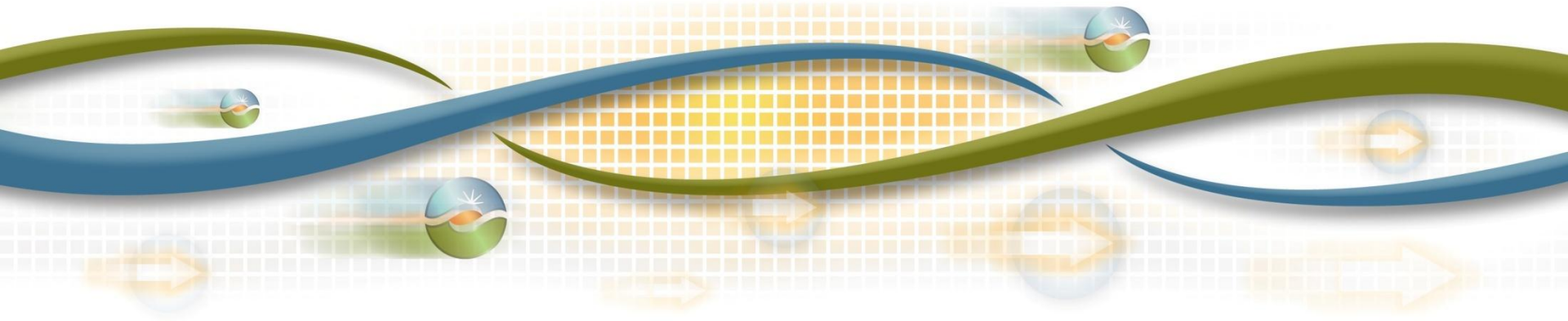


# Energy Imbalance Market Draft Final Proposal

Stakeholder Meeting  
September 30, 2013



# Agenda

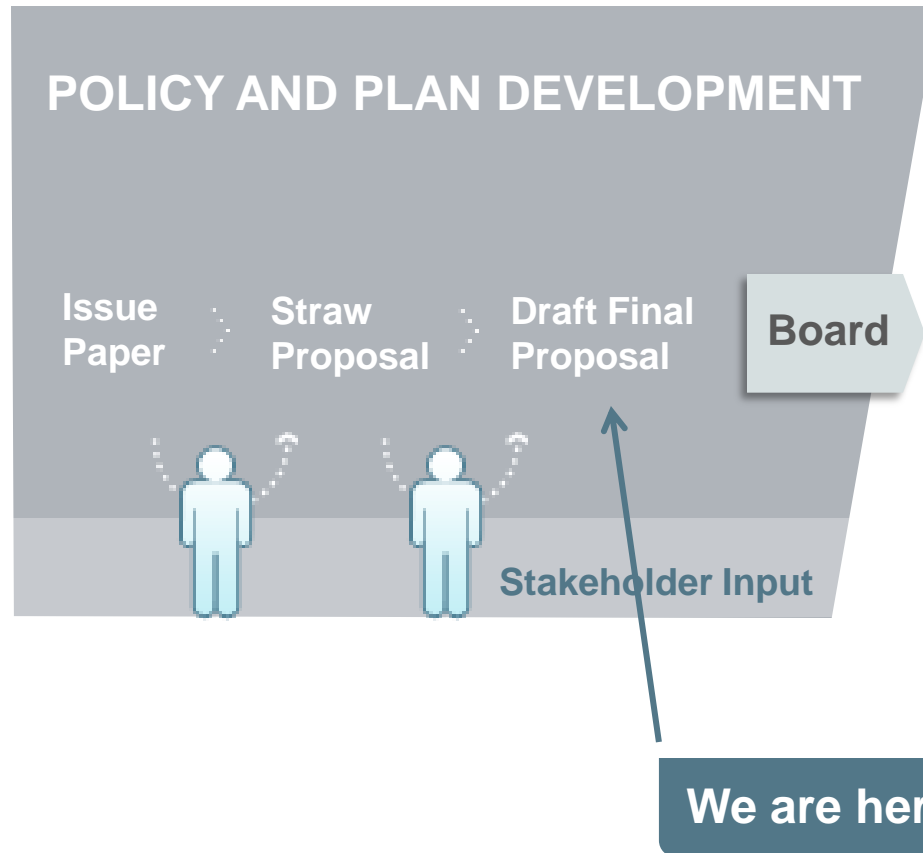
Time	Topic	Presenter
10:00 – 10:10	Introduction	Tom Cuccia
10:10 – 12:00	Summary of Design Changes EIM Overview Base Schedule Submission Resource Plan Approval	Don Tretheway
12:00 – 1:00	Lunch Break	
12:00 – 2:30	Resource Sufficiency Evaluation Real Time Bid Cost Recovery	Don Tretheway
2:30 – 2:40	Break	
2:40 – 3:50	Neutrality Accounts Future Design Enhancements	Don Tretheway
3:50 – 4:00	Wrap-up and Next Steps	Tom Cuccia

# ISO Policy Initiative Stakeholder Process



**We are here**

# ISO Policy Initiative Stakeholder Process



## Changes made in Draft Final Proposal (1 of 4)

- Added definition of EIM Transmission Service Provider, EIM Transfer, Base Schedule and Resource Plan.
- Added process to facilitate the submission of resource base schedules (non-participating resources and participating) and the review/approval of the resource plan by the EIM Entity Scheduling Coordinator.

