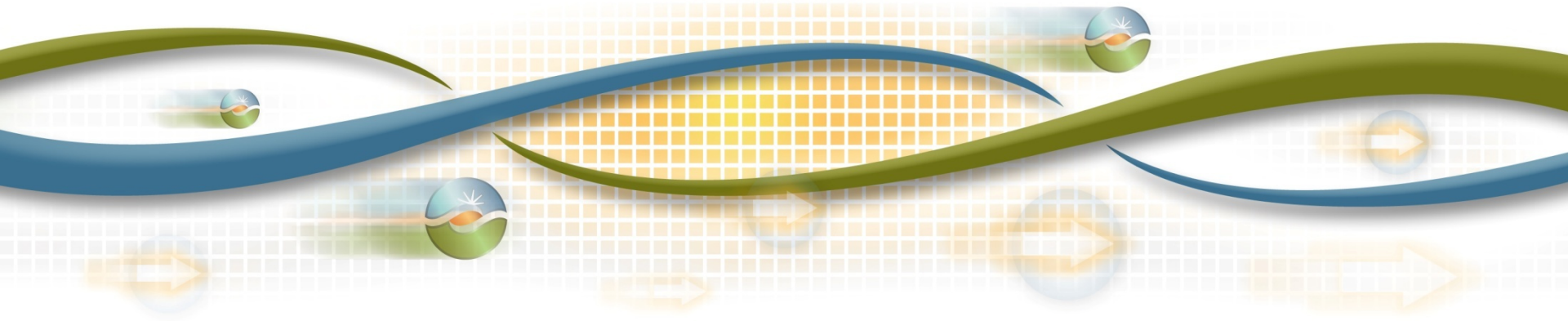


Energy Imbalance Market 2nd Revised Straw Proposal

Stakeholder Meeting
July 9, 2013



Agenda

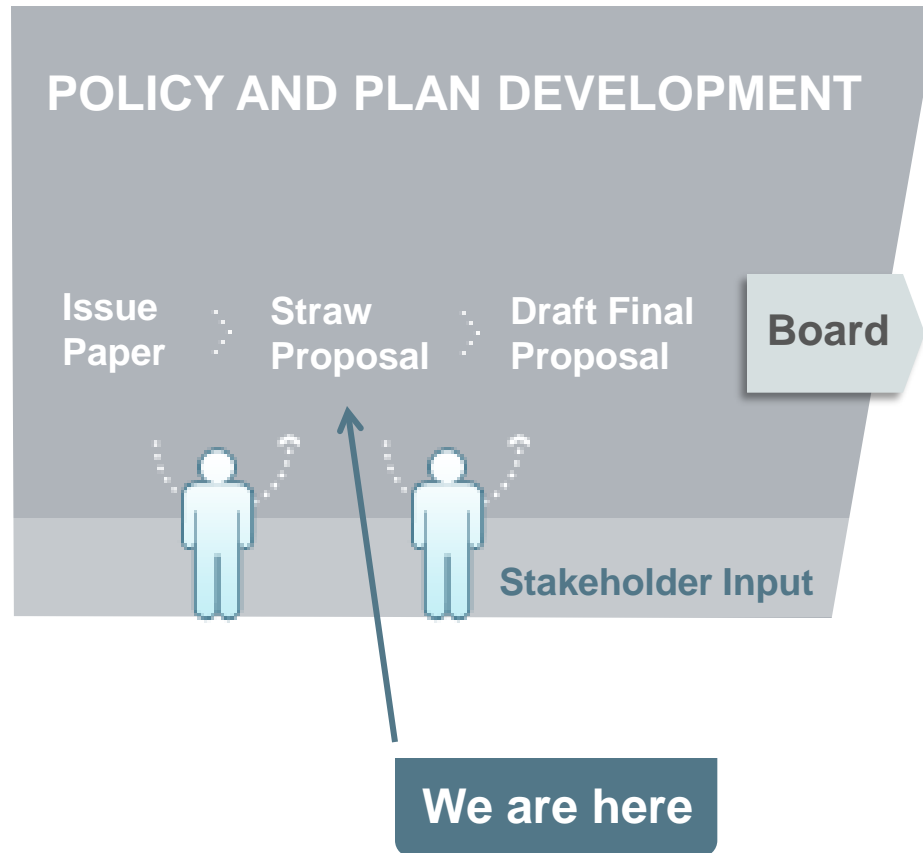
Time	Topic	Presenter
10:00 – 10:10	Introduction	Mercy Parker-Helget
10:10 – 12:00	EIM Definitions and Overview Summary of Design Changes	Don Tretheway
12:00 – 12:30	Lunch Break	
12:30 – 3:50	BAA Congestion Balancing Account Under-Scheduling Charge Flexible Ramping Constraint Neutrality Accounts RT Bid Cost Recovery Local Market Power Mitigation GHG Proposal	Don Tretheway
3:50 – 4:00	Wrap-up and Next Steps	Mercy Parker-Helget

ISO Policy Initiative Stakeholder Process



We are here

ISO Policy Initiative Stakeholder Process



Defined terms (1 of 4)

- **Energy Imbalance Market (EIM)** is operation of the ISO's real-time market to manage transmission congestion and optimize procurement of energy to balance supply and demand for the combined ISO and EIM footprint.
- **Market Operator** is the ISO.
- **EIM Entity** is a balancing authority that enters into the pro forma EIM Entity Agreement to enable the EIM to occur in its balancing authority area (BAA). By enabling the EIM, real-time load and generation imbalances within its BAA will be settled through the EIM.

Defined terms (2 of 4)

- **EIM Entity Scheduling Coordinator** is the EIM Entity, or a third-party designated by the EIM Entity, that is certified by the ISO and that enters into the pro forma EIM Entity Scheduling Coordinator Agreement. The EIM Entity Scheduling Coordinator is responsible for compiling and submitting balanced schedules for the EIM Entity BAA to the Market Operator, for imbalance energy settlement of resources not participating in EIM, and for distributing costs or revenues from uplift allocations to the EIM Entity BAA.

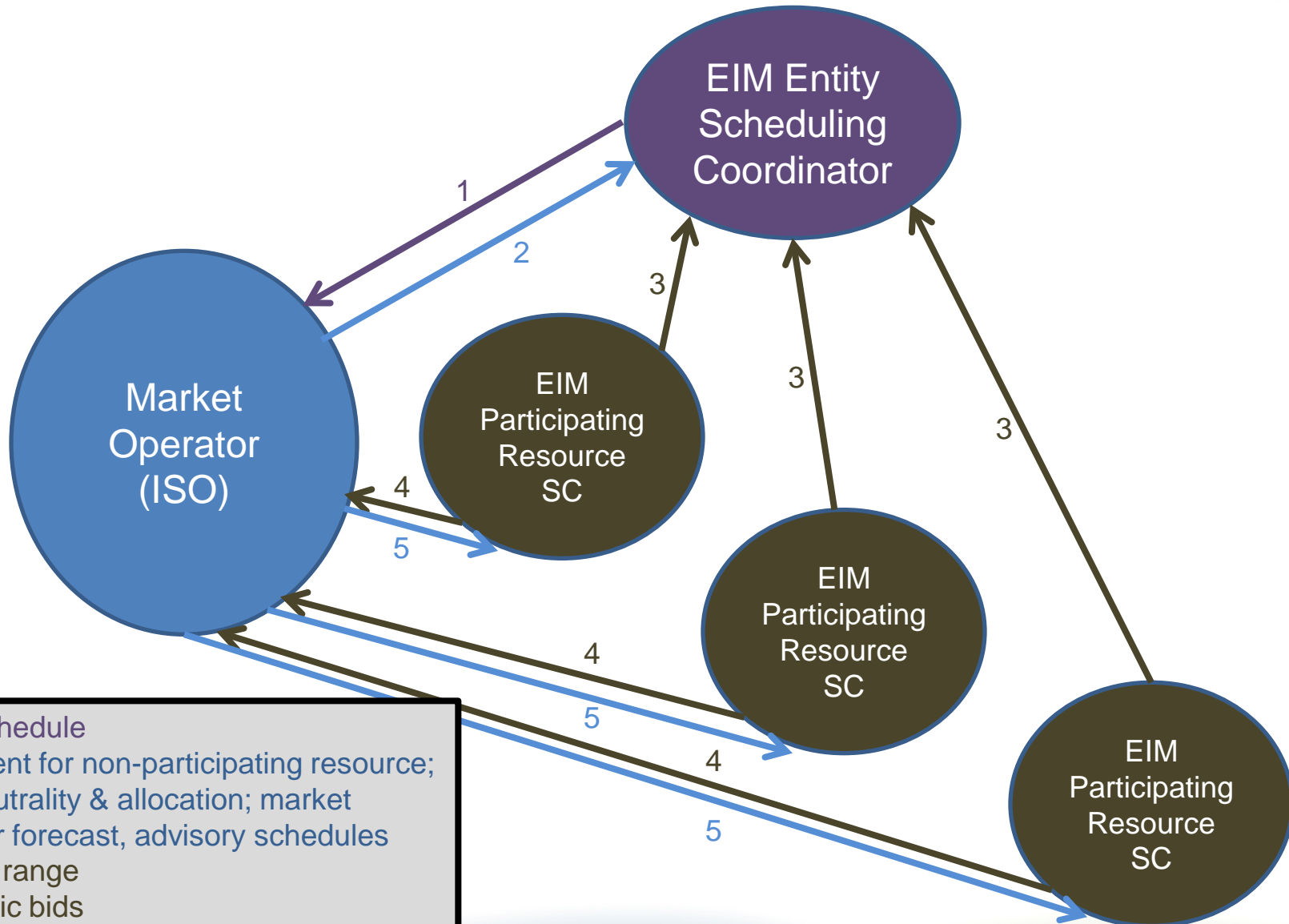
Defined terms (3 of 4)

- **EIM Participating Resource** is a resource located within the EIM Entity BAA that is eligible and elects to participate in the EIM and that enters into the pro forma EIM Participating Resource Agreement, under which is responsible for meeting the requirements specified in Tariff Section 29. In the 5-minute market, eligible resources may include Generating Units, Physical Scheduling Plants, Participating Loads, Proxy Demand Resources, Non-Generator Resources and Dynamic Schedules. In the 15-minute market, imports and exports that can be scheduled on a 15-minute basis are eligible to participate in addition to all resources eligible to participate in the 5-minute market.

