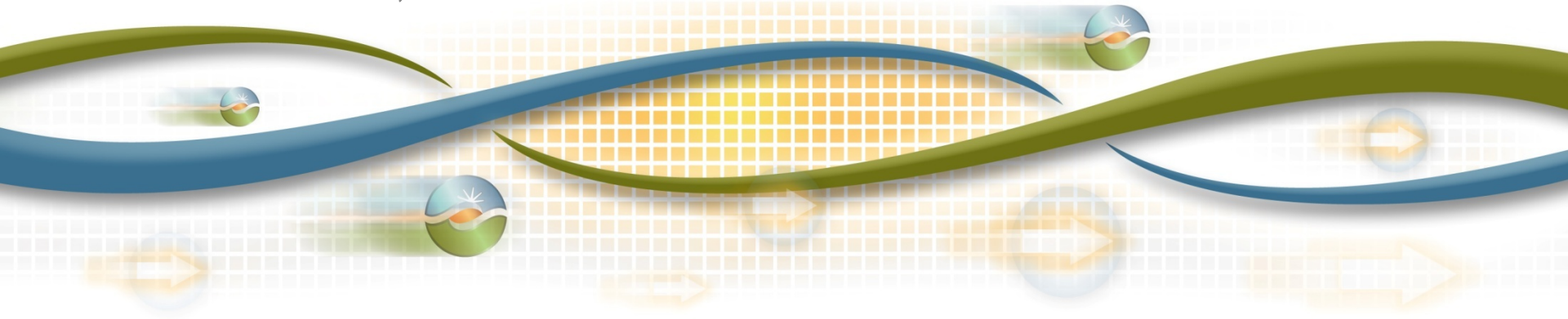


Energy Imbalance Market Year 1 Enhancements

Don Tretheway

Lead Market Design and Regulatory Policy Specialist

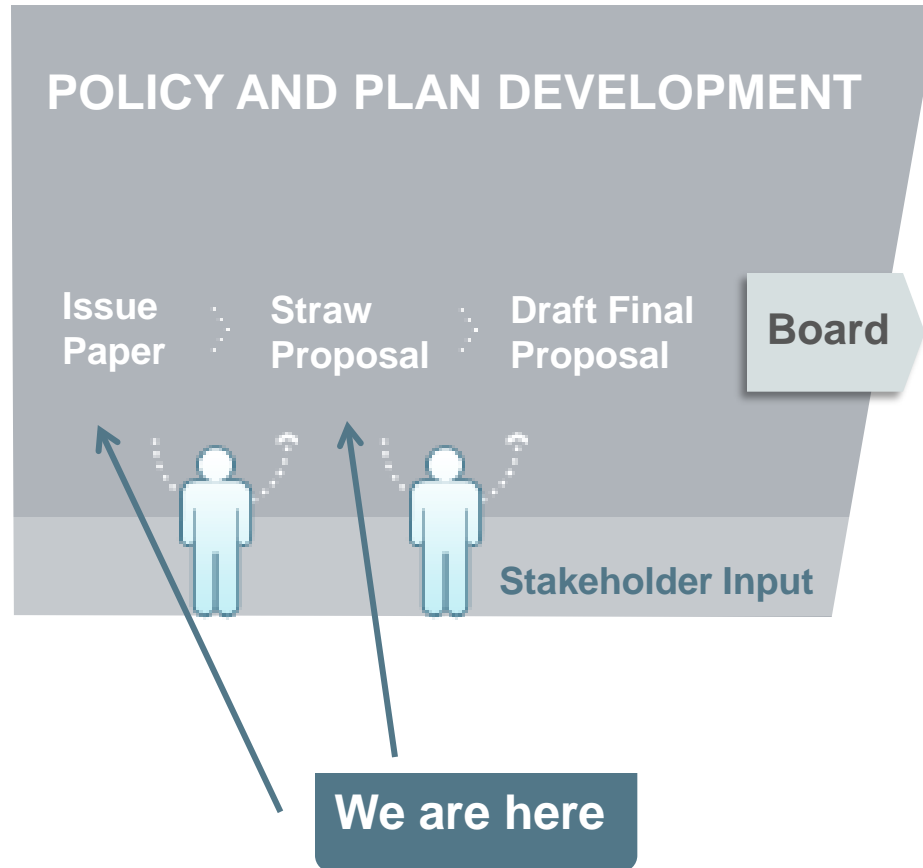
November 17, 2014



Agenda

Time	Topic	Presenter
10:00 – 10:15	Introduction	Kristina Osborne
10:15 – 12:00	Settlement of Non-Participating Resources GHG Flag and Cost Based Adder	Don Tretheway
12:00 – 1:00	Lunch	
1:00 – 3:50	EIM Transfers using Available Transfer Capability ISO Flexible Ramping Test 15-Minute Intertie Bidding EIM Transfer Limit Constraint Administrative Pricing	Don Tretheway
3:50 – 4:00	Wrap-up and Next Steps	Kristina Osborne

ISO Policy Initiative Stakeholder Process



Completed ISO stakeholder initiatives that impact EIM

- **EIM Go-Live Enhancements**
 - Apply Market Power Mitigation to EIM transfer constraints into an EIM BAA
 - Allow multi-stage generation (MSG) transition costs to be negotiated for non-gas units
 - <http://www.caiso.com/Pages/documentsbygroup.aspx?GroupID=B0B9231D-3C0A-4436-AA2E-A80ED0313E26>
- **Contingency Reserve Cost Allocation**
 - Same settlement for static import/exports and EIM transfers
 - Not an EIM charge per se
 - <http://www.caiso.com/informed/Pages/StakeholderProcesses/ContingencyReserveCostAllocation.aspx>
- **Grid Management Charge**
 - Establishes EIM administrative rate at \$0.19 MWh 2015-2017
 - <http://www.caiso.com/informed/Pages/StakeholderProcesses/Budget-GridManagementCharge.aspx>

Flexible ramping product will replace existing constraint in Fall 2015

- Add downward flexible ramping test in hourly resource sufficiency evaluation
- Allocates costs in same manner for participating and non-participating resources
