EIM Stakeholder Meeting

Dec 18, 2018

9am -12pm

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 • Review Timeline
9:10 – 10:30	• Settlements Discussion
10:30 – 10:40	• Break
10:40 – 11:30	• Continue Settlements Discussion • Non-Federal Generation Participation
11:30 – Noon	• Next Steps • Question and Answer Session

Topics For Today's Meeting

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

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

Issue we will be discussing today.

Issues discussed at previous EIM Stakeholder meetings.

These issues will be discussed at future meetings.

- Non-Federal Generation Participation
- Question and Answer Session

Statement of BPA's Principles:

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

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

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

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

Timeline Leading up to the ROD

Agendas for previous and future monthly EIM Stakeholder meetings:

July 24	•Grid Modernization Overview, 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, Relationship of EIM to other Emerging Markets
February 20	
March 13	**Table Tops:** Discussion of Impacts to Customers
April 10	
May 15	
June	
July	•Letter to the Region with a 30 day public comment
August	•BPA drafts Record of Decision (ROD)
September	•Final ROD for signing the EIM Implementation Agreement

These meetings will be full day.

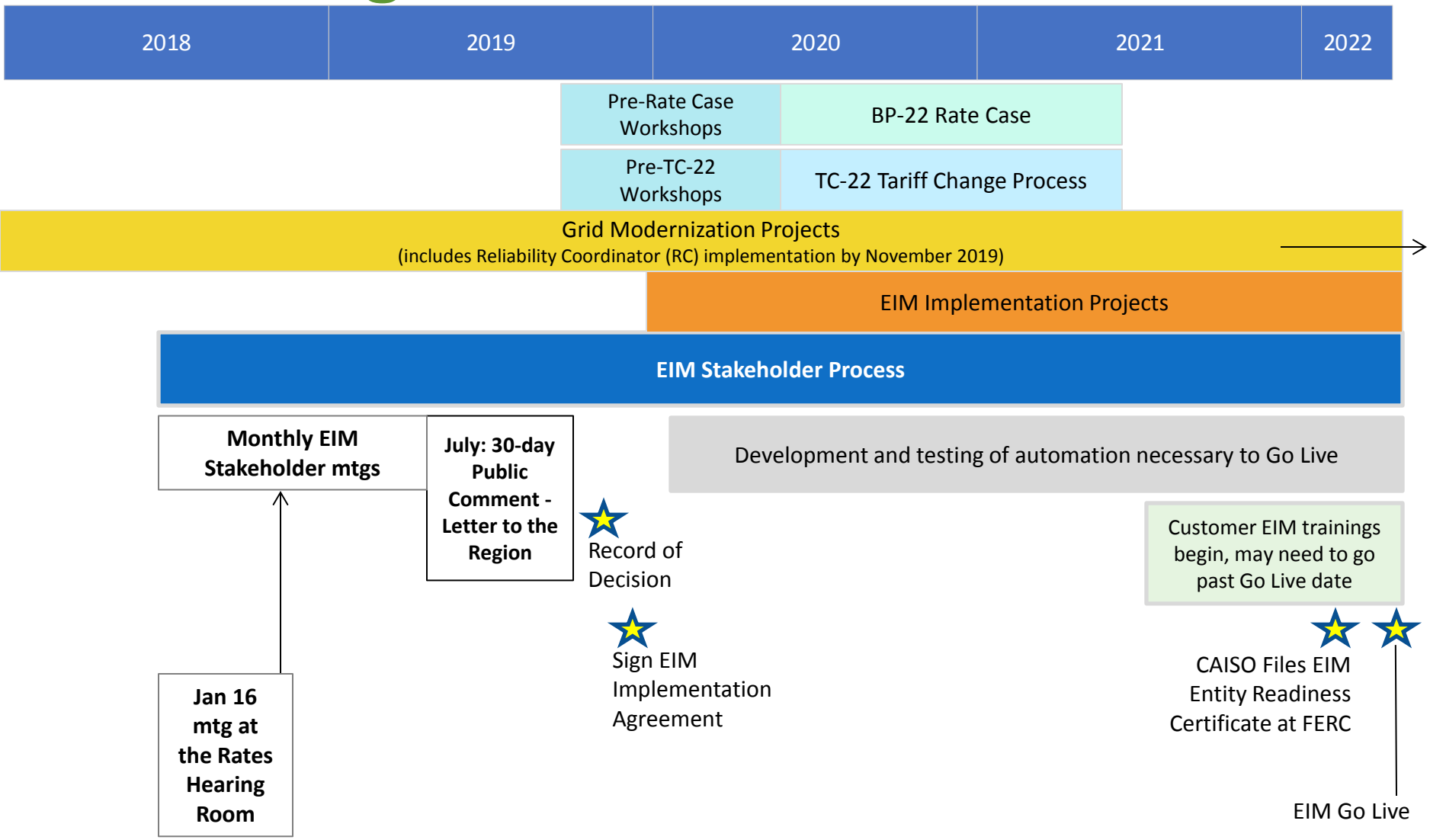
Issues to be Discussed at upcoming monthly EIM Stakeholder meetings:

1. Power Products
2. Generation Inputs BP-22
3. Cost Benefit Analysis
4. Market Mitigation
5. Transmission
6. Carbon Issues
7. Governance

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

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

BPA's High Level EIM Timeline



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

EIM Settlements – Introduction to BPA's Approach

Goal for Today

- Educate on processes and impacts regarding **BPA's relationship with the Market Operator** (CAISO) to better prepare you for ongoing EIM stakeholder engagement regarding settlements:
  - Introduction to BPA's EIM Settlements Scoping Approach
  - Overview of Settlement Interactions if BPA joins the EIM
  - Educate on existing EIM processes
  - Review BPA's identified EIM Settlement process challenges
  - Work through some simple EIM Settlement Scenarios

- **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. 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 in a simplified process to the extent possible.
  - Enables transparency of processes and information with BPA's customers
  - Provides high quality (accurate and timely) outputs for our customers

EIM Settlements Learning Approach

- EIM Settlements Scoping Task (April – July 2018)
  - Understand requirements for a successful EIM Settlements function at BPA.
  - Understand challenges and impacts to BPA and our customers

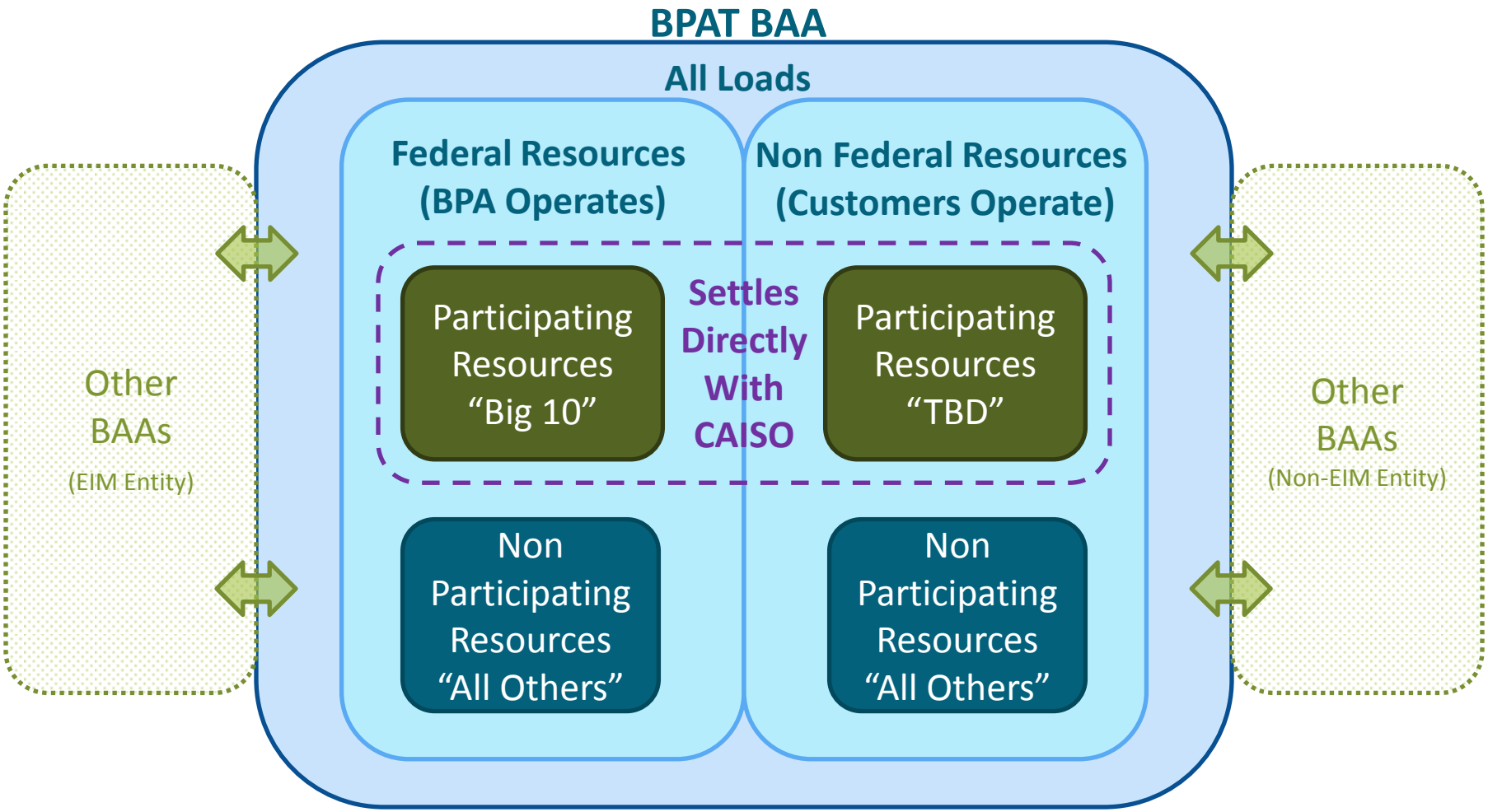
- Information Gathering
  - CAISO Web Based Trainings
  - Benchmarking with existing EIM Entities
  - CAISO Business Practice Manuals & Configuration Guides
  - External Training Courses
  - Internal SME knowledge