Defined terms (4 of 4)

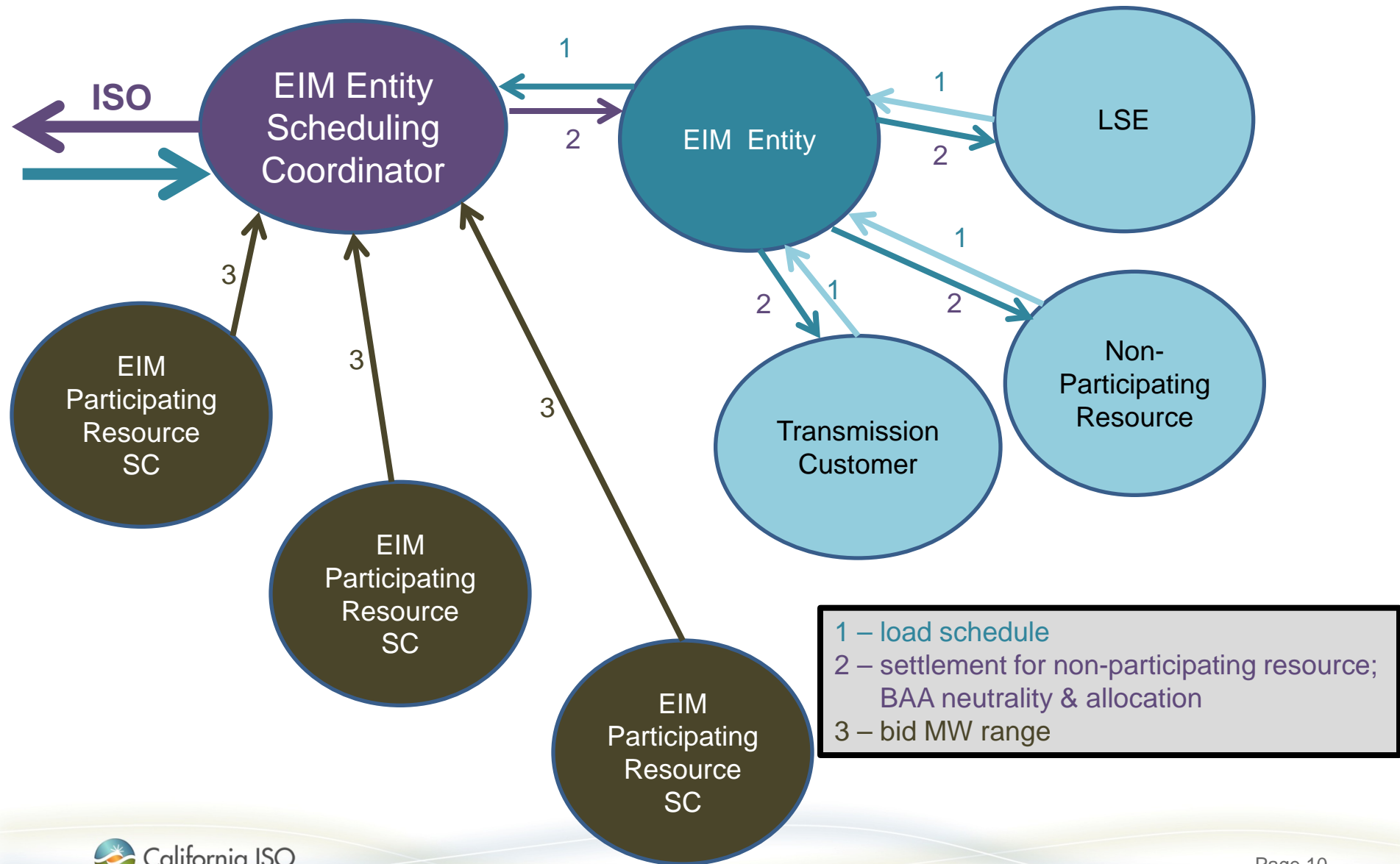
- **EIM Participating Resource Scheduling Coordinator** is the resource, or a third-party designated by the resource, that is certified by the ISO and enters into the pro forma EIM Participating Resource Scheduling Coordinator Agreement, under which it is responsible for meeting the requirements specified in Tariff Section 29 on behalf of the resource. The EIM Participating Resource Scheduling Coordinator interfaces with the Market Operator on behalf of resources in an EIM Entity BAA that voluntarily elect to economically participate in the EIM.

SC/Market Operator relationships

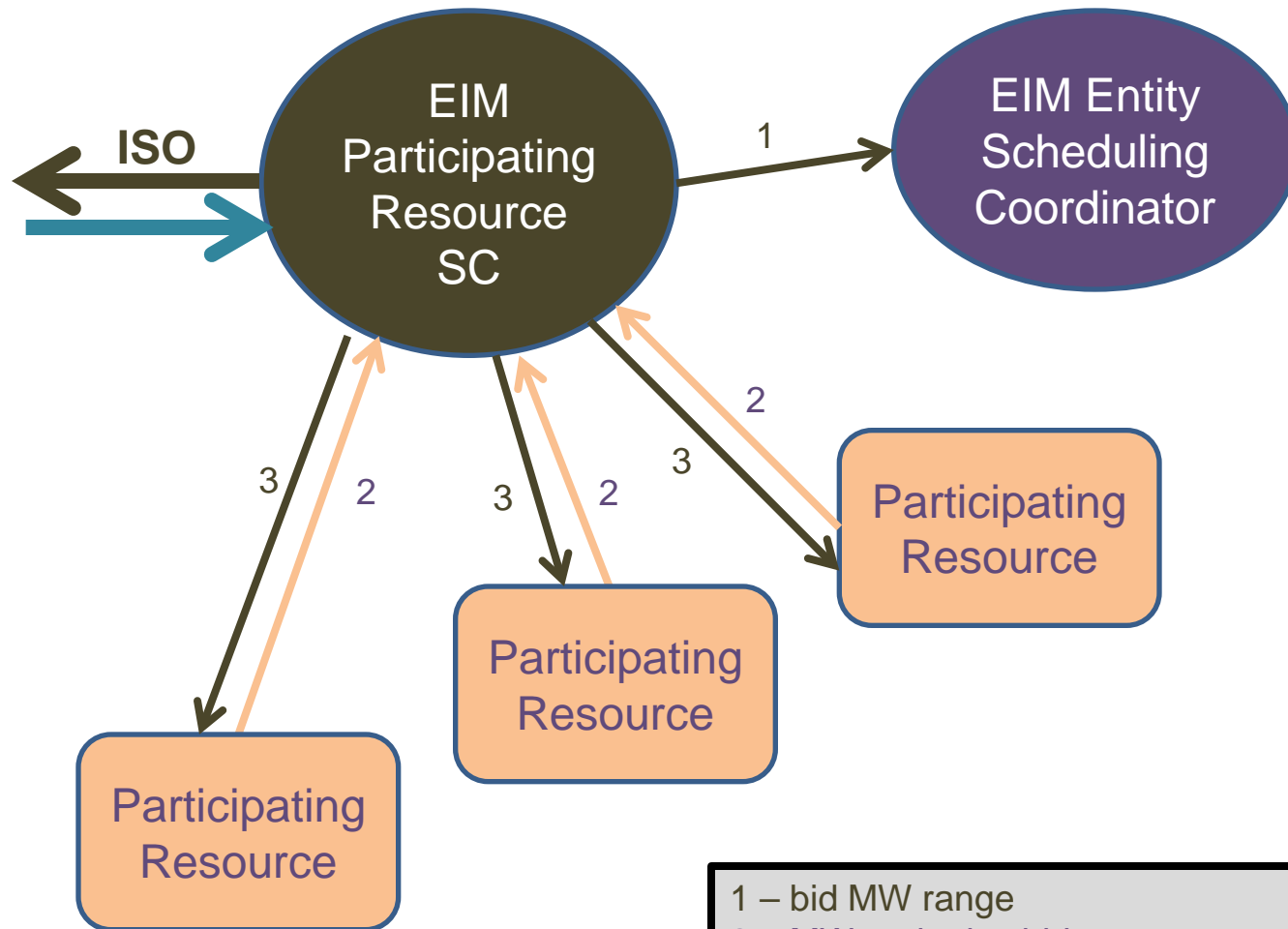


- 1 – base schedule
- 2 – settlement for non-participating resource; BAA neutrality & allocation; market operator forecast, advisory schedules
- 3 – bid MW range
- 4 – economic bids
- 5 – imbalance energy settlement

EIM Entity Scheduling Coordinator communication



EIM Participating Resource Scheduling Coordinator communication



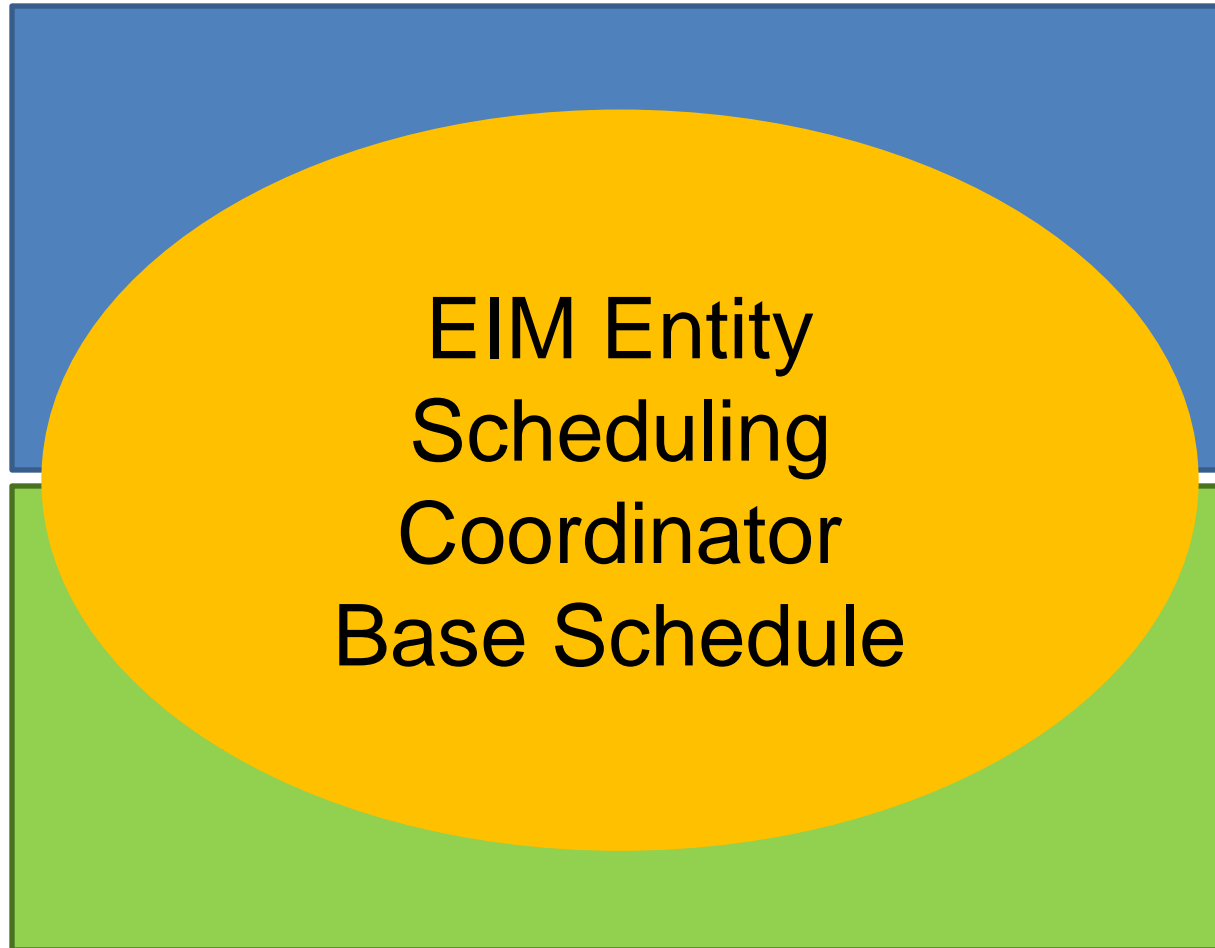
- 1 – bid MW range
- 2 – MW and price bids
- 3 – imbalance energy settlement

