is dependent on further discussions and could be expected to begin prior to the BPA proposal in the FY 2022 rate case, if BPA signs the EIM implementation agreement.

**11. Explain which GridMod costs are driven by the EIM decision and also explain how GridMod costs would be allocated or borne by Slice customers.**

Per the Grid Mod roadmap shared on July 24<sup>th</sup>, BPA's active Grid Mod projects are necessary regardless of BPA's EIM decision. If BPA decides to sign the EIM Implementation Agreement, BPA would kick off 6 EIM Implementation projects in FY2020. BPA is currently forecasting that EIM start-up costs would cost about \$35.3 million with \$14.2M of that dedicated to Transmission centric projects and another component going to joint projects. For BP20, Power's Grid Mod costs are part of the composite cost pool and thus included in all Tier 1 rates.

**12. Explain the factors driving the current timing of potentially joining the EIM.**

In January, Bonneville released its 2018-2023 Strategic Plan that identified modernizing federal power and transmission system operations as a strategic objective, Objective 2b. The strategic plan describes the actions Bonneville will take over the next several years to become more competitive and responsive to customer needs, to leverage and enable industry change through modernized assets and system operations, and to deliver on our public responsibilities through a commercially successful business.

As California and other western states increase the amount of variable energy resources on the grid, we will seek opportunities to market the valuable flexibility and capacity services that clean hydropower resources can provide. BPA has been performing its due diligence in part by engaging other Northwest utilities who also are evaluating wholesale market changes, modernizing their systems to be in the best position to take advantage of market opportunities, and that have or are planning on joining the Western EIM. Many of our experiences in the market are similar, particularly in our shared need to find ways to fully realize the value of flexible, carbon-free hydropower.

**13. Explain the scope of the Milestones identified the July 24th meeting. In particular, what will be defined in the Daft EIM ROD Public Process and what activities will be included in the EIM Implementation Project.**

BPA’s decision to sign an EIM Implementation agreement will be based on two primary factors: the business case and our ability to continue meeting our statutory and regulatory obligations. BPA is also evaluating issues within eight topical categories: the treatment of transmission, generation participation model, governance, relationship of the EIM to other emerging markets, BPA resource sufficiency, market power, the administration of EIM settlements and the carbon obligation in the EIM. These issues need to be resolved or have a path to resolution prior to signing an EIM Implementation Agreement. Each of these eight categories will be addressed in depth at the monthly public EIM Stakeholder meetings, first of which took place on July 24<sup>th</sup> 2018. For more information on these stakeholder meetings please go to the Energy Imbalance Market “Initiatives” page on BPA.gov.<sup>3</sup>

An EIM Implementation Agreement outlines the terms and conditions of moving forward with scoping and joining the EIM. It contains a multi-year 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. The agreement also triggers BPA and the CAISO commitments to begin spending money on systems and processes, as well as making certain organizational changes, specific to joining the EIM.

Executing an Implementation Agreement represents a conditional decision to join the EIM. BPA will be continuing to engage with stakeholders and work through a number of issues with the Western EIM. If that work reveals that joining the EIM is not in BPA’s or the region’s best interest, BPA can withdraw its decision to join the EIM with minimal stranded cost exposure. However, we will continue to focus on grid modernization projects to achieve the objectives of the strategic plan.

For more information on the Western EIM and CAISO’s process, including examples of other EIM Implementation Agreements signed by other EIM entities, can be found on the CAISO website at: [www.westerneim.com](http://www.westerneim.com)

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14. Explain how the mis-match of timing will affect the hourly Slice product in general and more specifically, the dispatch of EIM Participating and Non-Participating Resources.

BPA does not expect the mismatch between EIM Base Schedule timing and the Slice tagging deadline to be an issue in terms of impacting the Slice product. However, changes to Slice tags that occur after the Base Schedule deadline may have imbalance implications. We are exploring this issue and evaluating methods to mitigate this impact which would require additional discussions with the CAISO, as noted above. We hope to work through this with Slice customers if we decide sign the Implementation Agreement.

As context, BPA currently plans the dispatch of federal resources at multiple points prior to the generating hour (t) and modifies those schedules based on changes in Slice loads through the tagging deadline of T-30, and as late as about T-15, when basepoint submittals to BpaT are due.

Within an EIM, dispatch plans solidify in base schedules as late as T-55 (participating) or T-40 (non-participating). Load changes that occur after those deadlines, and up to the T-30 Slice tagging deadline, will result in deviations from resource Base Schedules or cross-BA interchange, all of which have settlement implications.

