



EDAM

EXTENDED DAY-AHEAD MARKET

EDAM Revised Straw Proposal – Stakeholder Meeting

September 14, 2022



California ISO

AGENDA

Time	Topic
8:00 - 8:10	Welcome and overview
8:10 - 9:00	Day-Ahead Processes: GHG Accounting
9:00 – 10:00	Post Day-Ahead: Transfer Revenue and Congestion Revenue Allocation
10:00 - 10:15	Break
10:15 - 11:15	Post Day-Ahead: Settlements
11:15 - 11:45	EDAM Fees Framework
11:45 - 12:00	Next steps

EDAM

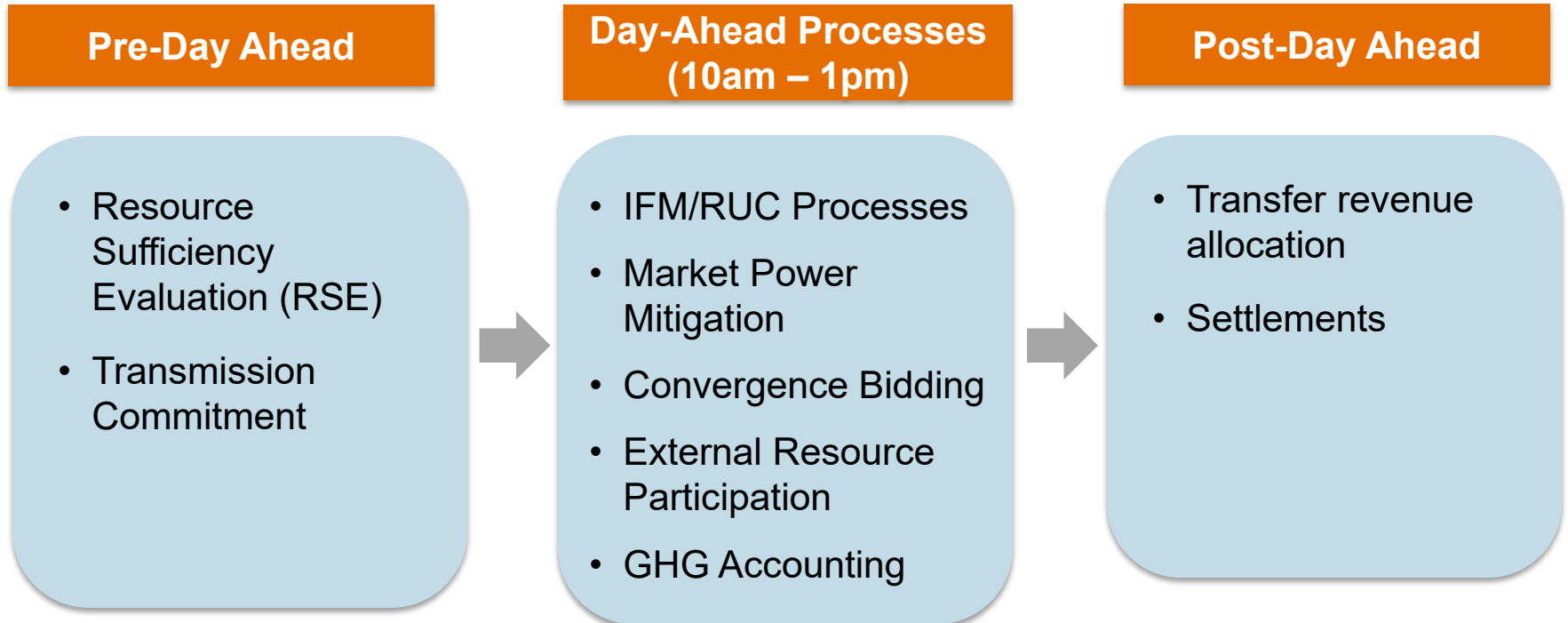
EDAM Straw Proposal Walkthrough – Processes and Activities

Milos Bosanac, *Regional Markets Sector Manager, Market
and Infrastructure Policy*



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EDAM design components – an overview



EDAM

GHG Accounting

Anja Gilbert, Lead Policy Developer, Market and Infrastructure Policy



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GHG Accounting Approach at the Start of EDAM

- The proposal adopts the resource specific approach to GHG accounting at the start of EDAM.
- Stakeholders are familiar with the design as an extension of the WEIM, it is the most defined option, it requires the least amount of implementation changes, and it will require fewer regulatory changes compared to the other proposals.
- We will continue to evaluate alternate approaches for evolving the EDAM GHG accounting design in the future.

Scalability and Adaptability

The GHG design will continue to evolve

- The resource-specific model implementation is foundational and allows for evolution to the zonal or LADWP approach, should state regulators move in that direction.
- The resource-specific model is also flexible enough to include additional constraints to reflect state climate goals that are not based on price.
 - These constraints could exclude resources with “x” emissions factor or certain resource types.
 - This would only apply to the resource specific and LADWP approaches.

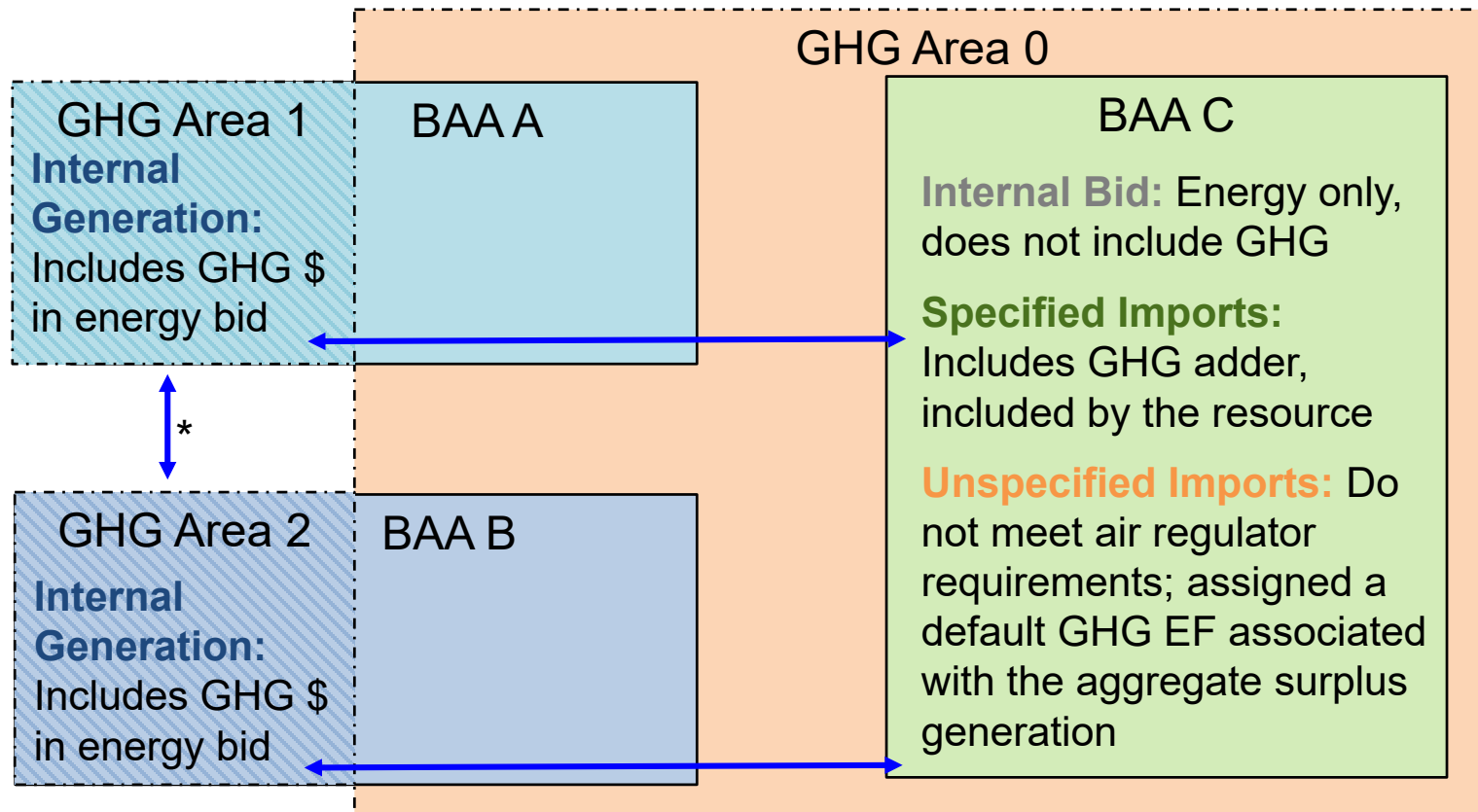
Common Elements of All of the Proposals:

1. Geographic Boundaries: The CAISO will define the GHG regulation areas based on state geographical boundaries as opposed to BAA boundaries. This will allow CAISO to reflect the costs associated with GHG pricing program compliance, but not reflect these costs in the dispatch of resources not subject to these programs

2. Treatment of resources in the GHG Reference Pass: Any self-schedules or bids from pseudo-tied resources would be included in the GHG Reference Pass