- Initiative is ongoing. Board approval in February 2015
- <http://www.caiso.com/informed/Pages/StakeholderProcesses/FlexibleRampingProduct.aspx>

Phase 1 items planned for BOG decision in March 2015

- Settlement of Non-Participating Resources
- GHG Flag and Cost Based Bid Adder
- Establishment of EIM Transfer Limits Using Available Transfer Capability (ATC)
- Resources Sufficiency Evaluation Applied to ISO BAA
- 15-Minute Bidding on Intertie Scheduling Points
- Modification of EIM Transfer Limit Constraints
- Administrative Pricing Rules
- Other Items Identified During Implementation

Phase 2 items informed by six month of operational experience

- EIM Transmission Charge
- Flow Entitlements
- Dynamic Market Power Mitigation
- Other Items Identified During Implementation

Settlement of non-participating resources based upon operational characteristics

- Non-participating resource base schedule is equivalent to an ISO real-time market self-schedule
- Separate energy categories classify deviations as instructed imbalance energy and uninstructed imbalance energy
- Important because Uninstructed Imbalance Energy (UIE) is used as the denominator in transferring Bid Cost Recovery (BCR) and Real Time Imbalance Energy Offset (RTIEO) between BAAs

Energy categories to reflect operational characteristics as instructed imbalance energy settled at RTD price

- **Standard Ramping Energy**
 - Changes between hourly base schedules
 - 20 minute ramp between hours
- **Ramping Energy Deviation**
 - Differences from standard ramp and actual ramp
- **Derate Energy**
 - Changes in P_{min} or P_{max}
- **Optimal Energy**
 - All remaining Instructed Imbalance Energy (Dispatch Operating Target equal to the base schedule)