# Grid Modernization Overview

## Federal Columbia River Power System

Quarterly Executive Meeting (FY19 Q2) NWD - BPA



April 19, 2019

Steve Kerns

Director of Grid Modernization  
Business Transformation Office



# Agenda

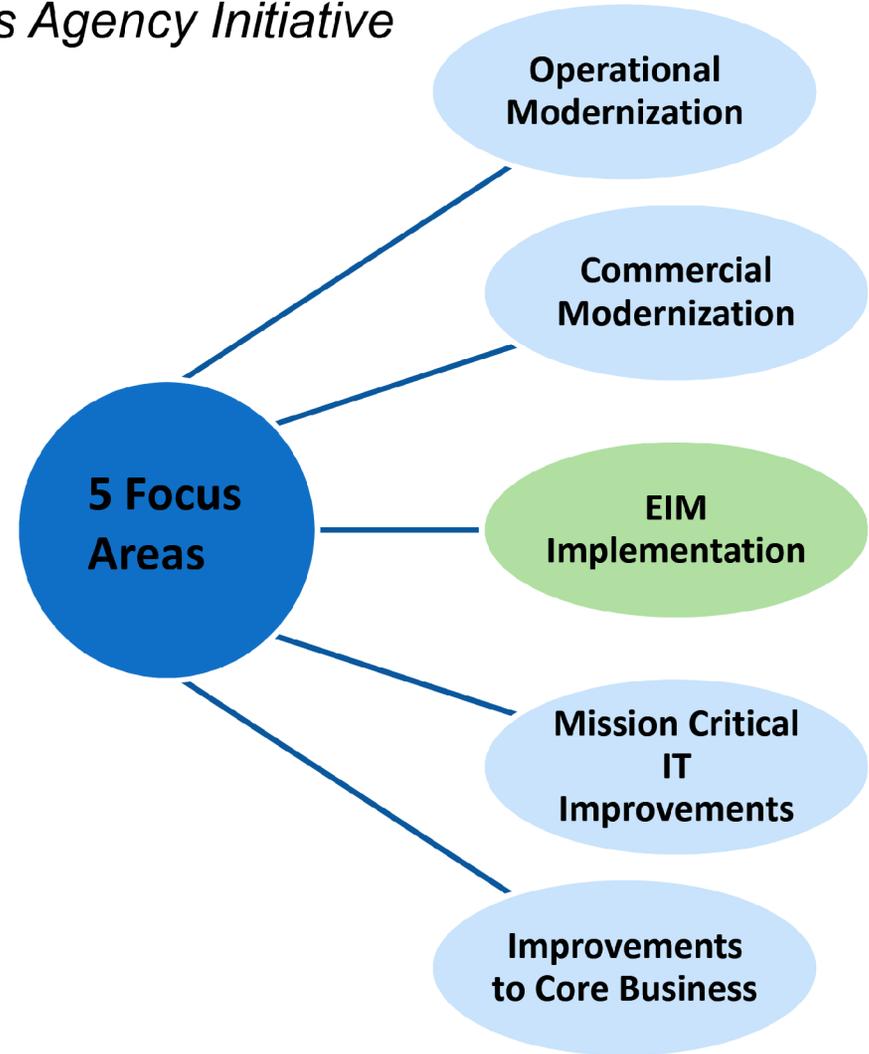
- Grid Modernization Initiative
  - 4 projects requiring close collaboration between BPA, Corps and Bureau
- Energy Imbalance Market
  - Overview
  - Process and Schedule
  - Federal Resource Participation
  - Expected impacts to Federal Resource systems and processes



# Grid Modernization Initiative

Strategic Plan Goal 2, Objective 2b: *A Cross Agency Initiative*

BONNEVILLE POWER ADMINISTRATION



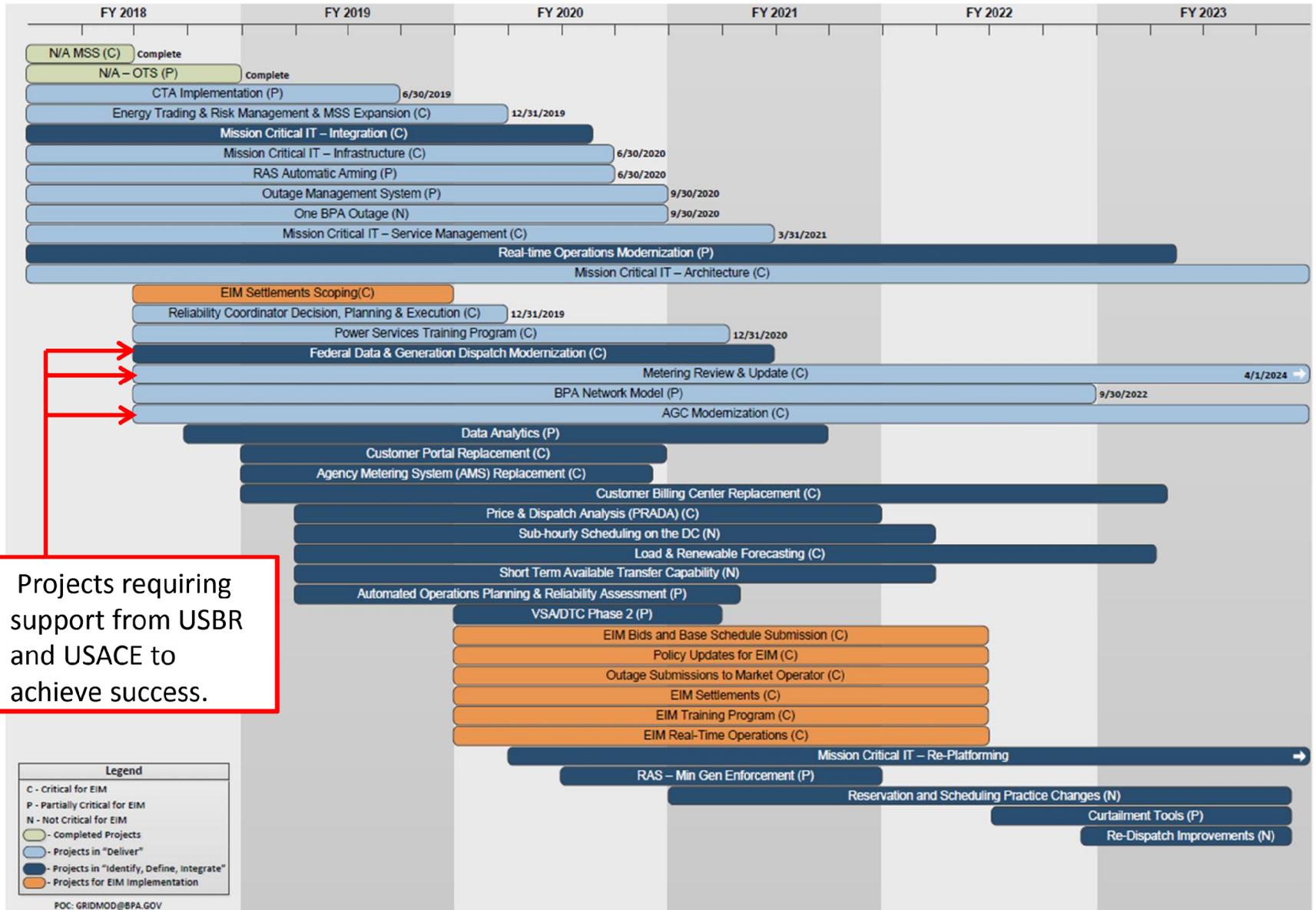
- If BPA chooses not to participate in the EIM, then the EIM Implementation projects will not be pursued.