EIM Process Overview

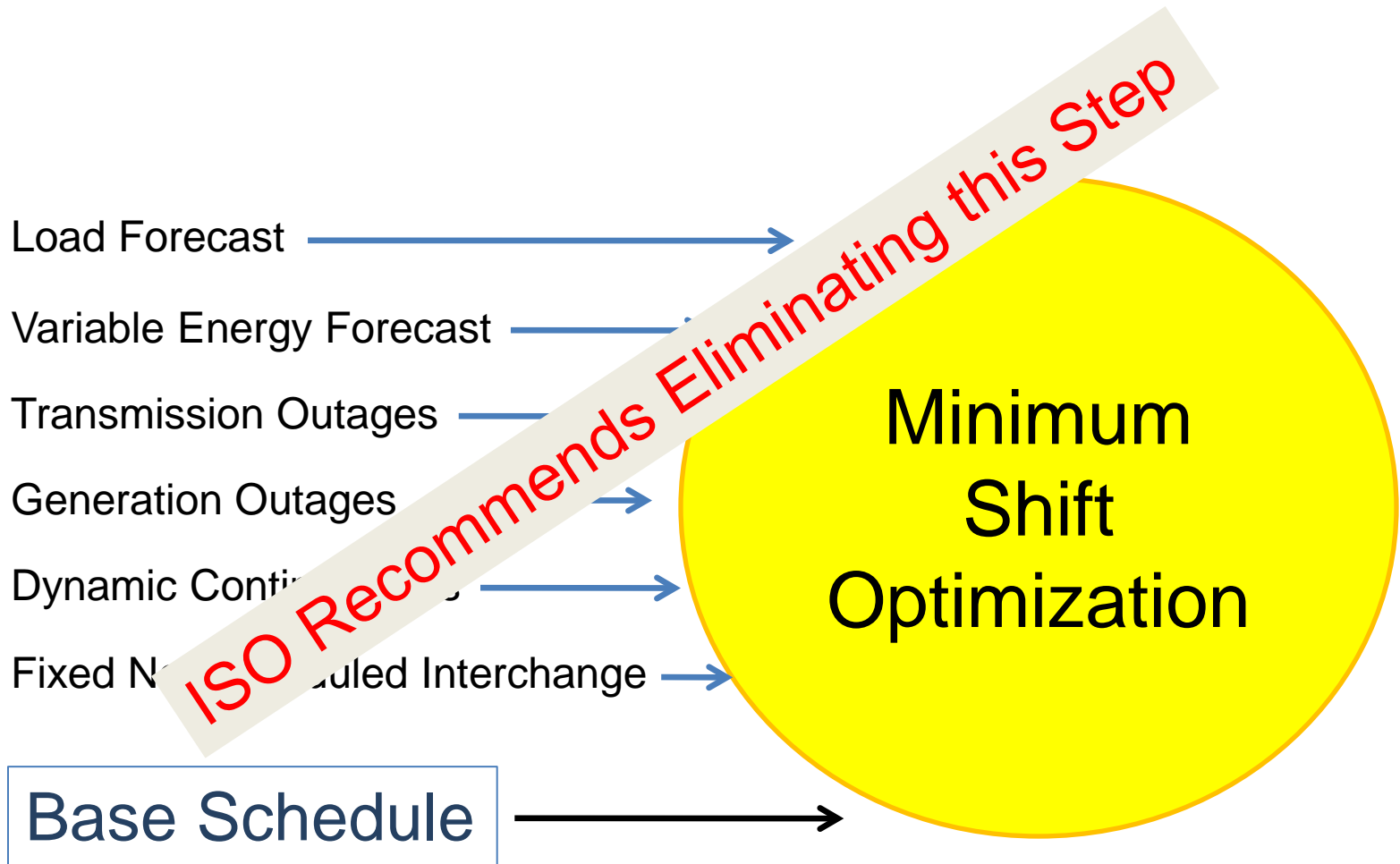
Full Network Model

Resource Master File

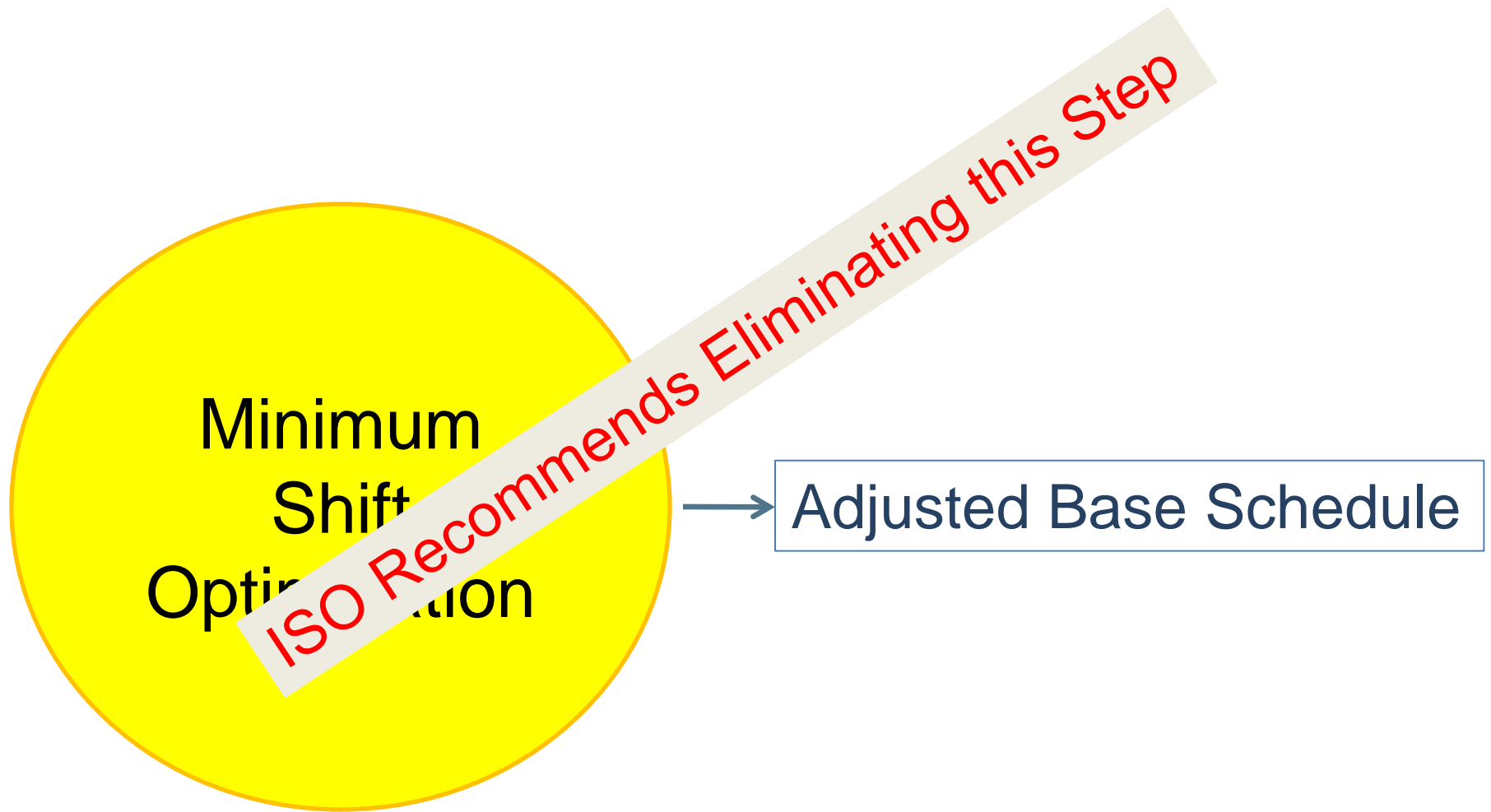
EIM Process Overview



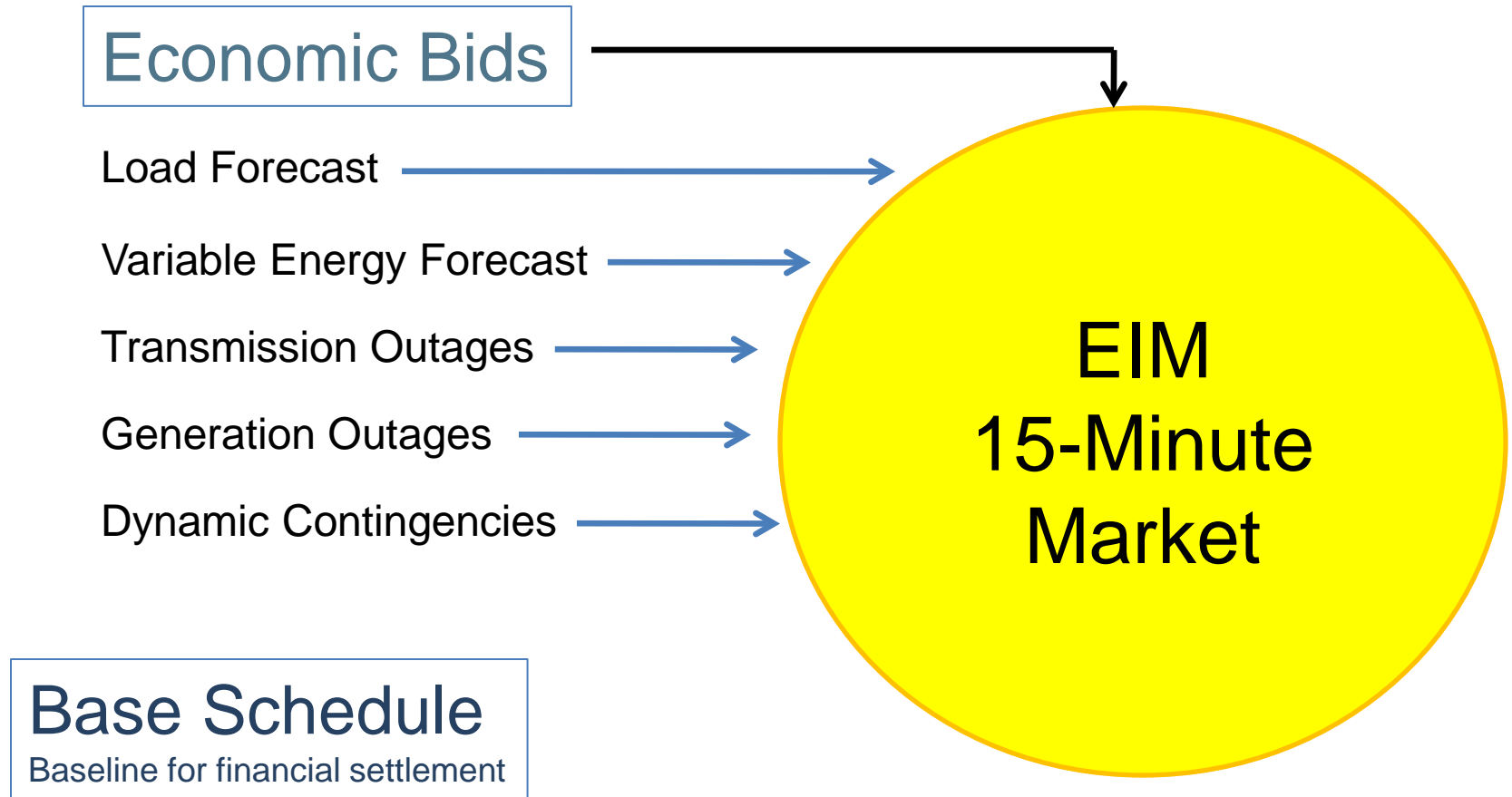
EIM Process Overview



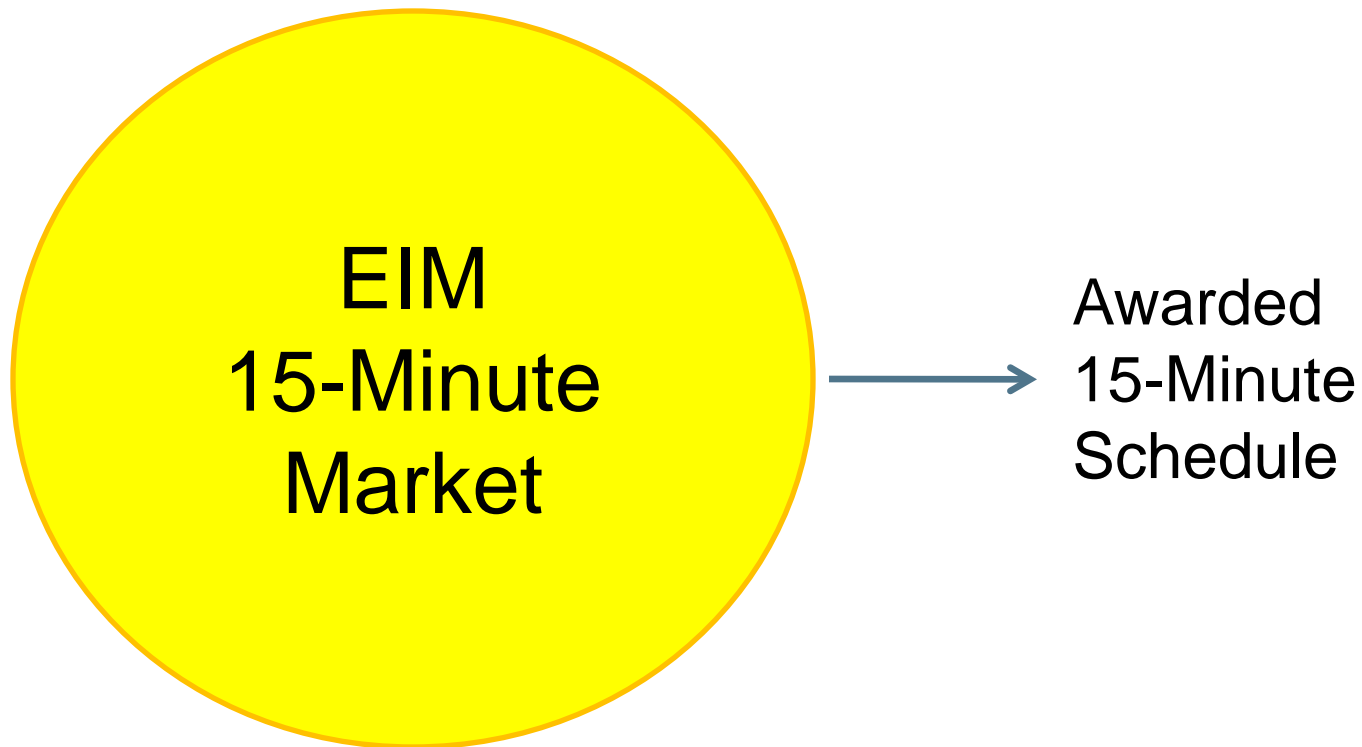
EIM Process Overview



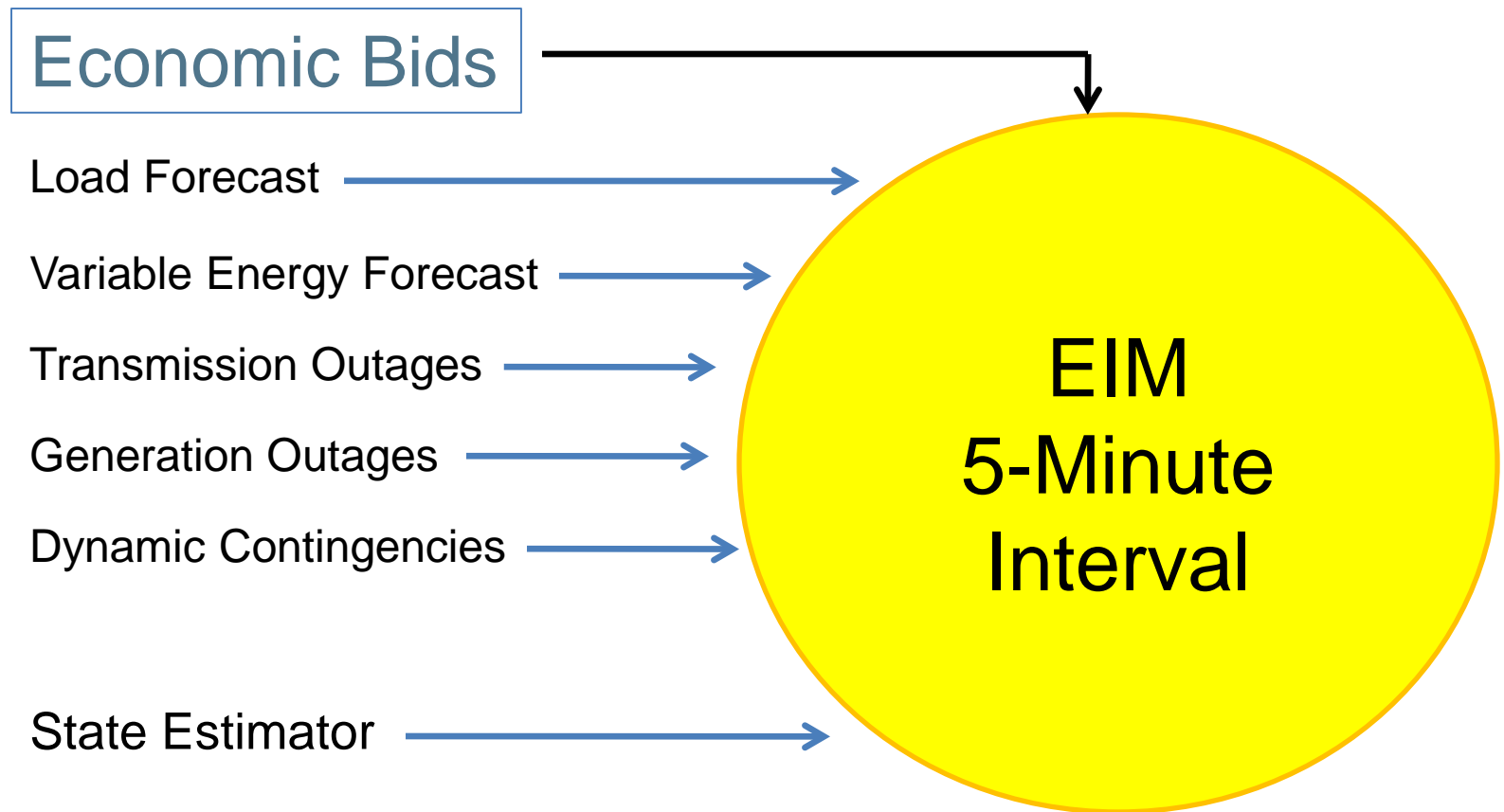
EIM Process Overview



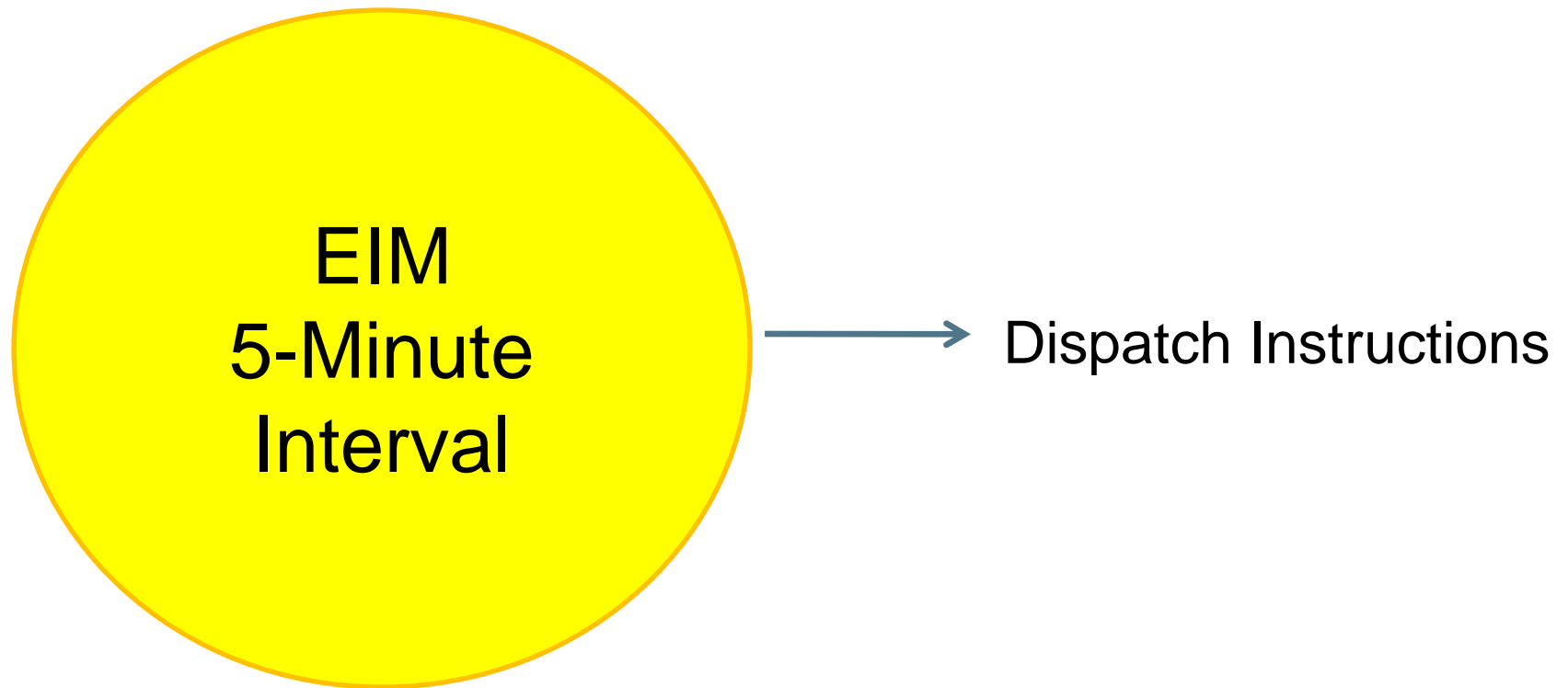
EIM Process Overview



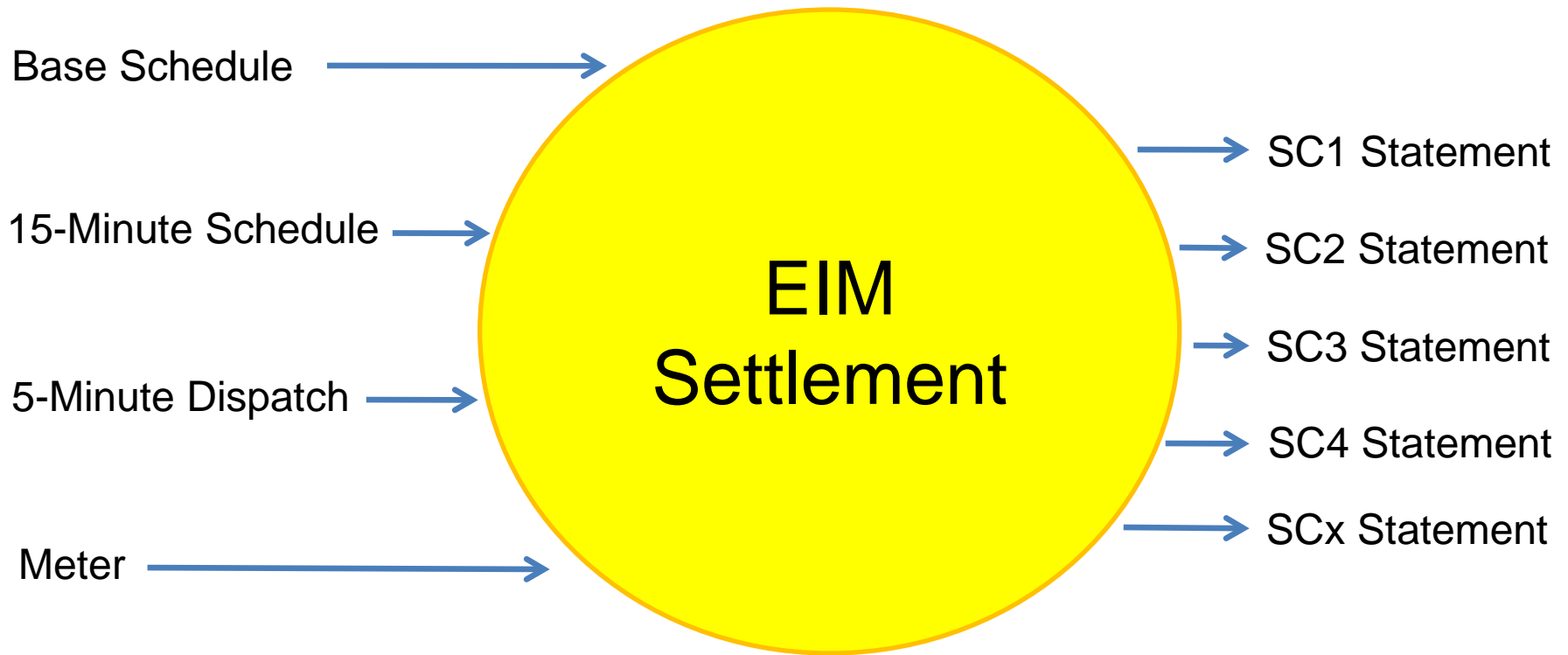
EIM Process Overview



EIM Process Overview



EIM Process Overview



15-minute base schedule submitted by EIM Entity Scheduling Coordinator at T-40 min

Load Forecast	1000 MW
Export A	100 MW
Export B**	200 MW
<hr/>	
Total	1300 MW

=

Gen A	500 MW
Gen B*	400 MW
Gen C*	150 MW
Import A*	100 MW
Import B**	150 MW
<hr/>	
Total	1300 MW

* Economic bids in RTUC & RTD

** Economic bids in RTUC

15-minute adjusted base schedule uses resources with economic bids to resolve congestion

Load Forecast	1000 MW
Export A	100 MW
Export B**	200 MW
<hr/>	
Total	1300 MW

EIM Transfer	0 MW
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Gen A	500 MW
Gen B*	350 MW
Gen C*	200 MW
Import A*	100 MW
Import B**	150 MW
<hr/>	
Total	1300 MW

ISO Recommends Eliminating this Step

Gen B reduced 50 MW
 Gen C increased 50 MW

The changes to base schedules are not settled by EIM.
 Settled under rules of the EIM Entity

* Economic bids in RTUC & RTD
 ** Economic bids in RTUC

15-minute market (RTUC) schedules resources to meet load forecast

Load Forecast	1100 MW
Export A	100 MW
Export B**	140 MW
<hr/>	
