California ISO
Shaping a Renewed Future

Reliability Services
Market mechanism working group

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Est. Time	Workshop Agenda Topic
9:30 – 10:00	Scope and overview
10:00 – 10:30	Residual procurement in the future
10:30 – 11:30	Options for CPM replacement
11:30 – 12:00	Presentation by CPUC
12:00 – 1:00	Lunch
1:00 – 1:20	Presentation by SCE
1:20 – 1:40	Presentation by PGE
1:40 – 2:00	Presentation by Calpine
2:00 – 2:20	Presentation by WPTF
2:20 – 2:30	Break
2:30 – 3:55	Illustration of market mechanism
3:55 – 4:00	Next Steps

SCOPE

Reliability Services scope phase 1

- Create durable CPM pricing mechanism for backstop capacity procurement
- Standardize eligibility criteria and must-offer requirements for local, flexible, and system RA resources as needed
- Enhance incentive mechanisms for RA resource market participation

Reliability Services scope phase 2

- Update the CPM to include multi-year backstop procurement authority
- Revaluate need for risk-of-retirement backstop procurement authority

Timeline and coordination

- In the draft straw proposal ISO will include:
  - Timeline of related ISO initiatives and their scope
  - CPUC and ISO expected process and timelines

Residual procurement mechanism scope

- Create a durable residual procurement mechanism that would replace the current capacity procurement mechanism (CPM) when it expires
- Simplify and increase efficiency of residual procurement, replacement, and substitution process

OVERVIEW OF CURRENT RESIDUAL PROCUREMENT PROCESSES

High level CPM process

- The ISO determines whether to issue a CPM for backstop capacity based on criteria in tariff section 43
- In the annual and monthly process, the LSE is given a chance to cure its shortage before the ISO issues a CPM
- The ISO therefore distinguishes between shortages, which the LSE has an opportunity to cure and deficiencies or insufficiencies that remain after the cure period (or for which there is no cure period) that cause the ISO to issue a CPM designation

CPM process- shortage versus deficiency

- Shortage: there is an opportunity to cure shortage
- Deficiency (or Insufficiency):
  - Prior to RA compliance term: deficiency that remains after the cure period that causes the ISO to issue a CPM designation
  - Within RA compliance term: deficiency due to reliability event where there is no cure opportunity that causes the ISO to issue a CPM designation

Procurement for a shortage or deficiency

- Procurement for a shortage or a deficiency is *residual* procurement
- Residual procurement is any procurement that occurs after primary procurement
- For ISO LSE's, primary procurement is done through the bilateral market

Overall residual procurement process

Primary procurement	Residual procurement	
CPUC/LRA and ISO: Annual and Monthly requirements	Cure period - shortage	Backstop - deficiencies
Forward bilateral market	Residual bilateral procurement	Mandatory procurement

Occurrences of shortages and deficiencies in practice

- The ISO *often* indicates there is a shortage that an LSE must cure to prevent being subject to backstop procurement costs
  - LSEs will cure this through:
    - Alternative capacity they have already procured, or
    - Capacity procured in the residual bilateral market

- The ISO *rarely* issues a CPM designation
  - CPMs were primarily designated due to unsystematic reliability events (ED or significant event)

Shortages occur infrequently in the annual RA process

- The annual RA process requires:
  - 90% system
  - 90% flexible
  - 100% local
- There are infrequently shortages and they occur primarily in the local capacity requirement
- The CPUC considers shortages in the annual process a deficiency and may issue a fine to the short LSE

Shortages occur frequently in the monthly process

- Shortages are primarily due to scheduled outages not replaced at the time of the compliance showing
- In the event of a net system shortage the ISO requires the replacement of resources on planned outages
- Average replacement requirement deficiency in a representative outage season month was in excess of 2,000 MW per day
- These shortages are mostly, but not entirely cured through previously contracted/owned capacity

Shortages and substitutions occur frequently within the month

- Shortage: any planned outages that are extended must go through the ISO's outage coordination office and replacement may be required
- Supply plan change: suppliers may provide substitute capacity to avoid being penalized under current SCP
  - This process that is still evolving
  - Complicated set of rules individual to resources and contracts

Reasons for the lack of deficiencies in monthly and annual process

- There is a known administrative price that acts as an anchor price
  - LSE has incentive to accept any offer lower than this rather than be deficient
- CPUC may impose penalty on an LSE that is *short* in the monthly or annual compliance showing
  - Further disincentive for LSEs to be short
- The lack of CPM designations is a construct of current rules and not an indication of what might happen following ISO and CPUC rule changes

Reliability Services scope related to flexible requirements

- The above mentioned processes currently do not include rules related to flexible requirements

<u>Flexible requirement scope for RSI:</u>

- Develop replacement and substitution rules for flexible resources
- Develop a standard flexible capacity product – an incentive mechanism to pay or penalize resources based on economic bid submission
- Develop backstop price that differentiates flexible capacity from system capacity

Summary observations on current process

The lack of CPM designations is not an indication of future use, nor an indication of the importance of residual procurement

- No incentive to use backstop
- Prior to replacement rule and flexible requirements RA procurement was relatively simple
- Complexity comes from:
  - Different time periods of procurement (replacement rule)
  - Different attributes (flexible requirement)
  - Increase in state mandated procured resource types (renewables and preferred resources)

Pricing mechanism scope and goal

- Create a durable residual procurement mechanism that would replace the current capacity procurement mechanism (CPM) when it expires
- Simplify and increase efficiency of residual procurement, replacement, and substitution process
- An overarching goal is to develop a unified residual procurement process, given the current and foreseeable increased complexity in RA procurement
- **The ISO believes a residual market is the best way to achieve this goal**

RESIDUAL PROCUREMENT IN THE FUTURE

Uses of residual procurement

- Unexpected capacity needs
- Remaining capacity requirements or excess after putting together an efficient portfolio
- Difficult to contract for capacity due to specific attribute being needed
  - Flexible categories (currently 3)
  - Other products (potential future)