## Changes made in Draft Final Proposal (2 of 4)

- Incorporated EIM transfers out prior to the start of the operating hour in the flexible ramping sufficiency test.
- Modified the flexible ramping constraint formulation to allow loop flow through EIM Entity BAAs that fail the flexible ramping sufficiency test.
- Added an over-scheduling penalty.
- Modified the allocation of scheduling penalties from monthly to daily.

## Changes made in Draft Final Proposal (3 of 4)

- Removed the option for an EIM Entity to not allow unit commitment which simplified the bid cost recovery proposal.
- Added ability for EIM Transmission Service Providers, including 3<sup>rd</sup> party transmission service providers, to make transmission available for EIM use.
- Provided additional discussion on the transmission used to support EIM transfers between EIM Entities and the ISO.

## Changes made in Draft Final Proposal (4 of 4)

- Added a \$0.00 bid floor for GHG compliance bids and modified the bid to a single daily value.
- Clarified metering requirements for participating and non-participating resources.
- Added additional discussion on coordination with non-EIM BAAs.
- Includes minor edits to improve clarity from 3<sup>rd</sup> revised straw proposal.



## Defined terms (1 of 7)

- **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.

## Defined terms (2 of 7)

- **EIM Entity** is a balancing authority, **which represents one or more EIM Transmission Service Providers that make transmission available for EIM use**, 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. The EIM Entity determines which resource types and transmission service is required to be eligible to participate in the EIM within the EIM Entity BAA. For example, an EIM Entity could determine that 15-minute economic bids for imports/exports would not be supported within the EIM Entity BAA even though this functionality is supported by the EIM.

## Defined terms (3 of 7)

- **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, under which it is responsible for meeting the requirements specified in Tariff Section 29 on behalf of the EIM Entity. The EIM Entity Scheduling Coordinator **is responsible for approving resource plans** for the EIM Entity BAA, for uninstructed 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 (4 of 6)

- **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 it is responsible for meeting the requirements specified in Tariff Section 29. In the 5-minute market, eligible resources are those that can deliver energy, curtailable demand, demand response services or other similar services under the ISO Tariff provided they are enabled by the EIM Entity under its requirements for the delivery of energy or other similar services within its BAA, and may include Generating Units, Physical Scheduling Plants, Participating Loads, Proxy Demand Resources, Non-Generator Resources and Dynamic Transfers. 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 (5 of 7)

- **EIM Participating Resource Scheduling Coordinator** is the participating 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 elects to economically participate in the EIM.

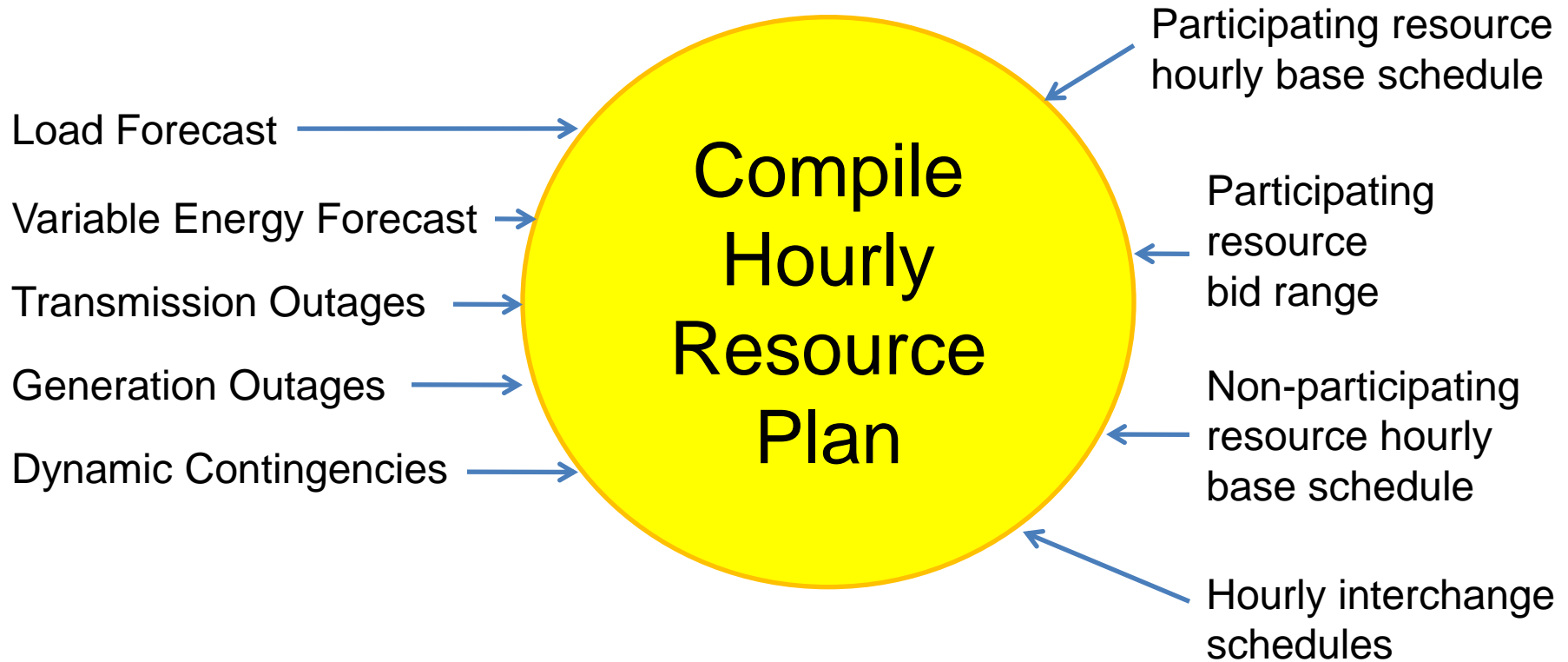
## Defined terms (6 of 7)

