

Flexible Ramping Products Draft Final Proposal

Incorporating FMM and EIM

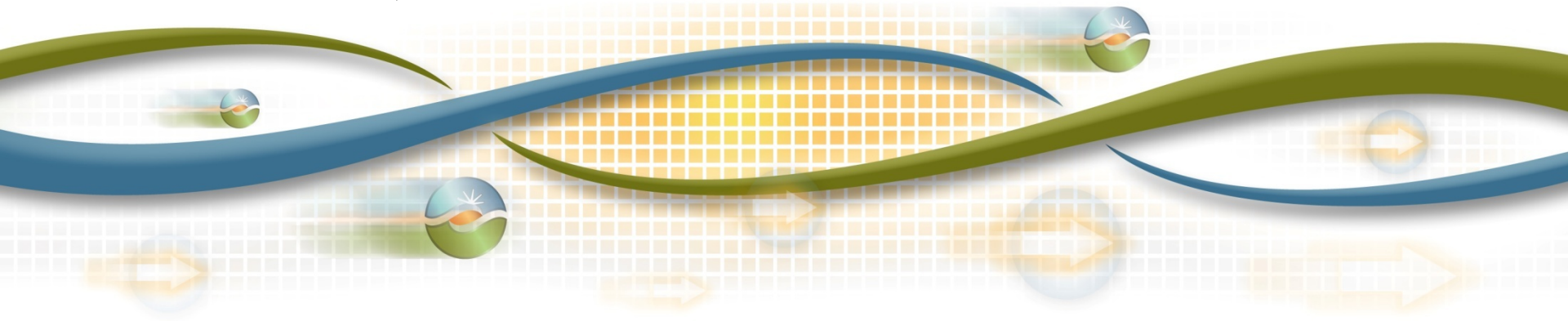
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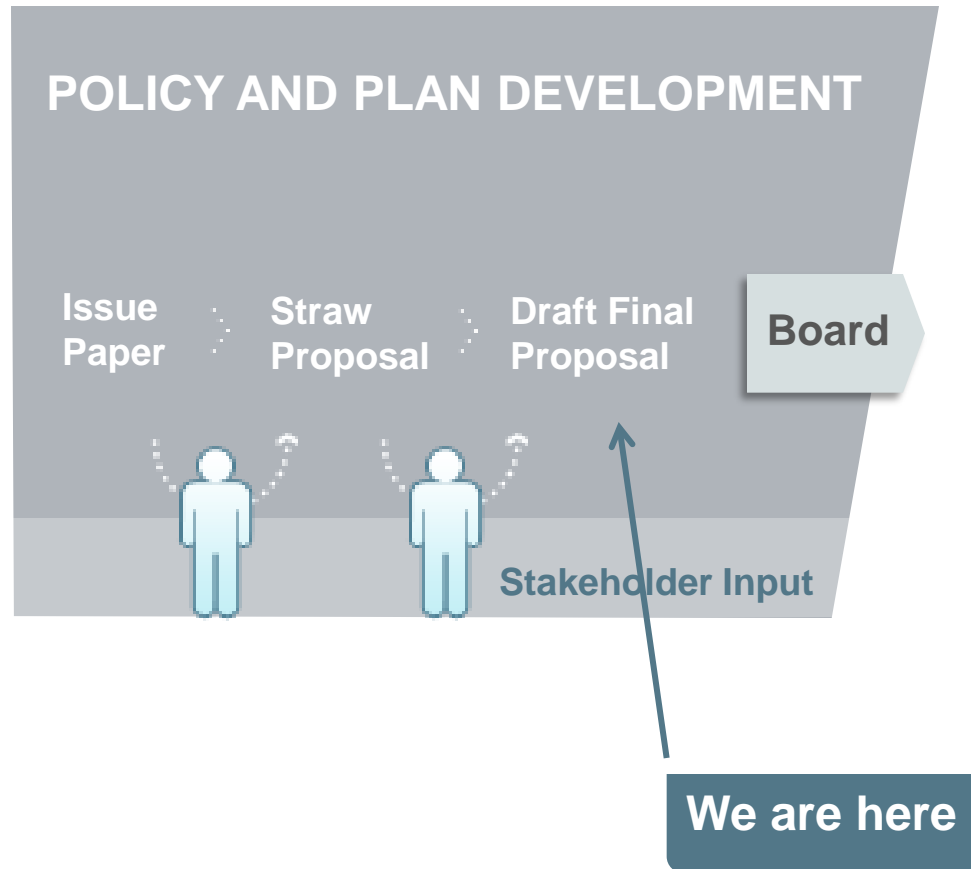
December 11, 2014