Total	1340 MW

=

Gen A	500 MW
Gen B*	350 MW
Gen C*	250 MW
Import A*	100 MW
Import B**	150 MW
<hr/>	
Total	1350 MW

EIM Transfer Out	10 MW
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Load forecast up 100 MW
 Export B reduced 60 MW
 EIM Transfer Out 10 MW

Gen B decreased 50 MW
 Gen C increased 100 MW

All deviations settled in EIM at the 15-minute LMP

* Economic bids in RTUC & RTD

** Economic bids in RTUC

5-minute market (RTD) dispatches resources to meet load forecast

RTD Interval 1 of the 15-minute RTUC interval

Load Forecast	1050 MW
Export A	100 MW
Export B**	140 MW
<hr/>	
Total	1290 MW

=

Gen A	500 MW
Gen B*	350 MW
Gen C*	200 MW
Import A*	100 MW
Import B**	150 MW
<hr/>	
Total	1300 MW

EIM Transfer Out 10 MW

Load forecast 50 MW lower

Gen C decreased 50 MW

All deviations settled in EIM at the 5-minute LMP

* Economic bids in RTUC & RTD

** Economic bids in RTUC

5-minute market (RTD) dispatches resources to meet load forecast

RTD Interval 2 of the 15-minute RTUC interval

Load Forecast	1100 MW
Export A	100 MW
Export B**	140 MW
<hr/>	
Total	1340 MW

=

Gen A	450 MW
Gen B*	350 MW
Gen C*	280 MW
Import A*	100 MW
Import B**	150 MW
<hr/>	
Total	1330 MW

EIM Transfer In	10 MW
-----------------	-------

Load has no deviation from 15-min schedule

Gen A outage (negative deviation) of 50 MW

Gen C dispatch 30 MW above 15-min schedule

EIM Transfer direction changes to Import of 10 MW

All deviations settled in EIM at the 5-minute LMP

* Economic bids in RTUC & RTD

** Economic bids in RTUC

5-minute market (RTD) dispatches resources to meet load forecast