- **EIM Transmission Service Provider** is a transmission owner or customer (may be a 3rd party separate from the EIM Entity) that controls transmission in the EIM Entity BAA. Such a provider can voluntarily inform the EIM Entity that it is making its transmission available for EIM use.
- **EIM Transfer** is a transfer of real-time energy between an EIM Entity BAA and the ISO BAA or between EIM Entity BAAs using transmission capacity available in the EIM.

## Defined terms (7 of 7)

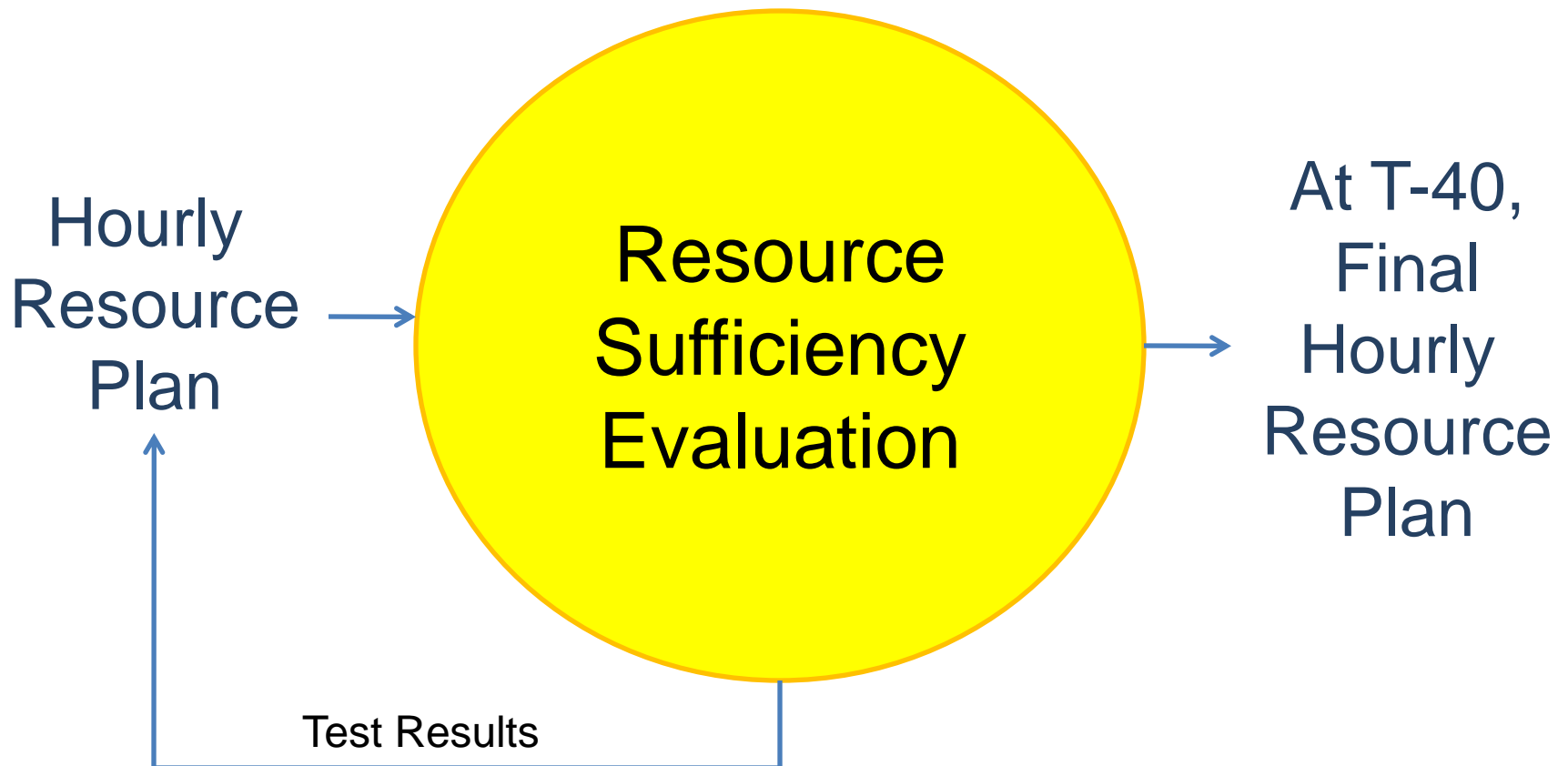
- **Base Schedule** is a forward energy schedule, with hourly granularity, that is the baseline to measure deviations for settlement through the EIM. Base schedules include the hourly forecasts of load, hourly generation schedules and hourly interchange schedules.
- **Resource Plan** is the combination of load base schedules, generation base schedules, interchange base schedules, ancillary services plans of the EIM Entity, and the bid range voluntarily submitted by EIM Participating Resources. Resource plans balance demand and supply and are used in the resource sufficiency evaluation.