Agenda

Time	Topic	Presenter
10:00 – 10:10	Introduction	Kristina Osborne
10:10 – 11:00	RTD, FMM, IFM Requirement	Don Tretheway
11:00 – 11:50	Cost Allocation	Don Tretheway
11:50 – 12:00	Wrap-up and Next Steps	Kristina Osborne

ISO Policy Initiative Stakeholder Process



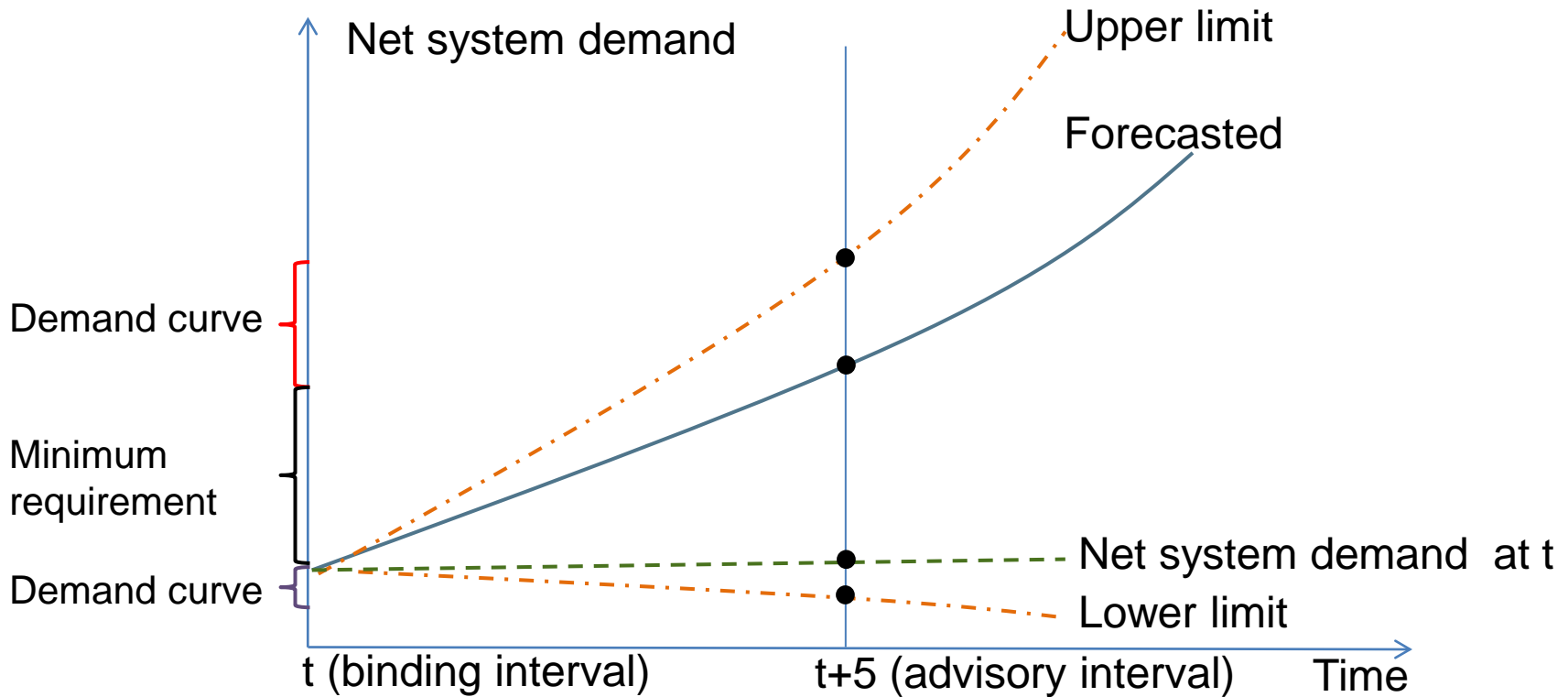
Flexibility is how the fleet moves from hourly schedules to meet actual real-time system conditions

