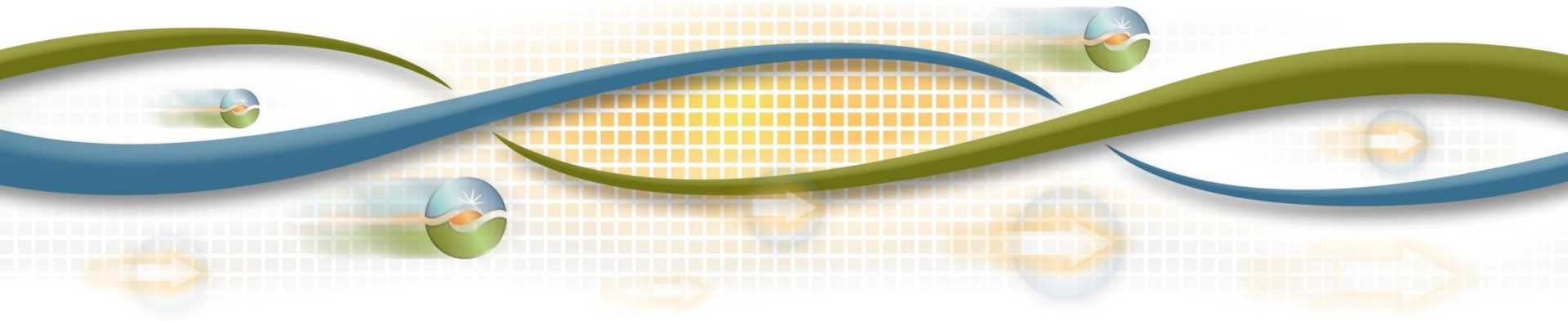


Regional Resource Adequacy: Stakeholder Working Group

August 10, 2016



Agenda

Time (PST)	Topic	Presenter
10:00 - 10:10	Introduction	Kristina Osborne
10:10 - 12:00	Reliability Assessment	Chris Devon
12:00 - 1:00	Lunch	
1:00 - 2:00	Reliability Assessment (continued)	Chris Devon
2:00 - 3:55	Outages and Substitute Capacity	Karl Meeusen
3:55 - 4:00	Next Steps	Kristina Osborne

Regional RA Reliability Assessment Discussion and Examples

Chris Devon
Regional Advisor – Infrastructure Policy

Purpose of discussion is to facilitate stakeholder understanding of proposed reliability assessment

- ISO would like to demonstrate how this assessment will work in an expanded BAA under Regional RA provisions
 - Need to convey mechanics to stakeholders and discuss
- Also intended to be a dialogue on how reliability assessment process should be described in further detail under future Regional RA proposals
 - Feedback and discussion encouraged, ISO is open to input from stakeholders
- Meeting should also be educational for stakeholders that may not be as familiar with ISO RA validation and assessment process
 - Please ask questions if you need clarification