RTD Interval 3 of the 15-minute RTUC interval

Load Forecast	1200 MW
Export A	100 MW
Export B**	140 MW
<hr/>	
Total	1440 MW

=

Gen A	450 MW
Gen B*	400 MW
Gen C*	300 MW
Import A*	130 MW
Import B**	150 MW
<hr/>	
Total	1430 MW

EIM Transfer In	10 MW
-----------------	-------

Load forecast up 100 MW

Gen A outage of 50 MW (hold prior RTD)

Gen C increased 50 MW (hold prior RTD)

Gen B increased 50 MW

Import A (dynamic schedule) increased 30 MW

All deviations settled in EIM at the 5-minute LMP

* Economic bids in RTUC & RTD

** Economic bids in RTUC

EIM Entity unit commitment and outages are reflected in next 15-minute base schedule and settled by EIM Entity tariff

Load Forecast	1200 MW
DA Export to ISO	100 MW
Export B**	200 MW
<hr/>	
Total	1500 MW



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Outage in Base
↓

Gen A	450 MW
Gen B*	400 MW
Gen C*	250 MW
Gen D	150 MW
Import A*	100 MW
Import B**	150 MW
<hr/>	
Total	1500 MW



Meet higher load and replace Gen A outage

* Economic bids in RTUC & RTD

** Economic bids in RTUC

Changes made in 2nd Revised Straw Proposal (1 of 5)

- Clarifies that EIM Entity Scheduling Coordinator does not perform the role of EIM Participating Resource Scheduling Coordinator
- Discusses eliminating the need for the minimum shift optimization to establish adjusted base schedules given EIM design changes in the 2nd revised straw proposal related to establishing real-time congestion balancing account per BAA, flexible ramp constraint requirement, and the under-scheduling penalties.