# Grid Modernization Roadmap: Strategic and prioritized investments

## Grid Modernization Roadmap

FY19 Q2 Update  
Updated as of 3/31/2019 – Subject To Change



Projects requiring support from USBR and USACE to achieve success.

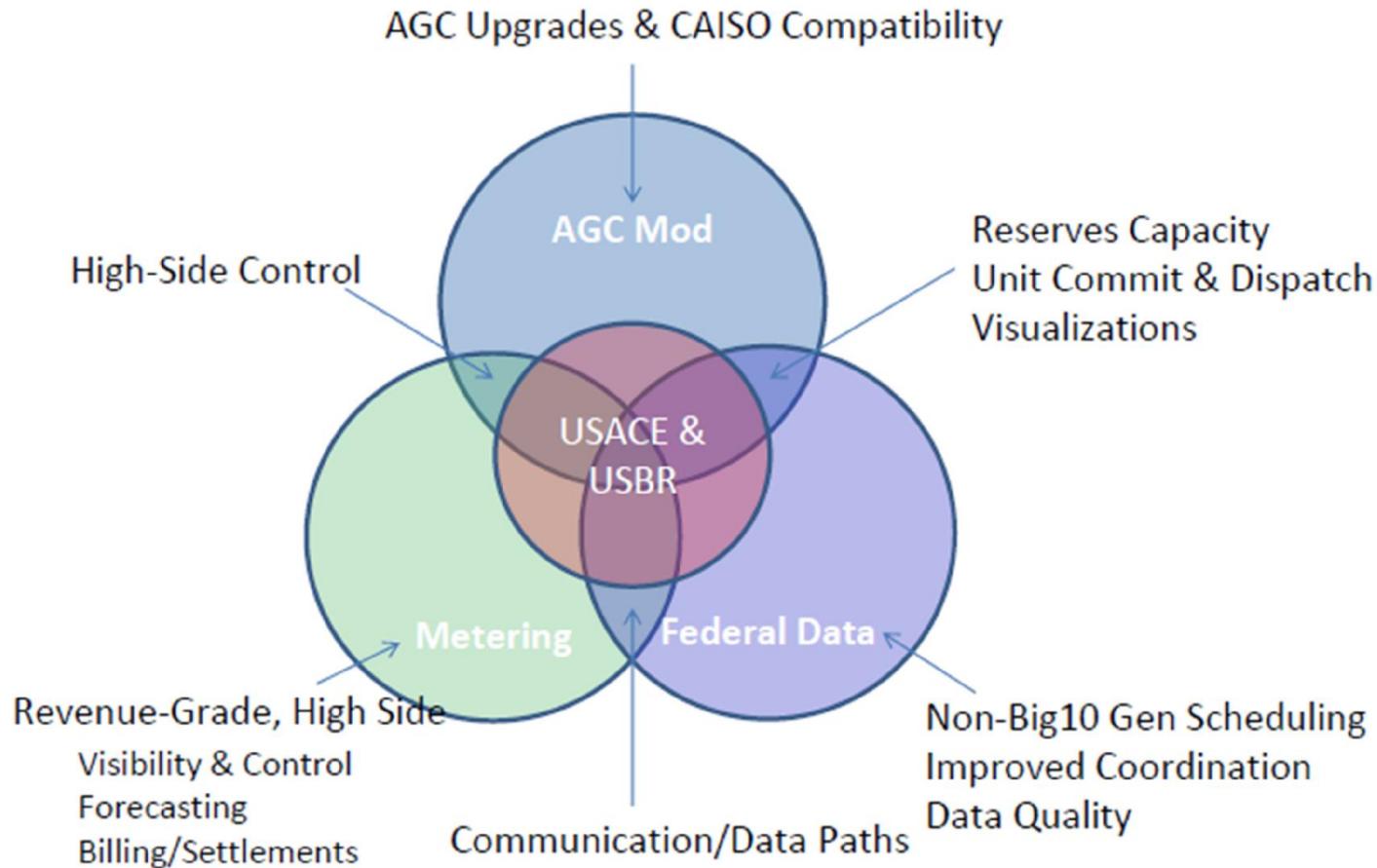
- Legend**
- C - Critical for EIM
  - P - Partially Critical for EIM
  - N - Not Critical for EIM
  - Green - Completed Projects
  - Blue - Projects in "Deliver"
  - Dark Blue - Projects in "Identify, Define, Integrate"
  - Orange - Projects for EIM Implementation