Regional RA reliability assessment annual process overview

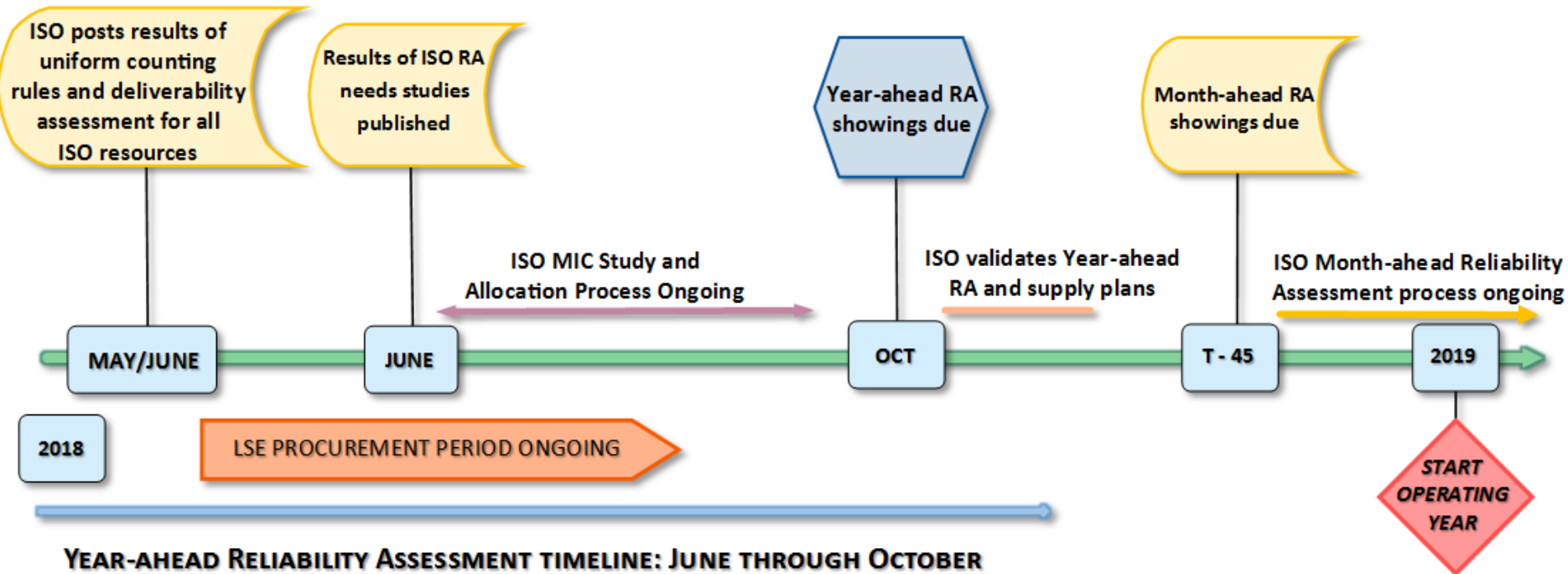


DIAGRAM IS FOR ILLUSTRATIVE PURPOSES ONLY

Reliability assessment inputs and reference data

- What are the inputs and data used for the reliability assessment?
- System Capacity Requirement
 - Load Forecasting
 - Planning Reserve Margin Requirement
 - Resource Capacity Values: Uniform Counting Rules + Deliverability
 - Maximum Import Capability Allocations
- Local Capacity Requirement
- Flexible Capacity Requirement
 - Local and Flexible capacity requirements will require similar inputs

Reliability assessment validations

- Cumulative System-wide assessment
 - System Requirements
 - Flexible Requirements
- TAC area assessment
 - Local Requirements
- Continue cross-validation of RA and supply plans