Resource Specific

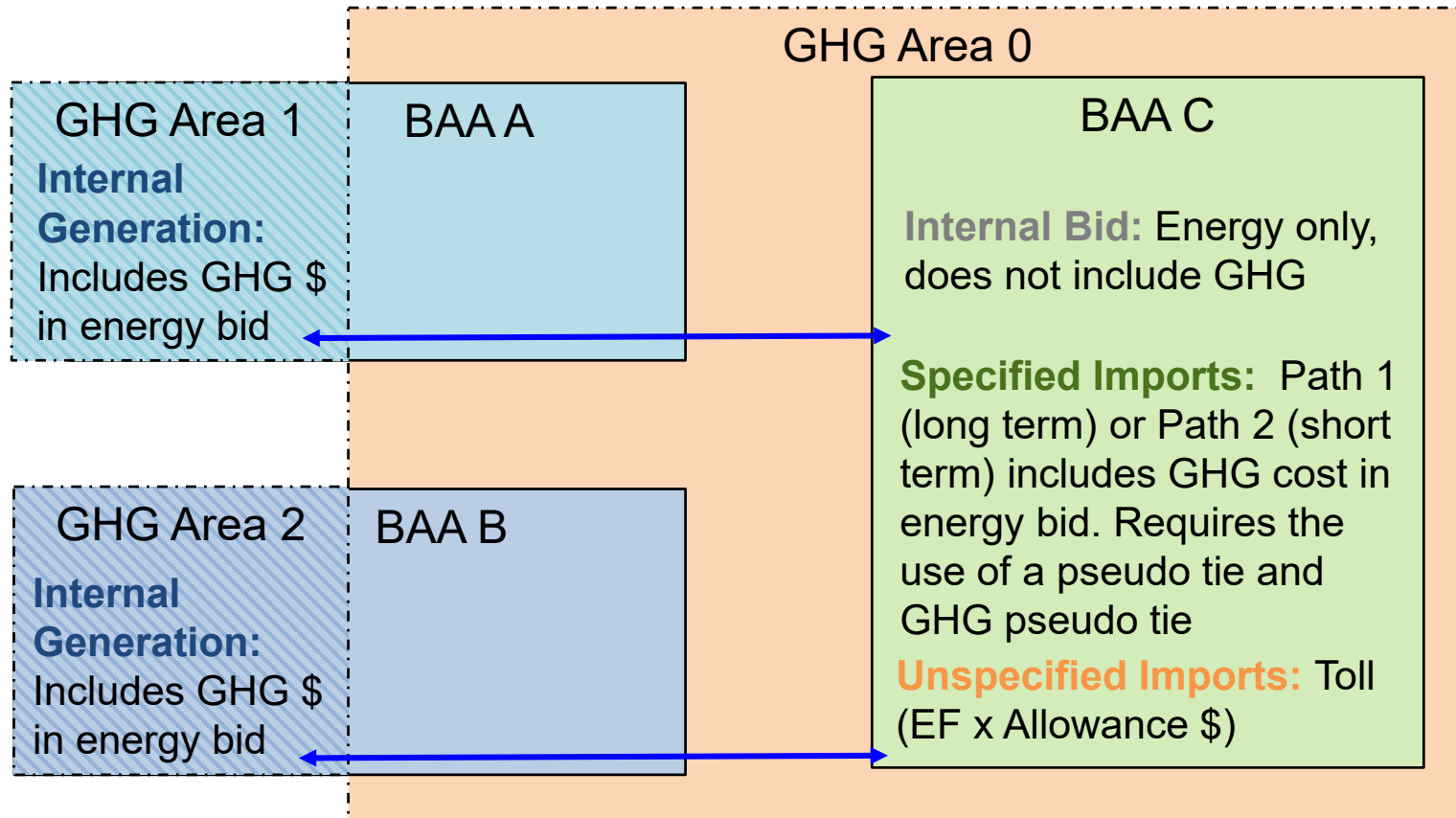
An extension of the WEIM design that uses resources specific GHG bid adders to optimize GHG dispatch. Requires compliance and reporting by non-GHG regulation areas if their resources are attributed.



* **Between GHG regions:** unlinked (GHG bid adder); linked (energy bid includes GHG \$)

Zonal

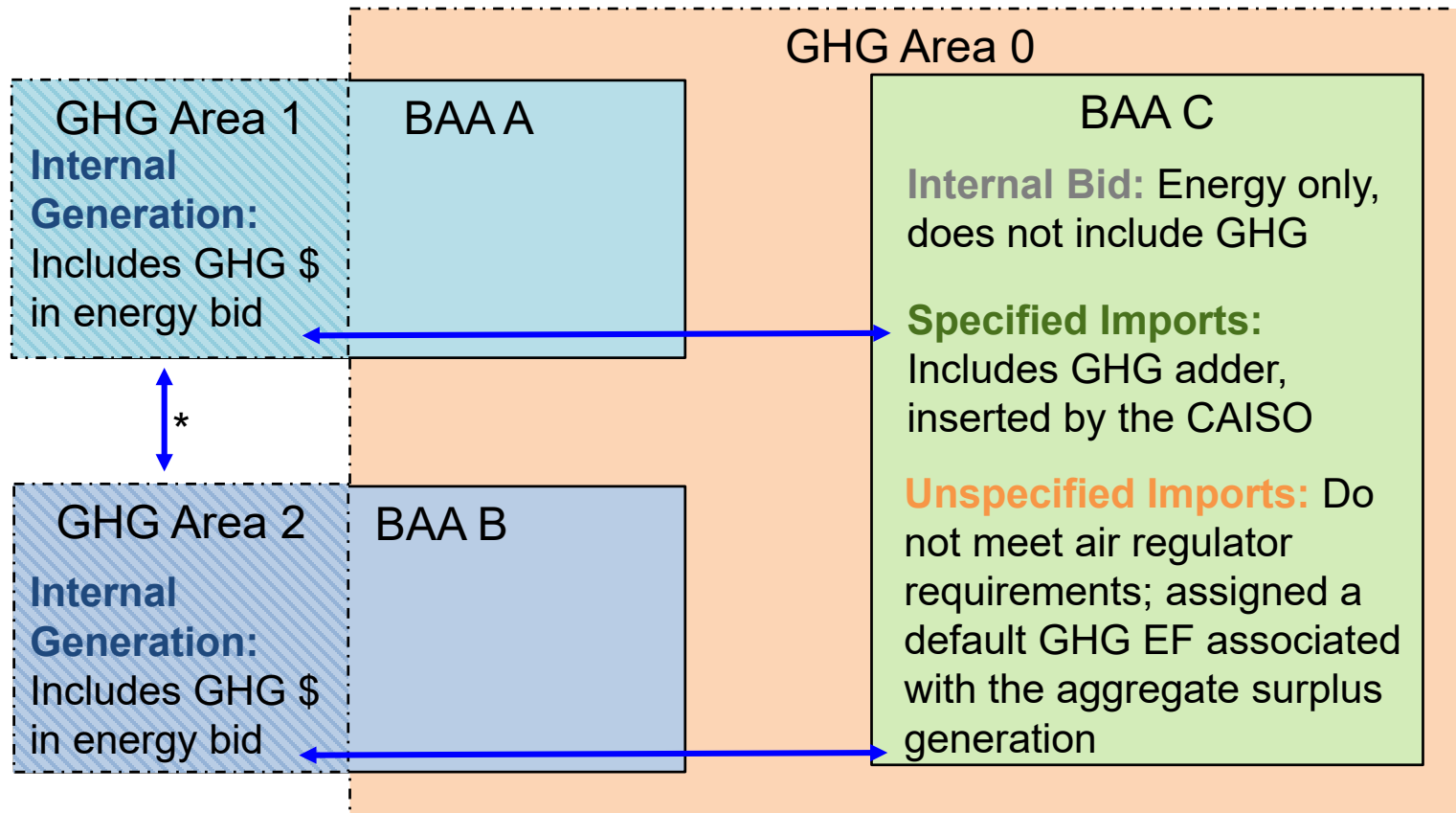
The design offers a source specific pathway, otherwise a toll applies to transfers. Compliance and reporting would be handled by the CAISO.



- **Between GHG regions:** unlinked (specified P1 or P2 or unspecified import toll); linked (opportunity for transfers to occur without a hurdle rate)

LADWP

An extension of the resource specific design with three key changes: (1) CAISO would insert bids for non-GHG area resources; (2) imports would use load based accounting by GHG area LSEs; and (3) it eliminates compliance and reporting by non-GHG area resources.



* **Between GHG regions:** unlinked (GHG bid adder); linked (energy bid includes GHG \$)

Leakage and Secondary Dispatch

	Leakage or Secondary Dispatch	Quantification
Resource Specific	Yes, secondary dispatch can arise as a result of higher emitting resources backfilling lower emitting resources serving GHG regulation area load.	<p>Secondary dispatch can be estimated as the sum of GHG attributions below the GHG reference.</p> <p>Secondary dispatch emission cost can be addressed by state air regulators.</p>
Zonal	Leakage can occur if the toll is set too low.	The approach does not include a GHG counterfactual or means of quantifying leakage.
LADWP	Yes, secondary dispatch can arise as a result of higher emitting resources backfilling lower emitting resources serving GHG regulation area load.	<p>Secondary dispatch can be estimated as the sum of GHG attributions below the GHG reference.</p> <p>The approach plans to account for secondary dispatch through a total emissions calculation to be worked out with state air regulators.</p>

For all proposals, air regulators may choose to address this emissions leakage with regulatory tools. In WEIM this is addressed by CARB through the Outstanding Emissions Calculation

Resource Specific Approach: GHG Attribution and Secondary Dispatch

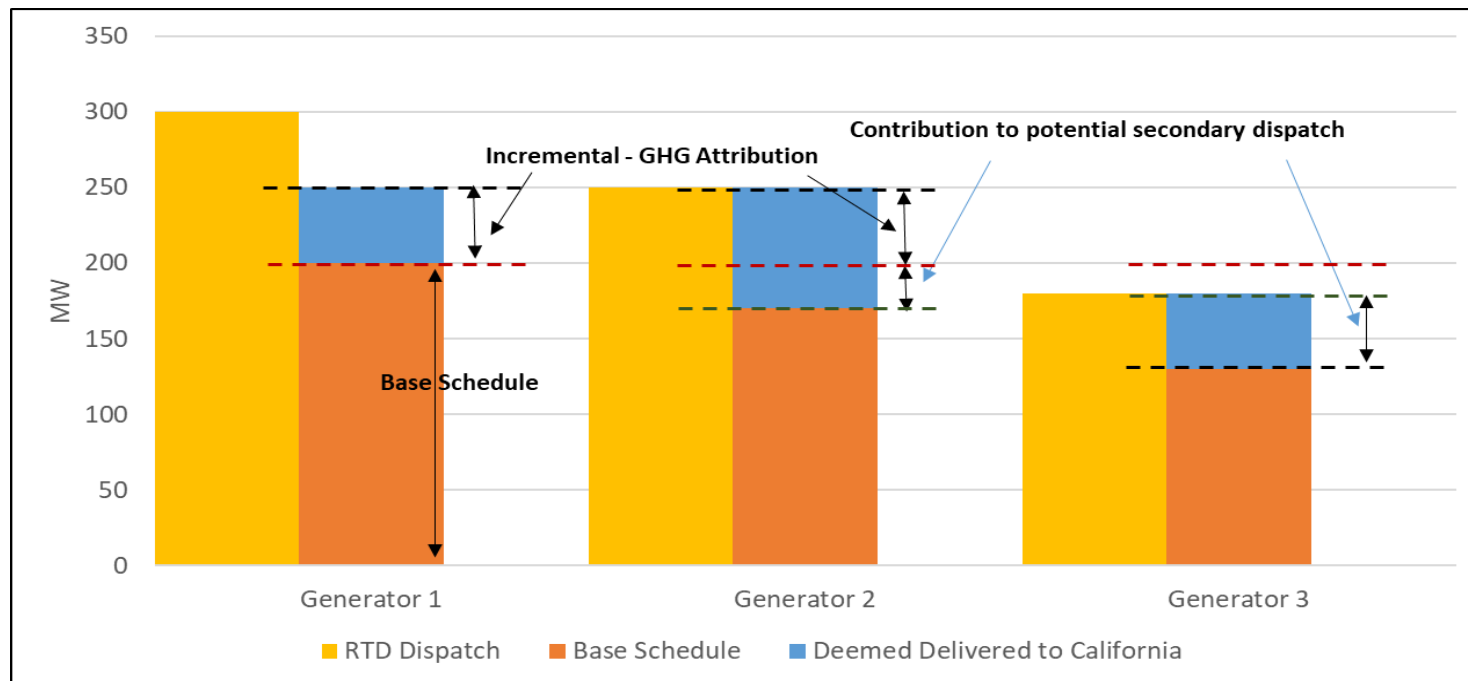
The optimization takes the total imports for a GHG regulation area and then attributes resources (based on their composite energy and GHG bid) lowest to highest. The marginal resource sets GHG price.