Optimal Energy is used to calculate Bid Cost Recovery

- BCR should be zero for non-participating resources because there is no energy bid (assumed zero)
- However, in extremely rare cases BCR may be paid to non-participating resources
 - Locational marginal pricing inserted as the cost, not bid
- Therefore, need to clarify that all resources are eligible for BCR

GHG Flag for EIM participating resources to opt out of being deemed delivered to CAISO

- Add flag in master file and cost based bid
- GHG can only be awarded to participating resources that have elected to be considered for supporting EIM transfers into the ISO
- Total EIM transfer can exceed the total bid range of participating resources selecting flag
 - Method to allocate GHG awards beyond bid range

GHG awards when EIM transfer exceeds available bid range

	Pmax	Pmin	Base	Dispatch	GHG Award			Total
					Step 1	Step 2	Step 3	
Resource A	100	50	75	100	50.0	30.0	10.0	90.0
Resource B	100	25	75	100	75.0	25.0	0.0	100.0
Resource C	100	50	100	100	50.0	30.0	10.0	90.0
					175.0	85.0	20.0	280.0

Step 1 – Full bid range awarded

Step 2 – Remaining EIM transfer allocated pro-rata based upon award, but capped at total output of resource

Step 3 – Remaining EIM transfer allocated pro-rata based on remaining total output

Cost based GHG bid adder follows the same rules as GHG compliance costs in ISO resource's default energy bid

- Negotiated Option and Variable Cost Option
- On a daily basis, the variable cost option considers
 - Incremental heat rate
 - GHG emissions rate authorized by California Air Resources Board
 - Applicable GHG compliance obligation cost
 - Plus 10% adder
- Resource must submit a daily GHG Bid adder \leq Cost
 - If Bid Adder $>$ Cost, ISO will override with resource's cost
 - GHB Bid adder must be greater than zero

Using available transmission capability for establishing EIM transfer limit

- NV Energy plans to use ATC for EIM transfer constraint limit
- Final market participant base schedule due at T-55
- Financially binding base schedule update only by EIM Entity SC at T-40
- Hourly base schedule imports/exports must be tagged no later than T-20
- Dynamic schedule for EIM transfers set at T-20

Timeline for hour ending 10:00

7:45:00 – Hourly economic bids due

8:05:00 – Final base schedules due from market participants

8:20:00 – EIM Entity approves binding base schedules

EIM Entity communicates ATC for real time unit commitment (RTUC)

Final resource sufficiency evaluation performed

8:22:30 – Start of FMM for binding interval 9:00-9:15

8:37:30 – Start of FMM for binding interval 9:15-9:30

8:40:00 – Dynamic schedule to tag EIM transfers

8:52:30 – Start of FMM for binding interval 9:30-9:45

Start of RTD for binding interval 9:00-9:05

Transfer capability can change for a variety of reasons

- Derate, Outages, MP not tagging counter-flow or base schedule
- The ISO uses our hour head scheduling process (HASP) to allocate transmission for real-time hourly block schedules on the intertie
 - Schedules are price takers in FMM
- Not required to tag hourly schedules prior to T-20
 - In FMM, assumed market participant will tag
- If SC doesn't tag HASP schedule, then resolved in real time dispatch (RTD)

Propose similar treatment for base schedules that are not tagged as ISO hourly block schedules not tagged

- RTUC ATC communicated to ISO by EIM Entity
 - ATC should estimate untagged base schedules until final dynamic schedule submitted at T-20
- RTD ATC is the transmission profile of the dynamic schedule at T-20
- Any deviation from base schedule settled as OA at the RTD price until included in the FMM schedule
- For intervals, not subject to RTD price, then subject to hourly schedules decline charge

The difference between hourly base schedule and actual tag value is settled with SC