Regional RA month-ahead Reliability Assessment timeline

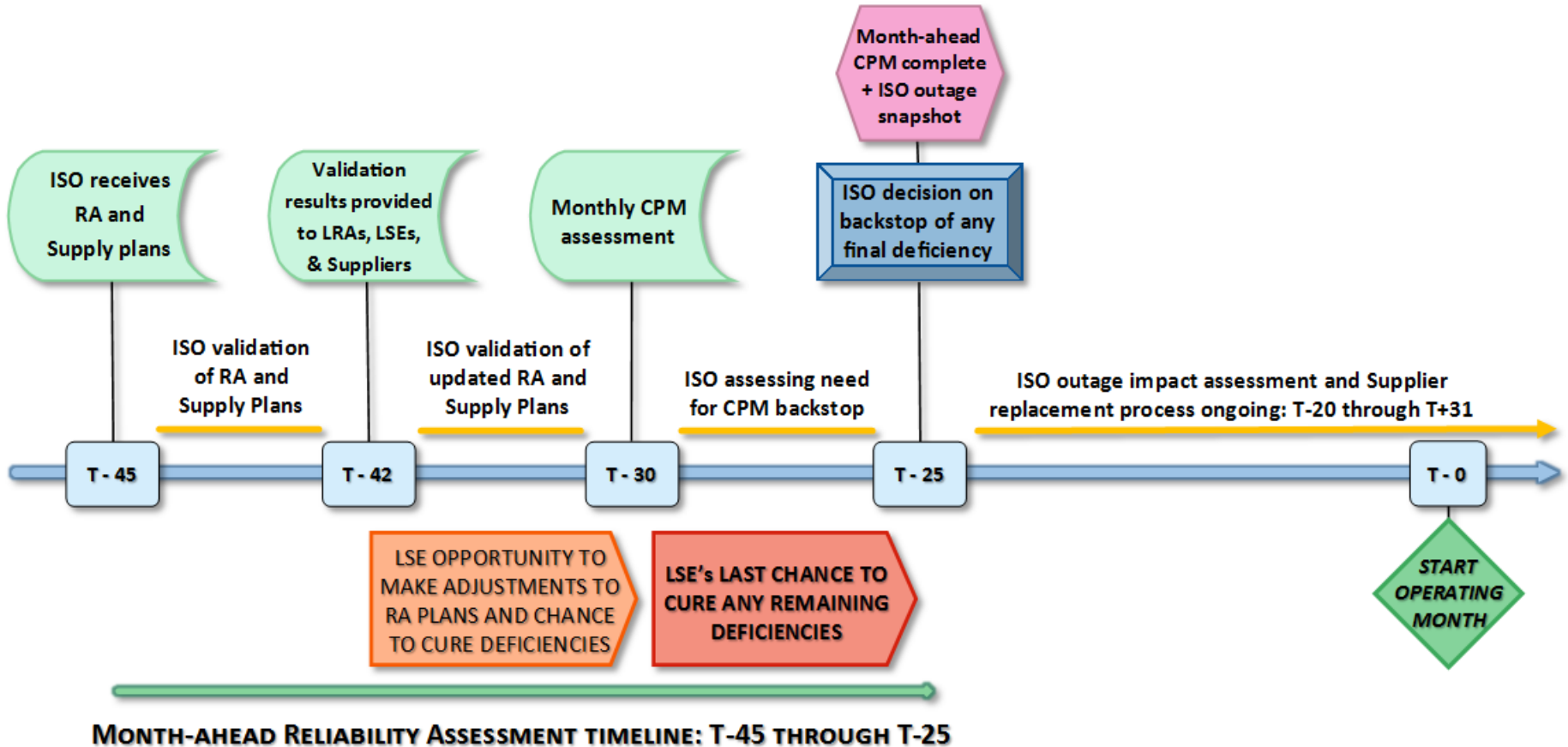


DIAGRAM IS FOR ILLUSTRATIVE PURPOSES ONLY

RA Plan showings

- LSEs use RA Plans to demonstrate to ISO what resources they have secured for RA purposes
- ISO validates RA plans against NQC list and supply plans
- Template uploaded through CIRA system
- Example RA plan:

Resource Capacity Contract Number	Resource ID in CAISO Master File	RA Capacity (MW 00.00 No Rounding)	RA Capacity Effective Start Date (mm/dd/yyyy hh:mm:ss)	RA Capacity Effective End Date (mm/dd/yyyy hh:mm:ss)	Capacity Designation (D, S, or N)	Rank for Replacement Capacity (blank for D, Resource ID for S, or numeric for N)
CNTR_1	CAISO_2_RESA	100.00	11/1/2013 00:00:00	11/30/2013 23:59:59	D	
CNTR_2	CAISO_2_RESA	50.00	11/1/2013 00:00:00	11/30/2013 23:59:59	D	
CNTR_3	CAISO_2_RESBB	25.00	11/1/2013 00:00:00	11/30/2013 23:59:59	D	
CNTR_4	CAISO_2_RESCC	10.00	11/1/2013 00:00:00	11/30/2013 23:59:59	S	CAISO_2_RESBB

ISO validates RA showings on upload

- Does each RESOURCE_ID exist (spelling)?
- Is there a MW value greater than zero and entered to two decimal places?
- Are the Start Date and End Date entered correctly?
- Do all required fields have appropriate data?
 - **LSE must provide RA plan**
 - **\$500/day penalty for each day the plan is late**
- ISO proposes that the Uniform Counting Rules capacity values will be used in this validation process under Regional RA

Supply plan showings

- Suppliers demonstrate their resources made available to be used by ISO as RA Resources
- Supplier is committing resource to ISO and it will be subject to must offer obligation and performance penalties/incentives
- Suppliers use Supply Plan to demonstrate which LSEs it has committed to providing RA capacity for
- Template uploaded through CIRA system
- Example supply plan:

Resource Capacity Contract Number	Resource ID in CAISO Master File	RA Capacity (MW 00.00 No Rounding)	RA Capacity Effective Start Date (mm/dd/yyyy hh:mm:ss)	RA Capacity Effective End Date (mm/dd/yyyy hh:mm:ss)	SCID of Load Serving Entity
CNTR_1	CAISO_2_RESA	100.00	11/1/2013 00:00:00	11/30/2013 23:59:59	LSE1
CNTR_2	CAISO_2_RESA	50.00	11/1/2013 00:00:00	11/30/2013 23:59:59	LSE1
CNTR_3	CAISO_2_RESBB	25.00	11/1/2013 00:00:00	11/30/2013 23:59:59	LSE1
CNTR_4	CAISO_2_RESBB	50.00	11/1/2013 00:00:00	11/30/2013 23:59:59	LSE2
CNTR_5	CAISO_2_RESBB	50.00	11/1/2013 00:00:00	11/30/2013 23:59:59	LSE3

Why do we need RA and Supply plans?

- RA plan demonstrates which resources an LSE has secured for meeting their RA requirements
 - Without RA plan the ISO would not be able to verify if individual LSEs have met their RA requirements
- Supply plan confirms that scheduling coordinator is committed to scheduling and/or bidding the RA capacity that has been reported to ISO
 - Without Supply plans, LSE will not get credit toward its RA obligations
- Supply plan establishes formal business commitment between ISO and RA resources by confirming status of resource as RA resource