Growing primary and residual procurement complexity

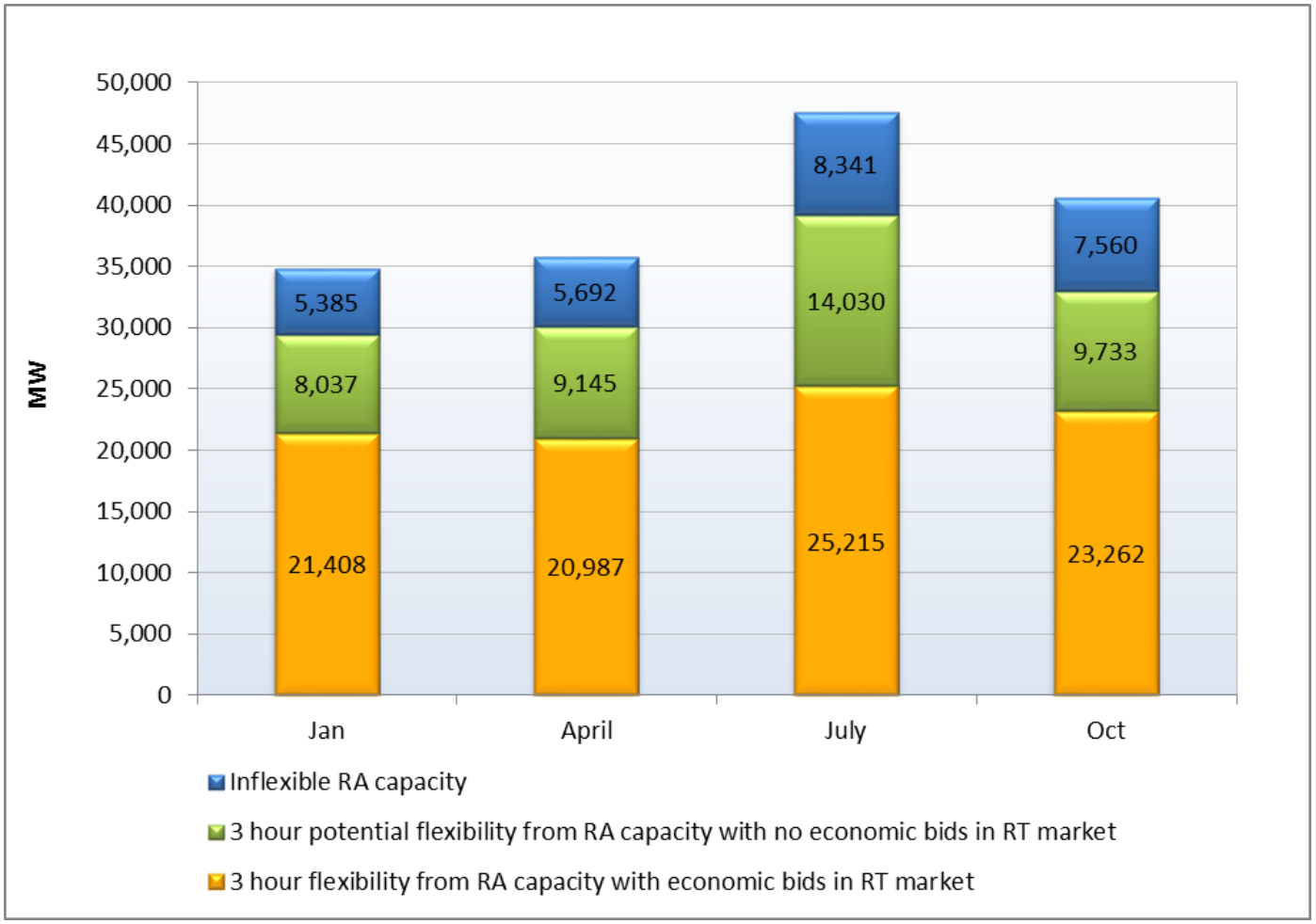
- Flexible requirement
  - Today, categories
  - In the future, potentially multiple flexibility types
- Replacement rule
  - Multiple procurement timeframes
- Other fundamental resource changes in RA
  - Increase in renewable resources
  - Increase in preferred resources
  - Increase in use-limited resources

Potential future requirements– analysis to be presented at next meeting or workshop