Changes made in 2nd Revised Straw Proposal (2 of 5)

- Clarifies local market power mitigation will be performed for each BAA using a BAA unique reference bus.
- Modifies over/under scheduling penalties to address leaning if EIM Entity Scheduling Coordinator elects to use its own load forecast.
- Introduces separate flexible ramping constraint requirement for the ISO and each EIM Entity BAA.

Changes made in 2nd Revised Straw Proposal (3 of 5)

- Discusses settlement neutrality charges under FERC Order No. 764 market design changes which replace the real-time imbalance energy offset. Introduces approach to allocate costs based upon transfers between BAAs.
- Establishes a real-time congestion balancing account for each BAA. Discusses the how to isolate the real-time congestion to each BAA and the implication on the minimum shift optimization and real-time leaning.

Changes made in 2nd Revised Straw Proposal (4 of 5)

- Introduces settlement rules for convergence bids to exclude congestion settlement from EIM Entity BAA constraints that are not modeled in the day-ahead market.
- Separates real-time bid cost recovery into energy and commitment costs. Introduces approach to allocate costs based upon transfers between BAAs.

Changes made in 2nd Revised Straw Proposal (5 of 5)

- Provides additional discussion on GHG requirements and includes 15-minute imports to the EIM Entity BAA in market optimization proposal. Expands last GHG example to include additional emitting resource.
- Adds an additional third round of Straw Proposal revision to allow more time for stakeholder input into the EIM market design, and policy development.
- Includes minor edits to improve clarity from previous straw proposal.

BAA Real-Time Congestion Balancing Account calculated cost of infeasible base schedules (1 of 2)

- Neutrality account from re-dispatch of generation to resolve RT constraints
 - Charge or credit, but transmission outages can drive up charges
- Isolate neutrality account to each BAA
 - Resources across EIM footprint impact constraints in each BAA
 - To isolate, sum impact on constraint in each BAA separately

BAA Real-Time Congestion Balancing Account calculated cost of infeasible base schedules (2 of 2)

- To calculate a resource's impact on a constraint
 - Shift factor of resource is the impact on constraint
 - Shadow price of the constraint represents the change in congestion costs
 - Delta between meter and base schedule is the change in flow
 - The product of the shift factor, shadow price and change in flow is the BAA real-time congestion balancing account
- Each BAA bears its own cost of infeasible schedules entering the EIM

ISO convergence bids are not settled for real-time congestion on EIM Entity constraints

- ISO market design includes convergence bidding, EIM Entities do not
 - Virtual supply sells at the DA LMP, buys at 15-min LMP
 - Virtual demand buys at the DA LMP, sells at 15-min LMP
- The schedule change between DA and RT is a change in flow, thus impacts RT congestion balancing account
- The ISO will not settle convergence bids for RT congestion on EIM Entity constraints
 - Using same approach calculating balancing account

Under-scheduling penalties to incentivize balanced base schedules

- EIM Entity using own load forecast
 - If load imbalance exceeds 4% (but at least 2MW) of LAP, then
 - Price = 125% of the LAP LMP
- EIM Entity using Market Operator forecast
 - If forecast > EIM Entity SC supply by >1%, then
 - Deemed to be using own forecast (price = 125% of the LAP LMP if imbalance > 4%)
- The 25% premium collected over month is allocated to load that has not under-scheduled in the month

Each BAA has a flexible ramping requirement to meet their dispatch independently (1 of 2)

- Ensures sufficient ramp capability is committed in RTUC and manages ramp capability in RTD
 - Flexible ramping constraint is only upward
 - Future product is upward and downward
- Flexible ramping requirement will be established for each EIM Entity BAA
 - Minimum requirement = transfer capability
 - Maximum requirement = forecast change between 15-minute intervals and historical uncertainty/variability
- Requirement must be met by resource plan

Each BAA has a flexible ramping requirement to meet their dispatch independently (2 of 2)

- Market operator will perform a ramp sufficiency test
- If base schedule passes, then full transfer capability available
 - Imbalance energy and flexible ramping constraint met by lowest cost resources in EIM footprint
- If base schedule fails, transfer capability set to zero
 - Prevents additional transfers to BAA for others
 - Isolates ramping shortage from other BAAs in EIM footprint
 - For inadequate BAA, this may lead to scarcity and pricing based upon administrative energy prices

The combined design elements eliminate the need for adjusted base schedule & minimum shift optimization

- BAA real-time congestion balancing account isolates the cost of infeasible base schedules to the BAA
- Under-scheduling incentivizes balanced base schedules and compensates other LAPs for leaning
- Flexible ramping requirement ensures EIM Entity can meet their dispatch requirements independently before start of market optimization across EIM footprint

FERC Order No. 764 market design to be implemented Spring 2014 address teal-time imbalance energy offset

- All imbalance are cleared and settled in the same market at the same price
 - Load is settled at the weighted average price based upon the load forecast used in market
 - Supply instructed imbalance energy (IIE) is equal to the load forecast used in market
- Neutrality accounts for energy not settled in market
 - LAP Hourly Settlement Neutrality
 - BAA Supply UIE and Loss Settlement Neutrality

LAP Hourly Settlement Neutrality arises from ...

- Excessive rate mitigation measure* for load serving entities within a load aggregation point
- Differences between the RTD load forecast and hourly meter
- Neutrality is allocated to metered demand within the LAP

* ISO posted settlement spreadsheet

BAA Supply UIE and Loss Settlement Neutrality arises from ...

- Generation/participating load uninstructed imbalance energy (UIE).
 - This is the difference between dispatch and 5-minute meter
- Regulation energy
 - For the ISO regulation energy is considered IIE
 - For EIM Entity BAA, this will be observed as UIE
- A credit since marginal loss paid exceeds actual loss
- Neutrality accounts summed by resources in its BAA

Allocation of BAA Supply UIE and Loss Settlement Neutrality considers transfers between BAAs

- On a 5 minute basis, the proportional share of cost is based upon
 - Absolute value of UIE (Supply and Demand) in BAA
 - 5 minute transfer out of the BAA
- For example*, assume Load UIE = 30 MWh, Supply = - 15 MWh, Transfer to EIM Entity #2 = 5 MWh
 - $5 / (30 + 15 + 5) = 10\%$ of the neutrality would be allocated to EIM Entity #2

* ISO posted settlement spreadsheet

Allocation of bid cost recovery payments (1 of 2)

- If RT revenues over day $<$ RT bid costs over day, then generation is paid to difference to make whole.
 - Results in an uplift as it is settled outside the market
- If unit commitment is optional for EIM Entities, then separate costs in (1) energy and (2) commitment costs
 - Energy = Energy, AS, flexible ramping constraint
 - Commitment Costs = Start up and minimum load
- Uplifts for each category calculated for each BAA based upon resources located in that BAA
 - Proportional daily uplift between BAAs based on daily transfers

Allocation of bid cost recovery payments (2 of 2)

- EIM Entity elects no unit commitment in EIM
 - No proportional transfer of costs from BAAs that allow unit commitment
 - EIM Entity responsible for paying commitment costs within EIM Entity BAA according to its rules
- EIM Entity elects unit commitment in EIM
 - Proportional transfer of costs with BAAs that allow unit commitment
 - EIM Participating Resources compensated for commitment costs through EIM

Clarifications to Local Market Power Mitigation

- Real-time LMPM will be applied separately for each BAA
 - Bid mitigation only on resources in the BAA the constraint is located
- All suppliers considered in the three pivotal supplier test
- A unique reference bus will be selected for each BAA
- See DMM presentation at MSC for more information on LMPM processes
 - http://www.caiso.com/Documents/LocalMarketPowerMitigation-EnergyImbalanceMarket-ISOPresentationJul2_2013.pdf

EIM dispatch algorithm will include GHG costs for EIM Participating Resources that transfer output to ISO

- EIM Entity load will not pay GHG costs for load met by resources outside California
- EIM Entity load indirectly pays GHG costs for transfers from ISO because GHG included in ISO resources' bids
- ISO load pays GHG costs for transfers from EIM Entity
- EIM Participating Resources paid the marginal cost of GHG for transfers to ISO and have a GHG compliance obligation
 - Includes 15-minute imports on EIM Entity BAA boundary

GHG responsibilities of EIM Participating Resource Scheduling Coordinators

- Provide resource emission factors to be included the ISO Master File prior to participating in EIM
- Register in CARB's compliance instrument tracking system service (CITSS)
- Register anticipated import resources that bid in EIM
- Report imports to California as part of annual emissions data report due by June 1

* The paper includes links to CARB processes

CARB is initial stages updating its Mandatory Reporting Regulation to incorporate EIM (1 of 2)

- GHG design being developed in consultation with CARB
- No requirement to use e-Tags at resource level
- ISO will calculate the output of each resource that is transferred to California
- This amount will be reportable to CARB in the annual emissions data report and the basis for GHG compliance obligation

CARB is initial stages updating its Mandatory Reporting Regulation to incorporate EIM (1 of 2)

- Resource shuffling rules are targeted at long term bilateral transactions, not to spot market trades that occur in EIM
- GHG proposal is consistent with how a market participant would consider bidding its resources today
 - If selling outside of California, would not include GHG cost in bid
 - If importing to California, would include GHG cost in bid
 - The proposal automates this process for EIM Participating Resources

Should the following be options within the EIM design?