- Assume tag submitted at T-20,
 - The first Fifteen Minute Market (FMM) awarded, second FMM optimization started
- Imbalance settlement with with SC
 - Tag = Base schedule, no imbalance settlement
 - Tag \neq Base schedule,
 - Imbalance settled at RTD price for first 30 minutes
 - Imbalance settled at FMM price for second 30 minutes
 - For FMM intervals 3 and 4 where the SC is not exposed to RTD price, subject to schedules decline charge
- Monthly schedules decline charge applies regardless of the reason for the tag difference
 - There are separate export and import charges by SC

The ISO is planning to extend the flexible ramping test to the ISO at T-40

- If the ISO has insufficient upward ramping capability incremental transfers in will be restricted
- If the ISO has insufficient downward ramping capability incremental transfer out will be restricted
- However, the transfer capability of the ISO may be different between T-40 and T-20
 - For the same reason as an EIM Entity BAA using ATC

How is difference between T-40 transfer capability and T-20 transfer capability considered in resource sufficiency evaluation?

- OA differences between the FMM awards and RTD is included in the historical calculation of the flexible ramping product (FRP) requirement
 - Over time, persistent transfer capability differences will increase ramping capability needed to pass test
- Seeking comments if additional measures are needed
 - BAA level hourly schedules decline penalty
 - Additional block energy adjustment included based on historical observations

Settlement implication of one BAA in EIM footprint allowing FMM participation by imports and exports and another BAA not allowing participation

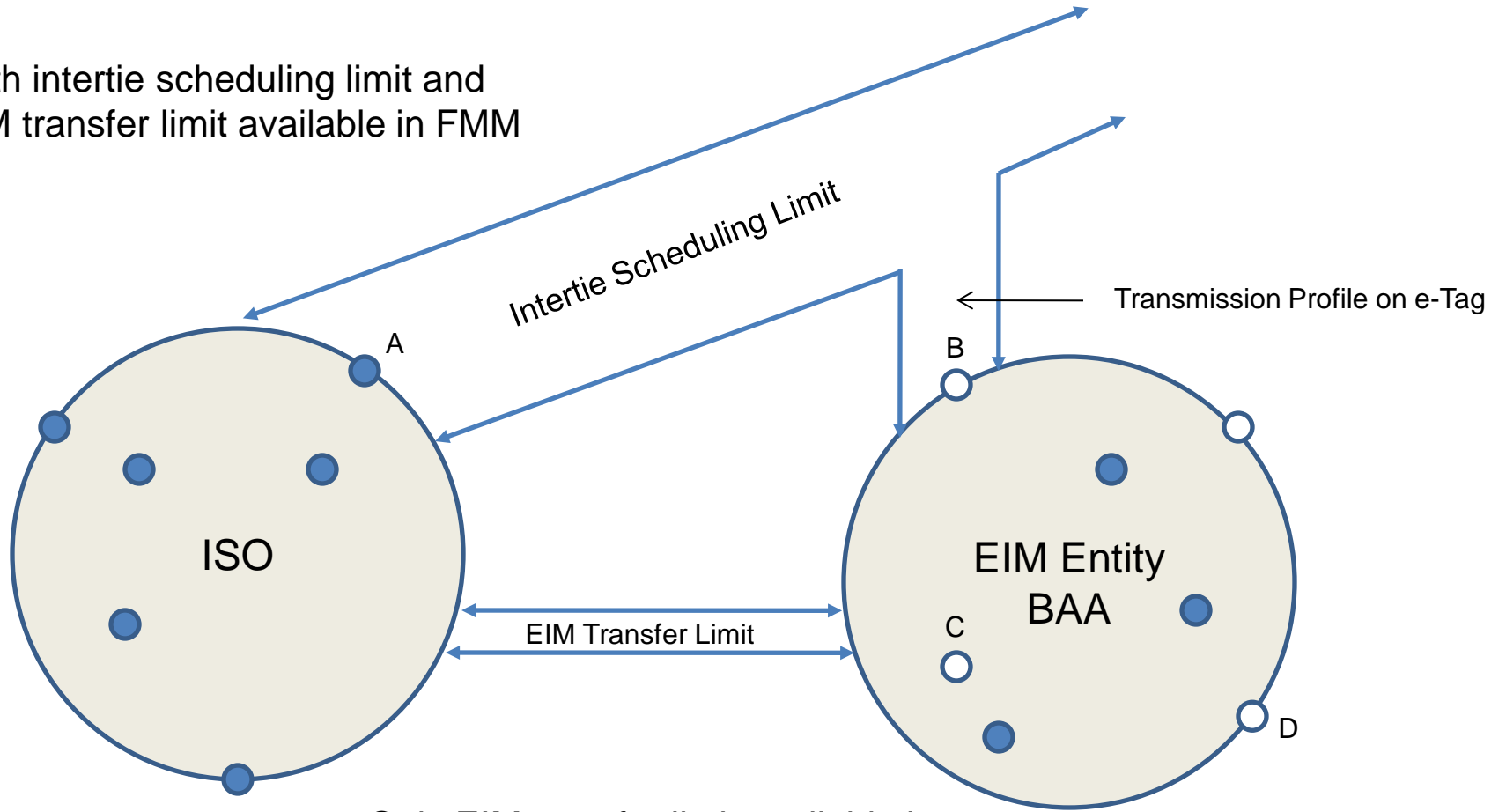
- Currently EIM Entity decides on participation rules within its BAA
- ISO allows FMM bidding by imports and exports. PacifiCorp does not allow FMM bidding.
- Several settlement scenarios if an ISO FMM import (export) is sourced (sunked) in PacifiCorp or wheeled through PacifiCorp