This process results in the market attributing transfers to lower emitting resources which may result in higher-emitting (*i.e.* more expensive) resources backfilling this attribution to serve load in other BAAs (secondary dispatch).

Calculating secondary dispatch allows states to quantify and take responsibility for their atmospheric impact if they choose to do so.

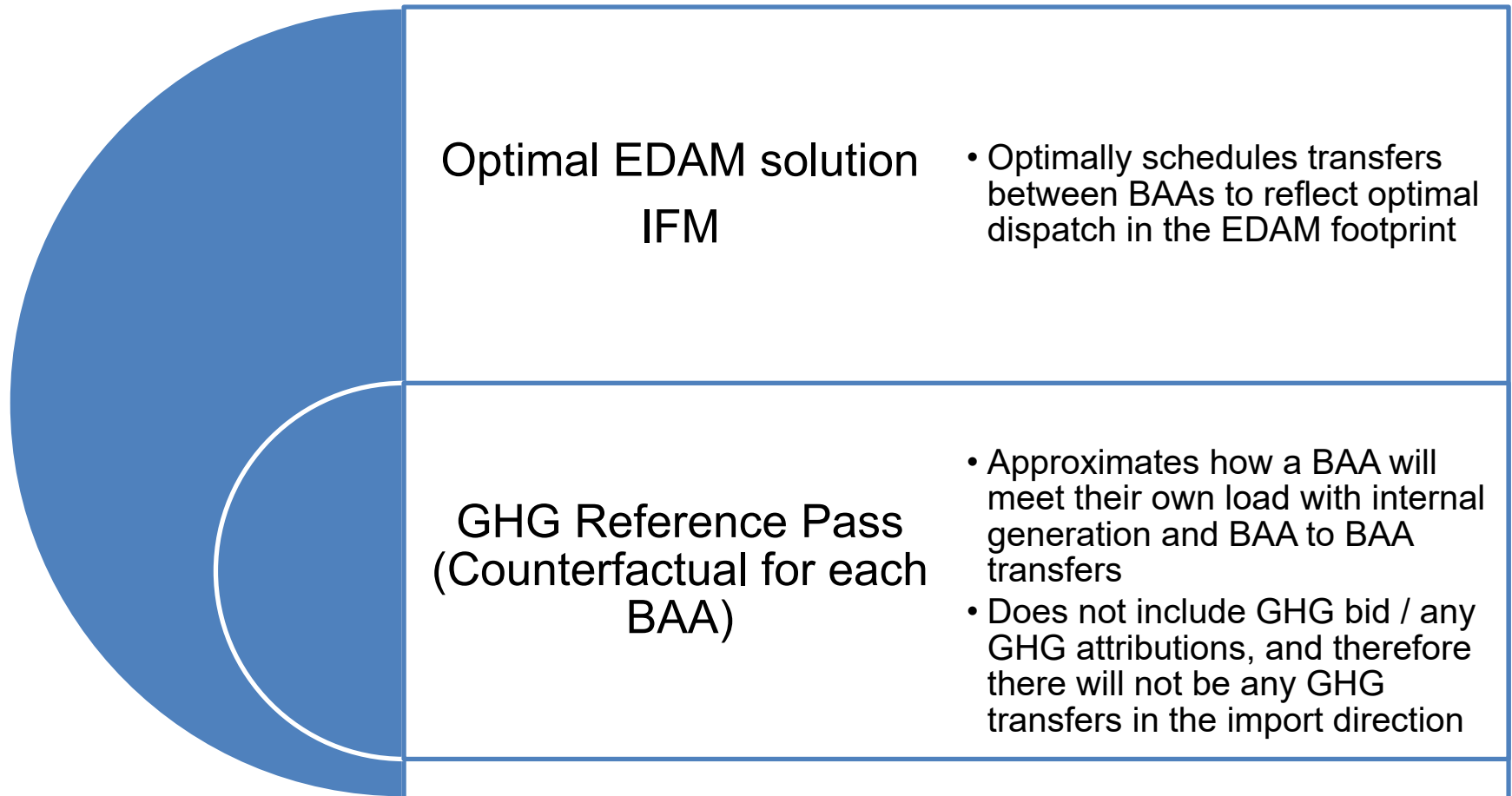
Resource Specific Approach: WEIM Attribution Example

Gen in EIM Area	Type	Base Schedule (MW)	RTD Dispatch (MW)	GHG Attribution – Deemed Delivered to California (MW)	Contribution to potential Secondary Dispatch (MW)
Gen 1	Hydro	200	300	50	0
Gen 2	Gas	200	250	80	30
Gen 3	Hydro	200	180	50	50



GHG Reference Pass

The counterfactual to determine secondary dispatch would be based on a market run before the actual market run (“GHG reference pass”). Identical to IFM (but without GHG).



The GHG Reference Pass would include any self-schedules/bids from pseudo-tied resources

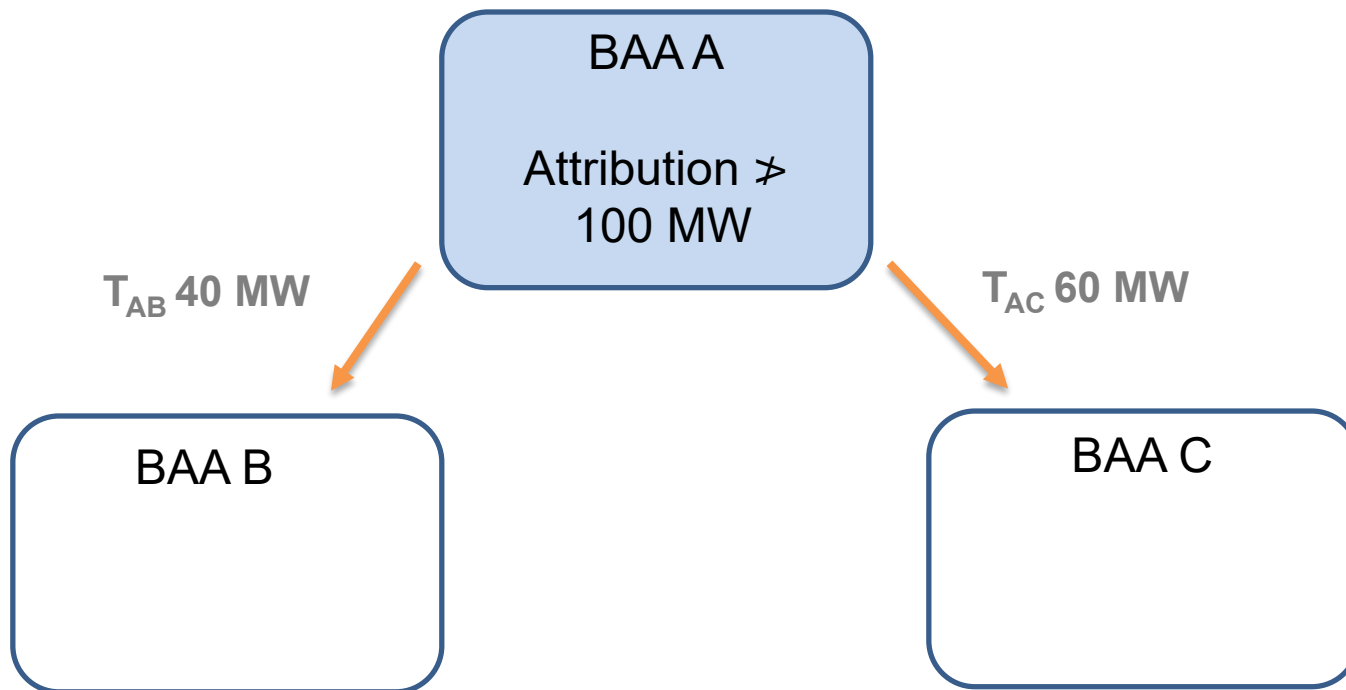
Resource Specific Approach: GHG Constraints to Limit Secondary Dispatch

The proposal reduces secondary dispatch, but does not eliminate it. Measures are in place to limit attribution, which will also result in limiting transfers

1. The GHG bid capacity, the optimal dispatch, and the difference between the upper economic limit (UEL) and the GHG Reference Pass: $\text{GHG MW} = \max(0, \min(\text{GHG Bid}, \text{UEL} - \text{GHG Reference Pass}, \text{Optimal Dispatch}))$
2. The hourly net export constraint: This constraint will not allow GHG attribution when they are:
 - Above BAA transfer limits (set by transmission made available in EDAM)
 - If the BAA is a net importer

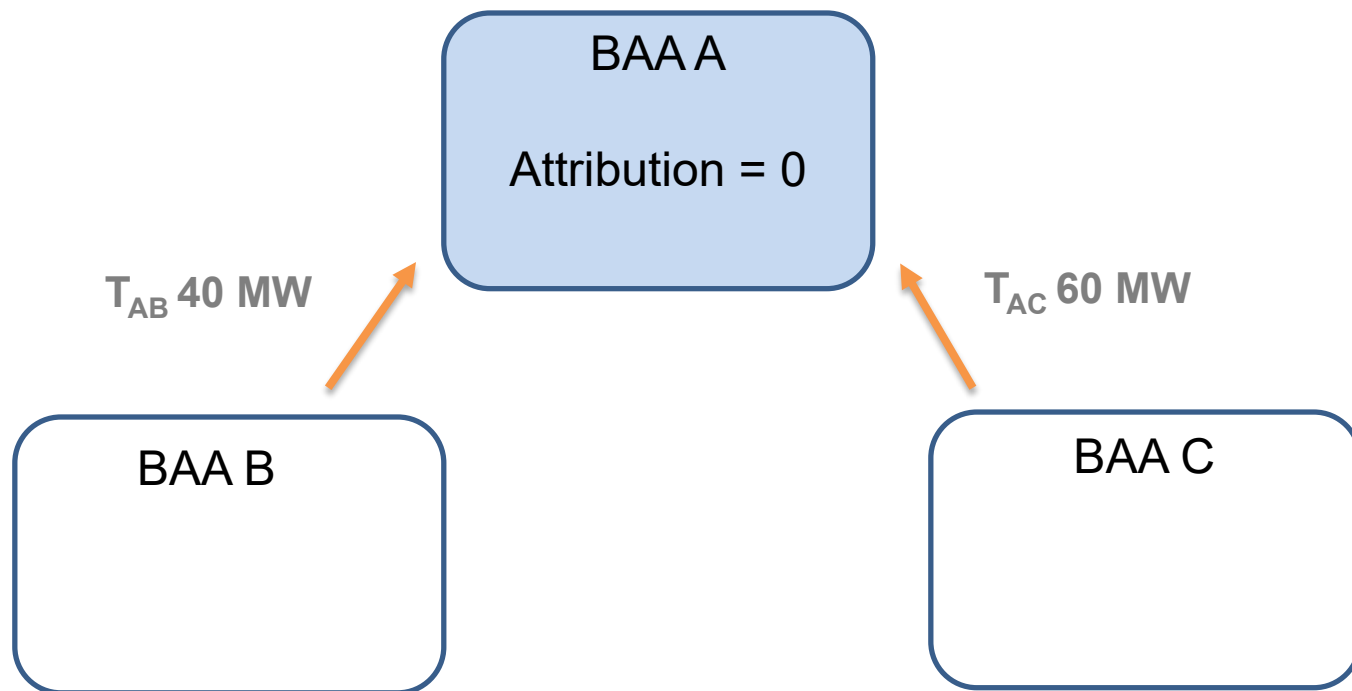
Example: BAA Attribution as a Net Exporter