EIM Settlements Learning Approach

- Initial scoping determined that continued analysis should occur
  - What should we do now to be prepared if BPA decides to join the market?
    - Preliminary evaluation of internal processes and functions to prepare for organizational changes
      - Alignment with interconnected Grid Mod projects
    - Further knowledge development about market settlement impacts
    - Improvement of existing CAISO settlement processes

EIM Settlements Interactions

EIM Settlement Interactions – Alternate View



Everything settles with BPAT except Participating Resources

EIM Settlements – Current Processes Overview

What are EIM Settlements

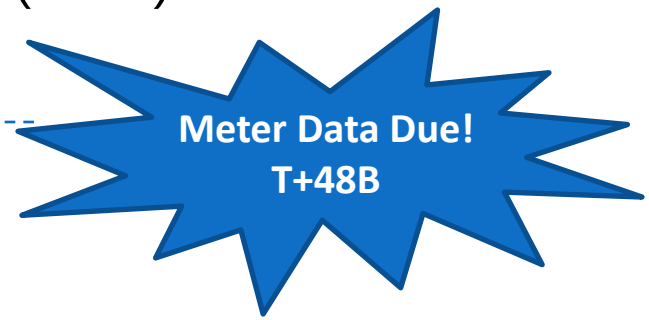
- Processes related to, and resulting in, the invoicing of charges and credits for EIM activity.
  - Settlements-Related Data Submission and Collection
  - Shadow Settlements (Validation)
  - Invoicing of EIM Charge Codes
  - Payment and Receipt of Funds for EIM Charges and Credits
  - Settlements-Related Dispute Management
  - Pre-Settlements & Market Operations Feedback

EIM Settlements – CAISO Process

- CAISO invoices the EIM Entity and Participating Resource Scheduling Coordinators weekly for EIM Settlements
  - Wednesday, by 10:00 AM (exceptions for holidays)
    - Invoice = payment is owed to CAISO
    - Payment Advice = CAISO owes money to you
- All payments for weekly invoices are due by 10:00 AM, 4 business days after the date the invoice is published
  - Typically, 10:00 AM the following Tuesday
- CAISO pays out on Payment Advices by 2:00 PM the same day (+4B)

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
- CAISO has a formal dispute process whenever there are questions or discrepancies with the settlement statements or invoices

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)

Settlement Statement	Dispute Deadline	Disputable Content
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

EIM Settlements Application

- Generating Resources
  - Participating
    - Elective (voluntary) participation by offering resource bids into the EIM
    - Has a **distinct, direct** relationship with CAISO (PRSC)
      - Big 10 hydro – FCRPS
      - Non-Fed – TBD
  - Non-Participating
    - Applies to all generating resources within BAA which do not voluntarily participate
- Interchange (CAISO's calls it Intertie)
  - Points of interchange between neighboring BAAs to the EIM Entity
- Load
  - All load in the BAA

Reminder: All settlements occur between CAISO and the EIM Entity (EESC), **except** settlements for Participating Resources which settle between CAISO and the Participating Resource Scheduling Coordinator (PRSC) directly

EIM Settlement Charge Codes

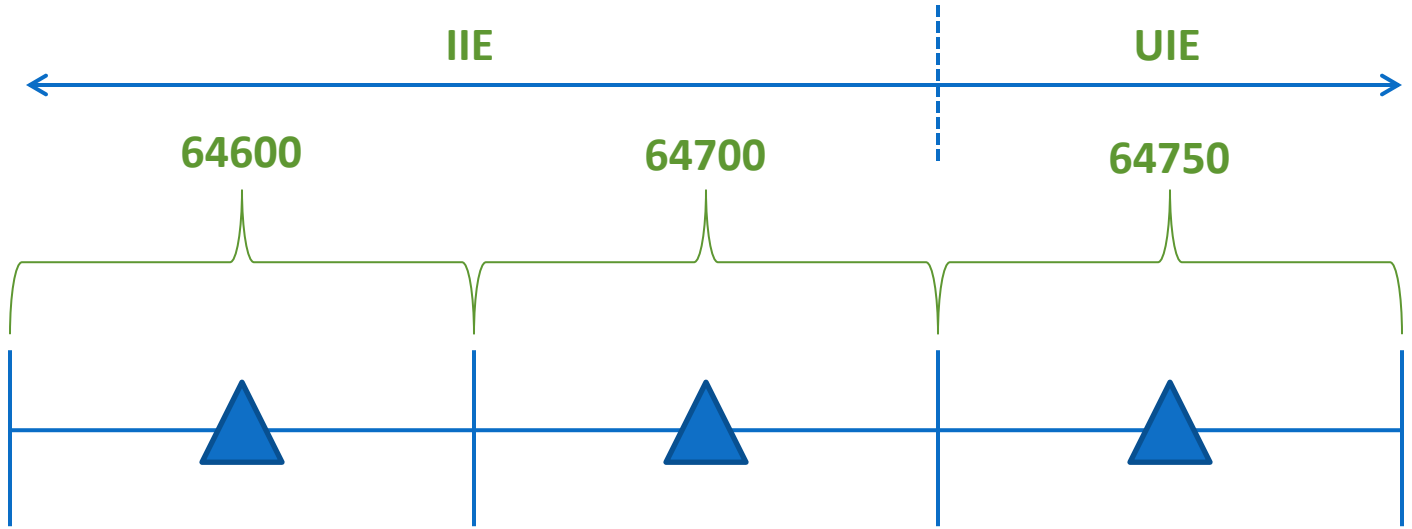
- CAISO currently settles on 42 distinct Charge Codes
  - 5 are applicable only to the Participating Resource Scheduling Coordinator
  - 12 are applicable only to the EIM Entity Scheduling Coordinator (BPAT)
  - 25 are applicable to either/both

EIM Settlement Charge Codes

- CAISO Charge Code Categories
  - Primary Charges
    - Imbalance Energy
      - Instructed
      - Uninstructed
    - Ancillary Services (e.g. flex ramp)
  - Market Clearing / Neutrality / Cost Recovery
    - Cost Recovery (Over/Under Scheduling)
    - Congestion (RT Offsets)
    - Bid Cost Recovery
    - Pass Through Billing (PTB)
    - Invoice Deviation Interest
    - EP Penalty
  - Timing / Process Efficiency
    - Interest
    - Late Payment Penalty
    - Other (Shortfall Allocation)
  - Administrative
    - Grid Management Charge
    - PIRP (Forecasting Service Fee)

EIM Settlement Charge Codes

- Imbalance Energy
  - Fifteen Minute Market (FMM) Instructed Imbalance Energy (CC 64600)
  - Real Time Dispatch (RTD) Instructed Imbalance Energy (CC 64700)
  - Uninstructed Imbalance Energy (CC 64750)



EIM Settlement Charge Codes

- Ancillary Services & Cost Recovery
  - Over/Under Scheduling Settlement & Allocation (CC 6045 & CC 6046)
  - Real Time Imbalance Energy Offset (CC 64770)
  - Flexible Ramp Uplifts
    - Daily Flexible Ramp Up Uncertainty Award Allocation (CC 7077)
    - Monthly Flexible Ramp Up Uncertainty Award Allocation (CC 7078)
    - Daily Flexible Ramp Down Uncertainty Capacity Settlement (CC 7081)
  - Real Time Bid Cost Recovery Allocation (CC 66780)
  - Real Time Congestion Offset (CC 67740)
  - Real Time Marginal Losses Offset EIM (CC 69850)

EIM Settlement Process Challenges

EIM Settlement Challenges

- Identified potential Challenges
  - Dispute Submission Timing
  - Market Data Transparency
  - Number and Timing of Recalculation Settlement Statements
  - Frequency of CAISO Invoices
  - Settlement Quality Meter Data (SQMD) Submission Timing

EIM Settlement Challenges

- **Dispute Submission Timing**
  - **Current EIM Process**
    - Average dispute window closes about +21B from the Settlements Statement published date
  - **Challenges**
    - How do we enable BPA's customers the ability to review data and file disputes within CAISO's filing window?
    - Ensuring customers have access to settlement data early enough to have an adequate opportunity to review & file a dispute if warranted
      - Customers' capability to process large volumes of data in a relatively short period of time.