Transmission profile observed when FMM awards import/export schedules that economically bid

- Transmission is an hourly product in the West
- FMM award cannot exceed the lowest transmission profile tagged on any path external to the ISO
- To receive incremental awards in the first FMM interval, transmission profile must be tagged before T-37.5
- ISO updates energy profile on tag to FMM schedule
- This functionality can be extended to EIM External Interties

FMM allows ISO intertie bidding using transmission profile on e-Tag to cap FMM awards

Both intertie scheduling limit and EIM transfer limit available in FMM



Letters used in examples 1-8

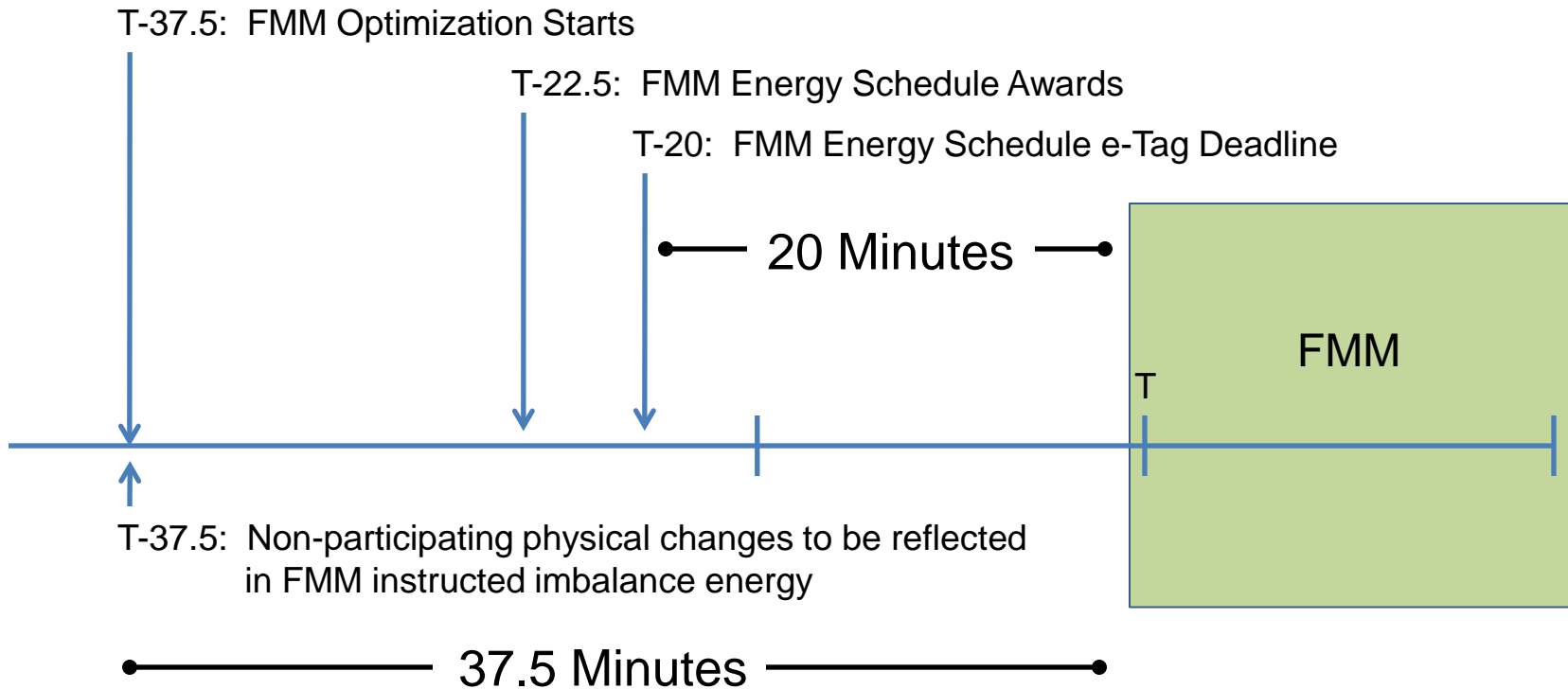
Only EIM transfer limit available in RTD (also constrained by DTC)

- Biddable nodes
- Non-biddable nodes (non-participating resources)

EIM Entity must approve e-Tags and notify ISO of manual dispatches to non-participating resources

- If e-Tag not approved, intertie deviation settled as an operational adjustment in the ISO BAA
 - Until reflected in new FMM schedule, settled at the RTD LMP
 - Reflected in new FMM schedule, settled at the FMM LMP, but subject to monthly intertie schedules decline charge
 - While the e-Tag may identify a specific resource, this is irrelevant for settlement purposes