- Base schedules submitted hourly versus updated every 15-minutes
- Unit commitment in EIM Entity versus no unit commitment

Benefits of base schedule submitted hourly versus every 15 minutes (1 of 2)

- Simplified submission of base schedules by EIM Entity Scheduling Coordinator. Only hourly submission of balanced schedule versus every 15-minutes.
- All supply, import, export imbalances from bilateral hourly interval transactions are settled in EIM. No OATT settlement for imbalances.
- All non-participating load imbalances from hourly forward schedules are settled in the EIM using the most efficient resources in the EIM footprint.

Benefits of base schedule submitted hourly versus every 15 minutes (2 of 2)

- EIM Entity can take full advantage of the real-time intertie scheduling options offered from FERC Order No. 764 design changes with external BAAs
- Under FERC Order No. 764, 15-minute schedules will reflect physical outages from supply. There is no uninstructed imbalance energy for supply resources once the physical change is reflected in the 15-minute market optimization.

Benefits of real-time unit commitment for EIM Entities within EIM

- EIM can determine most economically efficient commitment in RT
- RT commitment costs and start up costs to resources are settled through EIM.
 - No separate settlement needed under EIM Entity tariff
- RT commitment is a feature of the ISO real-time market
 - EIM Entities and ISO fully utilize market functionality

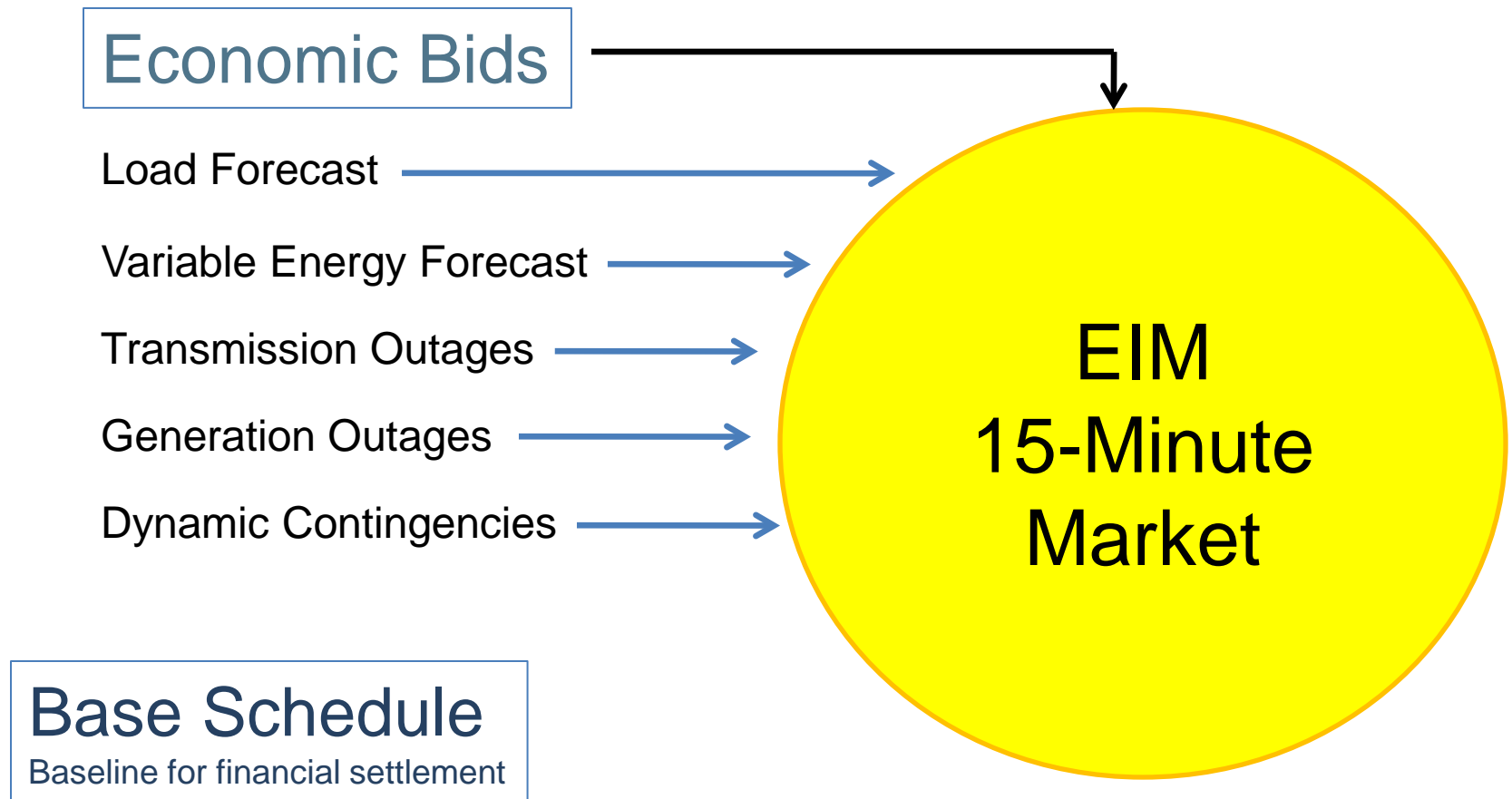
Transmission Service proposal unchanged from revised straw proposal

- Initial implementation: no transmission costs for transfers between EIM Entity BAAs or within EIM Entity BAAs
- Future design would be informed by actual operation experience
- The ISO is still evaluating potential options and will discuss further in next paper
- Additional stakeholder comments or responses to other stakeholder comments are welcome