EIM Settlement Challenges

- **Market Data Transparency**
  - **Current EIM Process**
    - Some data used to calculate EIM Settlement Charge Codes amounts is considered proprietary
    - EIM Entities have the flexibility to determine how and which Settlements support data to provide to their customers in addition to their invoices
  - **Challenges**
    - About 5-10% of the Charge Code dollars cannot be 100% verified (Proprietary data)
    - Lack of a centralized repository for market data results in inconsistent sharing of supporting Settlements data amongst EIM Entities

EIM Settlement Challenges

- **Number and Timing of Recalculation Settlement Statements**
  - **Current EIM Process**
    - Three guaranteed revisions (T+3B, T+12B, T+55B)
    - Likely four additional revisions (T+9M, T+18M, T+33M, T+36M)
      - Recalculation statements could be considered similar to BPA's Prior Period Adjustment (PPA) process
      - Delta issued on next invoice; no historical true-up of invoices
  - **Challenges**
    - Impacts to financial accounting and reporting
    - Timing between revisions T+55B → T+ 36M are lengthy
      - If you're owed money on a true-up of the T+55B statement, you won't receive it until T+9M is published, etc.

EIM Settlement Challenges

- **Frequency of CAISO invoices**
  - **Current EIM Process**
    - Weekly invoicing of EIM Entities
    - Mandatory weekly payments to CAISO at +4B
      - Must pay even if a dispute is filed (enables CAISO to retain a revenue neutral position)
  - **Challenges**
    - Bearing the financial burden of the invoice timing discrepancies
      - We don't currently have a good sense of the magnitude of the financial impact
        - » Impacts to cash flow
    - BPA Staff resourcing for on-time processing

EIM Settlement Challenges

- **Settlement Quality Meter Data (SQMD) Submission Timing**
  - **Current EIM Process**
    - SQMD due to CAISO by T+48B
    - $1,000/day per “meter point” penalty if submitted late
  - **Challenges**
    - BPA analyzing likely penalties based on historical data given current processes and capabilities, compared to the costs of investing in mitigating actions
      - Reprogramming of meters to report events or other metering investments
      - Increased field personnel to respond to issues
      - Internal meter validation processes

EIM Settlement Scenarios

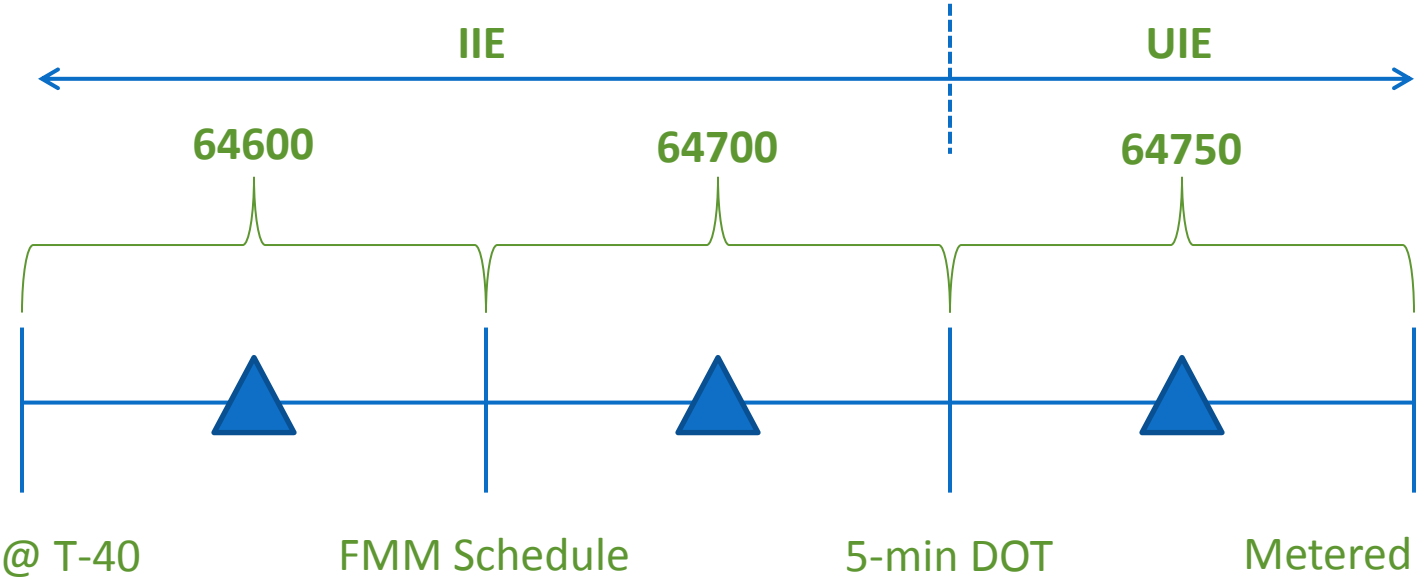
EIM Settlement Scenarios - Context

- All scenarios will be from the perspective of BPA's relationship with CAISO as the Market Operator
  - Participating Resource (**Generating)**
  - Non-Participating Resource **(Generating)**
  - Point-to-Point **Interchange** Settlement
  - **Load** Imbalance

- Allocations between BPAT as the EIM Entity and BPA's Customers are To Be Determined, therefore these scenarios will not be covered in this presentation.

EIM Settlement Scenario - Context

- Today we will focus on the primary Charge Codes (CC) related to Imbalance Energy and how they apply in different (common, simplified) scenarios
- All scenarios are based on CAISO's financially-binding schedule submission timeline of T-40
- All volumes will be shown in MWs
- All Locational Marginal Prices (LMPs) will be shown in MWh
- All amounts will be rounded (no decimals)



EIM Settlement Scenario - Context

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

EIM Settlement Scenario - Context

- There are four main categories of volumes used to calculate the Instructed Imbalance Energy (IIE) and Uninstructed Imbalance Energy (UIE) Charge Codes

Base	100										
FMM RTUC (15 min)	112			86			100			90	
RTD (5 min)	88	112	112	104	80	92	100	100	110	114	90	90
Metered Actuals	88	110	112	95	86	104	100	112	112	120	90	90

EIM Settlement Scenario - Context

- In addition, there are two LMPs that are used to determine the settlement totals

Base	100										
FMM RTUC (15 min)	112			86			100			90	
FMM LMP	$20			$22			$25			$20	
RTD (5 min)	88	112	112	104	80	92	100	100	110	114	90	90
RTD LMP	$30	$35	$30	$32	$28	$20	$20	$25	$30	$32	$35	$25
Metered Actuals	88	110	112	95	86	104	100	112	112	120	90	90

Participating Resources

EIM Settlement Scenario – Participating Resource

CC 64600: FMM Instructed Imbalance Energy

- A Base Schedule of 100 MW is submitted by CAISO's financially-binding T-40

Base	100				÷ 4
	-				
FMM RTUC (15 min)	112	86	100	90	
	x				
FMM LMP	$20	$22	$25	$20	
	=				
FMM IIE	**($60)**	**$77**	**$0**	**$50**	

Total FMM IIE for the hour = $67 (charge)

- FMM IIE = (Base – FMM RTUC) ÷ 4 x FMM LMP
- FMM IIE_1 = (100 – 112) ÷ 4 x $20
- FMM IIE_1 = (-12) ÷ 4 x $20
- FMM IIE_1 = -$60