- BAA A is a non-GHG regulation area that exports to BAA B and BAA C
- Net exports for HE 16, based on transmission made available in EDAM, is 100 MW total for BAA A (40 MW → BAA B and 60 MW → BAA C); total attribution cannot exceed 100 MW



Example: BAA Attribution as a Net Importer

- BAA A is a non-GHG regulation area that is a net importer in HE 16
- As a result, in HE 16 total attribution will be zero



Resource Specific Approach: Reporting to support states and market participants

State reported data:

- Today CAISO reports total and EIM-entity level MWh GHG attributions to CARB. Through OATI, CARB collects total MWh of tagged imports (outside the WEIM) which is used to quality assure imports reported to CARB under the Mandatory Reporting Regulation (MRR)
- The CAISO is willing to provide total WEIM and EDAM transfers to states with and without GHG pricing programs

Market participant reported data:

- Currently, WEIM market participants receive
 - Settlement statements which include GHG attribution
 - GHG attributions through CMRI
- In EDAM, the CAISO will provide settlement statements which include GHG attribution DA and RT (deviation from DA)

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Day Ahead Market Outputs

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Day Ahead Market Outputs: Transfer Revenue and Congestion Revenue Allocation

James Lynn, Principal, Market Settlement Design



California ISO

Terminology

- Intertie transmission constraint (ITC):
 - Aggregate limit on schedules, including non-EDAM/non-WEIM import and export schedules and transfer schedules, that clear market at one or more scheduling points and/or one or more transfer point
 - ITC-like constraints are respected on various WEIM entity systems today.
- Transfer scheduling limit:
 - Aggregate limit of transfer schedules, co-optimized for energy and capacity, determined from submitted intertie Available Transfer Capacity (ATC) and any updates due to planned or forced outages or derates
- Transfer revenue:
 - price difference between the marginal energy component of the LMP between BAAs
 - net transfer scheduling limit reached for an EDAM BAA at interfaces with other EDAM BAAs.
- Congestion revenue:
 - price differences in the marginal congestion component of LMP
 - triggered when internal system congestion materializes or intertie constraints (ITC) binding

WEIM Energy Transfer System Resource (ETSR) background

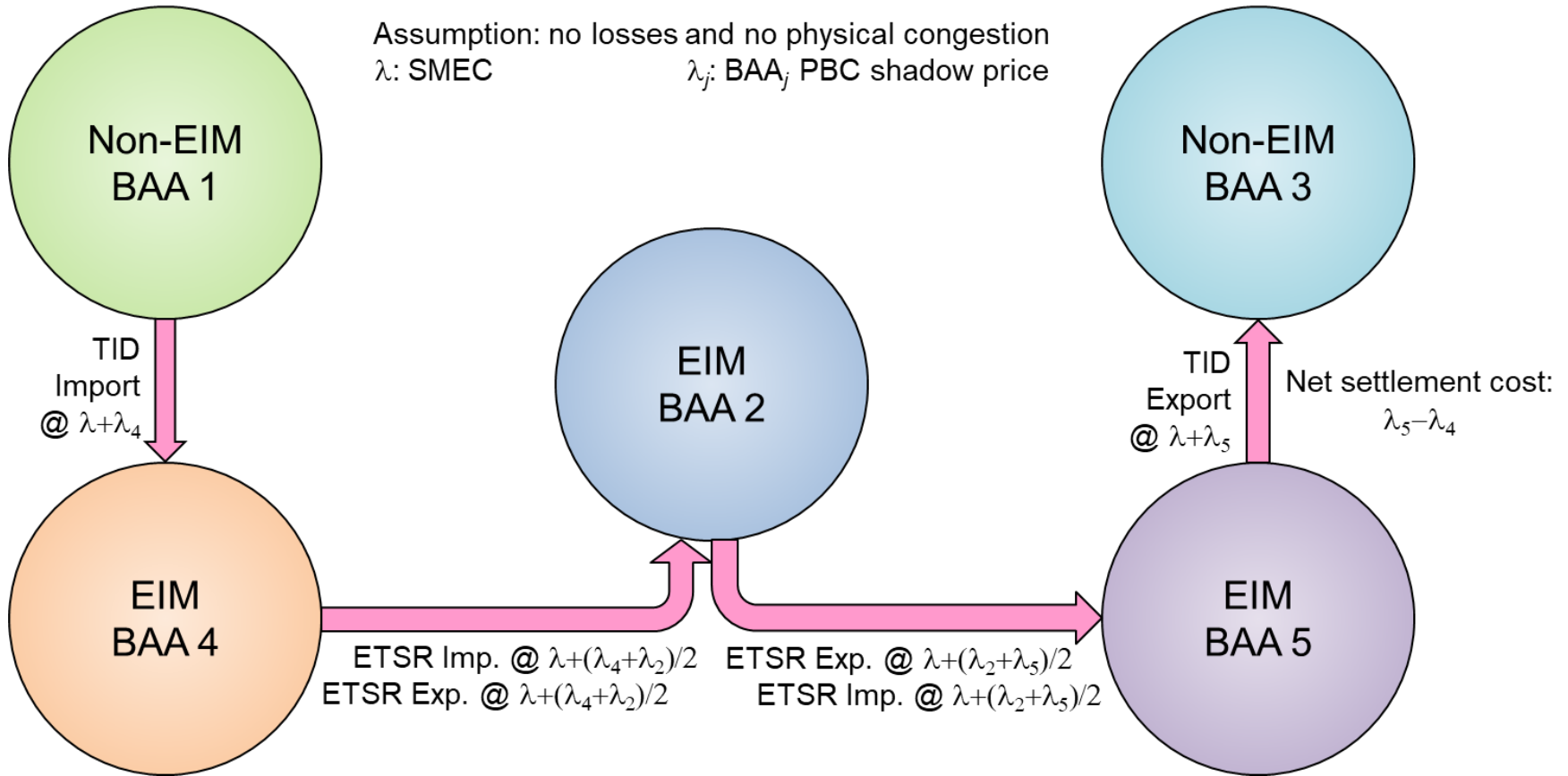
- What is a WEIM ETSR?
 - Transfer of energy between an two BAAs within WEIM Area using transmission capacity made available (ATC) by the WEIM Entity
 - Aggregate resources at the Default Generation Aggregation Point (DGAP),
 - Represent an aggregation of all supply resources within the BAA
 - Dedicated System Resources, as either an import or an export, at an associated WEIM/CAISO intertie
- WEIM ETSR Type:
 - Base ETSR: Transfer of Energy between two BAAs procured ahead of WEIM through bi-lateral market
 - Static and Dynamic ETSR: Transfer of energy between two BAAs procured through market optimization

WEIM Transfer and Congestion Revenue Allocation

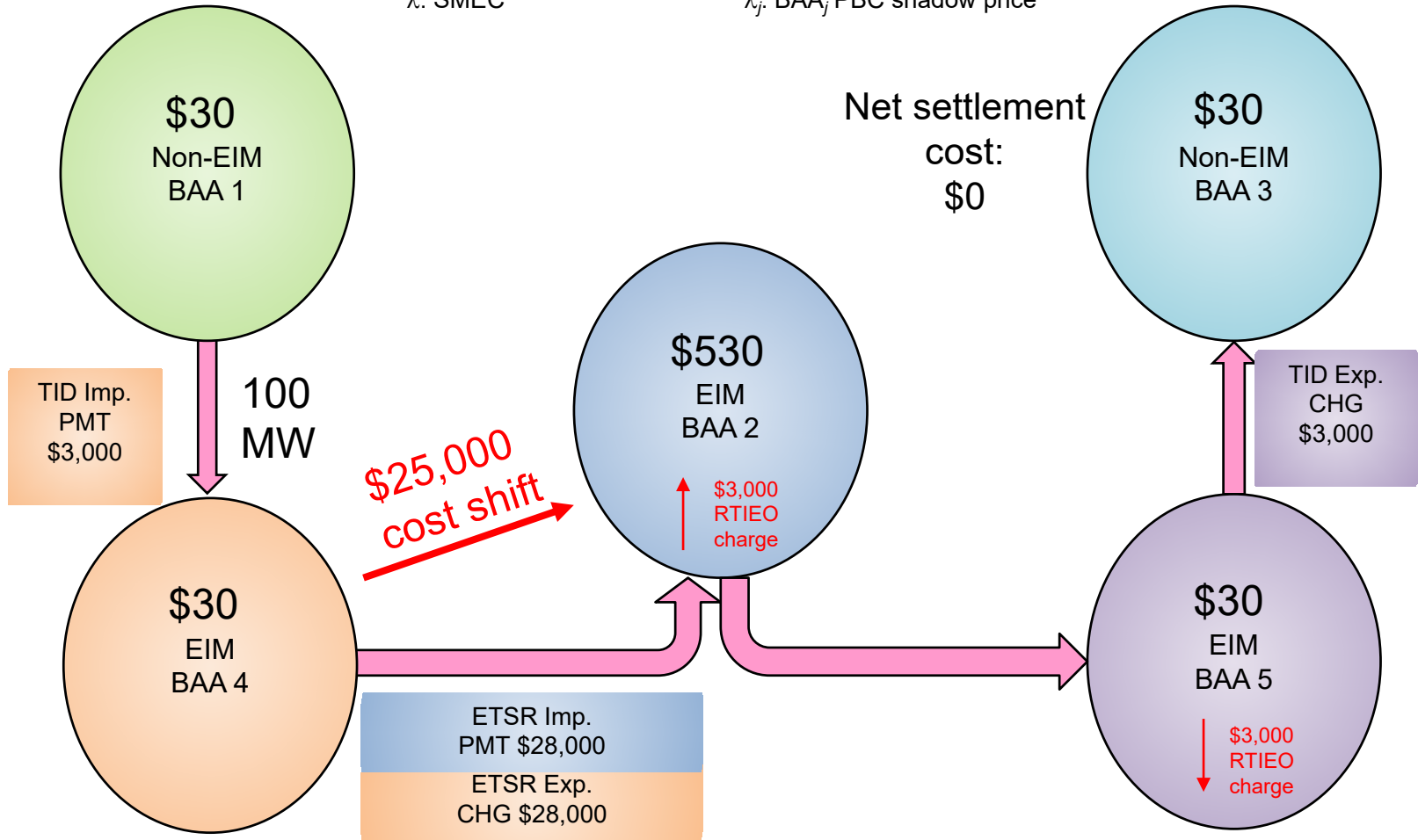
- In the WEIM, transfer congestion revenue is not differentiated explicitly from internal congestion revenue, it is all termed congestion revenue.
 - Congestion revenue accrues when either internal or transfer constraints bind.
 - Reflects both energy and congestion price differences.
- Congestion revenue in WEIM is allocated as follows:
 - Transfer constraint:
 - 50:50 allocation between WEIM BAAs
 - 100:0 allocation between WEIM BAA and CISO BAA
 - Internal congestion: allocation 100% to the BAA
 - ITC congestion revenue: allocation 100% to BAA where it is binding