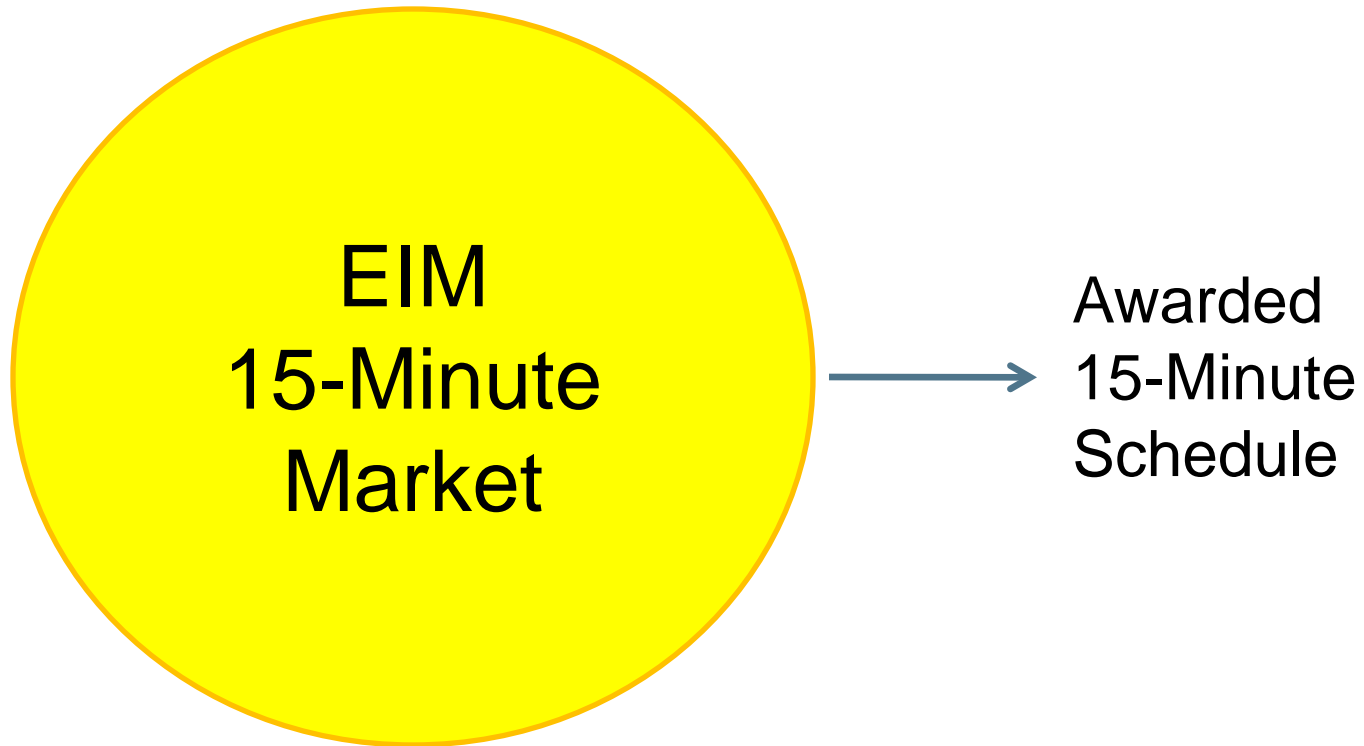
EIM Process Overview

**EIM Entity
Scheduling
Coordinator
Base Schedule**

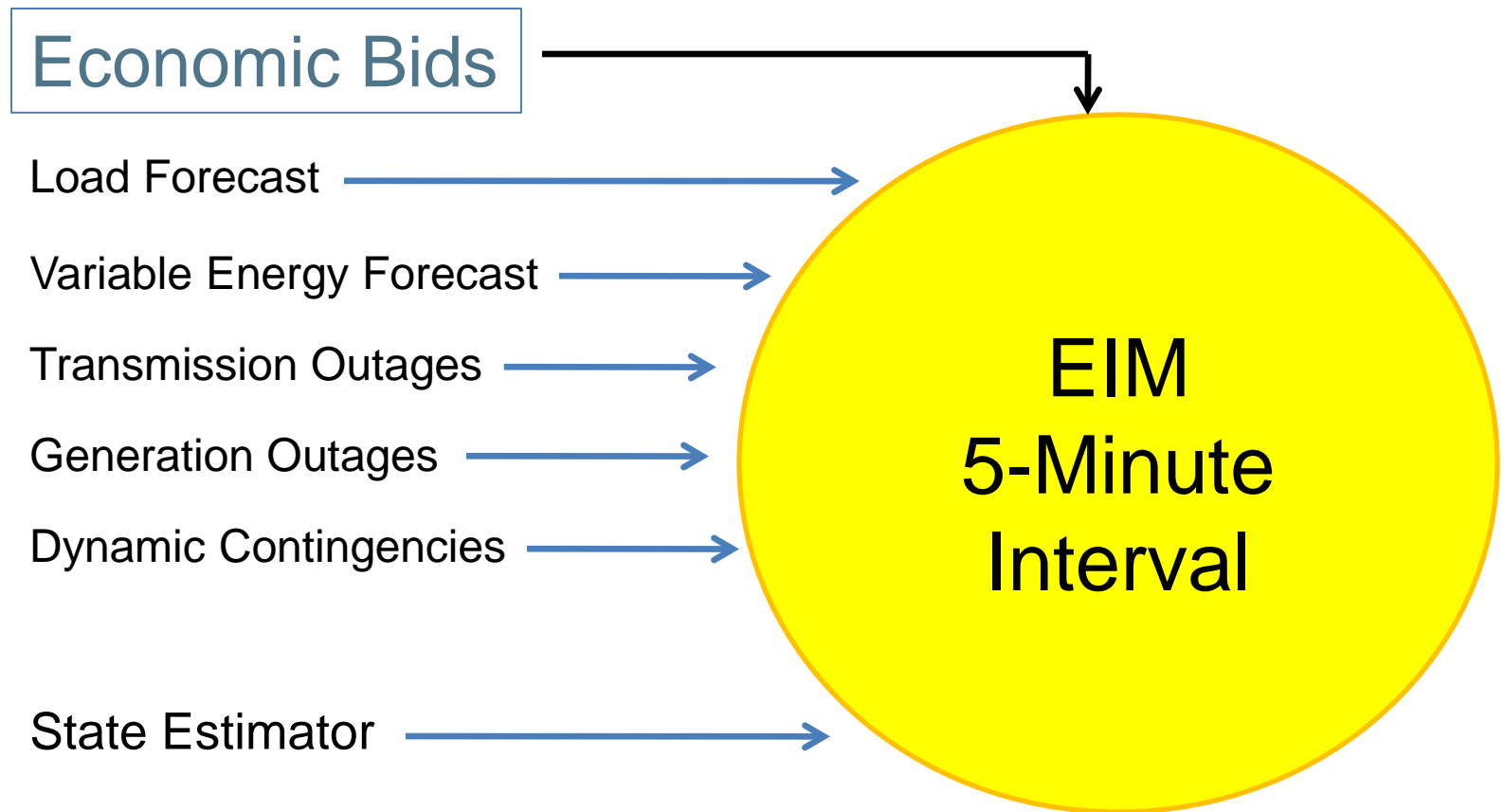
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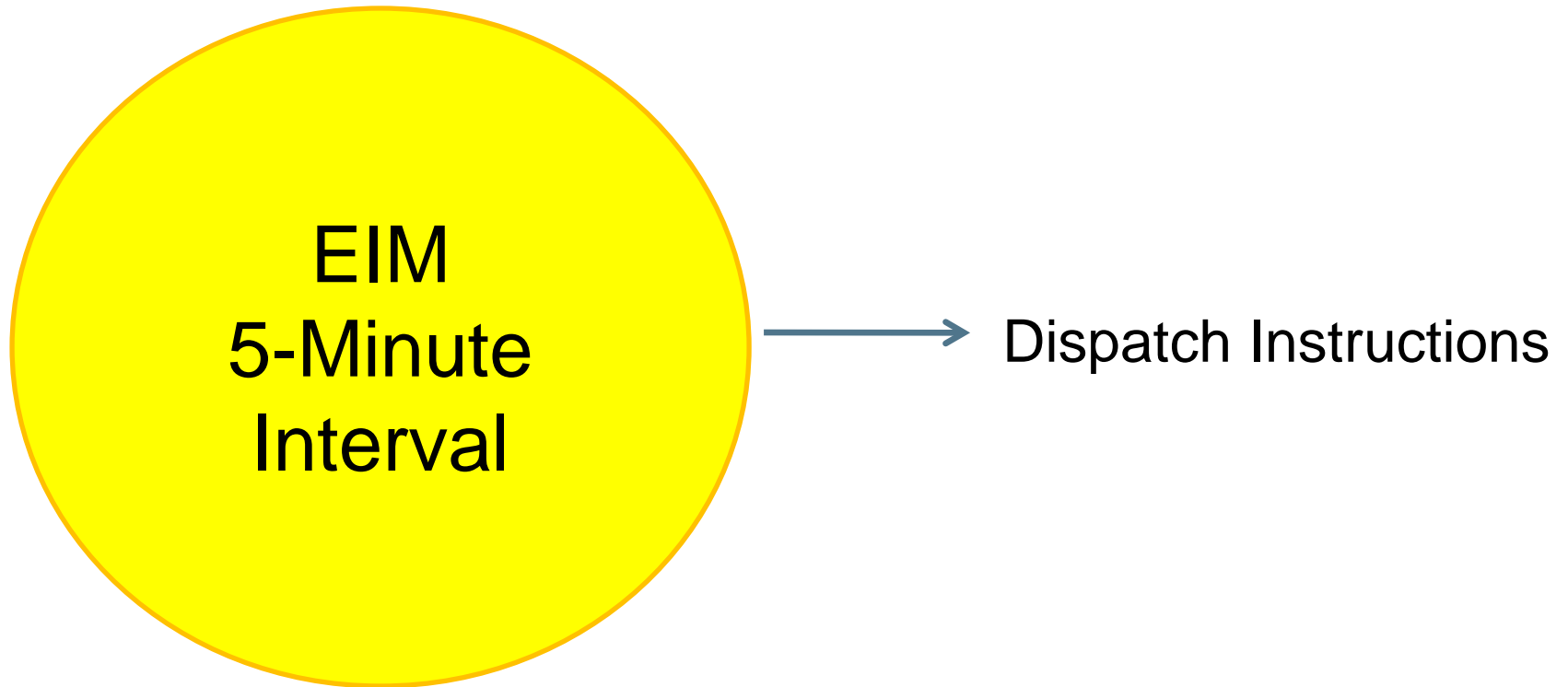
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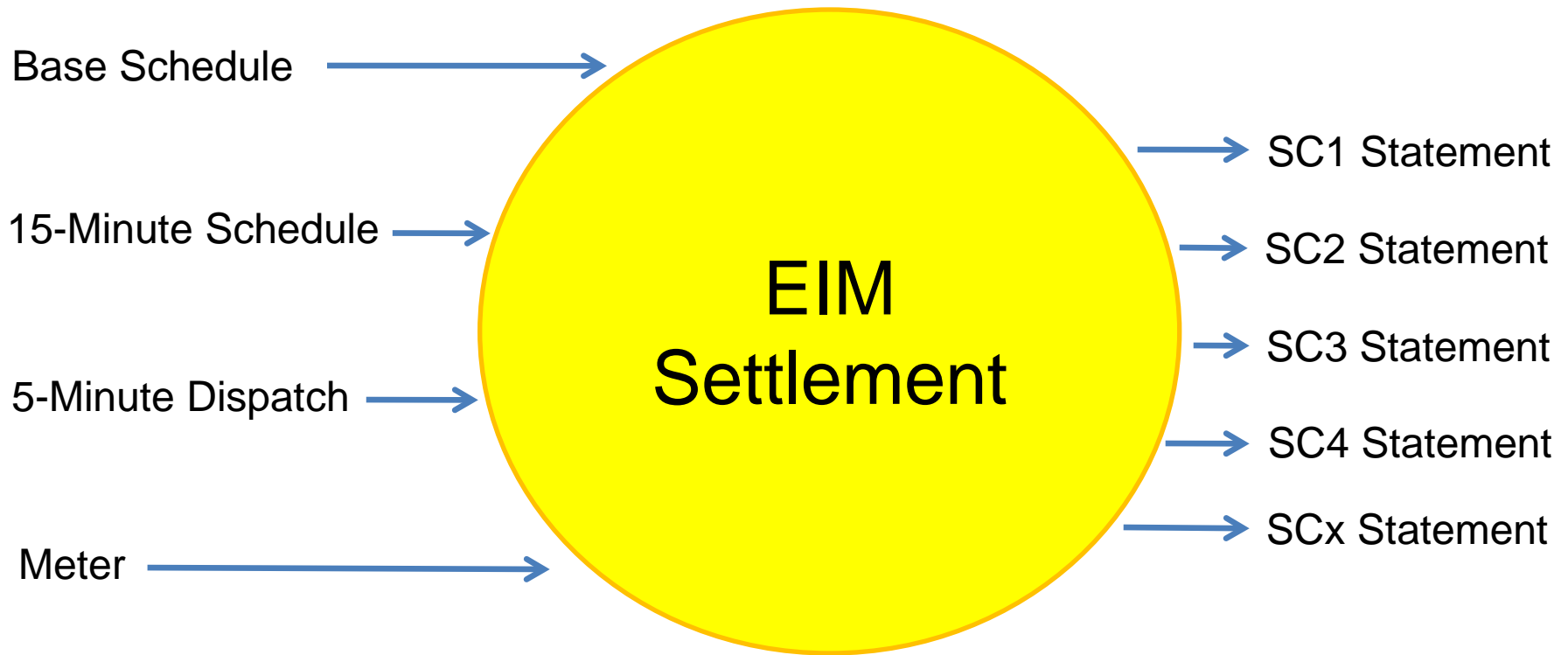
EIM Process Overview



EIM Process Overview



EIM Process Overview



Parallel Governance Stakeholder Initiative

- ISO plans to publish white paper no later than August 13
- White paper will be discussed at August 20 stakeholder meeting in Portland
- Stakeholder comments on white paper due August 27
- Revisions to the white paper and subsequent discussions will be scheduled to address stakeholder comments received

Next Steps:

Comments to EIM@caiso.com by July 26

Item	Date
Post 2 nd Revised Straw Proposal	July 2, 2013
Stakeholder Meeting (Phoenix)	July 9, 2013
Stakeholder Comments Due	July 26, 2013
Post 3 rd Revised Straw Proposal and Governance White Paper	August 13, 2013
Stakeholder Meeting (Portland)	August 20, 2013
Stakeholder Comments Due	August 27, 2013
Post Tariff Framework	September 10, 2013
Stakeholder Comments Due (Tariff Framework)	September 20, 2013
Post Draft Final Proposal (DFP)	September 23, 2013
DFP Stakeholder Meeting (Folsom)	September 30, 2013
Tariff Framework Stakeholder Meeting (Folsom)	October 1, 2013
Stakeholder Comments Due (DFP)	October 8, 2013
Board Decision (Policy)	November 7-8, 2013
Post Draft Tariff Language	November 12, 2013
Stakeholder Comments Due (Tariff)	December 5, 2013
Tariff Stakeholder Meeting (Folsom)	December 19, 2013