POC: GRIDMOD@BPA.GOV



# Grid Mod Projects engaging with USACE & USBR

Bonneville's success relies upon the support from our Federal Partners



# Grid Mod Projects engaging with USACE & USBR

## *Outage Tracking System: Completed*

Previously outages were coordinated using manual processes and a legacy system using outdated technology

### *Business Value:*

- Reduction in manual processes
- Enables analysis of outage requests to minimize costs or operational risk
- Reduce risk of system failure by using modern technology

### *USACE/USBR Collaboration:*

- USBR and USACE provided valuable sponsor and subject matter expertise through the duration of this project

# Grid Mod Projects engaging with USACE & USBR

## *Automatic Generation Control (AGC) Enhancements*

*Software changes and GDACS integration to enhance existing capabilities*

### ***Business Value:***

- High side metering capabilities (control, accuracy and performance)
- High side aggregation of resources rather than low side aggregations
- Enhancing reactive power & reserves management control capabilities
- Improving unit dispatch and optimization algorithms
- Improving calculations for both unit and plant level capacity and reserve capabilities

### ***USACE/USBR Collaboration:***

- GDACS improvements/changes are critical to success

# Grid Mod Projects engaging with USACE & USBR

## Federal Data & Generation Dispatch Modernization

*Current state for sharing data between BPA and the Federal Resources is inefficient which can result in poor data and inefficient operations*

### **Business Value:**

- Data Assessment – FCRPS data is reliable & accurate to support BPA operational and business decisions.
- Data Transfer – Relay of FCRPS data is timely, reliable, & accurate enough for BPA operational and business decisions.
- Non-Big10 Generation Scheduling – Generation plans are scheduled efficiently, minimizing error
- Unit and Plant Reserve and Generation Optimization – FCRPS generating units are configured to maximize flexibility and/or efficiency, according to market demands.
- Operations-Dispatch-Scheduling Coordination – Cross-agency coordination to maximize financial value of FCRPS in the markets in which BPA operates.

### **USACE/USBR Collaboration:**

- Identify current state of systems and processes that create data that is shared with BPA
- Explore changes to systems and processes to create more accurate and timely data
- Create and implement a method to efficiently develop generation schedule that are accurate, timely and maximize value
- Investigate and implement new ways to configure generating units to maximize value

# Grid Mod Projects engaging with USACE & USBR

## Metering Enhancements

*Current state for metering generation occurs at the low-side, which is not reflective of the amount of energy that hits the grid*

### **Business Value:**

- High-side metering on FCRPS Participating Resources allows for an accurate determination of the amount of energy that is used to meet load and used for surplus sales
- Improved accuracy for settlements and billing
- Improved data quality for determining interchange and load

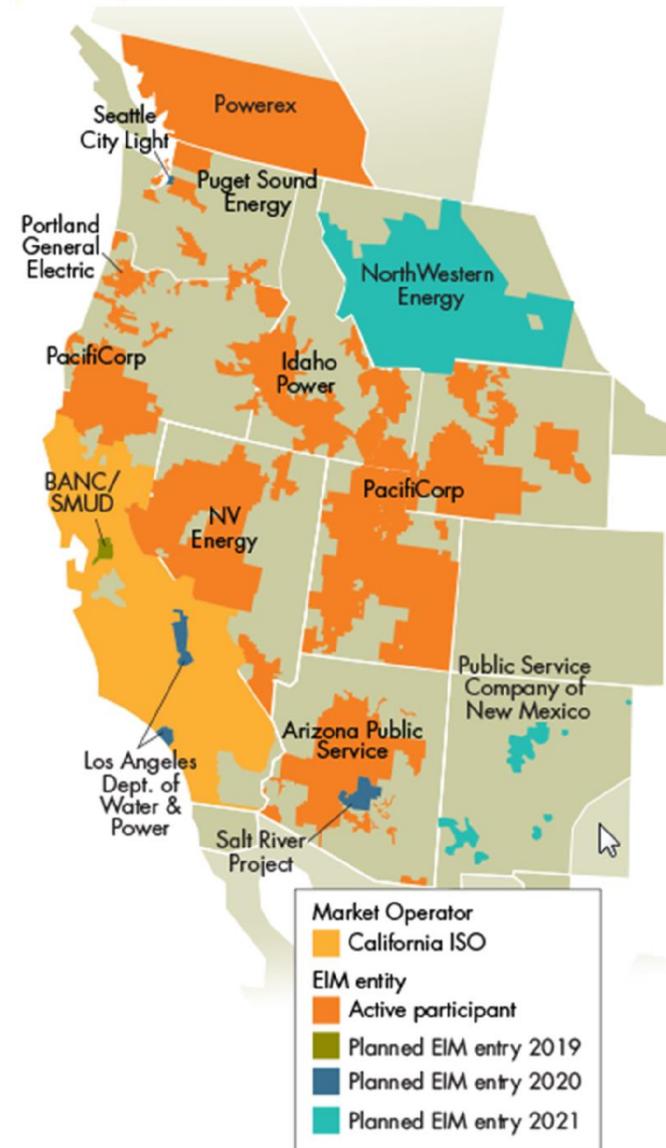
### **USACE/USBR Collaboration:**

- High-side metering at Big 8 facilities with 2 on hold pending further analysis;
- Potential to add LIB, HGH & DWR

# Drivers for EIM

- Variable energy resources are increasing in the West.
- Customer transmission use and system operations are changing in response to market developments and new tools are needed to respond optimally.
- Bonneville has discussed lessons learned from Northwest utilities that have or are planning on joining the Western EIM.
- Bonneville needs to find ways to fully realize the value of sub-hourly dispatch, flexible, and carbon-free hydro attributes.
- Bonneville has begun to study and determine *how and under what conditions Bonneville could join the CAISO Western EIM*.