- Real-time economic bids
- FMM
 - Real-time unit commitment
 - 15-minute intertie scheduling
- RTD
 - Flexible ramping product
- Regulation

Flexible ramping product ensures sufficient ramping capability in RTD available to manage the grid

- Secures ramping capability in the IFM, FMM, and RTD
- Compensates resources whose dispatch is held back in financially binding interval to meet future ramping needs
- Allocates costs to movement that requires others to be dispatched who drive requirement and uninstructed imbalance energy
- Must procure real ramp between intervals, but use demand curves to meet variability and uncertainty

Flexible Ramping Product to meet Real Ramping Need

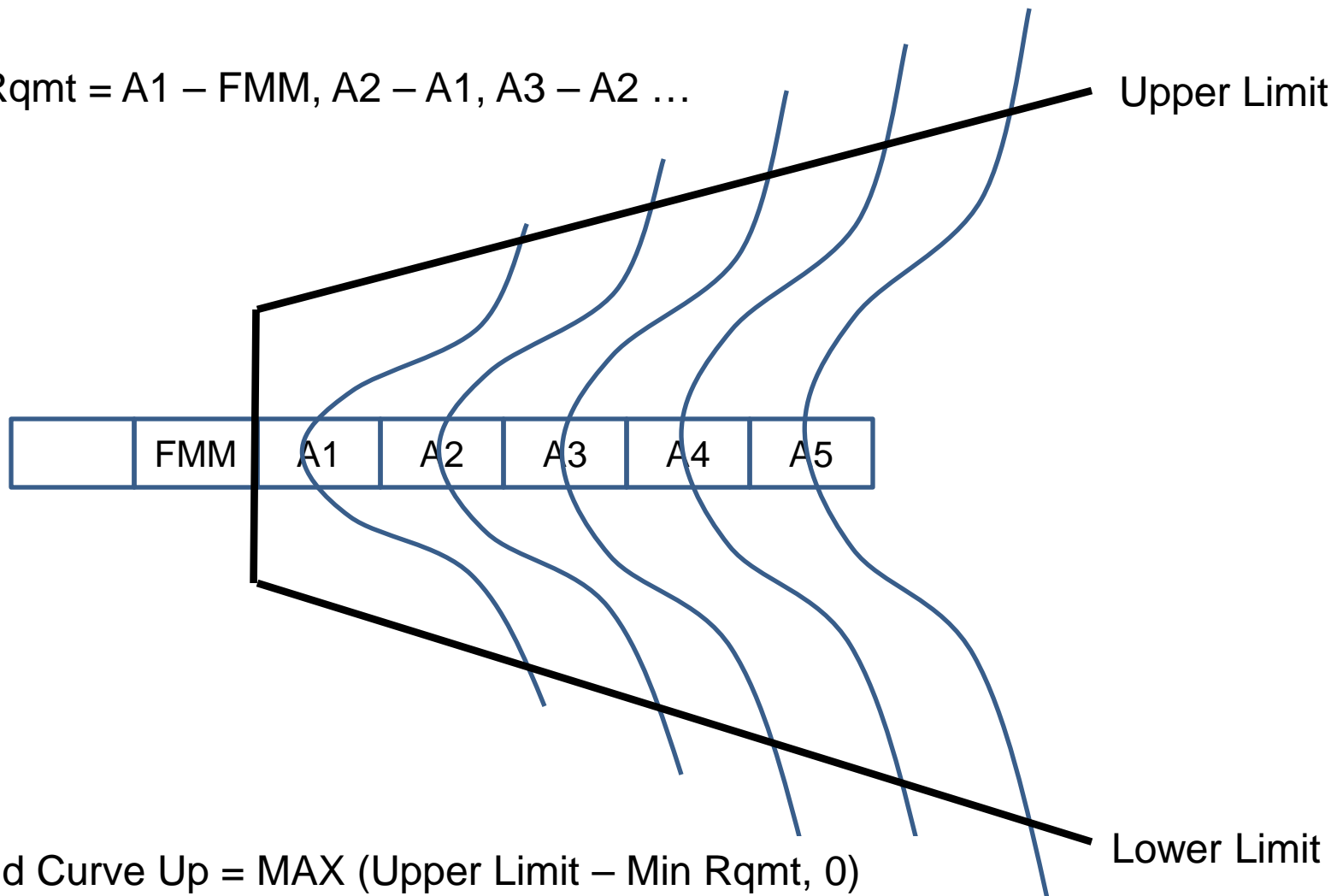


Real ramping need:

Potential net load change from interval t to interval t+5*
(net system demand t+5 – net system demand t)

Envelope calculated for each FMM and RTD market run

Min Rqmt = $A1 - \text{FMM}$, $A2 - A1$, $A3 - A2 \dots$



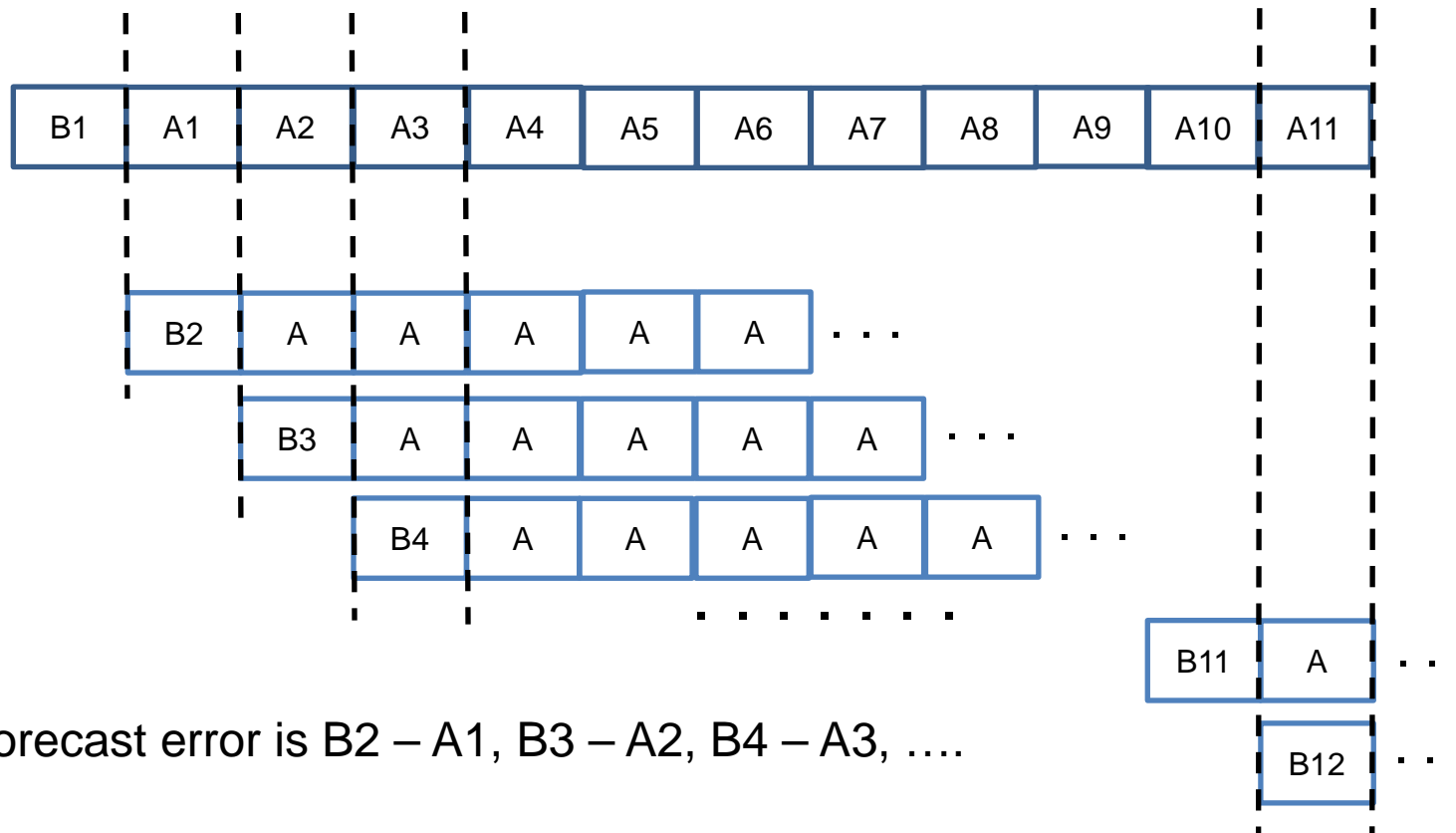
Demand Curve Up = $\text{MAX}(\text{Upper Limit} - \text{Min Rqmt}, 0)$