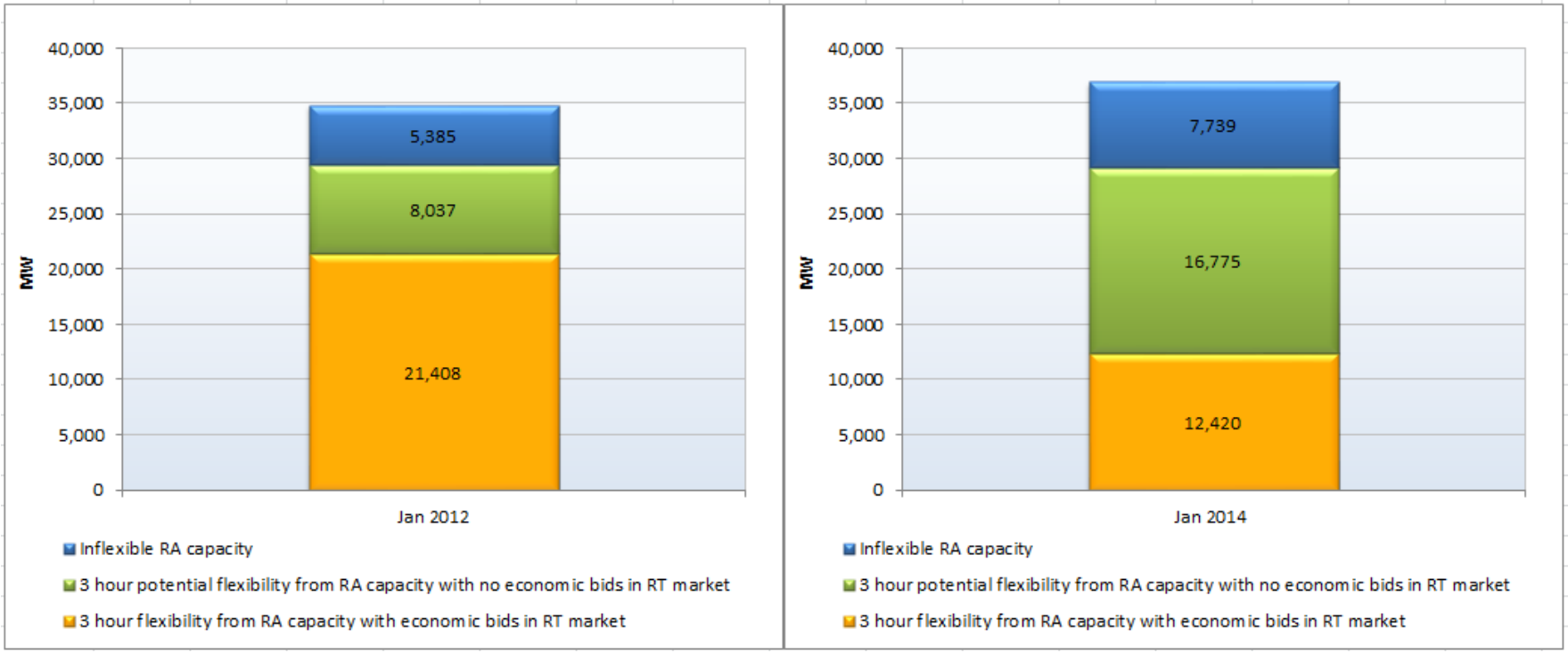
- Continuous ramping
  - Reminder analysis of why three hour ramping was used and how that was only an interim compromise
- Speed
  - What was required previously, currently, and in the future
  - The previous, current, and future speed of the RA fleet
- Downward ramping
- Integration of preferred and use-limited resources
- Other

Please comment, no promises.

Preliminary look– 2012 flexible RA capacity



Preliminary look– 2014 flexible RA capacity (January)



- This is the maximum flexibility in 2012 compared to the minimum in 2014
- Taking a snapshot of the available flexibility is challenging and the results are highly dependent of how you analyze the data

Preliminary look – 2012 flexibility by technology type

	RA capacity	Maximum capacity economically bid-in during month	Percent of RA capacity that is economically bid into the real-time market
Imports, Dynamics, Unkn	5,052	486	10%
Combined cycle	12,946	8,757	68%
Gas turbine	5,332	1,812	34%
Hydro turbine	4,944	2,475	50%
Other	787	0	0%
Photovoltaic	2	0	0%
Hydro pump-turbine	1,007	645	64%
Pump-turbine	324	324	100%
Reciprocating engine	300	218	73%
Steam turbine	16,260	10,497	65%
Wind turbine	632	0	0%
Total	47,586	25,215	-

- The average maximum amount of RA capacity economically bid into the July 2012 real-time market is about 53% of RA capacity

Residual procurement mechanism design goals

- Adaptable structure
- Simple framework as possible given the underlying complexity of RA procurement
- Efficiency
- Transparency

Mechanism goal: adaptable structure

- Develop a process that will allow for, but not necessitate more complicated procurement requirements
- This is what will create durability
  - Will help facilitate efficient short-term investment decisions
  - Market participants will not have to go through this process every few years
  - ISO can focus on other initiatives

Mechanism goal: simplification

- Overly complex, prescriptive market designs add transaction costs to the ISO and market participants
- There is the risk that an overly complex RA framework could jeopardize the reliable operation of the grid
- A complex process limits transparency and mutes any issues with the efficiency of the overall market

Mechanism goal: efficiency

- An efficient residual procurement mechanism will optimize procurement
  - This is particularly important with flexible requirements
- Optimized procurement will pick the least-cost resource mix that meets the requirement

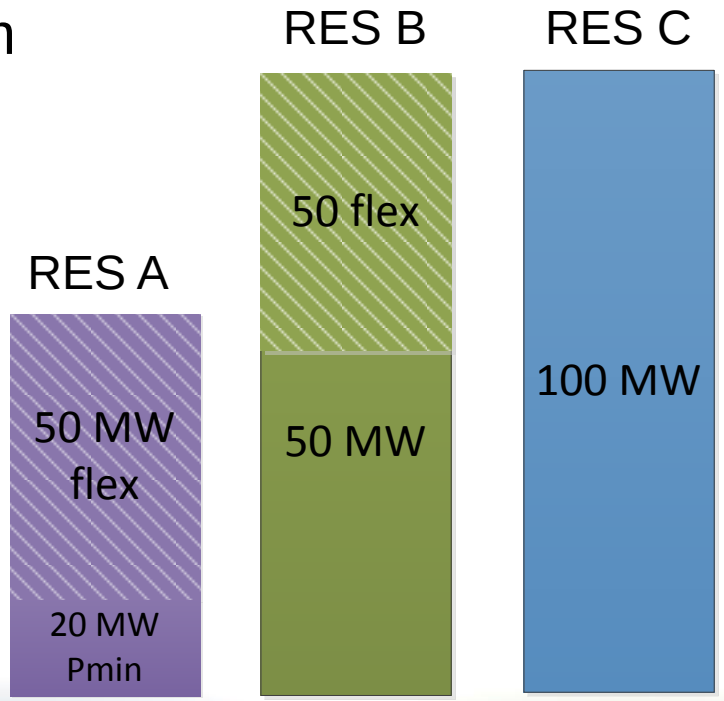
Mechanism goal: efficiency
Simplified example

- ISO shortage:
  - 100 MW flex category 1
  - 170 MW system
- LSE shortages:
  - LSE1
    - Short 50 MW flexible
  - LSE2
    - Short 50 MW flexible
    - Short 100 MW system
  - LSE3
    - Short 70 MW system