Regional RA month-ahead Reliability Assessment timeline

ISO validations of RA and supply plans

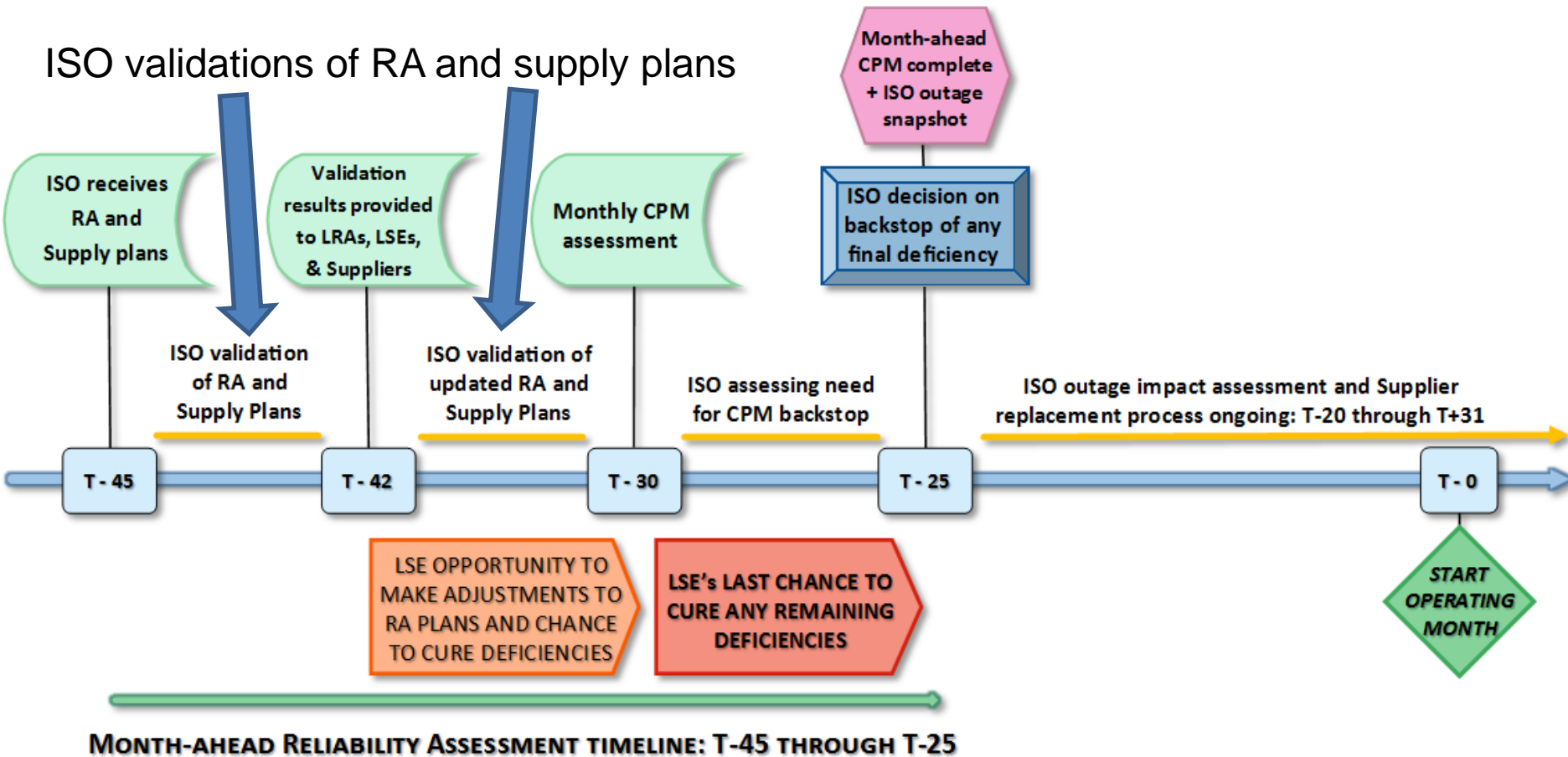


DIAGRAM IS FOR ILLUSTRATIVE PURPOSES ONLY

ISO validates Supply plans on upload

- Does each RESOURCE_ID belong to this SCID?
- Does the total MW shown per RESOURCE_ID add up to less than the deliverable capacity value of the resource?
- Are the Start Date and End Date entered correctly?
 - **Supplier must provide supply plan**
 - **\$500/day penalty for each day the plan is late**

What is cross validation?



- Cross validation is the first thing CAISO does after plan due date
- Matches LSE records to supplier records and generates basic errors and warnings when records do not match
- **Error-free capacity becomes committed as RA capacity**
 - Once “designated” capacity records on RA and supply plans pass individual validation and cross validation, resources and associated capacity are established as RA capacity for duration indicated in RA and supply plan

Resource Adequacy and supply plan showings – how uniform counting rules will be applied

- ISO will post uniform counting rules capacity value for individual resources advance of procurement timeframe
 - LSEs and Suppliers provide plans through CIRA
- ISO will confirm that the total MW value for each resource ID **does not exceed** that resource's deliverable MW capacity value as determined through ISO uniform counting rules process
 - Showings for a particular Resource ID should not exceed the deliverable uniform counting rules MW capacity value

Uniform counting rules and RA and Supply plan validation examples: Example 1: One LSE, One supplier

- Resource ID: Mighty Wind 1
 - Uniform counting rules capacity value = 100 MW
 - Claims to have sold 100 MW of capacity from Mighty Wind 1
- LSE SC ID: LSE 1
 - Claims to have procured 100 MW of capacity from Mighty Wind 1
- Showings:
 - RA plan for LSE 1 identify Mighty Wind 1 RA MW value = 100 MW
 - Supply plan for Mighty Wind 1 Scheduling Coordinator identifies Mighty Wind 1 = 100 MW
- Validation results for Mighty Wind 1 Resource ID:
 - LSE SC MW value shown = Resource SC MW shown
 - 100 MW shown for RES ID Mighty Wind 1 **does not exceed** deliverable uniform counting rule MW capacity value of 100 MW