- Manual dispatches classified as instructed imbalance energy, but applicable LMP depends...
 - ISO told prior to start of FMM optimization, deviation from base schedule settled at FMM LMP
 - ISO told after start of FMM optimization, deviation from base schedule settled at RTD LMP

“Dog chasing tail” dilemma because resource schedule changes must be known before FMM makes awards on ISO intertie scheduling points



Any difference between the FMM ISO intertie award and EIM resource will be settled at the RTD price, not the FMM price.

Example 1: FMM (non-EIM) export bid clears on ISO intertie scheduling point and sinks in EIM Entity BAA

- No manual dispatch communicated prior to FMM to ISO
- EIM Entity BA approves the e-Tag
 - ISO export (A) pays FMM LMP at intertie scheduling point
 - EIM Entity import (B) paid RTD LMP at intertie scheduling point
 - This is a deviation from the FMM schedule
 - Resource (C) pays RTD LMP at its location if it deviated
- EIM Entity BA does not approve the e-Tag
 - ISO export (A) pays FMM LMP at intertie scheduling point
 - ISO export (A) paid RTD LMP at intertie scheduling point
 - No deviations in the EIM Entity

Non-EIM = Not using EIM Transfer Limit

Example 2: FMM export bid clears on ISO intertie scheduling point and sinks in EIM Entity BAA