Demand Curve Down = $\text{MAX}(\text{Min Rqmt} - \text{Lower Limit}, 0)$

RTD forecast error is advisory RTD intervals to binding RTD interval for each interval in horizon

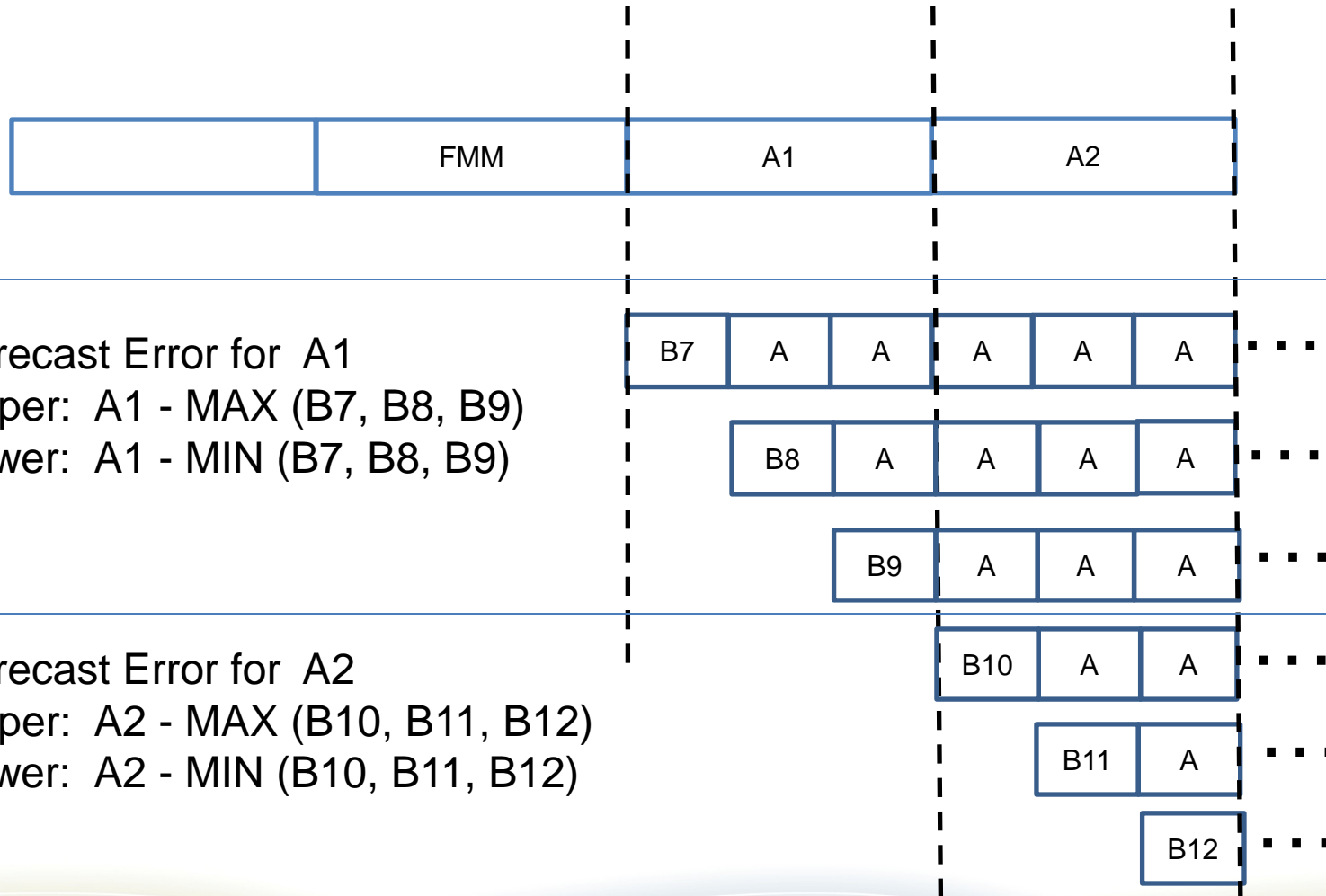
B = Binding A = Advisory

Requirement for RTD run B1



Forecast error is $B2 - A1$, $B3 - A2$, $B4 - A3$,

Use maximum and minimum binding RTD interval for each 15-minute interval to create FMM envelope