**ISO validates RA and Supply plans
Resource committed as RA capacity**

Uniform counting rules and RA and Supply plan validation examples: Example 2: One LSE, One supplier

- Resource ID: Mighty Wind 1
 - Uniform counting rules capacity value = 100 MW
 - Claims to have sold 130 MW of capacity from Mighty Wind 1
- LSE SC ID: LSE 1
 - Claims to have procured 130 MW of capacity from Mighty Wind 1
- Showings:
 - RA plan for LSE 1 identify Mighty Wind 1 RA MW value = 130 MW
 - Supply plan for Mighty Wind 1 Scheduling Coordinator identifies Mighty Wind 1 = 130 MW
- Validation results for Mighty Wind 1 Resource ID:
 - LSE SC MW value shown = Resource SC MW shown
 - 130 MW shown for RES ID Mighty Wind 1 **exceeds** deliverable uniform counting rule MW capacity value of 100 MW

ISO notifies LSE SC and Resource SC of discrepancies in validation process

Uniform counting rules and RA and Supply plan validation examples: Example 3: One LSE, One supplier

- Resource ID: Mighty Wind 1
 - Uniform counting rules capacity value = 100 MW
 - Claims to have sold 80 MW of capacity from Mighty Wind 1
- LSE SC ID: LSE 1
 - Claims to have procured 100 MW of capacity from Mighty Wind 1
- Showings:
 - RA plan for LSE 1 identify Mighty Wind 1 RA MW value = 100 MW
 - Supply plan for Mighty Wind 1 Scheduling Coordinator identifies Mighty Wind 1 = 80 MW
- Validation results for Mighty Wind 1 Resource ID:
 - **LSE SC MW value shown > Resource SC MW shown**
 - 80 MW shown for RES ID Mighty Wind 1 **does not exceed** deliverable uniform counting rule MW capacity value of 100 MW

**ISO notifies LSE SC and Resource SC to resolve discrepancy
If no change, ISO uses 80 MW from supply plan as committed RA and
LSE may be deficient**

Uniform counting rules and RA and Supply plan validation examples: Example 4: Two LSEs, One supplier

- Resource ID: Mighty Wind 1
 - Uniform counting rules capacity value = 100 MW
 - Claims to have sold:
 - 75 MW of capacity to LSE1
 - 25 MW of capacity to LSE2
- LSE SC ID:
 - LSE 1 claims to have procured 75 MW from Mighty Wind 1
 - LSE 2 claims to have procured 25 MW from Mighty Wind 1
- Showings:
 - RA plan for LSE 1 identify Mighty Wind 1 RA MW value = 75 MW
 - RA plan for LSE 2 identify Mighty Wind 1 RA MW value = 25 MW
 - Supply plan for Mighty Wind 1 Scheduling Coordinator identifies Mighty Wind 1 = 100 MW

Example 4: Two LSEs, One supplier (cont.)

- Validation results for Mighty Wind 1 Resource ID:
 - Sum of LSE SC MW value shown = Resource SC MW shown
 - 100 MW shown for RES ID Mighty Wind 1 **does not exceed** deliverable uniform counting rule MW capacity value of 100 MW

**ISO validates RA and Supply plans
Resource committed as RA capacity**

Uniform counting rules and RA and Supply plan validation examples: Example 5: Two LSEs, One supplier

- Resource ID: Mighty Wind 1
 - Uniform counting rules capacity value = 100 MW
 - Claims to have sold:
 - 75 MW of capacity to LSE1
 - 50 MW of capacity to LSE2
- LSE SC ID:
 - LSE 1 claims to have procured 75 MW from Mighty Wind 1
 - LSE 2 claims to have procured 50 MW from Mighty Wind 1
- Showings:
 - RA plan for LSE 1 identify Mighty Wind 1 RA MW value = 75 MW
 - RA plan for LSE 2 identify Mighty Wind 1 RA MW value = 50 MW
 - Supply plan for Mighty Wind 1 Scheduling Coordinator identifies Mighty Wind 1 = 100 MW

Example 5: Two LSEs, One supplier (cont.)