- Manual dispatch (B & C) equal to FMM ISO export schedule communicated prior to FMM to ISO
- EIM Entity BA approves the e-Tag
 - ISO export (A) pays FMM LMP at intertie scheduling point
 - EIM Entity import (B) paid FMM LMP at intertie scheduling point
 - Resource (C) pays FMM LMP at its location
- EIM Entity BA does not approve the e-Tag
 - ISO export (A) pays FMM LMP at intertie scheduling point
 - ISO export (A) paid RTD LMP at intertie scheduling point
 - EIM Entity import (B) paid FMM LMP at intertie scheduling point
 - EIM Entity import (B) pays RTD LMP at intertie scheduling point
 - Resource (C) pays FMM LMP at its location

Example 7: FMM import bid clears on ISO intertie scheduling point and wheels through EIM Entity BAA

- No manual dispatch communicated prior to FMM to ISO
- EIM Entity BA approves the e-Tags
 - ISO import (A) paid FMM LMP at intertie scheduling point
 - EIM Entity export (B) pays RTD LMP at intertie scheduling point
 - EIM Entity import (D) paid RTD LMP at its intertie scheduling point
- EIM Entity BA does not approve the e-Tags
 - ISO import (A) paid FMM LMP at intertie scheduling point
 - ISO import (A) pays RTD LMP at intertie scheduling point
 - No deviations from base schedule in EIM Entity

Example 8: FMM import bid clears on ISO intertie scheduling point and wheels through EIM Entity BAA

- Manual dispatch (B & D) equal to FMM ISO import schedule communicated prior to FMM to ISO
- EIM Entity BA approves the e-Tags
 - ISO import (A) paid FMM LMP at intertie scheduling point
 - EIM Entity export (B) pays FMM LMP at intertie scheduling point
 - EIM Entity import (D) paid FMM LMP at its intertie scheduling point
- EIM Entity BA does not approve the e-Tags
 - ISO import (A) paid FMM LMP at intertie scheduling point
 - ISO import (A) pays RTD LMP at intertie scheduling point
 - EIM Entity export (B) pays FMM LMP at intertie scheduling point
 - EIM Entity export (B) paid RTD LMP at intertie scheduling point
 - EIM Entity import (D) paid FMM LMP at its intertie scheduling point
 - EIM Entity import (D) pays RTD LMP at its intertie scheduling point

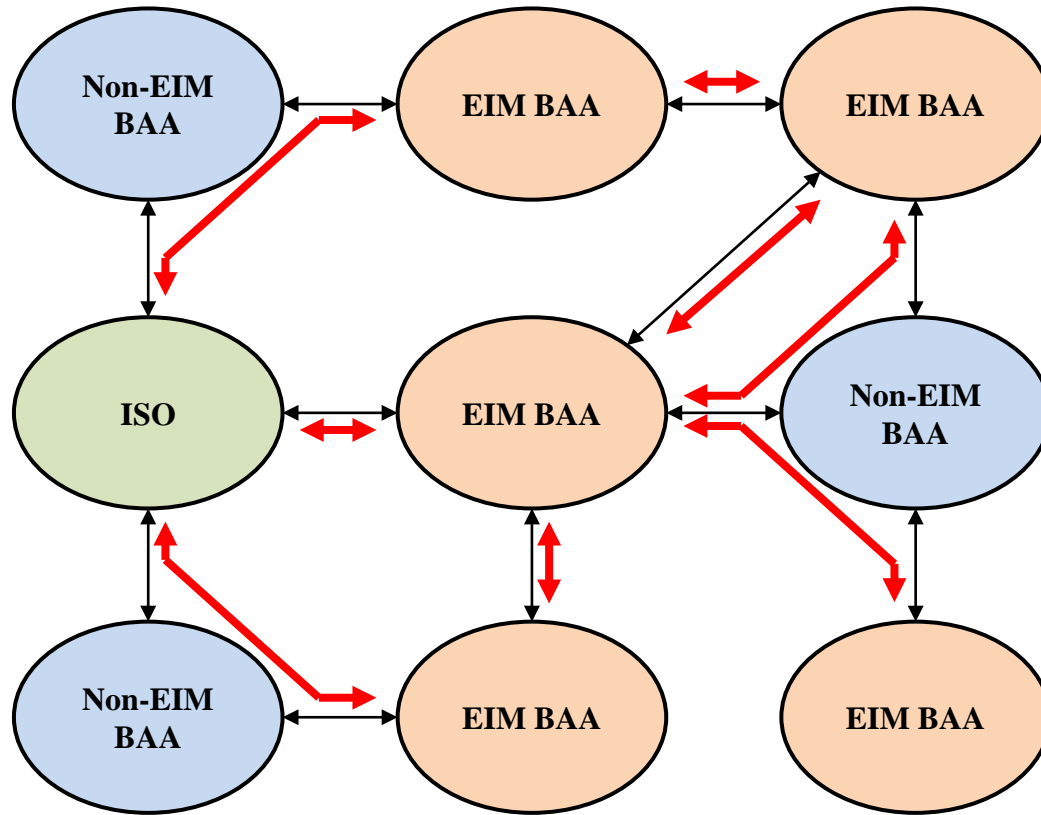
Better to economically bid at the resource or EIM External Intertie versus bidding on ISO schedule point