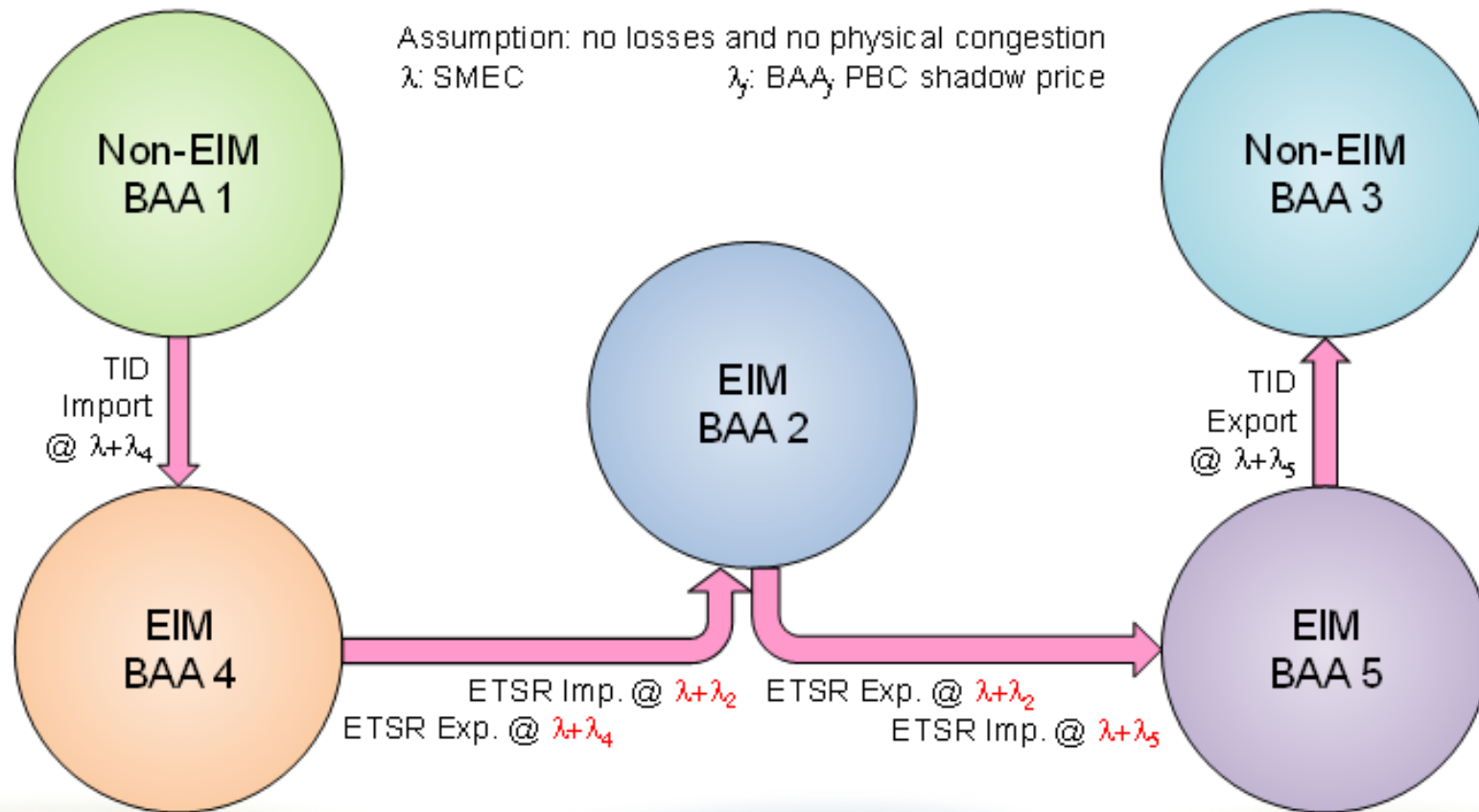
Asymmetrical Wheeling issue review

- Identified a settlement issue when energy wheels through multiple EIM BAA and there is a power balance constraint in one of the EIM BAAs
- Cost can inappropriately shift between EIM BAAs if all wheeling schedule changes are not settled
- Exacerbated by the Base ETSR deviation settlement optionality

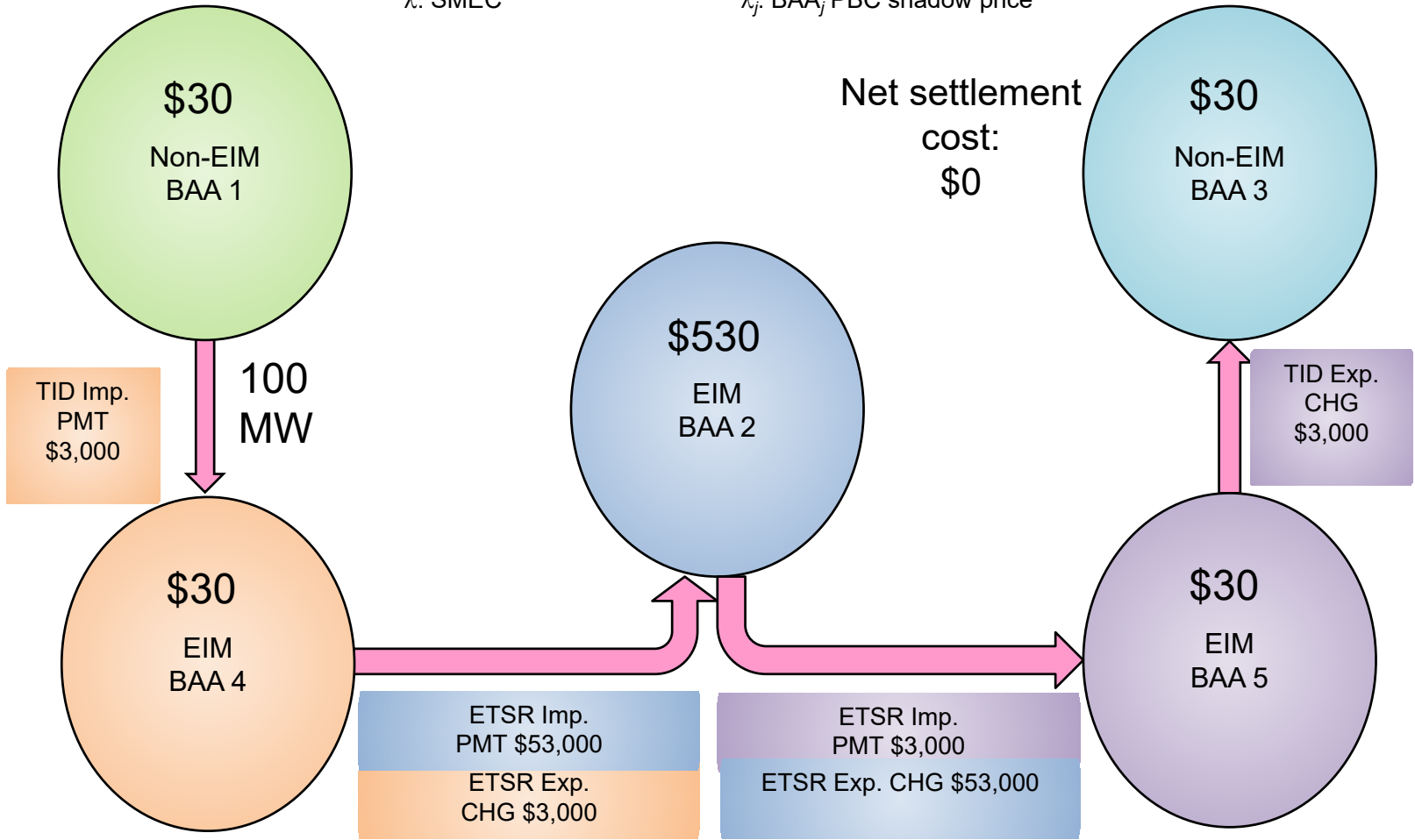


Assumption: 100 MW flow, no losses and no physical congestion
 λ : SMEC λ_j : BAA_j, PBC shadow price





Assumption: 100 MW flow, no losses and no physical congestion
 λ : SMEC λ_j : BAA_j PBC shadow price



Real Time Settlement review

- Asymmetrical Wheeling short term solution:
 - Mandatory settle all base transfer deviation
 - Settlement base transfer deviation at the respective SP-Tie LMP
- Asymmetrical Wheeling long term solution:
 - Consider the EIM BAA PBC shadow price part of the Marginal Energy Component of LMP
 - Currently part of the Marginal Congestion Component
 - There will not be a System Marginal Energy Cost
 - Each BAA will have its own Marginal Energy Price
 - All Transfer (Base/Static/Dynamic) deviations will be settled at the respective SP-Tie LMP

Transfer Revenue Allocation (1 of 2)