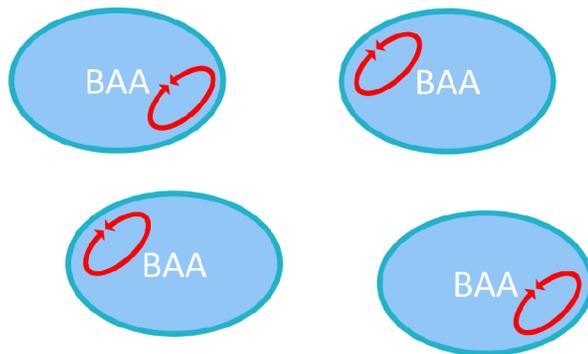
Western EIM active and pending participants



# EIM Summary

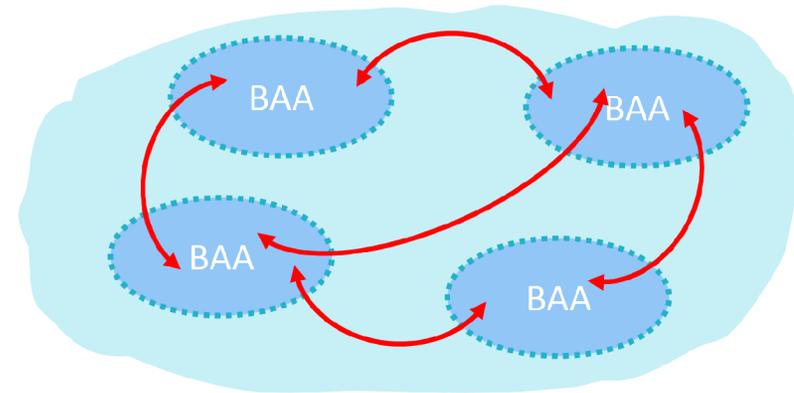
## Without EIM:

Each BA must balance loads and resources within its borders.



## With EIM:

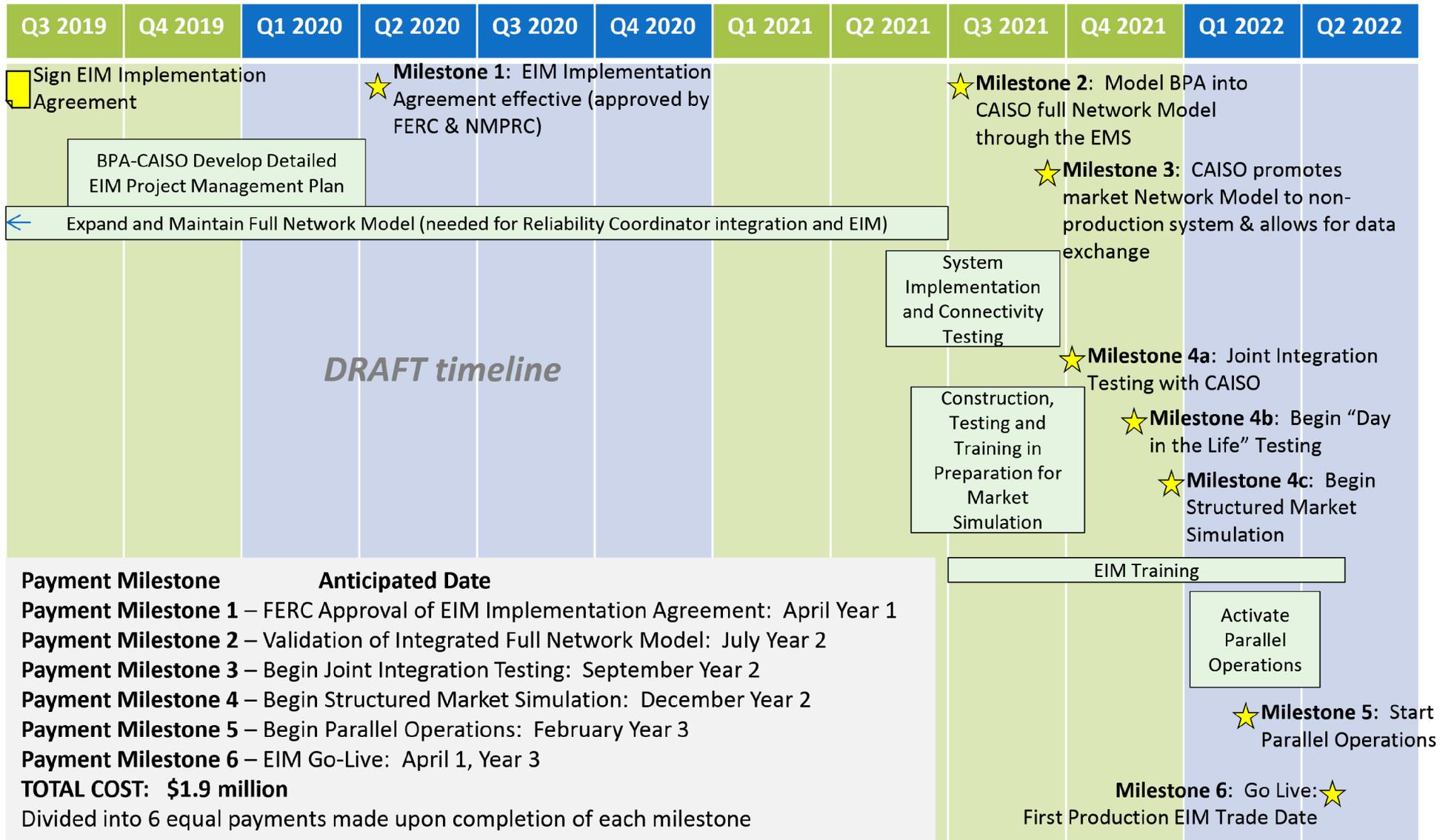
The market dispatches resources across BAAs to balance demand