- Validation results for Mighty Wind 1 Resource ID:
 - Sum of LSE SC MW value shown = Resource SC MW shown
 - 125 MW shown for RES ID Mighty Wind 1 **exceeds** deliverable uniform counting rule MW capacity value of 100 MW

**ISO rejects RA and Supply plans
Notifies LSE SC and Resource SC**

Uniform counting rules and RA and Supply plan validation examples: Example 6: Two LSEs, One supplier

- Resource ID: Mighty Wind 1
 - Uniform counting rules capacity value = 100 MW
 - Claims to have sold:
 - 50 MW of capacity to LSE1
 - 25 MW of capacity to LSE2
- LSE SC ID:
 - LSE 1 claims to have procured 75 MW from Mighty Wind 1
 - LSE 2 claims to have procured 25 MW from Mighty Wind 1
- Showings:
 - RA plan for LSE 1 identify Mighty Wind 1 RA MW value = 75 MW
 - RA plan for LSE 2 identify Mighty Wind 1 RA MW value = 25 MW
 - Supply plan for Mighty Wind 1 Scheduling Coordinator identifies Mighty Wind 1 = 50 MW sold to LSE1
 - Supply plan for Mighty Wind 1 Scheduling Coordinator identifies Mighty Wind 1 = 25 MW sold to LSE2

Example 6: Two LSEs, One supplier (cont.)

- Validation results for Mighty Wind 1 Resource ID:
 - Sum of LSE SC MW value shown > Resource SC MW shown
 - LSE 1 showing **not** equal to Resource SC showing
 - LSE 2 showing equal to Resource SC showing
 - 75 MW shown for RES ID Mighty Wind 1 **does not exceed** deliverable uniform counting rule MW capacity value of 100 MW

ISO rejects LSE 1's RA showing and corresponding submission on Mighty Wind 1 Supply plan

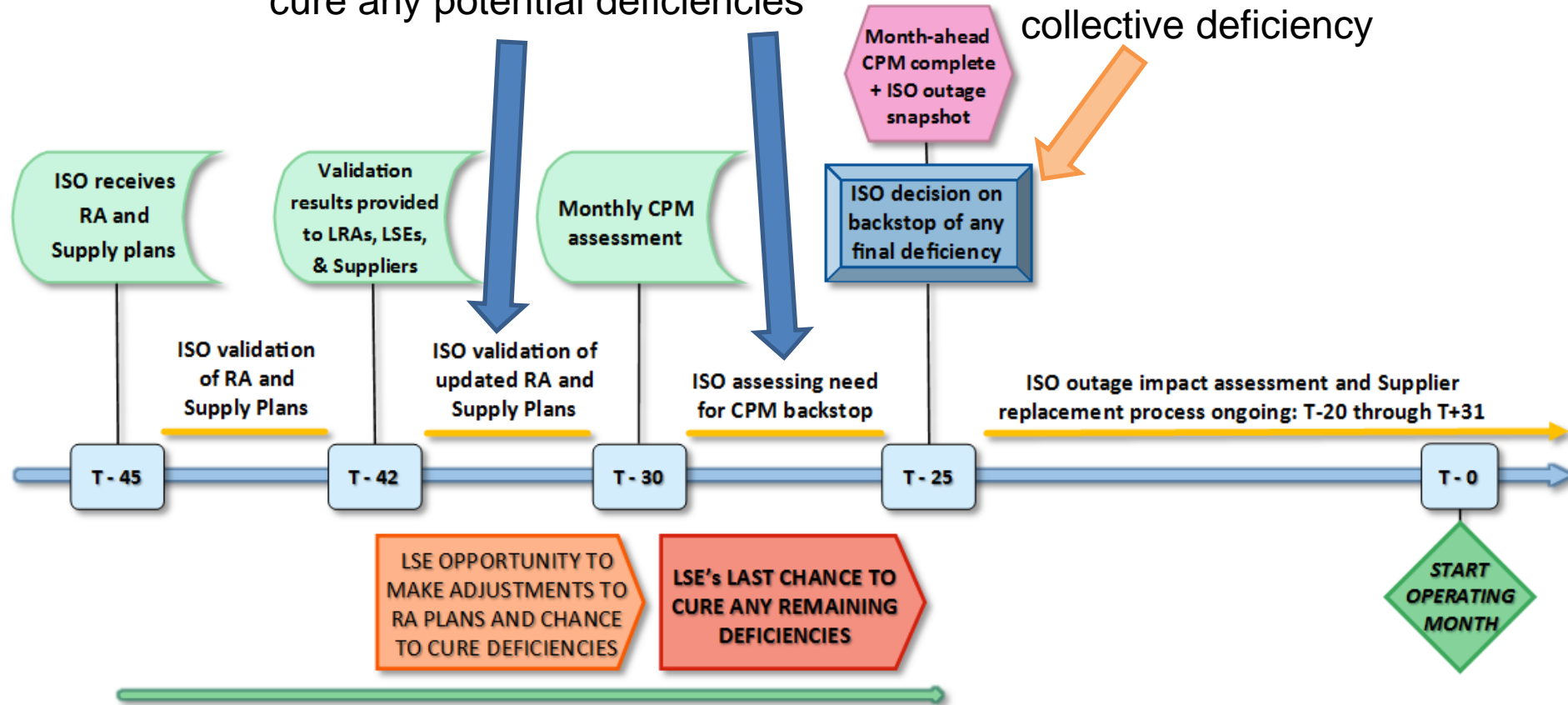
ISO validates LSE 2's RA showing and corresponding submission on Mighty Wind 1 Supply plan