- **Transfer Types:**
 - *Energy transfer revenue*: Price differences between the Marginal Energy Cost (MEC) component of the LMP across EDAM BAAs
 - BAA MEC is the shadow price of the power balance constraint of that BAA
 - *Imbalance Reserve Transfer Revenue*: Price differences between the imbalance reserve capacity up price/imbalance reserve capacity down price (IRUP/IRDP) across BAAs
 - BAA IRUP/IRDP is the shadow price of the IRU/IRD procurement constraint of that BAA, respectively
 - *Reliability Capacity Transfer Revenue*: Price differences between the Reliability Capacity Up Price/Reliability Capacity Down Price (RCUP/RCDP) across BAAs
 - BAA RCUP/RCDP is the shadow price of the RCU/RCD procurement constraint of that BAA, respectively

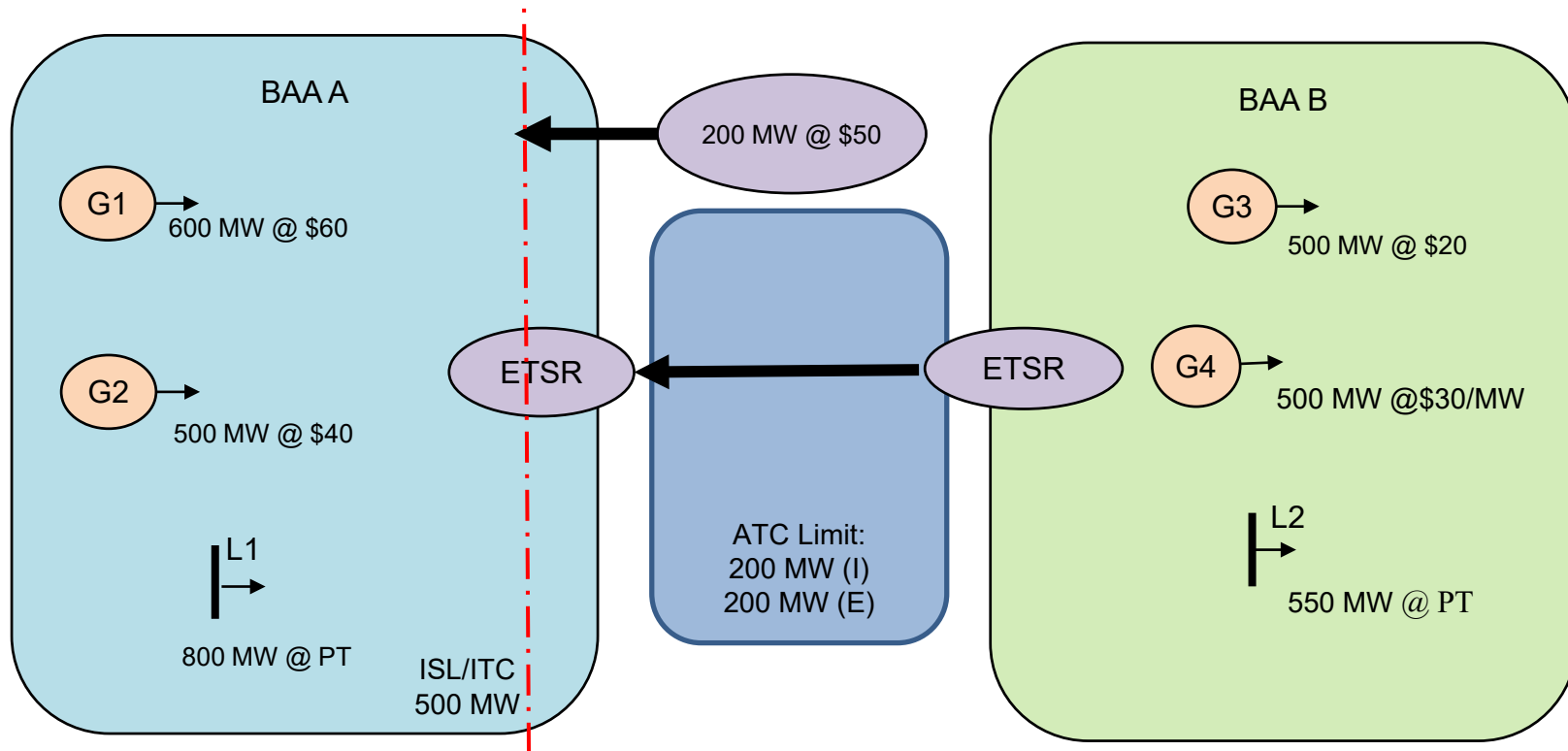
Transfer Revenue Allocation (2 of 2)

- Transfer Revenue Collection
 - The differences between import transfers settlement and export transfer settlement when transfer constraint binds
 - Energy transfers, Imbalance Reserve transfers, Reliability Capacity transfers
- Transfer Revenue Allocation (in proportional to transmission):
 - BAAs associated with transfer location share in distribution, 50:50
 - EDAM BAAs will allocated per OATT
 - CAISO BAA will allocated to Metered Demand
 - Transmission Customer who releases transmission right to market (pathway 2) will receive 100 percent of Transfer Revenue associated with their transmission rights

Congestion Revenue Allocation

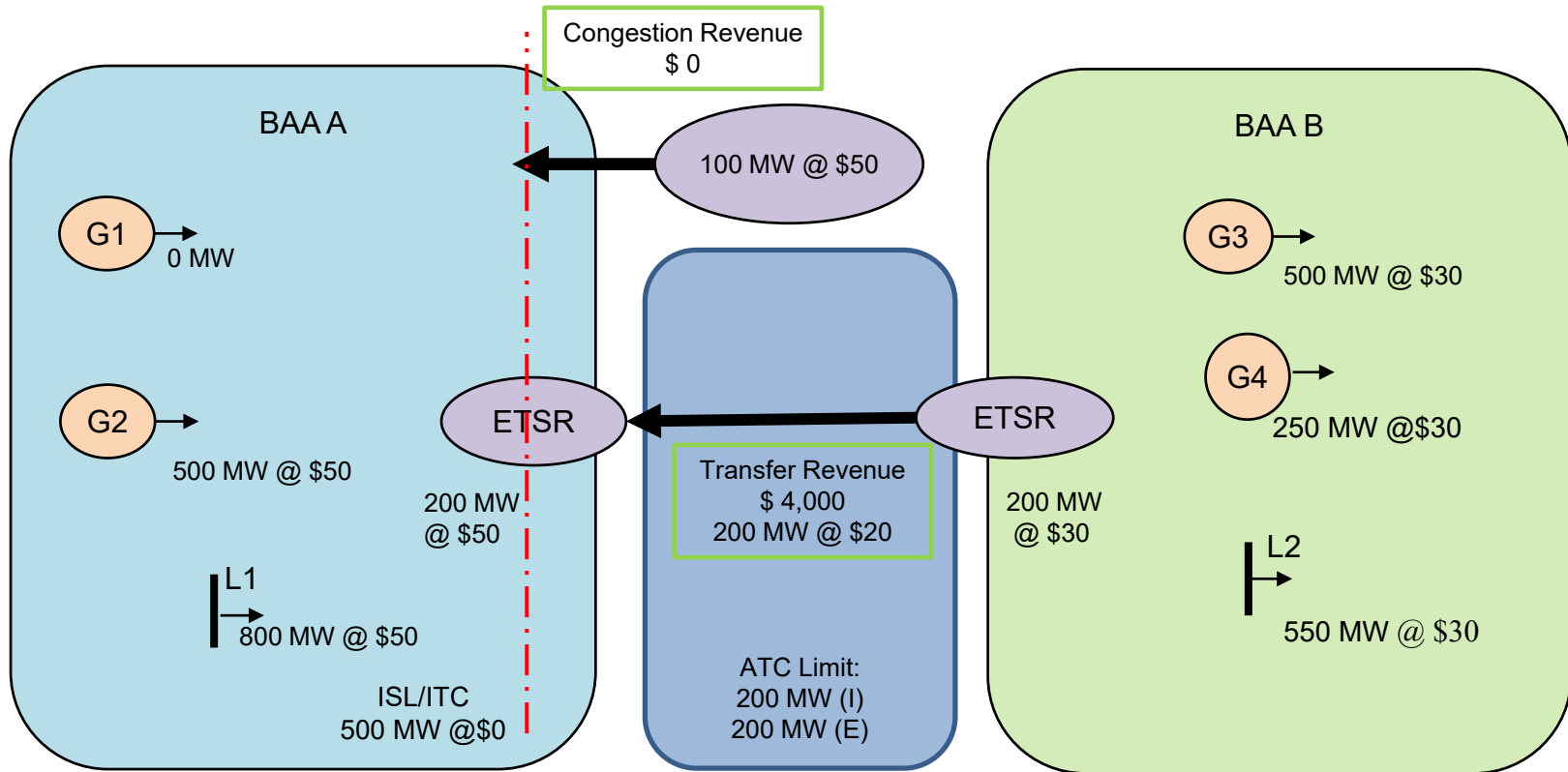
- Marginal cost of congestion (MCC) reflects the shadow price of a binding internal transmission constraint or scheduling limits.
- Collected from
 - MCC price differences across nodes within a BAA
 - MCC price difference between boundary intertie scheduling points (ITC/ISL) and internal nodes within BAA
- Allocated to the BAA in which the transmission constraint is modeled
 - For EDAM BAAs it will be allocated per OATT
 - For CAISO BAA it will be allocated to CRRs and Measured Demand