EIM Settlement Scenario – Participating Resource

CC 64700: RTD Instructed Imbalance Energy

FMM RTUC (15 min)	112			86			100			90			÷ 12
	-												
RTD (5 min)	88	112	112	104	80	92	100	100	110	114	90	90	
	x												
RTD LMP	$30	$35	$30	$32	$28	$20	$20	$25	$30	$32	$35	$25	
	=												
RTD IIE	**$60**	**$0**	**$0**	**($48)**	**$14**	**($10)**	**$0**	**$0**	**($25)**	**($64)**	**$0**	**$0**	

Total RTD IIE for the hour = ($73) (credit)

- RTD IIE = (FMM RTUC – RTD) ÷ 12 x RTD LMP
- RTD IIE_1 = (112 – 88) ÷ 12 x $30
- RTD IIE_1 = (24) ÷ 12 x $30
- RTD IIE_1 = $60

EIM Settlement Scenario – Participating Resource

CC 64750: RTD Uninstructed Imbalance Energy

RTD (5 min)	88	112	112	104	80	92	100	100	110	114	90	90
	-											÷ 12
Metered Actuals	88	110	112	95	86	104	100	112	112	120	90	90
	x											
RTD LMP	$30	$35	$30	$32	$28	$20	$20	$25	$30	$32	$35	$25
	=											
RTD UIE	**$0**	**$6**	**$0**	**$24**	**($14)**	**($20)**	**$0**	**($25)**	**($5)**	**($16)**	**$0**	**$0**

Total RTD UIE for the hour = ($50) (credit)

- RTD UIE = (RTD – Metered Actuals) ÷ 12 x RTD LMP
- RTD IIE_1 = (88 – 88) ÷ 12 x $30
- RTD IIE_1 = (0) ÷ 12 x $30
- RTD IIE_1 = $0

This scenario results in a total credit of ($56) for the operating hour ($67 - $73 - $50)

Non-Participating Resources

EIM Settlement Scenario – Non Participating Resource

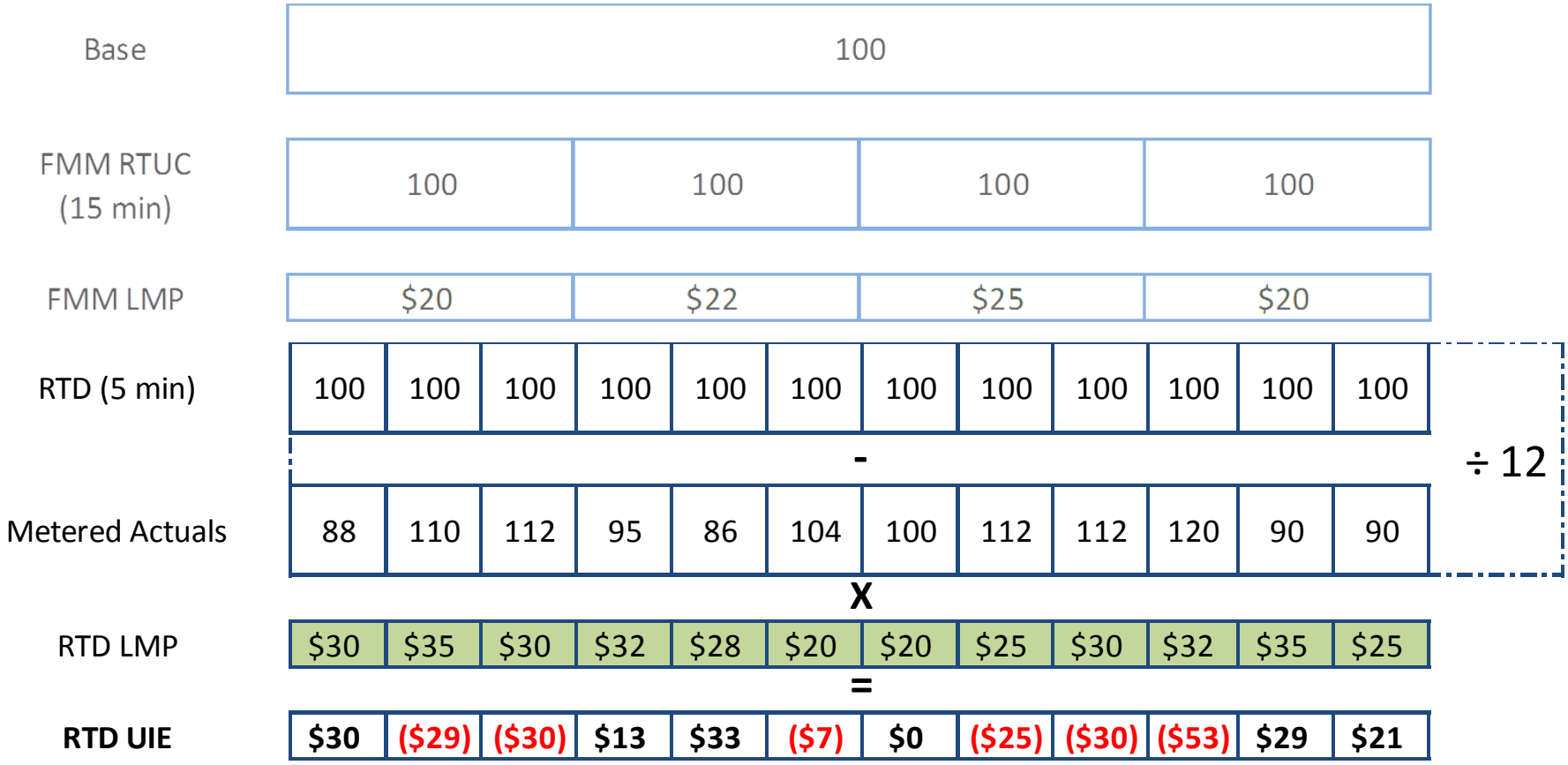
- The primary difference for Non-Participating Resources is that the FMM RTUC and RTD values equal the Base Schedule submitted by T-40
  - CAISO does not “instruct” Non-Participating Resource movements

Base	100										
FMM RTUC (15 min)	100			100			100			100	
FMM LMP	$20			$22			$25			$20	
RTD (5 min)	100	100	100	100	100	100	100	100	100	100	100	100
Metered Actuals	88	110	112	95	86	104	100	112	112	120	90	90
RTD LMP	$30	$35	$30	$32	$28	$20	$20	$25	$30	$32	$35	$25

EIM Settlement Scenario – Non Participating Resource

CC 64750: RTD Uninstructed Imbalance Energy

- No change to the Base Schedule after T-40
  - Results in $0 FMM & RTD **IIE** amounts
  - Will have non-zero RTD **UIE** amounts if metered actuals differ from the Base Schedule



Total RTD UIE for the hour = ($48) (credit)

EIM Settlement Scenario – Non Participating Resource

- **If the schedule is updated after T-40, there will be IIE settlement impacts**
  - E.g. the BAA sends a manual dispatch to operate at 120 MW at T-0 (top of the Trade hour)

Base	100										
FMM RTUC (15 min)	100			100			100			120	
RTD (5 min)	100	100	120	120	120	120	120	120	120	120	120	120
Metered Actuals	115	120	112	118	120	120	122	125	115	115	120	120

- Any market runs that have not initiated will reflect the updated schedule amount.
  - The first 3 FMM runs have already processed (T-37.5, T-22.5, T-7.5)
  - The first 2 RTD runs have already processed (T-7.5, T-2.5)
- Because there was a need to adjust the schedule, it is expected that metered actuals would also increase to reflect meeting the demand.