# Energy Imbalance Market Overview

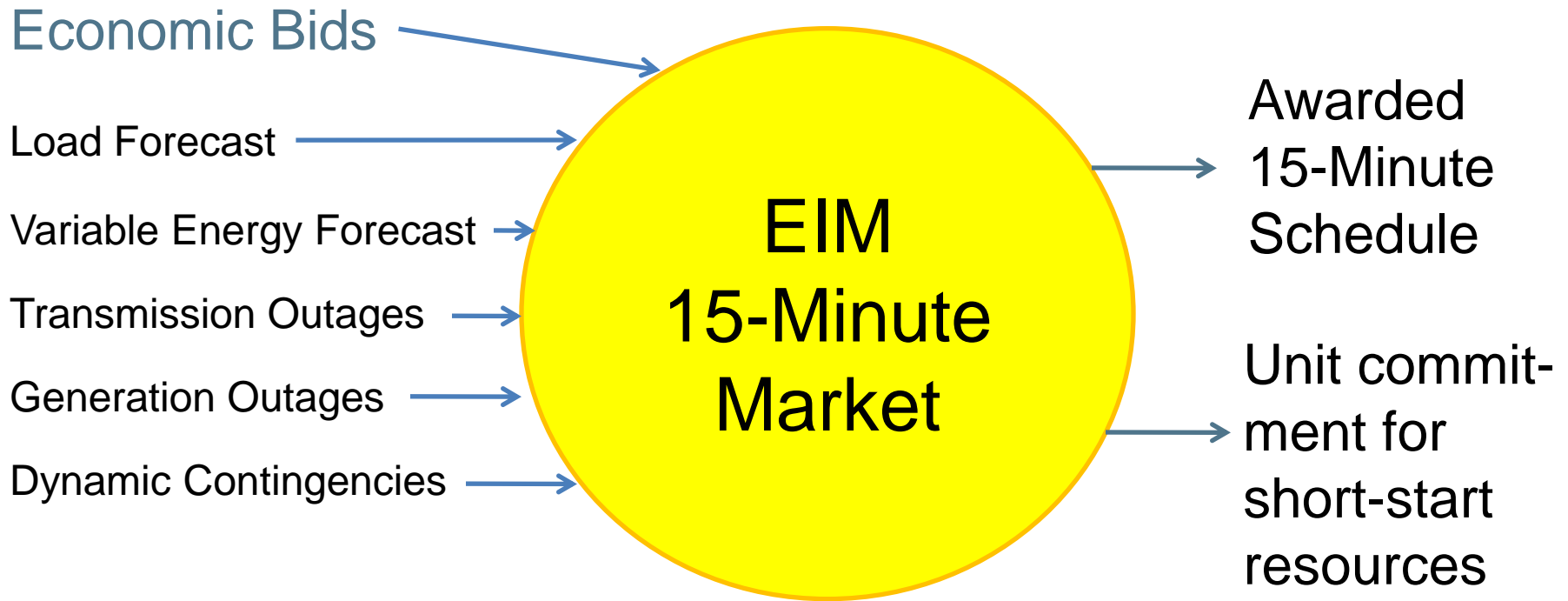




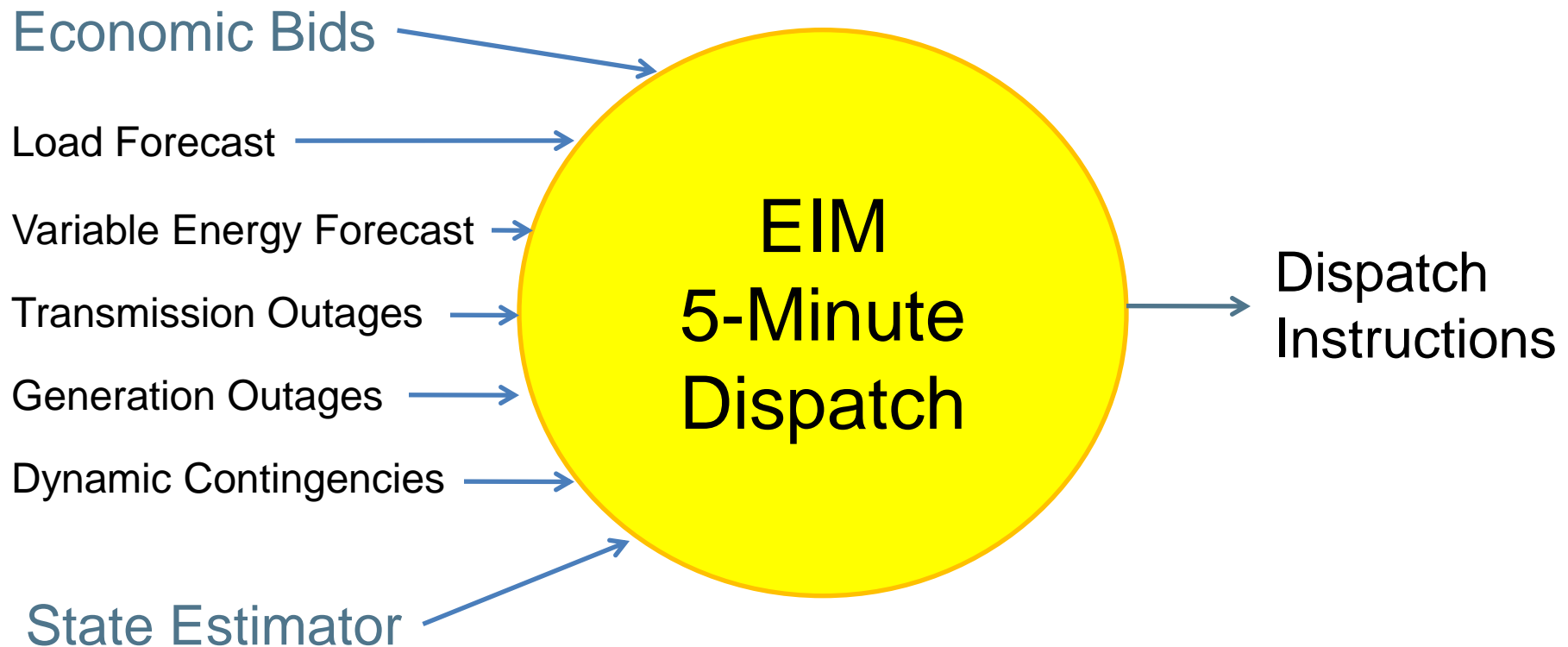
# Energy Imbalance Market Overview



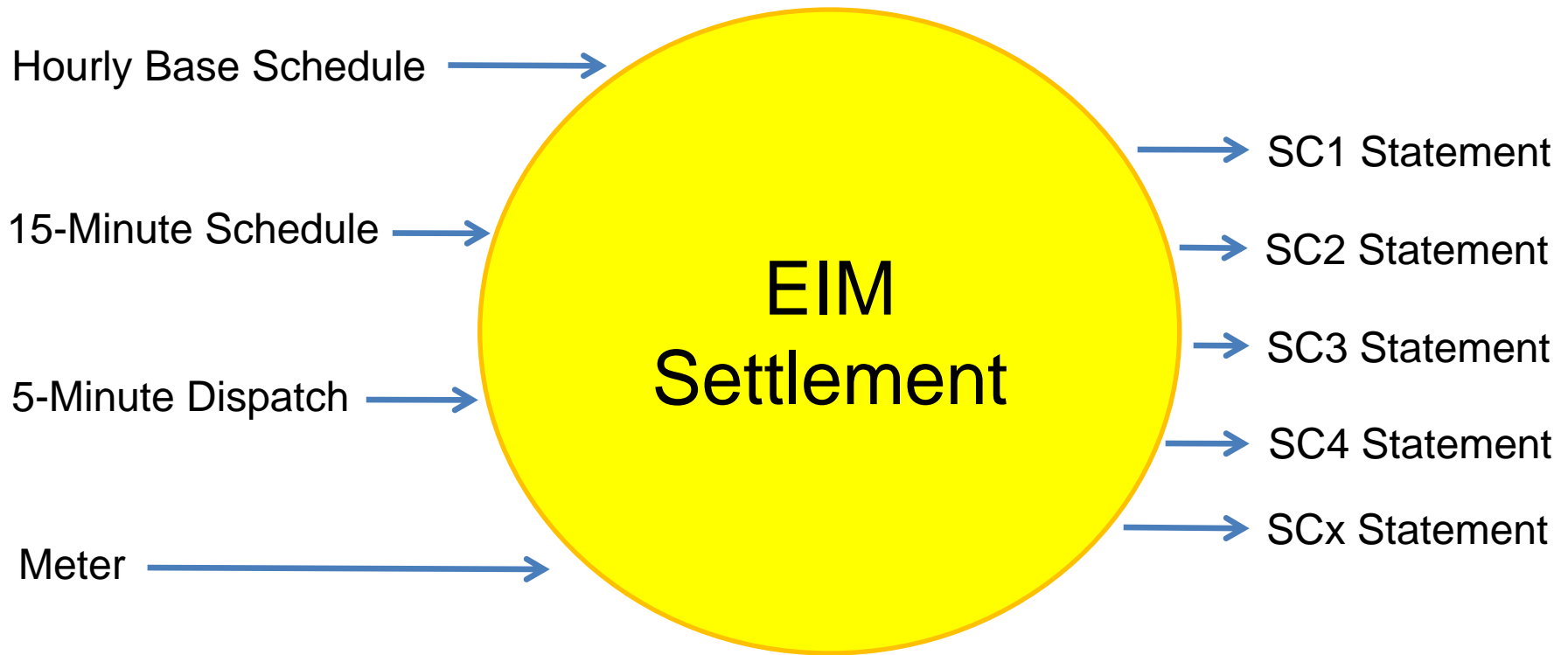
# Energy Imbalance Market Overview



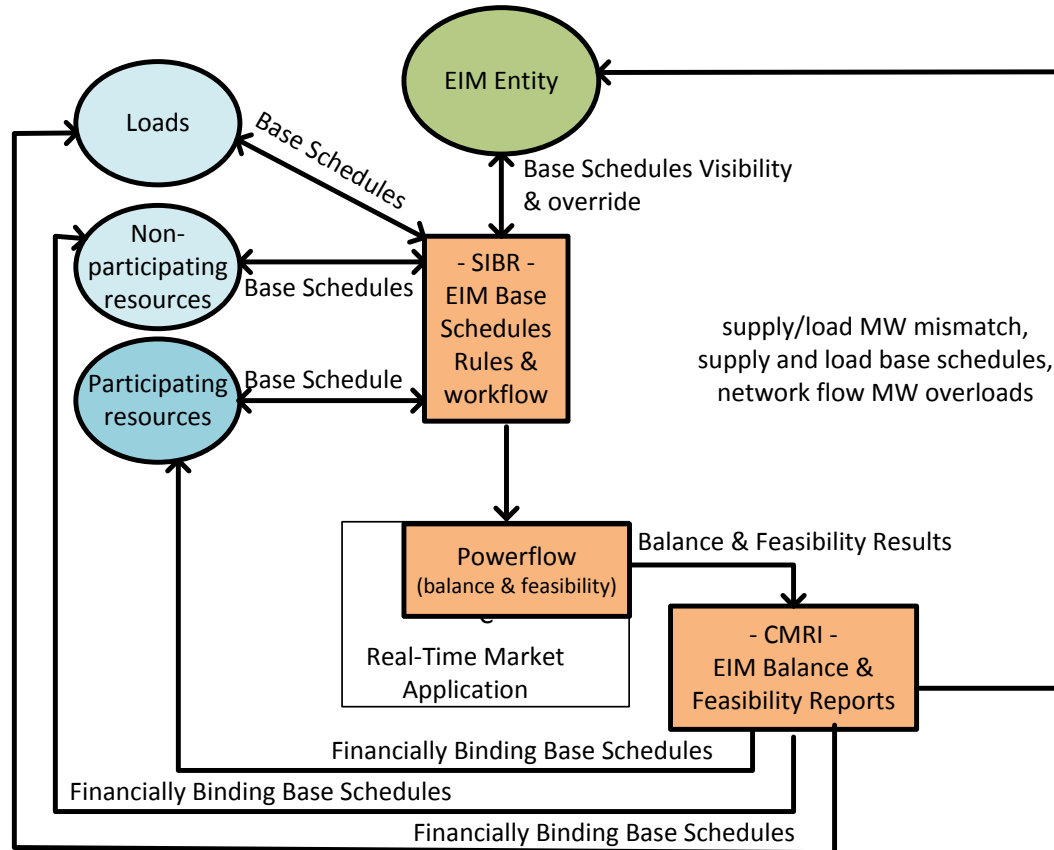
# Energy Imbalance Market Overview



# Energy Imbalance Market Overview



# EIM design includes functionality to submit base schedules and review/approve resource plans



## Facilitation of submission of hourly base schedules and review/approval of hourly resource plans (1 of 3)

- Provide EIM Entity branded SIBR user interface for EIM resources to specifically submit their base schedules.
- First deadline for submission of all base schedules from all resources for trade hour starting at T shall be T-75 minutes.