## 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

# CAISO EIM Payment Milestones and Agreements



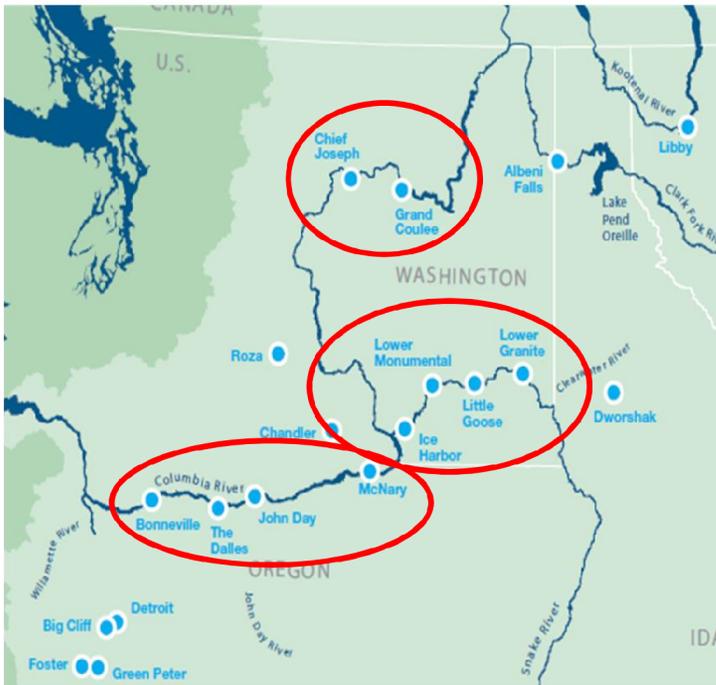
# FCRPS Generation Projects

- **Big 10 Projects:** Grand Coulee, Chief Joseph, McNary, John Day, The Dalles, Bonneville, Lower Granite, Little Goose, Lower Monumental, and Ice Harbor.
- **Non-Big 10 Projects:** include headwater projects, Willamette projects, Palisades, Upper Snake projects, and CGS.