EIM Settlement Scenario – Non Participating Resource

CC 64600: FMM Instructed Imbalance Energy

Base	100				÷ 4
	-				
FMM RTUC (15 min)	100	100	100	120	
	x				
FMM LMP	$20	$22	$25	$20	
	=				
FMM IIE	**$0**	**$0**	**$0**	**($100)**	

Total FMM IIE for the hour = ($100) (credit)

- FMM IIE = (Base – FMM RTUC) ÷ 4 x FMM LMP
- FMM IIE_4 = (100 – 120) ÷ 4 x $20
- FMM IIE_4 = (-20) ÷ 4 x $20
- FMM IIE_4 = -$100

EIM Settlement Scenario – Non Participating Resource

CC 64700: RTD Instructed Imbalance Energy

FMM RTUC (15 min)	100			100			100			120			÷ 12
	-												
RTD (5 min)	100	100	120	120	120	120	120	120	120	120	120	120	
	X												
RTD LMP	$30	$35	$30	$32	$28	$20	$20	$25	$30	$32	$35	$25	
	=												
RTD IIE	**$0**	**$0**	**($50)**	**($53)**	**($47)**	**($33)**	**($33)**	**($42)**	**($50)**	**$0**	**$0**	**$0**	

Total RTD IIE for the hour = ($308) (credit)

- RTD IIE = (FMM RTUC – RTD) ÷ 12 x RTD LMP
- RTD IIE_4 = (100 – 120) ÷ 12 x $32
- RTD IIE_4 = (-20) ÷ 12 x $32
- RTD IIE_4 = -$53

EIM Settlement Scenario – Non Participating Resource

CC 64750: RTD Uninstructed Imbalance Energy

RTD (5 min)	100	100	120	120	120	120	120	120	120	120	120	120
	-											÷ 12
Metered Actuals	115	120	112	118	120	120	122	125	115	115	120	120
	X											
RTD LMP	$30	$35	$30	$32	$28	$20	$20	$25	$30	$32	$35	$25
	=											
RTD UIE	**($38)**	**($58)**	**$20**	**$5**	**$0**	**$0**	**($3)**	**($10)**	**$13**	**$13**	**$0**	**$0**

Total RTD UIE for the hour = ($58) (credit)

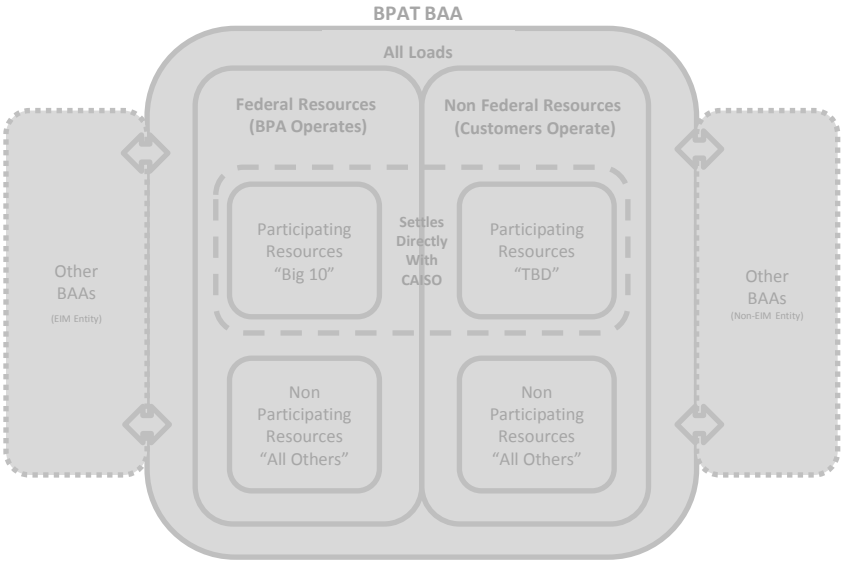
- RTD UIE = (RTD – Metered Actuals) ÷ 12 x RTD LMP
- RTD IIE_4 = (120 – 118) ÷ 12 x $32
- RTD IIE_4 = (2) ÷ 12 x $32
- RTD IIE_4 = $5

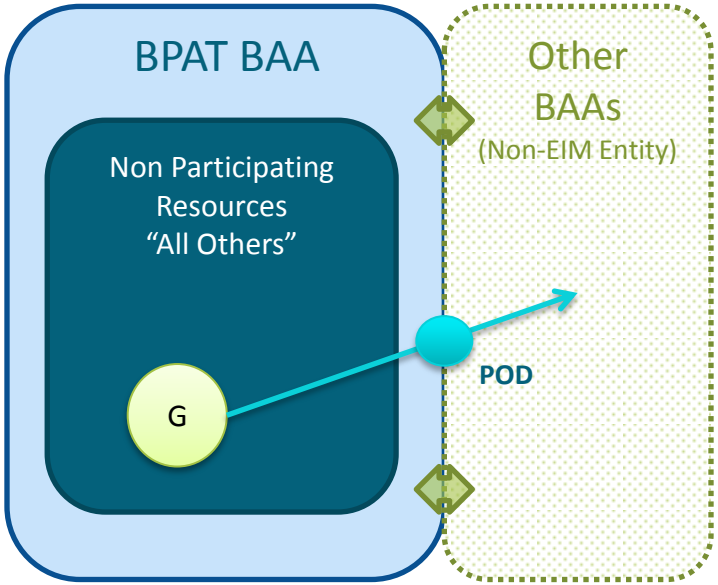
Changing the schedule after T-40 results in a total credit of ($466) for the operating hour (-$100 - $308 - $58)

Interchange (Interties)

EIM Settlement Scenario – Point-to-Point Interchange

- Interchange settles at the Point of Interchange identified between BAAs
- Imbalance for Interchange is typically only settled as IIE (CC 64600 & CC 64700)
  - The financially-binding Base Schedules for Interchange are owed to CAISO on the same schedule as the Base Schedules for Resources (T-40)
  - If the Interchange Base Schedule is updated after T-40 (e-tag update), non-zero IIE will be assessed for the remaining portion of the market hour left to run





EIM Settlement Scenario – Point-to-Point Interchange

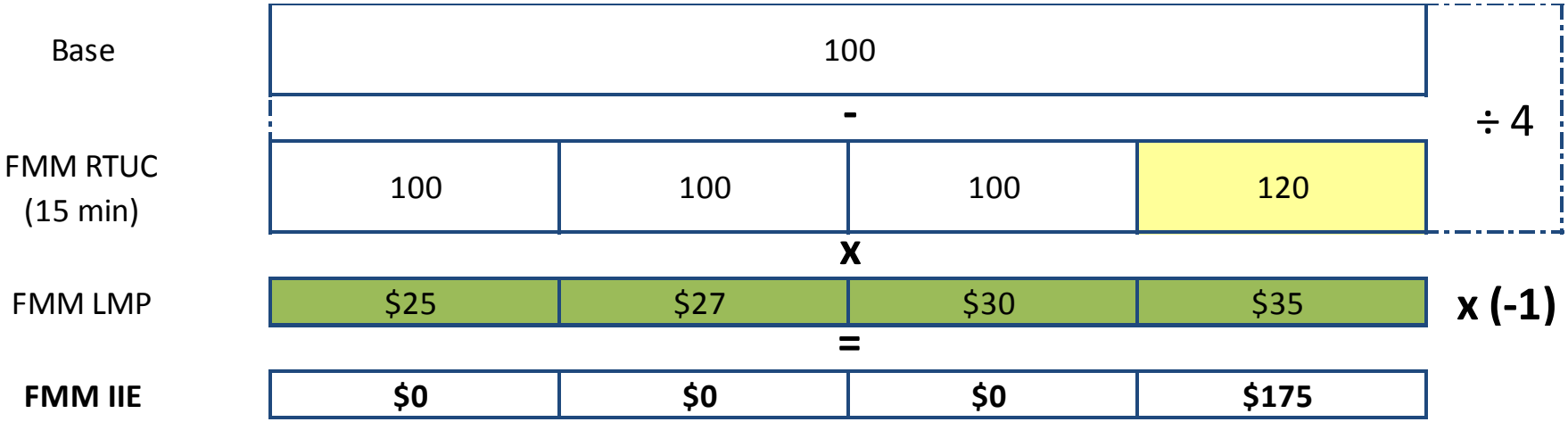
- **Using the previous Non Participating Resource example where the schedule is updated after T-40, there will also be an associated tag update after T-40 for the export schedule**
  - The Generator was manually dispatched to INC +20 MW, so they will be paid to meet the demand. This was a result of a demand schedule being too low, so there will be payment from the Interchange Point POD since it is the demand that is causing the need to INC.
  - The dollar differences will be in the LMPs at the Non Participating Resource and the Interchange Point (POD)

Base	100										
FMM RTUC (15 min)	100			100			100			120	
RTD (5 min)	100	100	120	120	120	120	120	120	120	120	120	120
Metered Actuals	115	120	112	118	120	120	122	125	115	115	120	120

EIM Settlement Scenario – Point-to-Point Interchange

CC 64600: FMM Instructed Imbalance Energy

– In this scenario, the LMPs at the Interchange POD are higher than at the Non Participating Resource