Mechanism goal: efficiency

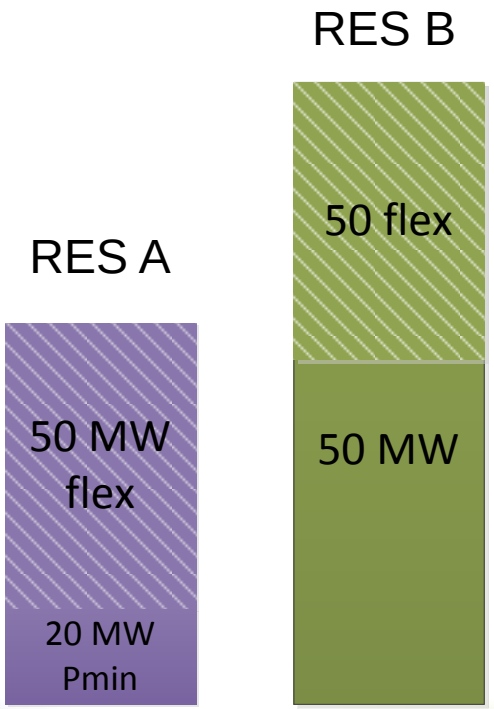
Example of individual LSE bilateral procurement

- Current example:
  - LSE 1 procures 50 MW flexible from resource A
  - LSE 2 procures 50 MW flexible and 100 MW system from resource B
  - LSE 3 procures 70 MW system from resource C



Mechanism goal: efficiency
Example of market optimization

- With a market optimization the ISO would procure:
  - 70 MW system and 50 MW flex from resource A
  - 100 MW system and 50 MW flex from resource B
- Reduces over-procurement of system resources

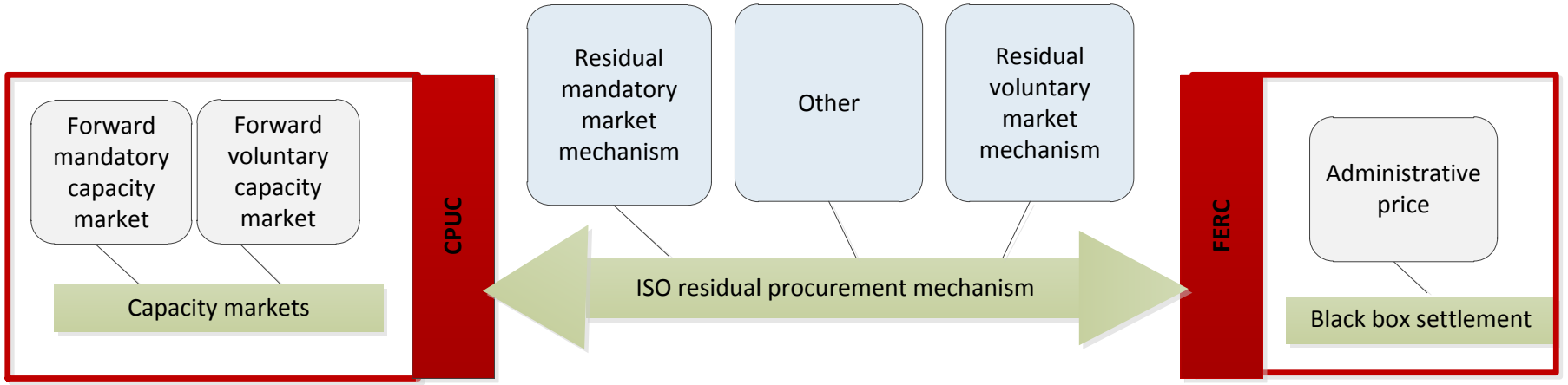


Mechanism goal: transparency

- A transparent price and process will encourage efficient procurement through a mix of the bilateral and residual markets
  - The bilateral market will efficiently procure resources prior to the residual market
  - Anything that is more efficient to procure through an optimization will be procured through the residual market

PRICING OPTIONS FOR RESIDUAL PROCUREMENT

ISO options


Forward mandatory capacity market
Forward voluntary capacity market
Capacity markets
CPUC
Residual mandatory market mechanism
Other
Residual voluntary market mechanism
ISO residual procurement mechanism
FERC
Administrative price
Black box settlement

Options for residual procurement mechanism

- Administrative price
- Residual market mechanism
  - Voluntary and/or mandatory
- Forward capacity market
  - Voluntary and/or mandatory

Overall residual procurement process

Primary procurement	Residual procurement	
CPUC/LRA and ISO: Annual and Monthly requirements	Cure period	Backstop
Forward bilateral market	Residual bilateral procurement	Mandatory procurement
Forward bilateral market	Voluntary residual capacity market	Mandatory residual capacity market
CPUC/LRA and ISO: Annual and Monthly requirements	Cure and backstop	
Forward bilateral market	Residual capacity market	

Administrative price

- Current method
- Fixed price paid for capacity

Timeframe	Deficiency situation	Price (kW-yr)	Must-offer requirement
Current	System	$70.88	System MO
Current	System and local	$70.88	System MO
Current	Local	$70.88	System MO

Administrative price in 2015

- Flexible requirements interim solution

Timeframe	Deficiency situation	Price (kW-yr)	Must-offer requirement
Current	System	$70.88	System MO
Current	System and local	$70.88	System MO
Current	Local	$70.88	System MO
FRAC MOO	Flexible	$70.88	Flexible MO
FRAC MOO	Flexible and system/local	$70.88	Flex and sys MO

- Backstop price does not differentiate between flexible and system capacity
- Flexible and generic capacity are unbundled

Administrative price RSI- valuing flexibility

Timeframe	Deficiency situation	Price (kW-yr)	Must-offer requirement
Current	System	$X	System MO
Current	System and local	$X	System MO
Current	Local	$X	System MO
RSI	Flexible only (no RA contract)	$Y	Flexible MO
RSI	Flexible only (system RA contract)	$Z	Flexible MO

- If the ISO is short on flexible capacity should the resource be paid more or less than if it is providing system capacity?
  - What if the resource already has a system RA contract?