**Notifies LSE 1 SC and Resource SC to resolve discrepancy
If no change, ISO uses 50 MW from supply plan as committed RA
and LSE 1 may be deficient**

Regional RA Month-ahead Reliability Assessment timeline

LSE's have two opportunities to cure any potential deficiencies

ISO makes backstop decision for any remaining outstanding collective deficiency



MONTH-AHEAD RELIABILITY ASSESSMENT TIMELINE: T-45 THROUGH T-25

DIAGRAM IS FOR ILLUSTRATIVE PURPOSES ONLY

Backstop procurement decision under Regional RA

- ISO will only engage in any decision for backstop procurement in a situation when there was an identified **cumulative deficiency** that **remains uncured**
- ISO will only make a backstop decision after all deficient LSEs have been notified and provided with opportunities to cure

Backstop procurement cost allocation under Regional RA

- **IF** ISO makes a decision to backstop a remaining cumulative deficiency, associated costs will be allocated to LSEs that have not met their individual RA requirements
- ISO intends to continue current cost allocation rules for backstop procurement under any CPM necessary due to Regional RA reliability assessment
- Cost allocation based on short LSEs' proportional share of any backstopped cumulative shortage:

Total cost allocation to a deficient LSE =

Backstop MW procured x (LSE showing deficiency ÷ Sum of all deficiencies of deficient LSEs)

- Examples on following slides

Backstop procurement cost allocation: Example 1

- Individual LSE System RA requirements:

LSE 1 = 100 MW

LSE 2 = 100 MW

LSE 3 = 100 MW

- LSE RA plan showings:

LSE 1 = 100 MW

LSE 2 = 50 MW

LSE 3 = 75 MW

Backstop procurement cost allocation: Example 1 (cont.)

- System assessment:
 - System deficient 75 MW
 - Assume ISO backstops 75 MW of System RA
 - LSEs 2 and 3 deficient
 - Sum of LSEs 2 and 3 deficiencies = 75 MW
- Resulting cost allocation:
 - LSE 1 = 75 MW * (0 MW deficiency/75 MW sum of deficiencies)
 - 0% of costs allocated = Cost of procuring 0 MW
 - LSE 2 = 75 MW * (50 MW deficiency/75 MW sum of deficiencies)
 - 66% of costs allocated = Cost of procuring 50 MW
 - LSE 3 = 75 MW * (25 MW deficiency/75 MW sum of deficiencies)
 - 33% of costs allocated = Cost of procuring 25 MW

Backstop procurement cost allocation: Example 2

- Individual LSE System RA requirements:

LSE 1 = 100 MW

LSE 2 = 100 MW

LSE 3 = 100 MW

- LSE RA plan showings:

LSE 1 = 125 MW

LSE 2 = 50 MW

LSE 3 = 75 MW

Backstop procurement cost allocation Example 2 (cont.)

- System assessment:
 - System deficient 50 MW
 - Assume ISO backstops 50 MW of System RA
 - LSEs 2 and 3 deficient
 - Sum of LSEs 2 and 3 deficiencies = 75 MW
- Resulting cost allocation:
 - LSE 1 = 50 MW * (0 MW deficiency/75 MW sum of deficiencies)
 - 0% of costs allocated = Cost of procuring 0 MW
 - LSE 2 = 50 MW * (50 MW deficiency/75 MW sum of deficiencies)
 - 66% of costs allocated = Cost of procuring 33.33 MW
 - LSE 3 = 50 MW * (25 MW deficiency/75 MW sum of deficiencies)
 - 33% of costs allocated = Cost of procuring 16.66 MW