IFM Bid Data – Transfer Scheduling Limit binding



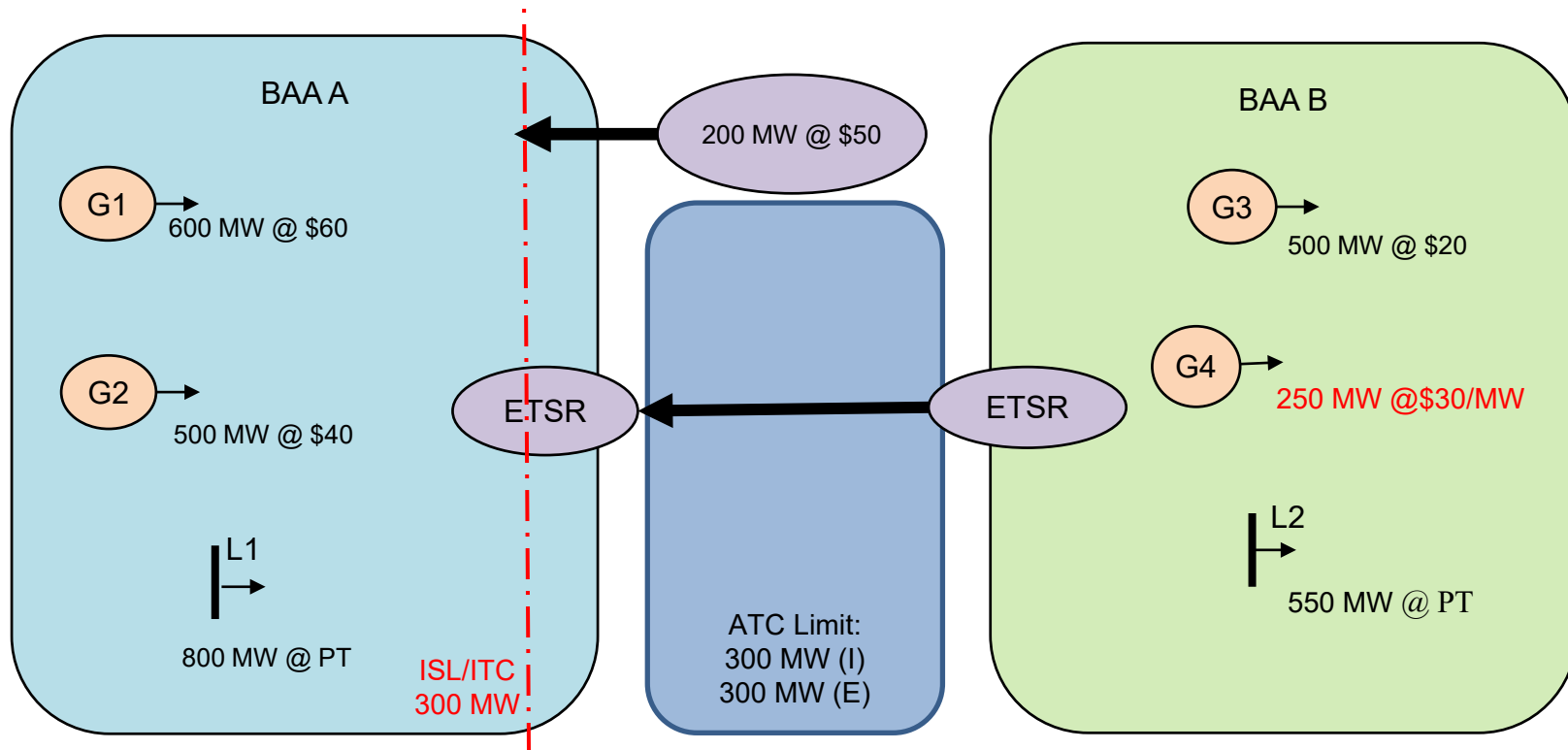
- Transfer Available Transmission Capacity limit is 200 MWs
- Intertie Scheduling Limit/Intertie Transmission Limit is 500 MWs

Transfer Revenue vs Congestion Revenue – Transfer Binding



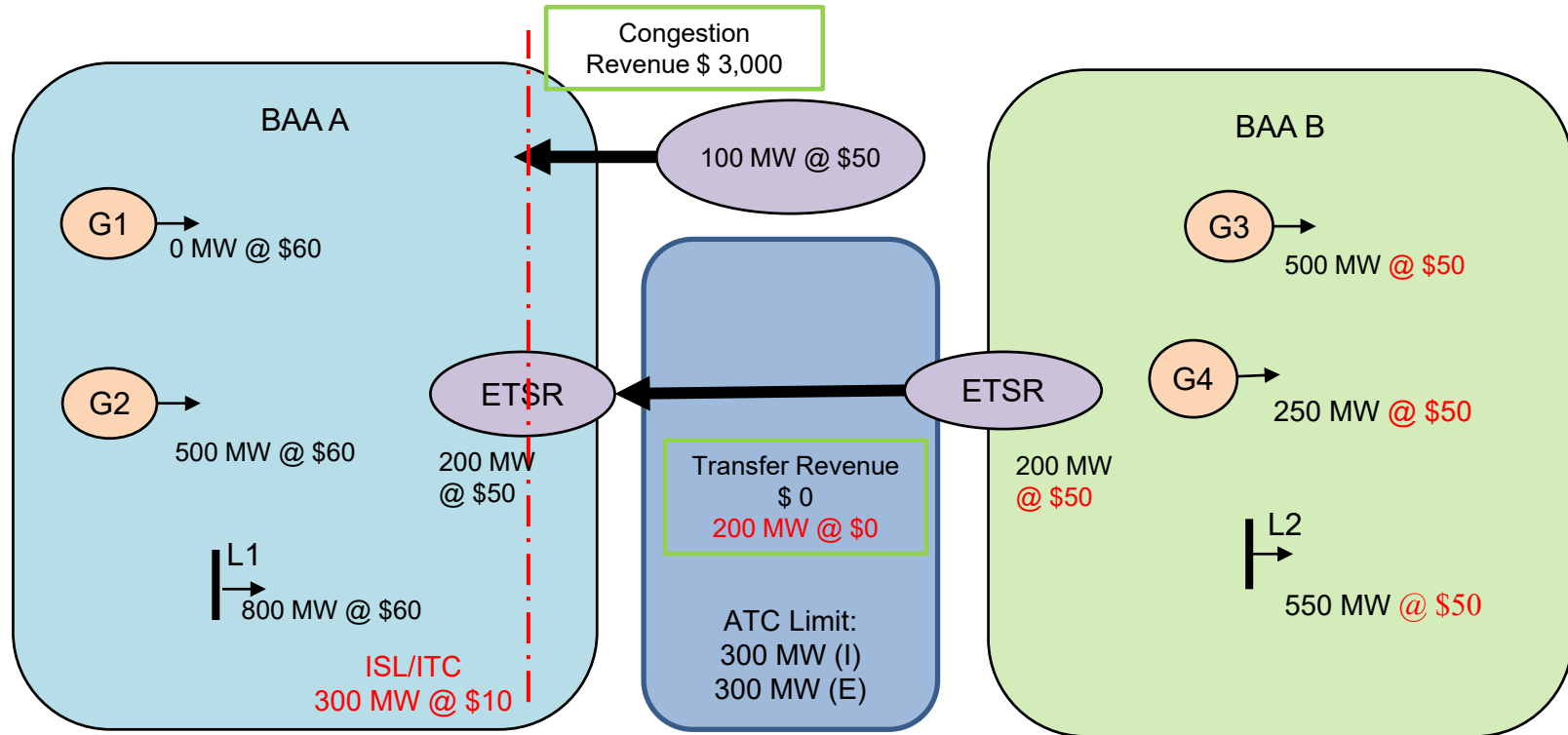
- Transfer Revenue is shared 50:50 between BAAA and BAA B at \$2,000 each
- Congestion Revenue is \$0 allocated to BAAA. ITC not binding

IFM Bid Data - Intertie Constraint (ITC) Binding



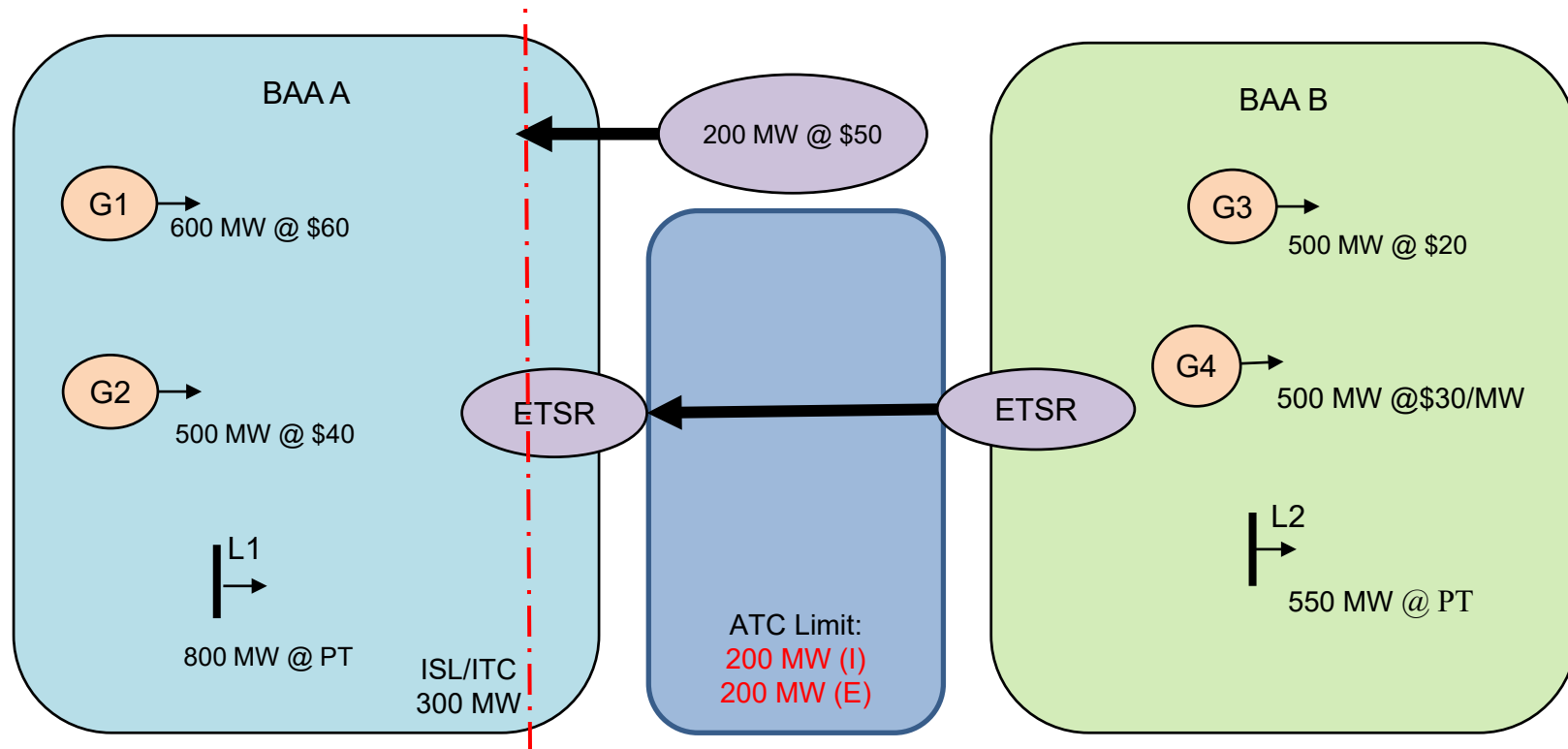
- Transfer Available Transmission Capacity limit is 300 MWs
- Intertie Scheduling Limit/Intertie Transmission Limit is 300 MWs