Forecast Error for A1

Upper: $A1 - \text{MAX}(B7, B8, B9)$

Lower: $A1 - \text{MIN}(B7, B8, B9)$

Forecast Error for A2

Upper: $A2 - \text{MAX}(B10, B11, B12)$

Lower: $A2 - \text{MIN}(B10, B11, B12)$

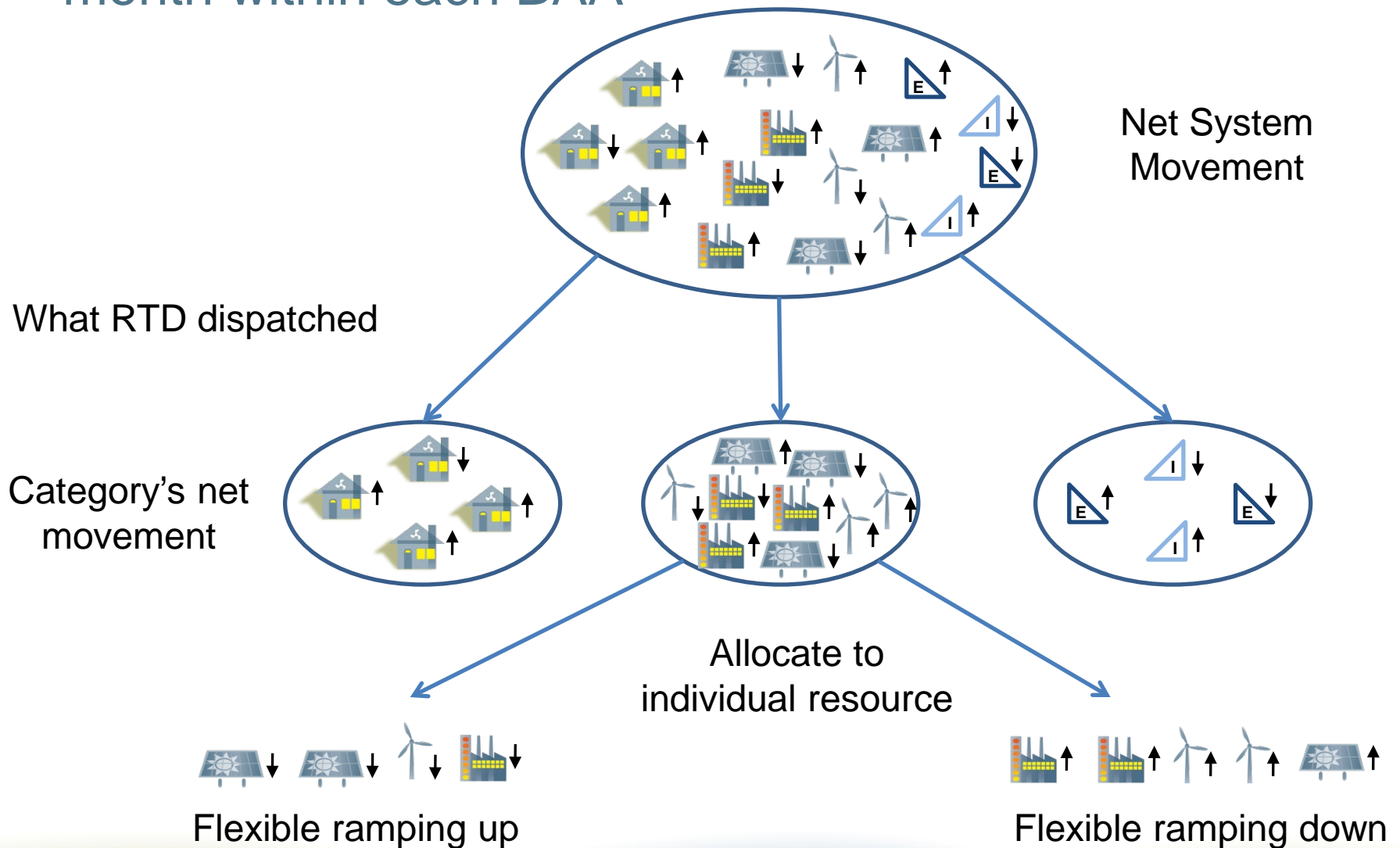
Day Ahead quantity procured using demand curve only