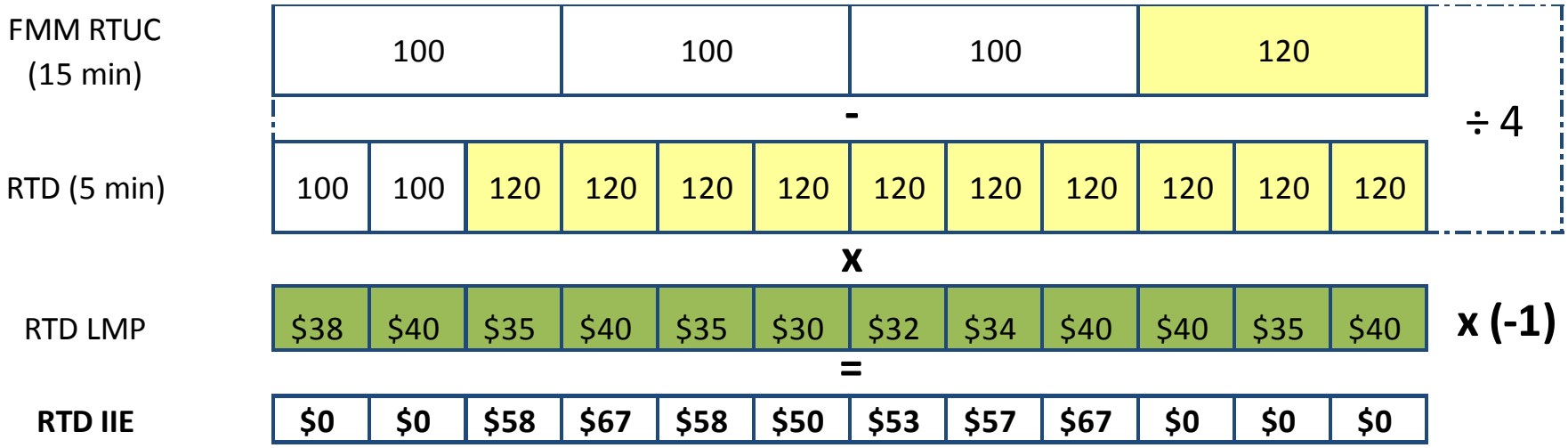
Total Interchange FMM IIE for the hour = $175 (charge)

- FMM IIE = ((Base – FMM RTUC) ÷ 4 x FMM LMP) x (-1)
- $FMM\ IIE_4$ = ((100 – 120) ÷ 4 x $35) x (-1)
- $FMM\ IIE_4$ = ((-20) ÷ 4 x $35) x (-1)
- $FMM\ IIE_4$ = $175

EIM Settlement Scenario – Point-to-Point Interchange

CC 64700: RTD Instructed Imbalance Energy

– In this scenario, the LMPs at the Interchange POD are higher than at the Non Participating Resource



Total RTD IIE for the hour = $410 (charge)

- RTD IIE = ((FMM RTUC – RTD) ÷ 12 x RTD LMP) x (-1)
- RTD IIE_4 = ((100 – 120) ÷ 12 x $40) x (-1)
- RTD IIE_4 = ((-20) ÷ 12 x $40) x (-1)
- RTD IIE_4 = $67

Changing the tag after T-40 results in a total charge of $585 for the operating hour ($175 + $410)

EIM Settlement Scenario – Point-to-Point Interchange

- **What results, is the following settlement for the Non Participating Resource generator and point of interchange**
  - Non-Participating Resource FMM IIE (CC 64600) = ($100)
  - Non-Participating Resource RTD IIE (CC 64700) = ($308)
  - Non-Participating Resource RTD UIE (CC 64750) = ($58)

+

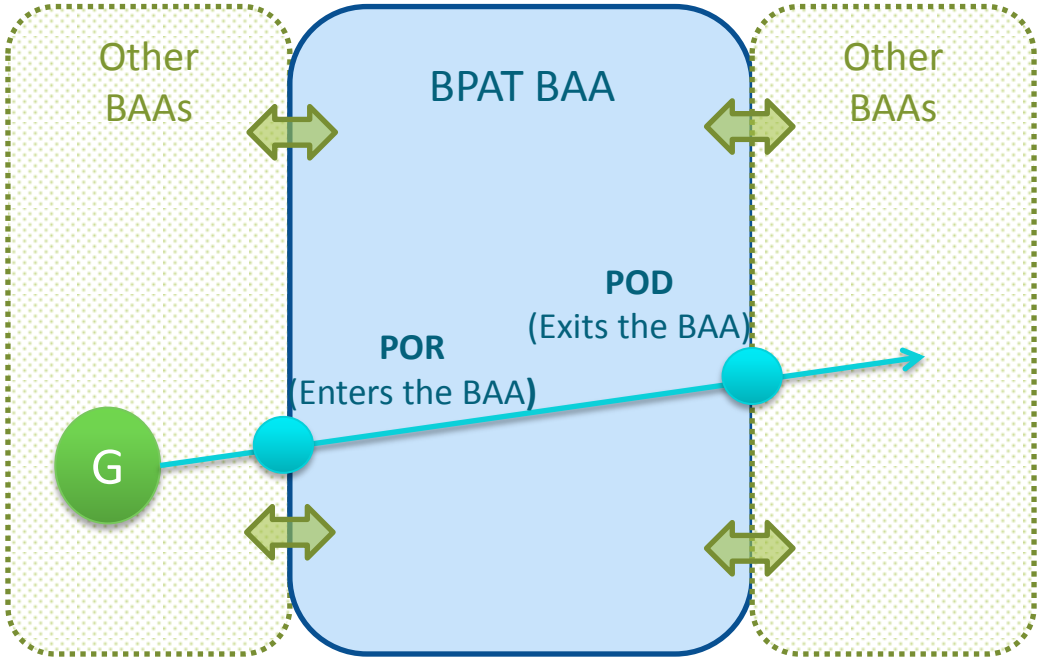
  - **Interchange FMM IIE (CC 64600) = $175**
  - **Interchange RTD IIE (CC 64700) = $410**

=

$119 charge to the EIM Entity Scheduling Coordinator

EIM Settlement Scenario – Wheel-Through Interchange

- Wheel-through Interchange is settled similarly to Point-to-Point
  - Both Interchange Points (POR and POD) will be settled for IIE
    - If one or more of the adjacent BAAs are also an EIM Entity, CAISO will settle for Interchange with each EIM Entity involved
    - If one or more of the adjacent BAAs is not an EIM Entity, CAISO will settle for interchange only with the EIM Entity for that specific Point of Interchange



Load Imbalance

EIM Settlement Scenario – Load Imbalance

- Load Imbalance is only settled for UIE (CC 64750)
  - Compares the Load Base Schedule to the Load "Metered Actuals"

- Load "Metered Actuals" are determined by a calculation before being submitted to CAISO

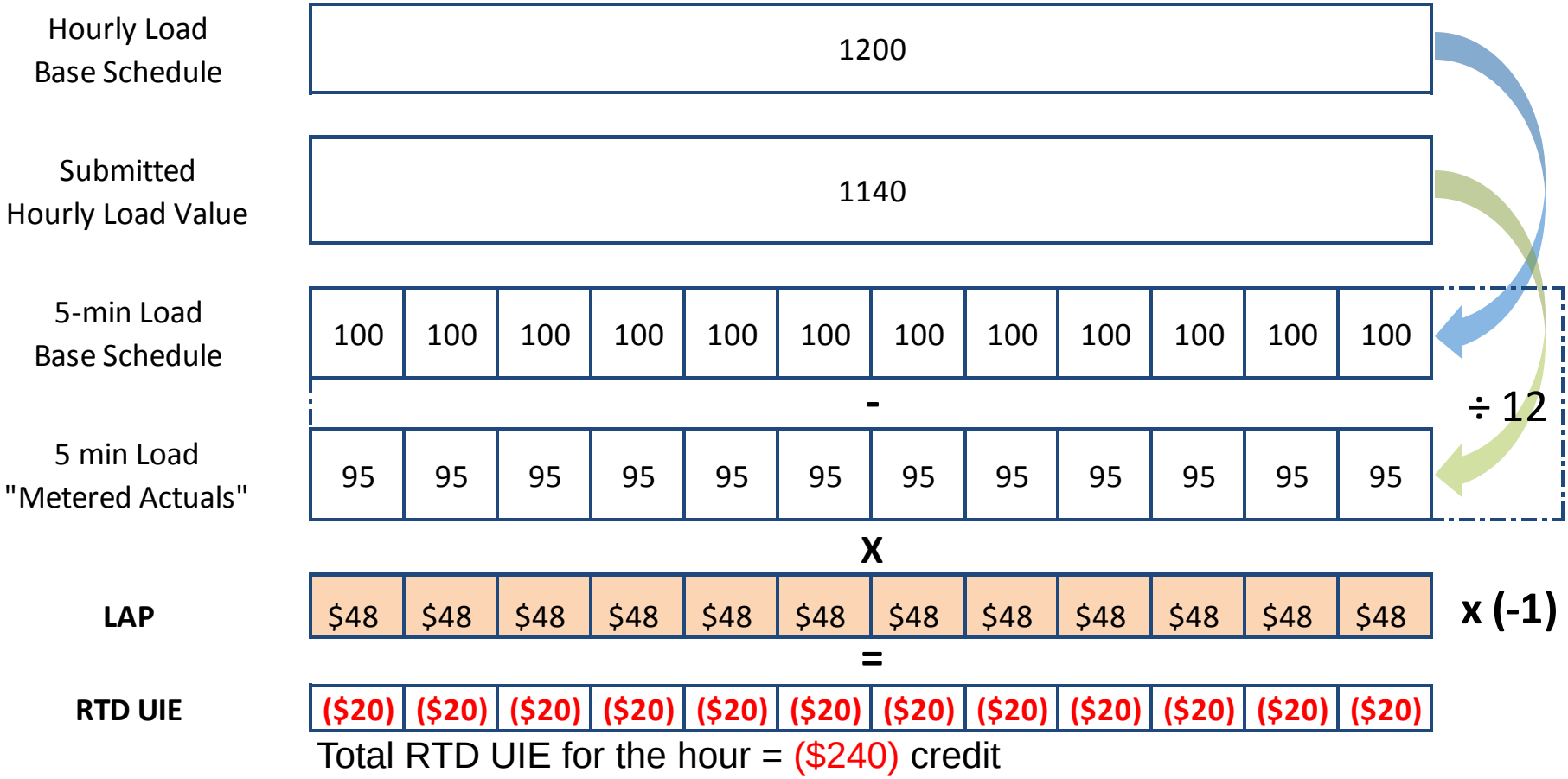
  $= \text{Sum}(GEN_{SQMD}) - \text{Sum}(INT_{SQMD}) - \text{Real Time Losses}$