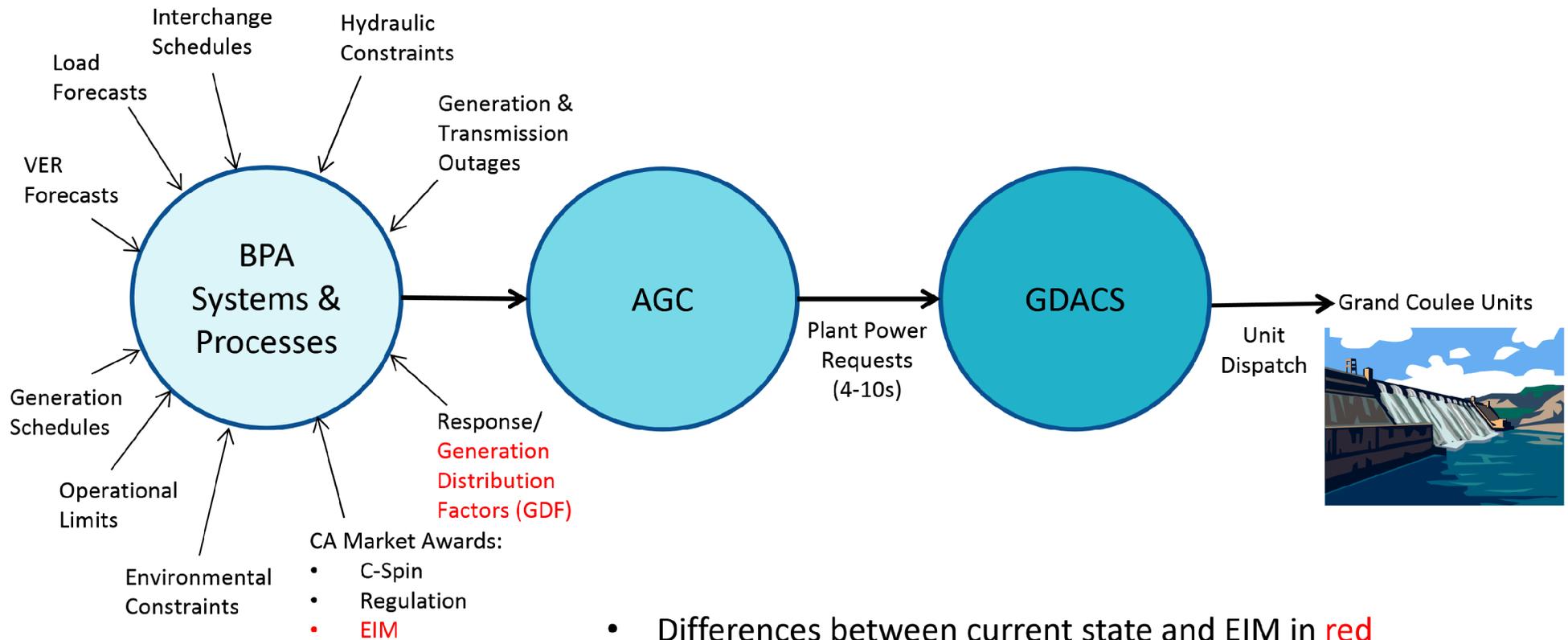
# EIM Generation Participation

Comparison of FCRPS Participation Alternatives :



Participation Alternative	Pro	Con
One Aggregate	<ul style="list-style-type: none"> <li>• Most similar to current way of optimizing FCRPS</li> </ul>	<ul style="list-style-type: none"> <li>• The least efficient congestion relief</li> <li>• Lack of additional revenue associated with differential LMPs</li> </ul>
Three Aggregates	<ul style="list-style-type: none"> <li>• More efficient congestion relief</li> <li>• Additional revenue associated with differential LMPs</li> </ul>	<ul style="list-style-type: none"> <li>• May not fully realize congestion relief and revenue benefits</li> </ul>
Project Level	<ul style="list-style-type: none"> <li>• Most efficient congestion relief</li> <li>• Additional revenue associated with differential LMPs</li> </ul>	<ul style="list-style-type: none"> <li>• More complexity, which increases the risk that BPA may, through its bids, operate the FCRPS less efficiently.</li> </ul>

# Current State vs EIM Operations



- Differences between current state and EIM in red
- BPA hydro desk and plant operators co-developing unit loading plans to inform market bidding will enhance the value

# Wrap-Up

- Grid Modernization Initiative
  - Improvements in outage coordination, data quality, and metering will reduce the amount of uncertainty in BPA operations and marketing
  - Improvements in AGC will increase the flexibility of FCRPS resources
  - **Reduced uncertainty + Increased flexibility = Increased Revenue**
- Energy Imbalance Market
  - Targeting Go-live in early 2022
  - Federal Resource Participation will be aggregated into three zones
  - No changes to GDACS are required for participation
  - BPA hydro desk and plant operators co-developing unit loading plans to inform market bidding will enhance the value of market participation



# Questions



# Appendix



# Grid Mod - Three Agency Coordination Plan

- The 3-Agency Coordination Plan is also a communication plan:
  - maintains alignment and project implementation cadence to complete projects on time and to scope.
- 3-Agency Teams have been engaged:
  - Weekly Monday morning check-ins
  - BPA – USACE and USBR Grid modernization project kick off meetings were held in October 2018, and have been continuing
  - BPA – USACE and USBR EIM Discussions started in January 2019 and will occur on a monthly basis.
    - Monthly EIM meeting for management and staff to discuss EIM.
    - First meeting was April 1, 2019 to discuss BPA’s EIM process and timeline, DRAFT EIM Implementation Agreement, and answer EIM questions USACE provided ahead of time.
    - Next meeting May 6, 2019 at BPA.

	Primary Points of Contact		
	BPA	USACE	USBR
<b>Executive Level</b>	Joel Cook <a href="mailto:jdcook@bpa.gov">jdcook@bpa.gov</a> 503-230-7640	Beth Coffey <a href="mailto:Frances.E.Coffey@usace.army.mil">Frances.E.Coffey@usace.army.mil</a> 503-808-3731	Lorri Gray <a href="mailto:lgray@usbr.gov">lgray@usbr.gov</a> 208-378-5012
<b>Management</b> (Leadership points of contact)	Wayne Todd <a href="mailto:watodd@bpa.gov">watodd@bpa.gov</a> 503-230-3470  Chris Allen <a href="mailto:crallen@bpa.gov">crallen@bpa.gov</a> 503-230-5040	Tony Kirk <a href="mailto:Tony.r.kirk@usace.army.mil">Tony.r.kirk@usace.army.mil</a> (503) 808-3880  Scott Thoren <a href="mailto:Scott.D.Thoren@usace.army.mil">Scott.D.Thoren@usace.army.mil</a> 509-527-7117	Rob Skordas <a href="mailto:rskordas@usbr.gov">rskordas@usbr.gov</a> 208-378-5084  Joe Summers <a href="mailto:jsummers@usbr.gov">jsummers@usbr.gov</a> 208-378-5290
<b>Grid Modernization Coordination Lead</b> (Primary points of contact for grid modernization communications)	For Grid Mod and EIM: Agnes Lut <a href="mailto:axlut@bpa.gov">axlut@bpa.gov</a> 503-230-5651	For Grid Mod: Shawn Worthington <a href="mailto:Shawn.M.Worthington@usace.army.mil">Shawn.M.Worthington@usace.army.mil</a> 503-808-3743  For EIM: John Easton <a href="mailto:Johnathan.R.Easton@usace.army.mil">Johnathan.R.Easton@usace.army.mil</a> 503-808-4330	For Grid Mod: Florence Webster <a href="mailto:fwebster@usbr.gov">fwebster@usbr.gov</a> 208-378-5332  For EIM: Coleman Smith <a href="mailto:cwsmith@usbr.gov">cwsmith@usbr.gov</a> 509-633-9501
<b>Staff</b>	See Table 2	See Table 2	See Table 2
<b>Grid Modernization Director</b> (cc on Executive & Management grid mod communications)	Steve Kerns <a href="mailto:srkerns@bpa.gov">srkerns@bpa.gov</a> 503-230-7542	N/A	N/A