Transfer Revenue vs Congestion Revenue - ITC Binding



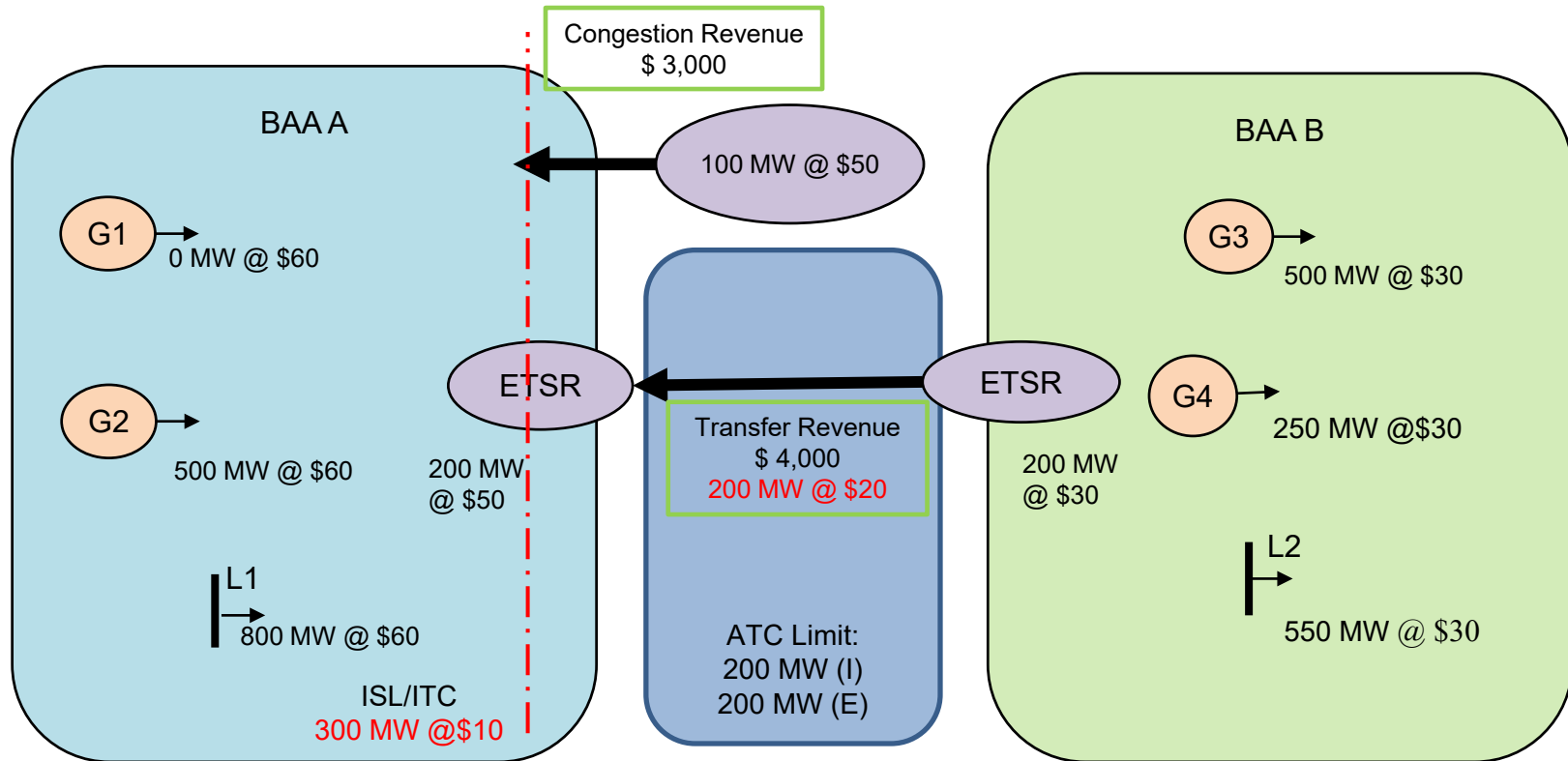
- Transfer Revenue is shared 50:50 between BAA A and BAA B at \$0 each
- Congestion Revenue is \$3,000 allocated to BAA A

IFM Bid Data - Both Binding



- Transfer Available Transmission Capacity limit is 200 MWs
- Intertie Scheduling Limit/Intertie Transmission Limit is 300 MWs

Transfer Revenue vs Congestion Revenue – Both Binding



- Transfer Revenue is shared 50:50 between BAA A and BAA B at \$2,000 each
- Congestion Revenue is \$3,000 allocated to BAA A

Transfer Revenue and Congestion Revenue

- Informed by stakeholder comments and workshop discussions
- Recognizes the shared value that results when two EDAM entities bring transmission to the transfer location
- Equally sharing the mutual benefit of the transfer is a fair and equitable solution.
- Recognizes that internal congestion revenues associated with the internal constraints should flow to the BAA where the constraint is modeled.

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Day Ahead Market Outputs: Settlements

James Lynn, Principal, Market Settlement Design

Settlement Overview

- Resource Sufficiency Settlement
- Day Ahead Award Settlement
- Reliability Capacity Settlement
- Bid Cost Recovery
- WEIM/RTM Settlement
- Transmission Revenue Recovery

Resource Sufficiency Evaluation Settlement

- IFM RSE failure settlement
 - BAA that fail the resource sufficiency test will be charged $\max(\text{PV}, \text{MID-C}) * 16 * \text{max hourly deficiency}$
 - Allocated pro-rata to net EDAM exporting BAAs
- RTM RSE failure settlement
 - WEIM RSEE Phase 2 Initiative looks to create assistance energy product to cure deficiencies in WEIM.
 - Collects from WEIM BAAs that cure using assistance energy
 - Allocated the assistance energy revenue to WEIM BAAs that provide the assistance energy

Extended Day Ahead Settlement

- IFM (including Virtual) Energy Schedules: Settle at IFM LMP
 - Transfer Energy schedules: settle between BAAs at IFM Transfer LMP
 - BAA MEC (PBC shadow price), plus ITC/ISL shadow price, plus MGC (marginal GHG cost)
- IFM GHG attributions: settle at IFM MGC
- ISO BAA energy neutrality settlement by component of LMP (Offsets)
 - BAA MEC and MCL Neutrality will be allocated to EDAM Entity/CAISO measured demand
 - MGC neutrality between GHG and non-GHG region allocated to metered demand
 - BAA MCG neutrality allocated as Congestion Revenue
- Ancillary Services: settle at ASMP
- Imbalance Reserve Awards: Settle at IRUP/IRDP
 - Transfer IRU/IRD schedules: settle between BAAs at IFM Transfer IRUP/IRDP
 - Allocated to EDAM Entity/CAISO DAME two tier allocation methodology

Reliability Capacity Settlement

- Reliability Capacity Up (RCU) award reliability capacity down (RCD) award will be settled at the locational marginal RCUP/RCDP
 - RCU/RCD transfers will be settled as an import and export between the two EDAM BAAs at the ETSR marginal RCU/RCD price
- Allocation:
 - Allocated to EDAM Entity/CAISO two tier allocation methodology described in DAME initiative

Bid Cost Recovery Settlement

- IFM BCR:
 - Supply resource whose daily IFM Revenue does not cover the daily IFM Costs shall be eligible to receive IFM BCR for the shortfall
 - Total BAA IFM BCR shall be allocated to EDAM Entity for allocation per OATT or via the CAISO two-tiered allocation methodology
- RUC/RTM BCR
 - BCR eligible resources will receive uplift for daily RTM/RUC net shortfall
 - RUC BCR portion of RUC/RTM uplift will be allocated to EDAM Entity or via the CAISO two-tiered allocation methodology
 - RTM BCR portion of RUC/RTM uplift will be allocated to EDAM Entity or via the CAISO current allocation methodology

WEIM/RTM Settlement (1 of 2)

- **Convergence Bid**
 - IFM Virtual Supply/Demand has a reversal settlement at the FMM LMP
- **Imbalance Energy Settlement in EDAM BAA**
 - Reference point for calculating Imbalance Energy is the resource Day-Ahead Schedule and not the Base Schedule (no base schedules in EDAM BAAs)
 - Intertie resources are subject to HASP Reversal provisions
 - RTM GHG settlement is a deviation settlement from IFM GHG attribution settlement
 - Transfers will have a financially binding imbalance settlement from day-ahead transfer transfer at the ETSR LMP
 - RTM transfer revenue will be calculated and distributed as described in Transfer Revenue section

WEIM/RTM Settlement (2 of 2)

- **Flexible Ramp Settlement**
 - RTM forecasted movement is an imbalance settlement from DAM accounting for day-ahead schedule forecasted movement
 - RTM Uncertainty settlement is an imbalance settlement of the 5-minute ramp-capable portion of the day-ahead Imbalance Reserve award
- **Intertie Deviation settlement will apply to intertie schedules**
 - Charge applied to intertie resources that receive an award in HASP and deviate from schedule for non-reliability reasons

Transfer Revenue Recovery Settlement

- BAA's TRR recovery amount collection
 - From EDAM footprint metered load less the recovering EDAM BAA's metered load.
 - From EDAM footprint gross metered load plus gross supply less the recovering EDAM BAA's gross metered load plus gross supply.
- Distribute BAA TRR recovered amount to the EDAM entity of EDAM BAA or ISO's participating transmission owners.

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EDAM Fees Framework

April Gordon, *Director, Financial Planning and Procurement*



California ISO

Implementation Agreement and Fee

- Implementation agreement will establish the implementation date for entity's participation in the day-ahead market
- Implementation at cost of service
 - Implementations costs will be tracked separately from other implementations
 - Projected average implementation cost is \$1.2M
 - Upfront deposit is \$300K; additional \$300K deposits as necessary
- Implementation activities include project management, administrative management, full network modeling of resources, system integration and functional testing, metering and settlements, and operations readiness and training.

EDAM Administrative Fees Framework

- Fees will consist of the existing market services charge and a new EDAM system operations charge
 - Market services charge represents fees for the real-time market and the day-ahead market services that EDAM offers, and applies to awarded MWh of energy and MW of capacity.
 - EDAM systems operations charge will represent the fees for real-time dispatch services that EDAM offers, and it applies to metered flows in MWh of supply and demand.
- All customers receiving market services will benefit from a lower market services charge once EDAM is operationally effective because the charge will be calculated using the incremental day-ahead MWh volumes from EDAM participants.

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Next Steps



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EDAM Tariff Framework – September 15

- WEIM tariff development started with a framework
 - guide to applicable CAISO tariff provisions
- EDAM tariff framework draft published in September will reflect the revised straw proposal in an outline format
 - facilitate understanding of the relationship between the market design and anticipated tariff provisions
- EDAM tariff framework published in November will reflect the draft final proposal and include market design details
 - establish the scope of applicable market rules
- EDAM draft tariff language will follow the final proposal and consideration by the WEIM GB/Board

Next steps

- Please submit comments on the revised straw proposal using the commenting tool linked on the initiative webpage.
 - Comments are due by end of day September 26.
- EDAM Settlements Workshops: Tentatively scheduled for October 5 and 6, 2022
- Visit the initiative webpage for more information: [California ISO - Extended day-ahead market \(caiso.com\)](https://www.caiso.com/California-ISO-Extended-day-ahead-market)
- If you have any questions, please contact ISOStakeholderAffairs@caiso.com