Administrative price RSI- valuing local attribute

- Local has enhanced must-offer requirements for preferred resources

Timeframe	Deficiency situation	Price (kW-yr)	Must-offer requirement
RSI	System	$X	System MO
RSI	System and local	$W	Local MO
RSI	Local	$V	Local MO
RSI	Flexible only (no RA contract)	$Y	Flexible MO
RSI	Flexible only (system RA contract)	$Z	Flexible MO

Administrative price RSI- valuing flexible attributes

- Three flexible categories

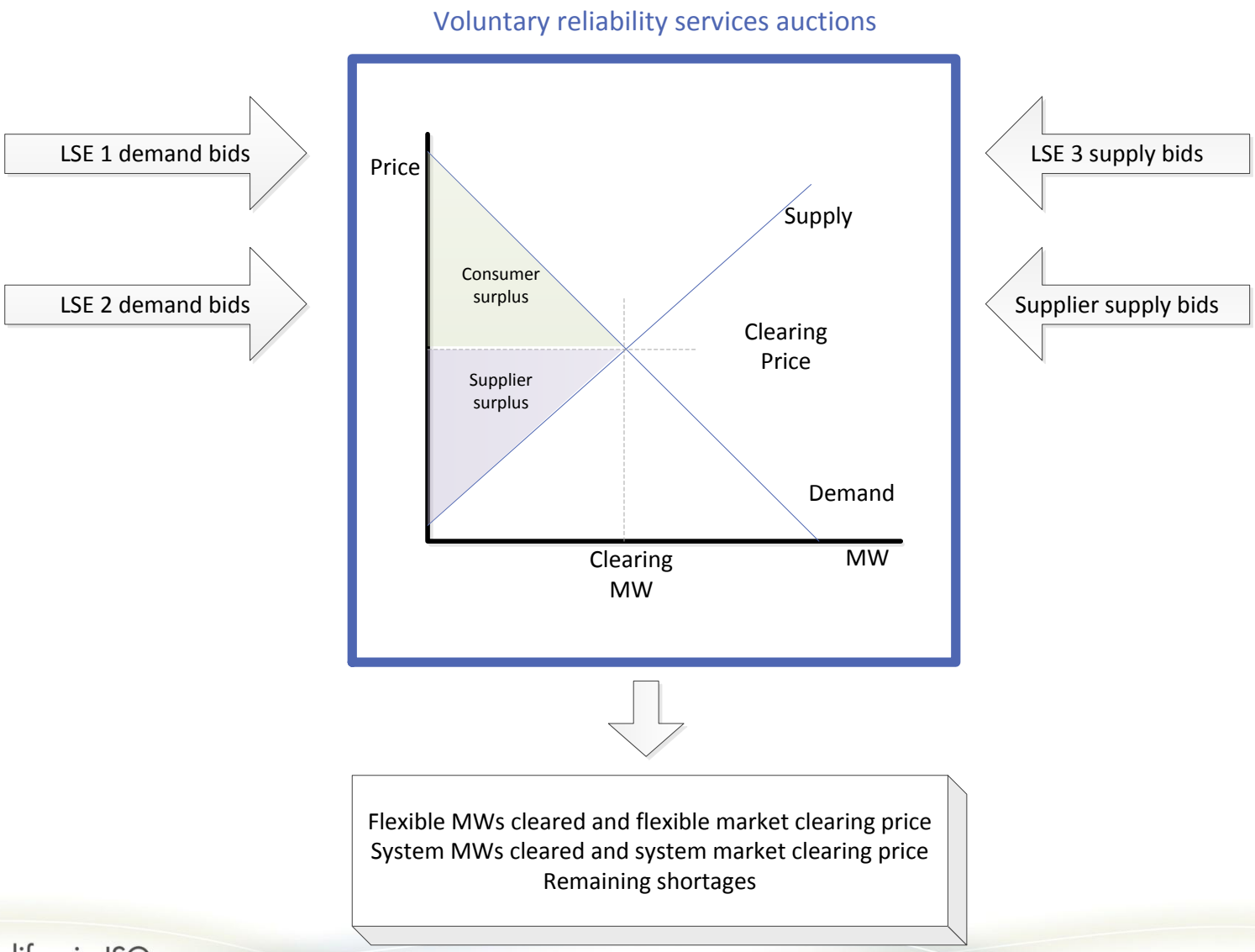
Timeframe	Deficiency situation	Price (kW-yr)	Must-offer requirement
RSI	System/local	*****	**********
RSI	Flexible category 1 (no RA contract)	$A	Flexible MO 1
RSI	Flexible category 1 (system RA contract)	$B	Flexible MO 1
RSI	Flexible category 2 (no RA contract)	$C	Flexible MO 2
RSI	Flexible category 2 (**system** RA contract)	$D	Flexible MO 2
RSI	Flexible category 2 (**local** RA contract)	$E	Flexible MO 2