- Load Settles at a Load Aggregation Point (LAP) price
  - Weighted average of the GEN and INT LMPs for the entire BAA

- Load is submitted to CAISO at the largest granularity of any specific Generation or Interchange meter point submitted, but always settled at the 5-minute LAP
  - If load is submitted at a granularity greater than 5-min, CAISO divides each hour accordingly to get the 5-min load values

EIM Settlement Scenario – Load Imbalance

CC 64750: RTD Uninstructed Imbalance Energy



Total RTD UIE for the hour = ($240) credit

- RTD UIE = ((Base – Actuals) ÷ 12 x LAP) x (-1)
- $RTD\ UIE_1$ = ((100 – 95) ÷ 12 x $48) x (-1)
- $RTD\ UIE_1$ = ((5) ÷ 12 x $48) x (-1)
- $RTD\ UIE_1$ = -$20

In-Flight Work

In-Flight Work

- Metering Inventory and Strategy
- Continued development of Charge Code knowledge
- Define internal processes
- Other Grid Mod projects
  - Customer Portal replacement
  - Customer Billing Center replacement

- The EIM Settlements topic will be revisited during an upcoming EIM Stakeholder meeting, likely in March 2019

Non-Federal Generation Participation

Non-Federal Generation Participation

- BPA will develop tools and processes for the non-FCRPS resources becoming EIM Participating Resources.

- Such participation will be offered consistent with principles of open access and non-discrimination.

- BPA has not made any determinations about how the provision of any Ancillary and Control Area Services may need to change under EIM participation, but we do expect to have discussion on topics including, but not limited to, the following as part of BP/TC-22 processes:
  - Resource sufficiency
  - VER/DER integration charges
  - Self-supply of balancing reserves
  - Data and metering requirements for EIM Participating and Non-Participating Resources
  - Scheduling Coordinator Metering Entity services
  - Transmission requirements for Participating Resources
  - Prior notice required by EIM Entity

EIM Participating Resource Agreements

- BPA will determine specific requirements, agreements, and forms unique to BPA as part of its tariff and BP development.

- The following agreements are required for ALL EIM Participating Resources
  - EIM Participating Resource Agreement (CAISO/Resource)
    - http://www.caiso.com/Documents/AppendixB19_EIMParticipatingResourceAgreement_Asof_Jul01_2014.pdf
  - EIM Participating Resource Scheduling Coordinator Agreement (CAISO/SC)
    - http://www.caiso.com/Documents/AppendixB20_EIMParticipatingResource_SchedulingCoordinatorAgreement_Asof_Jul01_2014.pdf.

Next Steps

- Next meeting scheduled for **Wednesday January 16th** at the Rates Hearing Room in the afternoon.
  - WebEx and Phone participation will be available
  - Agenda and materials will be distributed in advance via Tech Forum

- We welcome feedback on this meeting. Your comments will help shape future EIM Stakeholder Meetings, please email us at techforum@bpa.gov and reference "EIM Stakeholder Meeting" in the subject. Comments are due by January 3rd Thursday.

- 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

Appendix

Locational Marginal Price (LMP) Examples

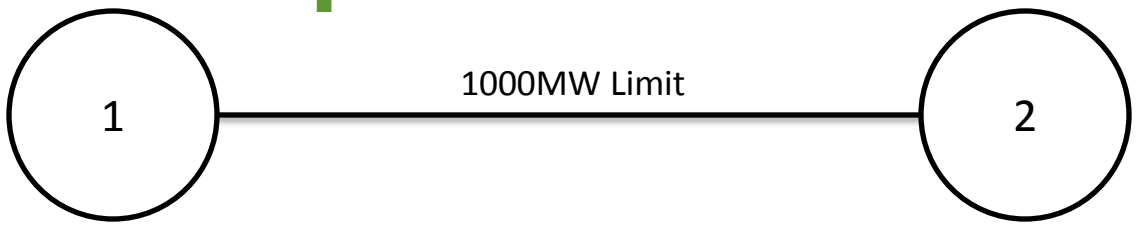
LMPs & GHG

- GHG compliance cost component of the LMP is the rate the market uses to calculate a payment to each generator in an EIM BAA for its output that is determined to serve ISO imbalances. This payment is funded through the price paid within the ISO for imbalance energy embedded in the system marginal cost of energy.

- For resources in an EIM entity's BAA, there are no GHG compliance costs when the resources serve load outside of the ISO. The EIM design allows EIM participating resources to submit two bids: (1) an energy bid and (2) a GHG bid adder.

- To avoid charging EIM entities for GHG compliance outside of California, the LMP of nodes in the EIM footprint outside of the ISO balancing authority area will include a negative GHG component if there is an EIM transfer into the ISO; otherwise, the value is zero.

LMP Example

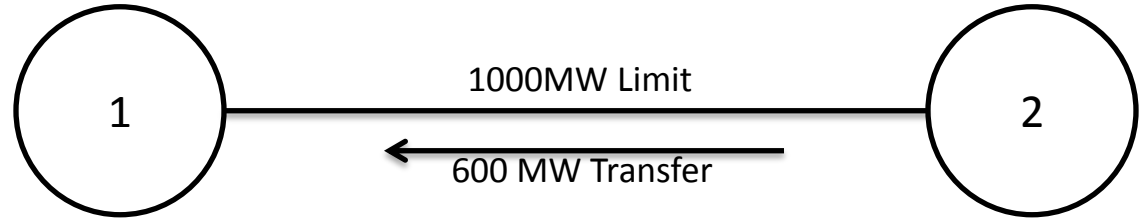


Demand = 600 MWh
Generator 1 (G1) Marginal Cost (MC) = $35/MWh
G1 Base Schedule (BS) = 600 MWh

Demand = 200 MWh
Generator 2 (G2) Marginal Cost (MC) = $20/MWh
G2 Base Schedule = 200 MWh

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

LMP Example (unconstrained)

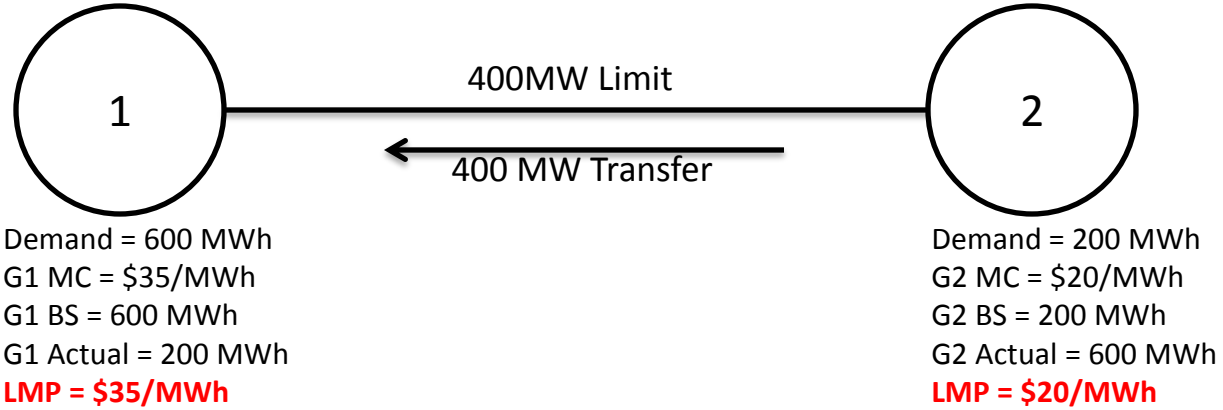


Demand = 600 MWh
G1 MC = $35/MWh
G1 BS = 600 MWh
G1 Actual = 0 MWh
LMP = $20/MWh

Demand = 200 MWh
G2 MC = $20/MWh
G2 BS = 200 MWh
G2 Actual = 800 MWh
LMP = $20/MWh