- Must e-Tag a transmission profile before FMM that can support FMM award on the ISO intertie scheduling point
 - Sunk cost for external transmission outside ISO, make transmission available for EIM transfers
- “Dog chasing tail” dilemma can result in settlement in both FMM and RTD in EIM Entity
- Schedule changes may not be economically optimal because of difference in congestion between FMM & RTD
- Exposure to ISO charges (GMC, TAC, A/S) and EIM Entity charges (Admin fee)
- In cases where schedule changes are uninstructed imbalance energy, exposure to uplift charges

Modification to EIM Transfer Limit Constraint (1 of 2)

- Current implementation enforces net schedule interchange \leq aggregate EIM transfer capability made available
 - Straight forward for PacifiCorp implementation using contract rights to support EIM transfers
- As EIM entities increase, it is more appropriate to enforce EIM transfer limits by individual intertie point
 - Improved modeling when ATC used for transfers
 - Supports use of contract rights for EIM transfers
 - Supports tagging of multiple dynamic schedules

Modification to EIM Transfer Limit Constraint (2 of 2)



- Issue – Net scheduled interchange doesn't reflect precisely the actual transmission capacity tagged to support EIM transfers

Administrative pricing rules are currently being modified in separate stakeholder initiative (1 of 2)

- Same rules apply when FMM or RTD prices are available
- FMM prices missing for 3 or fewer intervals use last best price from FMM
- RTD prices missing for 11 or fewer intervals use last best RTD price

Administrative pricing rules are currently being modified in separate stakeholder initiative (2 of 2)

- FMM prices missing for more than 3 intervals
 - If RTD prices available, use simple average of RTD
 - If RTD prices not available, use day-ahead price
- RTD prices missing for more the 11 intervals
 - If FMM price available, use FMM price
 - If FMM price not available, use day-ahead price
- EIM does not have a day-ahead price
 - EIM Entity tells ISO the price to use in case of imbalances

Next steps

Item	Date
Post Issue Paper / Straw Proposal	November 10, 2014
Stakeholder Meeting	November 17, 2014
Stakeholder Comments	December 1, 2014
Post Revised Straw Proposal	December 31, 2014
Stakeholder Meeting	January 8, 2015
Stakeholder Comments	January 22, 2015
Post Draft Final Proposal	February 11, 2015
Stakeholder Meeting	February 18, 2015
Stakeholder Comments Due	February 25, 2015
Board of Governors Decision	March 26-27, 2015
Phase 2 Items	TBD

Please submit written comments to EIM@caiso.com by December 1