- Historical observed RTD 5-minute ramp between hours
- Flexible ramping up
 - Maximum binding RTD interval of operating hour – Average binding RTD intervals from preceding hour
- Flexible ramping down
 - Average binding RTD intervals from preceding hour – Minimum binding RTD interval of operating hour

Data release planned prior to market simulation and implementation

- Q1 2015
 - Release requirement calculation and netted category information
- Spring 2015 Release
 - Resource specific movement and total gross movement within each category

Cost is allocated to movement in each hour over entire month within each BAA



Initial split to categories in RTD1 (1 of 2)

- Load Movement

- Load forecast RTD1 = 1000 MW, RTD2 = 1010 MW
 - FRU = 10, FRD = 0
- Load forecast RTD 1 = 1100 MW, RTD2 = 1080 MW
 - FRU = 0, FRD = 20

- Interties (includes OA) Movement

- Deemed delivered includes modeled ramps of FMM schedules, hourly blocks and operational adjustments
- Deemed delivered RTD1 = 100 MW (I), RTD2 = 105 MW (I)
 - FRU = 0, FRD = 5
- Demand delivered RTD1 = 200 MW (E), RTD2 = 210 MW (E)
 - FRU = 10, FRD = 0

Initial split to categories in RTD1 (2 of 2)

- Supply Movement

- Economically dispatched within bid range in either RTD1 or RTD2
 - FRU = 0 MW, FRD = 0 MW
- Dispatched at upper economic limit both RTD1 = 150 MW, RTD2 = 135 MW
 - FRU = 15 MW, FRD = 0 MW
- Dispatched at lower economic limit both RTD1 = 100 MW, RTD2 = 110 MW
 - FRU = 0 MW, FRD = 10 MW
- No economic bids, Dispatched at upper economic limit both RTD1 = 150 MW, RTD2 = 160 MW
 - FRU = 0, FRD = 10
- No economic bids, Dispatched at lower economic limit both RTD1 = 100 MW, RTD2 = 95 MW
 - FRU = 5, FRD = 0
- Manual dispatch, exceptional dispatch, or cut in self-schedule reflected in RTD2 is not movement, it is in response to ISO instruction

VER movement example – schedule to forecast with economic bid

Bid \$50
LMP \$60

- FRU allocation
 - FRU = 5
 - Forecast RTD1 = 50 MW, Forecast RTD2 = 45 MW
 - FRU = 0
 - Forecast RTD1 = 50 MW, Forecast RTD2 = 55 MW
- FRD allocation
 - FRD = 0
 - Forecast RTD1 = 50 MW, Forecast RTD2 = 45 MW
 - FRD = 0
 - Forecast RTD1 = 50 MW, Forecast RTD2 = 55 MW

VER movement example – schedule to forecast with self-schedule

- FRU allocation
 - FRU = 5
 - Forecast RTD1 = 50 MW, RTD2 = 45 MW
 - FRU = 0
 - Forecast RTD1 = 50 MW, RTD2 = 55 MW
- FRD allocation
 - FRD = 0
 - Forecast RTD1 = 50 MW, RTD2 = 45 MW
 - FRD = 5
 - Forecast RTD1 = 50 MW, RTD2 = 55 MW

Allocation of within each category

		Baseline	Actual	Deviation	Allocation
1	Load	Day-Ahead Schedule	Metered Demand	UIE	Gross Deviation
2	Variable Energy Resource	Instruction	5 Minute Meter	Resource Movement - UIE	Gross by Resource Outside of Threshold
	Generation	Instruction	5 Minute Meter		
	Dynamic Transfers	Instruction	5 Minute Meter		
3	Interties	Ramp Modeled	Assumed Delivered	Hourly Block Net Movement - OA not in FMM	Gross by SC

No netting across 5-minute settlement intervals.

Next Steps

Item	Date
Post Draft Final Proposal	December 4, 2014
Stakeholder Conference Call	December 11, 2014
Stakeholder Comments Due	January 2, 2015
Board of Governors Meeting	February 5-6, 2015

Please submit comments to FRP@caiso.com by January 2