  - Note base schedules can be submitted up to 7 days prior for advisory evaluation
- The resources can submit revised base supply schedules, until up to T-55 minutes. After T-55 only the EIM Entity Scheduling Coordinator can adjust base schedules.

## Facilitation of submission of hourly base schedules and review/approval of hourly resource plans (2 of 3)

- EIM Entity Scheduling Coordinator has full visibility of all base schedules at all times.
- EIM Entity Scheduling Coordinator can adjust/submit one or more base schedules to fix any remaining MW mismatch or overloads that were not resolved by the base schedules submitted by the various resources.
  - The EIM Entity Scheduling Coordinator can do adjustment of base schedules from T-50 minutes to T-40 minutes.
  - The final resource plan is approved at T-40 minutes by the EIM Entity Scheduling Coordinator.

## Facilitation of submission of hourly base schedules and review/approval of hourly resource plans (3 of 3)

- Market Operator will store MW balance mismatch and transmission flow overloads results for balancing all EIM base schedules for all intervals in time horizon of the market run before adding the impact of economic bids,
- Balancing and feasibility evaluation power flow run and publishing of the corresponding results is done according to the real-time market timeline.
- Create web service payloads and reports in CMRI for the relevant pre-market results such as base schedules for all EIM BAA resources, base load schedules, and overloaded equipment.