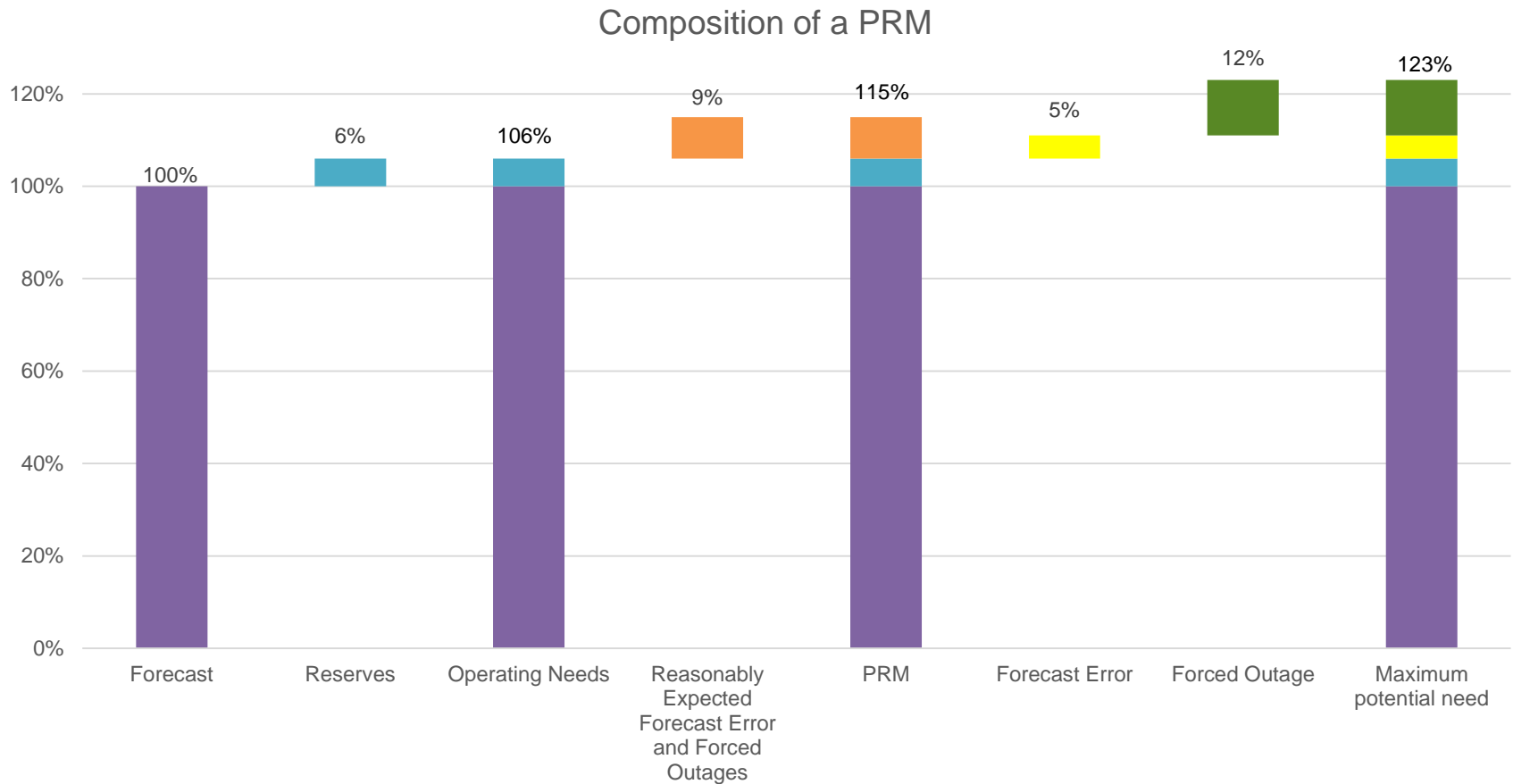
Backstop procurement cost allocation: Example 3

- Individual LSE System RA requirements:
 - LSE 1 = 100 MW
 - LSE 2 = 100 MW
 - LSE 3 = 100 MW
- LSE RA plan showings:
 - LSE 1 = 150 MW
 - LSE 2 = 75 MW
 - LSE 3 = 75 MW
- System assessment:
 - No cumulative deficiency = No ISO backstop procurement decision necessary

Outages and Substitute Capacity

Karl Meeusen, Ph.D.
Senior Advisor – Infrastructure Policy

Actual forecast error and forced outages may exceed the amount accounted for in planning reserve margin



Planned outages: the benefit of early outage reporting

- Based on ISO assessment, outage may be approved without substitution
 - Exempt from availability assessment during outage if approved without substitute capacity
- Approved based on a “first in” basis
 - Early request more likely to be approved without substitute capacity
- If resource is needed, ISO may ask SC to reschedule outage
- ISO may deny outage if SC is unable to provide substitute capacity or reschedule
 - Outage is not moved or substitute capacity not provided, outage may be redefined as forced outage

What are the availability incentives and replacement opportunities

- Provides upfront incentive to plan outages and take actions to reduce the occurrences of forced outages
- Assesses availability based on bids into CAISO market
 - Were you supposed to bid? Did you bid?
- Single availability metric and price for system, local and flexible capacity
- Resources with low availability pay penalty price, creating a pool of funds that are allocated to resources with high availability
- Resources on forced outage may provide substitute capacity to avoid outage charges

Why are there availability incentives and replacement opportunities

- Ensure resources relied upon for resource adequacy have an incentive to make capacity available to the ISO
- Some capacity is expected to be on forced outage during each month and is accounted for in planning reserve margin
 - Incentive to ensure outages do not exceed this level and that adequate resources are available to the ISO during critical times
- Capacity values are not discounted based on the probability of forced outages
 - i.e. RA counting rules and established PRM assume capacity is 100% available or 100% unavailable
- PRM does not cover local capacity forced outage needs

Next Steps

Request stakeholder comments by COB August 17

Be sure to use the comments template that will be available on August 11 at the initiative webpage

<http://www.caiso.com/informed/Pages/StakeholderProcesses/RegionalResourceAdequacy.aspx>

Submit to comments mailbox:

initiativecomments@caiso.com

Initiative Contact: Chris Devon – cdevon@caiso.com

Thank you!