Administrative price RSI- valuing flexible products

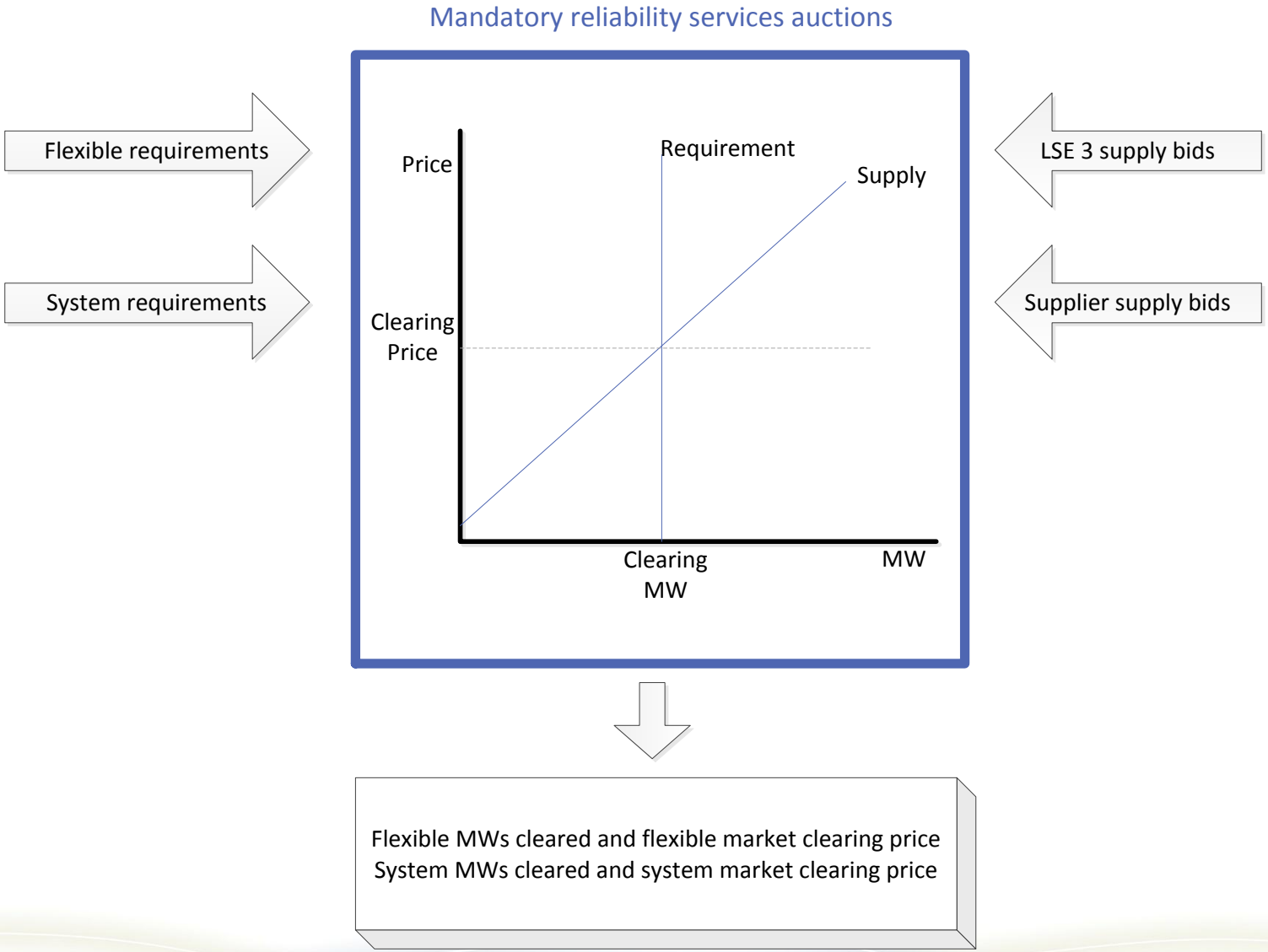
- In the future the ISO may have different flexible products in addition to categories
- For example, a load following product
- What is the value of load following capacity relative to:
  - Local, system, flexible categories 1, 2, and 3

- The development of the administrative price be simplified by not relatively valuing different attributes