## Resource sufficiency evaluation looks at balance, feasibility and flexibility

- Allows EIM Entity SC to update hourly base schedules in resource plan prior to start of EIM to address:
  - Demand (Load + Losses) and Supply Balance
  - Congestion
  - Insufficient Ramping
- T-40 approval of resource plan, with repercussions for imbalance, infeasibility and insufficient flexibility
  - Load adjustment and scheduling penalties
  - Accruals to BAA congestion balancing account
  - EIM transfers in restricted

## If Supply does not equal Demand...

- Demand Forecast = Load + Losses
- Load is base schedule for settlement imbalance energy
- Adjust Load so Demand equal Supply
- Unbalanced resource plans will be settled through EIM via Load settlement

# Under-scheduling penalties to incentivize balanced base schedules

- EIM Entity using own load forecast for base schedule
  - If load imbalance exceeds 5% (but at least 2MW) of LAP, then
    - Price = 125% of the LAP LMP
  - If load imbalance exceeds 10% of LAP, then
    - Price = 200% of the LAP LMP
- EIM Entity using Market Operator forecast
  - If forecast < EIM Entity SC base schedule supply by >1%, then
  - Deemed to be using own forecast and subject to penalties above
- Premiums collected over day allocated to load that has not incurred a scheduling penalty in any hour of the day

# Over-scheduling penalties to incentivize balanced base schedules

- EIM Entity using own load forecast for base schedule
  - If load imbalance exceeds 5% (but at least 2MW) of LAP, then
    - Price = 75% of the LAP LMP
  - If load imbalance exceeds 10% of LAP, then
    - Price = 50% of the LAP LMP
- EIM Entity using Market Operator forecast for base
  - If forecast < EIM Entity SC supply by >1%, then
  - Deemed to be using own forecast and subject to penalties above
- Discounts collected over day allocated to load that has not incurred a scheduling penalty in any hour of the day

# BAA Real-Time Congestion Balancing Account calculates cost of infeasible base schedules

- 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
- Each BAA bears its own cost of infeasible schedules entering the EIM

## Each BAA has a flexible ramping requirement to meet their potential dispatch independently

- Ensures sufficient ramp capability is available in RTUC and manages ramp capability in RTD
  - Flexible ramping constraint is only upward
  - Future product is upward and downward
- Flexible ramping requirement for each EIM Entity BAA sufficiency test recognizes diversity benefit and EIM transfers out
  - Requirement must be met in the hourly resource plan
- Market optimization selects for most efficient resources to meet the system requirement
  - EIM Entity SC allocated the cost of meeting BAA constraint

# Flexible ramping sufficiency test considers diversity benefit and EIM transfers out

- Performed for each EIM Entity BAA
  - After T-75', T-55', and T-40' for the Trading Hour starting at T
  - Data Used:
    - Initial schedules at T-7.5'
    - EIM resources energy bids and ramp rates
    - BAA flexible ramping requirement
      - Credit for diversity benefit up to import capability
      - Credit for EIM transfers out at T-7.5'
- Cumulative test for each 15' interval of the hour
  - 15' ramp from T-7.5' to T+7.5' (1st 15' interval)
  - 30' ramp from T-7.5' to T+22.5' (2nd 15' interval)
  - 45' ramp from T-7.5' to T+37.5' (3rd 15' interval)
  - 60' ramp from T-7.5' to T+52.5' (4th 15' interval)

# Market optimization constraint formulation uses all available import capability to minimize system cost

- **When Flexible Ramping Sufficiency Test Passes**
  - Bottom-Up hierarchical constraints for all BAA combinations
  - BAA (w/o diversity benefit) requirement reduced by total available import capability
- **When Flexible Ramping Sufficiency Test Fails**
  - Failed EIM BAA is excluded from group constraints
  - Net Import Interchange for failed EIM BAA is capped at last schedule for T-7.5'
- **Allow for loop flow through EIM Entities that fail Flexible Ramping Sufficiency Test**



## Bid cost recovery ensures participating resources in EIM footprint cover real-time costs

- If RT revenues over day  $<$  RT costs over day, then generation is paid the difference to make whole.
  - Results in an uplift as it is settled outside the market
- Determine daily BCR for resources with each BAA
- BCR payments made in 5-minute intervals when generator has shortfall
- 5-minute transfers out based upon BCR payments to generators in BAA

## EIM base schedules treated as self-schedules for real-time BCR rules

- BCR mitigation measures filed at FERC on September 25, 2013
- Existing BCR eligibility rules for self-commitment periods apply
- Not eligible for start-up cost if EIM participating resource is included in adjacent hourly base schedule

# Neutrality accounts needed since not all energy is settled through real-time market

- An excessive rate mitigation measure in the pricing formula for load aggregation points
- Differences between the Load forecast in and actual metered Load
- Uninstructed imbalance energy of generation
- Regulation energy
- Real-time marginal loss surplus
- Unaccounted for energy
- Inadvertent energy and time corrections

# Two neutrality accounts needed to keep Market Operator revenue neutral

- Real-Time Market BAA Neutrality Settlement
  - All IIE, UIE, UFE less RT BAA Congestion Balancing Account
  - Portion of neutrality allocated to export transfers to other BAAs
    - Done on a 5-minute basis
  - Then, neutrality is allocated to the EIM Entity SC of BAA
- Real-Time Market System Neutrality Settlement
  - Any residual amounts after transfers of RT Market BAA Neutrality Settlement between BAAs
  - Allocated based on metered demand of EIM Footprint