# Grid Mod - Three Agency Coordination Plan

Grid modernization updates occur routinely at the following forums:

- 3-Agency Executive
- BPA-Corps Executive Quarterly
- Joint Operating Committee (JOC):
  - BPA-Corps, BPA-Reclamation, Combined: BPA-Corps-Reclamation
- River Management JOC
- Reliability Implementation Technical (RITS)
- Technical Operations Implementation (TOIS)

Project Level Points of Contact			
	BPA	USACE	USBR
<b>Federal Data and Generation Dispatch Modernization</b>	Cindy Polsky <a href="mailto:chpolsky@bpa.gov">chpolsky@bpa.gov</a> 503-230-3995	Shawn Worthington <a href="mailto:Shawn.M.Worthington@usace.army.mil">Shawn.M.Worthington@usace.army.mil</a> 503-808-3743	Cliff Foster <a href="mailto:cfooster@usbr.gov">cfooster@usbr.gov</a> 509-633-9145
<b>Metering</b>	Kelly Gardner <a href="mailto:kjgardner@bpa.gov">kjgardner@bpa.gov</a> 360-619-6615	Shawn Worthington <a href="mailto:Shawn.M.Worthington@usace.army.mil">Shawn.M.Worthington@usace.army.mil</a> 503-808-3743	Israel Reyes-Negron <a href="mailto:ireyesnegron@usbr.gov">ireyesnegron@usbr.gov</a> 509-633-6194
<b>AGC Modernization</b>	Dave Brown <a href="mailto:drbrown@bpa.gov">drbrown@bpa.gov</a> 360-418-2909	Shawn Worthington <a href="mailto:Shawn.M.Worthington@usace.army.mil">Shawn.M.Worthington@usace.army.mil</a> 503-808-3743  Jason Williams Senior Project Manager, Walla Walla District <a href="mailto:Jason.C.Williams@usace.army.mil">Jason.C.Williams@usace.army.mil</a> 509-527-7591	Matt Elder <a href="mailto:melder@usbr.gov">melder@usbr.gov</a> 509-633-9221



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**From:** Greene, Richard A (BPA) - LP-7  
**Sent:** Friday, March 16, 2018 4:55 PM  
**To:** Davis, Thomas E (BPA) - LT-7 (tedavis@bpa.gov); Johnson, Tim A (BPA) - LP-7 (tajohnson@bpa.gov)  
**Cc:** Pettinger, Rebekah S (BPA) - LP-7  
**Subject:** Draft Legal Opinion  
**Attachments:** MEMORANDUM--ADF on Gen3-14-18.docx

Here is a first cut at the draft legal opinion on system sales and the ADF.

Rich

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**From:** Kochheiser,Todd W (BPA) - TOI-DITT-2  
**Sent:** Monday, March 05, 2018 3:01 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; 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  
**Cc:** robhawkins1@gmail.com; Stermer,Anna M (BPA) - PGSP-5  
**Subject:** ADF on the number of generation points - Todd's "Electrically Similar" and "Congestion Risk" documents  
**Attachments:** 20180305\_Congestion\_Risk\_v02\_Draft.docx; 20180223\_Electrically\_Similar\_Analysis\_v03\_Draft.docx  
**Sensitivity:** Private

Here are the latest version based on today's conversation.

Todd

[Bonneville Power Administration | Transmission Operations](#)

5411 NE Hwy 99 | TOK-DITT2 | Vancouver, WA 98663

Direct: (360) 418-8752 | [twkochheiser@bpa.gov](mailto:twkochheiser@bpa.gov)

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**From:** Kochheiser,Todd W (BPA) - TOI-DITT-2  
**Sent:** Monday, March 05, 2018 2:03 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; 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  
**Cc:** [robhawkins1@gmail.com](mailto:robhawkins1@gmail.com); Stermer,Anna M (BPA) - PGSP-5  
**Subject:** RE: ADF on the number of generation points bid into the EIM  
**Sensitivity:** Private

Here is a quick curtailment risk analysis. I will go over it today.

Todd

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-----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

**Cc:** robhawkins1@gmail.com; Stermer,Anna M (BPA) - PGSP-5

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

**When:** Monday, March 05, 2018 2:00 PM-3:00 PM (UTC-08:00) Pacific Time (US & Canada).

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

**Sensitivity:** Private

Rescheduling the 3/2 instance only. Moving to 3/5

**From:** Pettinger,Rebekah S (BPA) - LP-7  
**Sent:** Thu Mar 22 09:12:23 2018  
**To:** Greene,Richard A (BPA) - LP-7  
**Subject:** Fed Resource ADF - Draft Legal Analysis  
**Importance:** Normal  
**Attachments:** MEMORANDUM--ADF on Gen3-22-18.docx

Hi Rich. I incorporated Tim and Marcus's edits into the legal analysis (accepted most edits and got rid of comments I thought were taken care of). I also made a few additional adjustments, shown in redline.