Voluntary market mechanism



Mandatory market mechanism



MARKET MECHANISM ILLUSTRATION

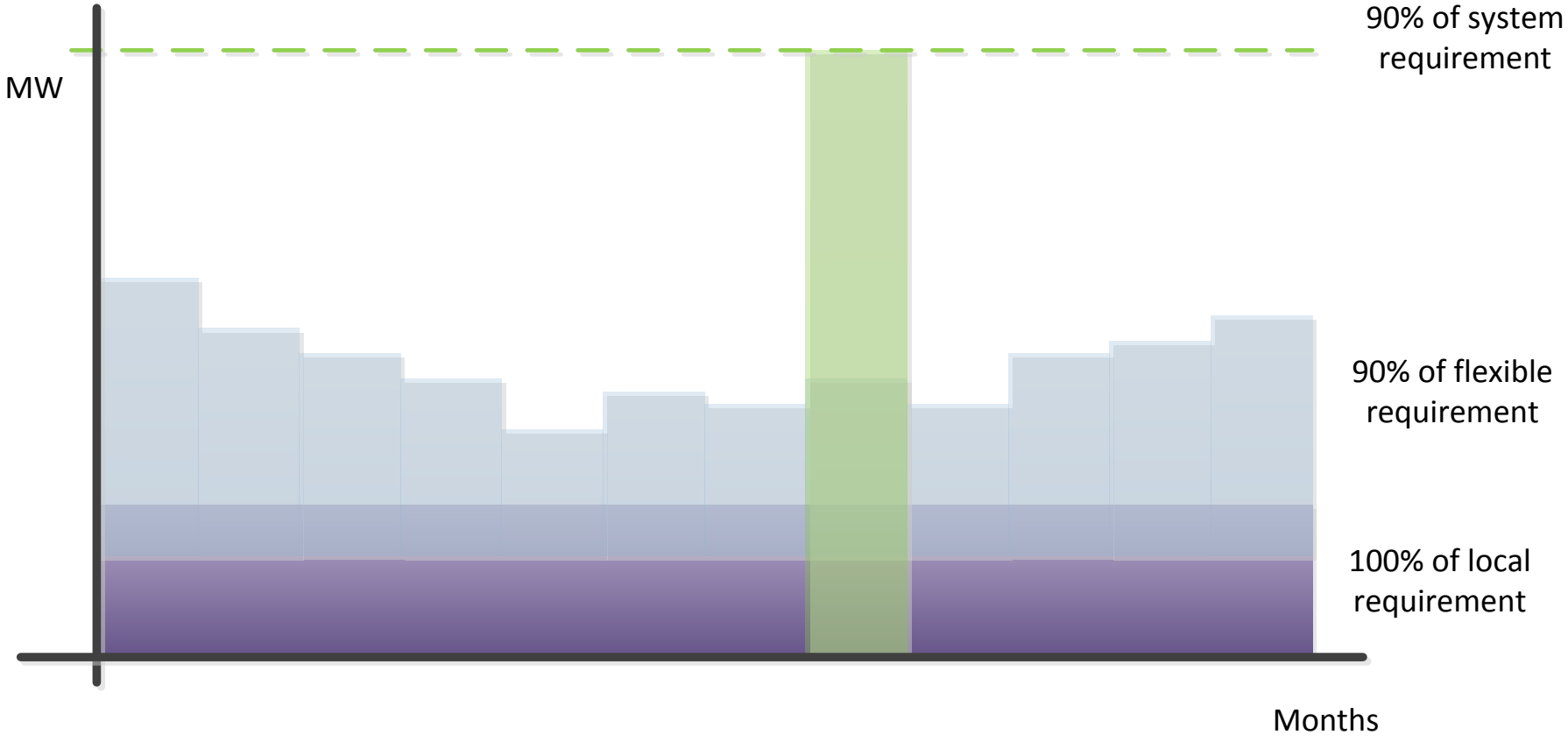
Capacity Procurement Mechanism

CPM backstop events

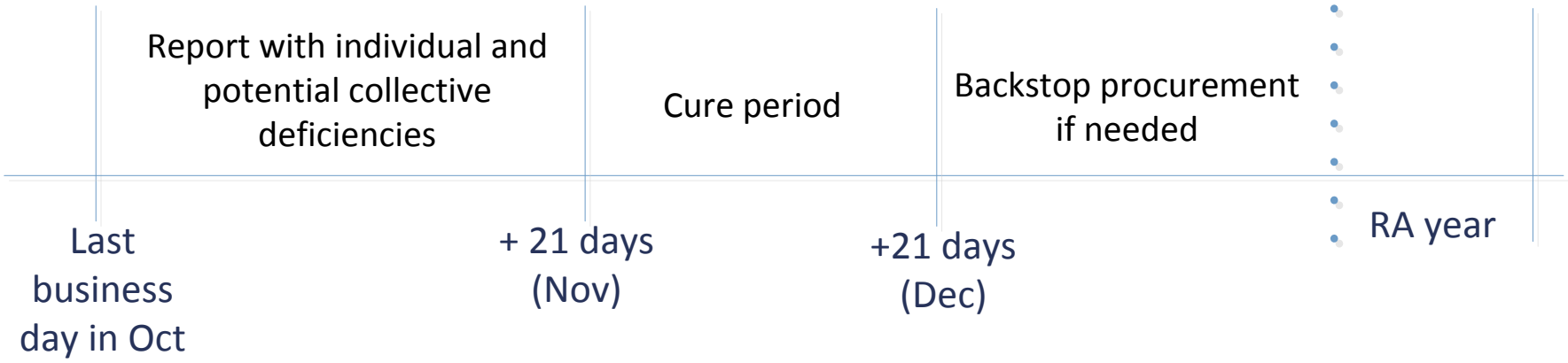
1. Insufficient local or system capacity in annual resource plan
2. Insufficient local or system capacity in monthly resource plan
    a) Replacement requirement deficiency
3. Collective deficiency in Local area
4. Significant event
5. Exceptional dispatch
6. Risk of retirement
7. Insufficient flexible in annual or monthly resource plan
8. Multi-year insufficiencies