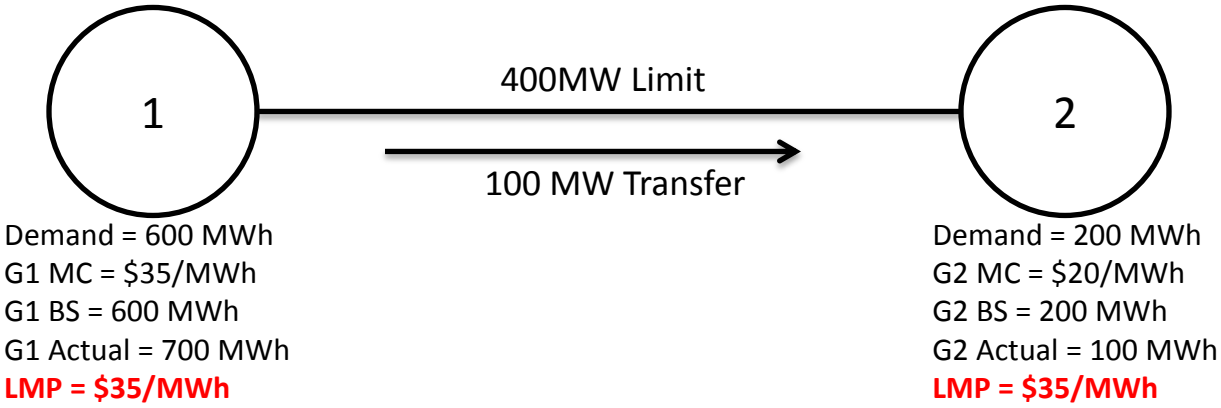
- If the transfer of energy between the two zones is unconstrained
  - G2 would serve the local 200 MWh of demand and the 600 MWh of demand in zone 1
  - There would be a transfer of 600 MWh from zone 2 to zone 1
- The LMP (i.e., cost to serve the next increment of demand) at both zone 1 and zone 2 would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

LMP Example (constrained)



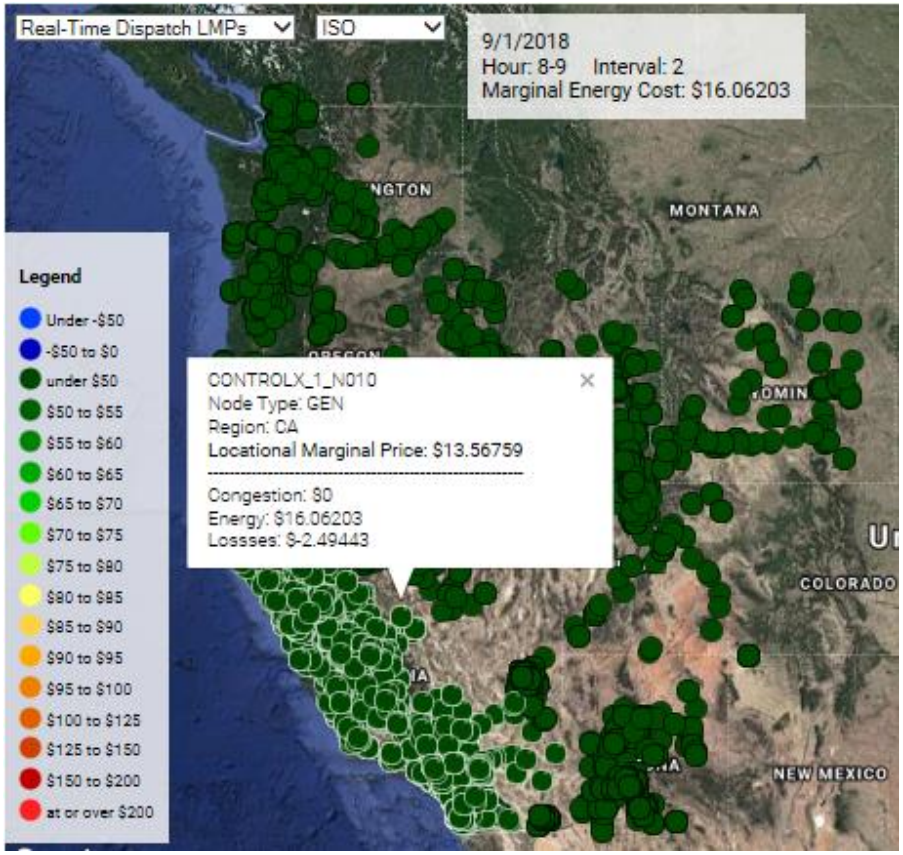
- If the transfer of energy between the two zones was limited to 400 MW
  - G2 would serve the local 200 MWh of demand, but could only transfer 400 MWh to zone 1 due to the constraint
  - G1 would have to service the remaining 200 MWh of demand in zone 1
  - The marginal cost of energy (LMP) in zone 2 would be $20/MWh
  - The marginal cost of energy (LMP) in zone 1 would be $35/MWh
- G1 would pay $35/MWh for the 400 MWh energy from G2
- G2 would be paid $20/MWh for the additional 400 MWh of energy produced to serve zone 1's demand
- EIM would collect from G1 $14,000 ($35 x 400)
- EIM would pay G2 $8,000 ($20 x 400)
- EIM collected excess revenue of $6000 ($14,000 - $8,0000) - this excess revenue is called "congestion revenue."

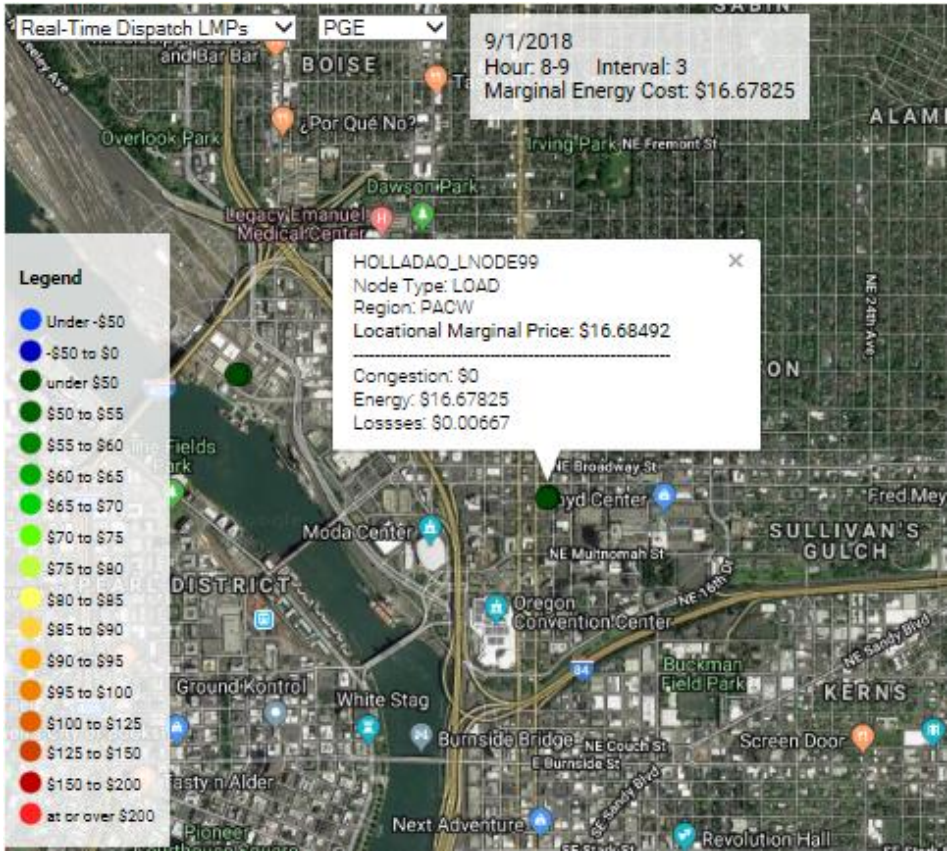
LMP Example (G2 Derate)



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

LMP Price Map





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