# Neutrality and Bid Cost Recovery 5-Minute Transfers

- EIM Entity with EIM Transfer Out
  - Proportional share of EIM Entity charge/credit based upon
    - $\text{EIM transfer out} / (\text{ABS Load UIE} + \text{ABS Supply UIE} + \text{ABS UFE} + \text{EIM transfer out})$
- Sum all EIM Entities with EIM Transfer Out to determine total charge/credit to EIM Entities with EIM Transfer In
- EIM Entity with EIM Transfer In
  - Proportional share of total charge/credit allocated based upon
    - $\text{EIM Entity transfer in} / \text{SUM (All EIM Entities with transfer in)}$

# Flexible Ramping Constraint Allocation to BAA

- Resources in EIM footprint compensated for resolving hierarchical constraints used in market optimization
- Each BAA allocated proportional share of resource payments that resolve flexible ramping constraint
- Hierarchical constraints shadow price used to calculate BAA allocation
  - If combined constraints binding, each BAA receives pro-rata share based upon individual BAA constraint MW

## EIM dispatch algorithm will include GHG bid adder for imbalance energy of EIM Participating Resources that transfer to ISO (1 of 2)

- 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 (reflected in ISO LMPs) GHG costs for transfers from EIM Entity

## EIM dispatch algorithm will include GHG bid adder for imbalance energy of EIM Participating Resources that transfer to ISO (2 of 2)

- EIM Participating Resources can bid their GHG compliance cost
  - Single value used for all hours in trade day
  - Minimum bid \$0.00
  - Energy Bid + GHG Compliance Bid  $\leq$  Bid Cap (\$1000)
  - GHG Compliance Bid not subject to LMPM
- EIM Participating Resources SC paid the marginal GHG compliance price for transfers to ISO and have a GHG compliance obligation
  - Includes 15-minute imports on EIM Entity BAA boundary



# ISO convergence bids are not settled for real-time congestion on EIM Entity constraints paid through uplift

- 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 charges on EIM Entity constraints
  - Allocating credits conflicts with EIM Entity SC's submitting resource plans without congestion

# Convergence bidding settlement allocates congestion uplift cost to convergence bidders

- Assign RT congestion uplift from EIM Entity BAA constraints into virtual bucket and physical bucket
  - In direct proportion to out-of-market congestion revenues received by virtual and physical schedules
- Allocate physical bucket to EIM Entity's RT BAA congestion balancing account
- Allocate virtual bucket to virtual schedules
  - In proportion to each schedule's receipt of the out-of-market revenues
- Approach is only applied where there is an out-of-market charge, no out-of market credits

## For first year, reciprocity between ISO and PacifiCorp for transmission used for transfers between BAAs in EIM

- The transfer capability of EIM will be based upon the transmission rights PacifiCorp makes available to EIM
- ISO is working with neighboring BAAs on management of dynamic schedules that enable EIM transfers
- Day-ahead imports from PacifiCorp will reduce import transfer capability available for transfers in EIM
  - Assume 100 MW PacifiCorp transmission right
  - If DA import to ISO = 80 MW, only 20 MW is available for incremental transfers into ISO through EIM

## Premature to develop an EIM phase in approach

- Transfer limits between ISO & EIM Entities undermines benefits and opportunity to identify/resolve issues
- Initial launch of EIM is naturally limited
  - ISO and two EIM Entities
  - EIM transfers limited by the transmission rights initially available
- Any phasing approach should be considered and developed after initial testing and market simulation
- Proposed phasing approach could be addressed as part of a briefing to the Board of Governors of testing and market simulation results prior to start of the EIM.

# Future EIM and real-time market design enhancements

- **Transmission Service**
  - Q2'15: Begin analysis with 6 months data
  - Q3'15: Initiate stakeholder initiative
  - Q4'15: Complete analysis with 12 months data
  - Q1'16: Complete stakeholder initiative
  - Fall '16: Implementation
- **Flexible Ramping Product**
  - Q1'14: Initiate stakeholder initiative
  - Q3'14: Complete stakeholder initiative
  - Spring '15: Implementation
- **Market Initiatives Catalog**
  - Stakeholder initiative begins in October

## Next steps

- Submit comments to [EIM@caiso.com](mailto:EIM@caiso.com) on Draft Final Proposal by October 7, 2013
- Board decision on EIM design on November 7-8, 2013
- Board decision on EIM governance on December 18-19, 2013

# Calendar of future EIM activities

Item	Date
DFP Stakeholder Meeting (Folsom)	September 30, 2013
Tariff Framework Stakeholder Meeting (Folsom)	October 1, 2013
Post Straw Proposal and Charter (Governance)	October 4, 2013
Stakeholder Comments Due (DFP)	October 8, 2013
Stakeholder Conference Call (Governance)	October 11, 2013
Stakeholder Comments Due (Governance)	October 25, 2013
Board Decision (Policy)	November 7-8, 2013
Post Draft Final Proposal and Charter (Governance)	November 7, 2013
Stakeholder Conference Call (Governance)	November 14, 2013
Stakeholder Comments Due (Governance)	November 25, 2013
Post Draft Tariff Language	November 12, 2013
Stakeholder Comments Due (Tariff)	December 5, 2013
Tariff Stakeholder Meeting (Folsom)	December 16, 2013
Board Decision (Governance)	December 18, 2013
Post Revised Tariff Language	January 16, 2014
Stakeholder Comments Due (Tariff)	January 23, 2014
Tariff Stakeholder Meeting (Tariff)	January 30, 2014

# Appendix