ANNUAL RESIDUAL PROCUREMENT MARKET MECHANISM

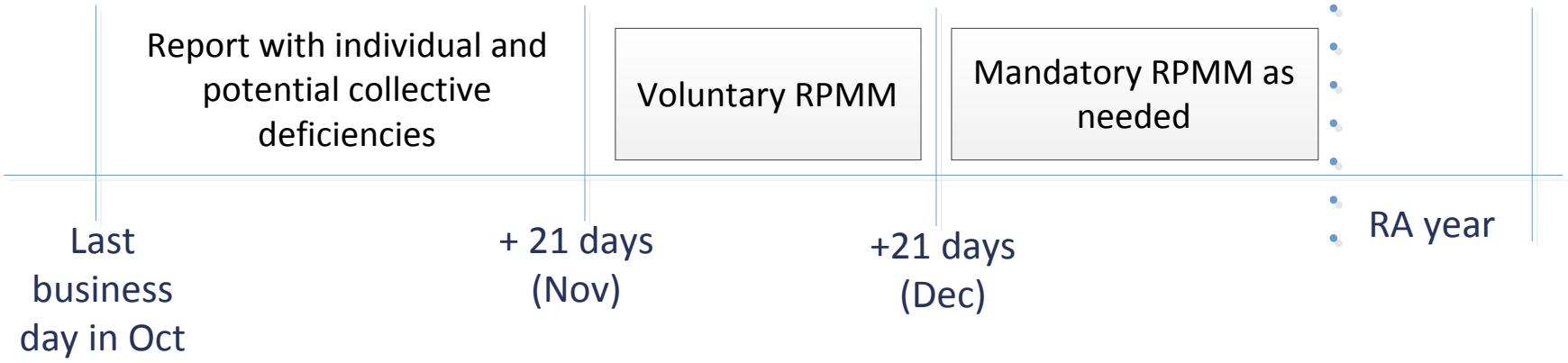
ISO annual requirement



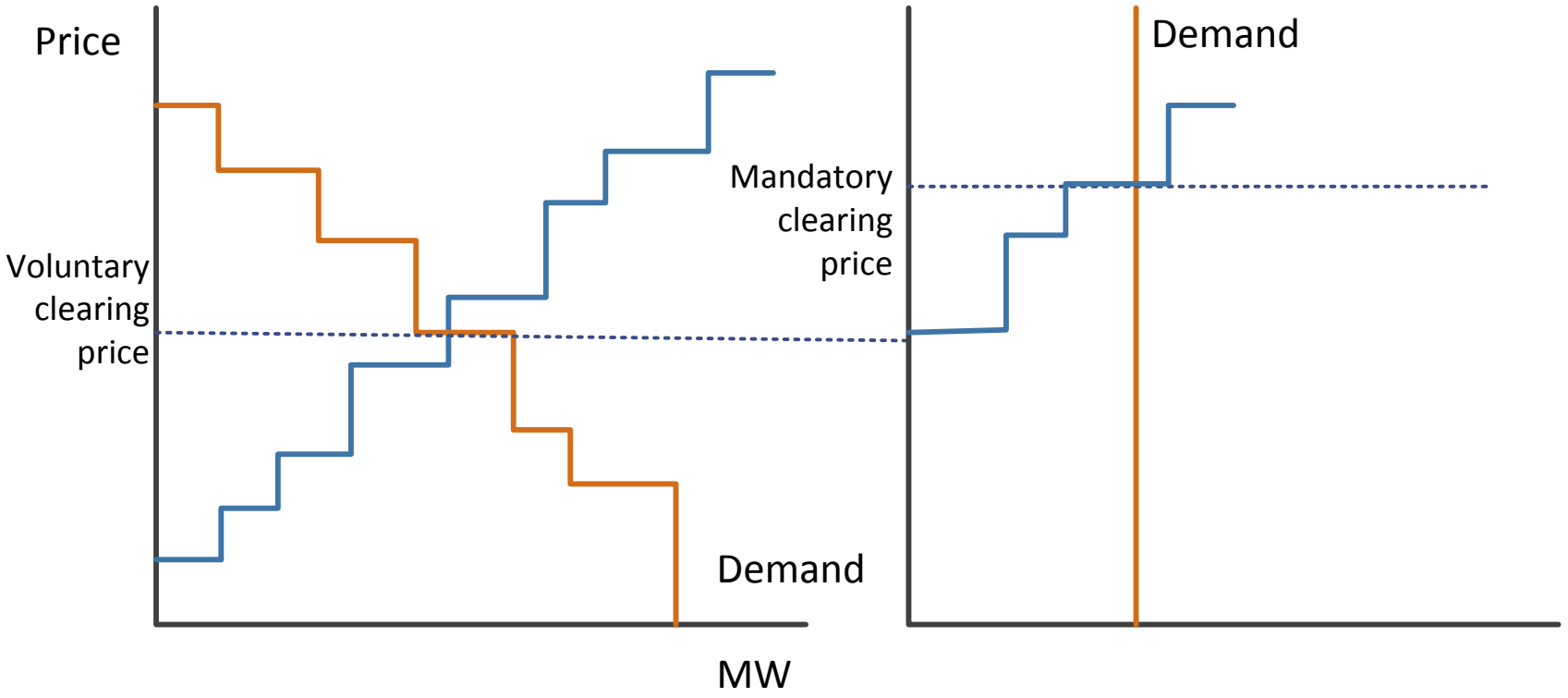
Current annual residual procurement process



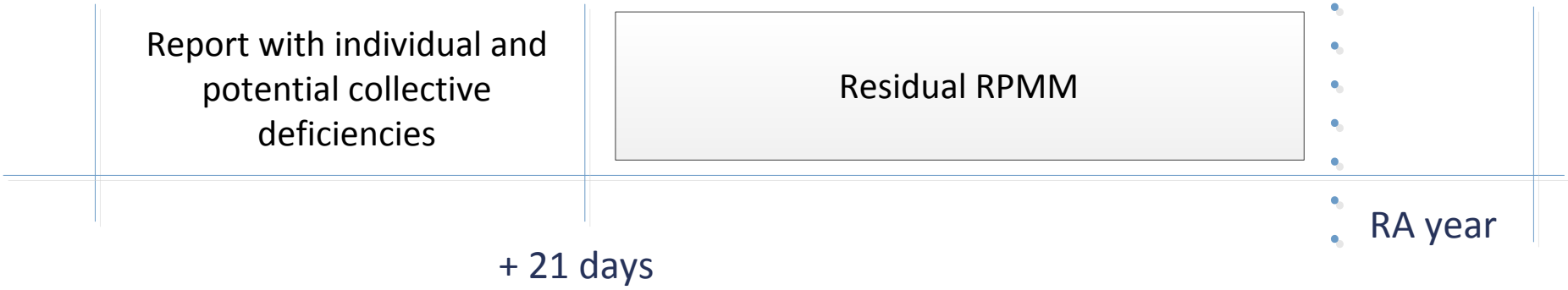
Potential future annual residual procurement process



Example of voluntary and mandatory annual auctions



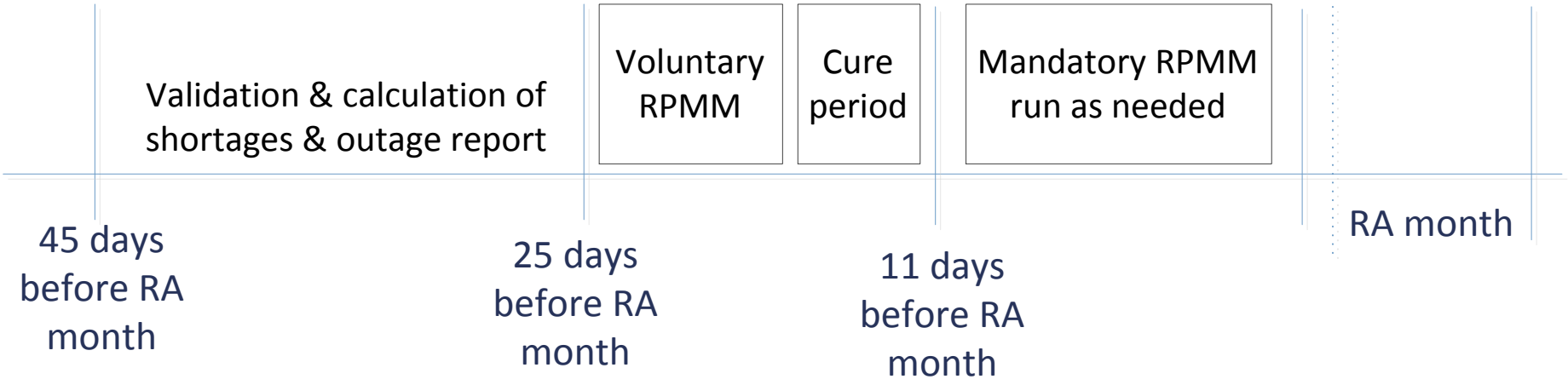
Another potential future annual residual procurement process



- Sloped demand curve

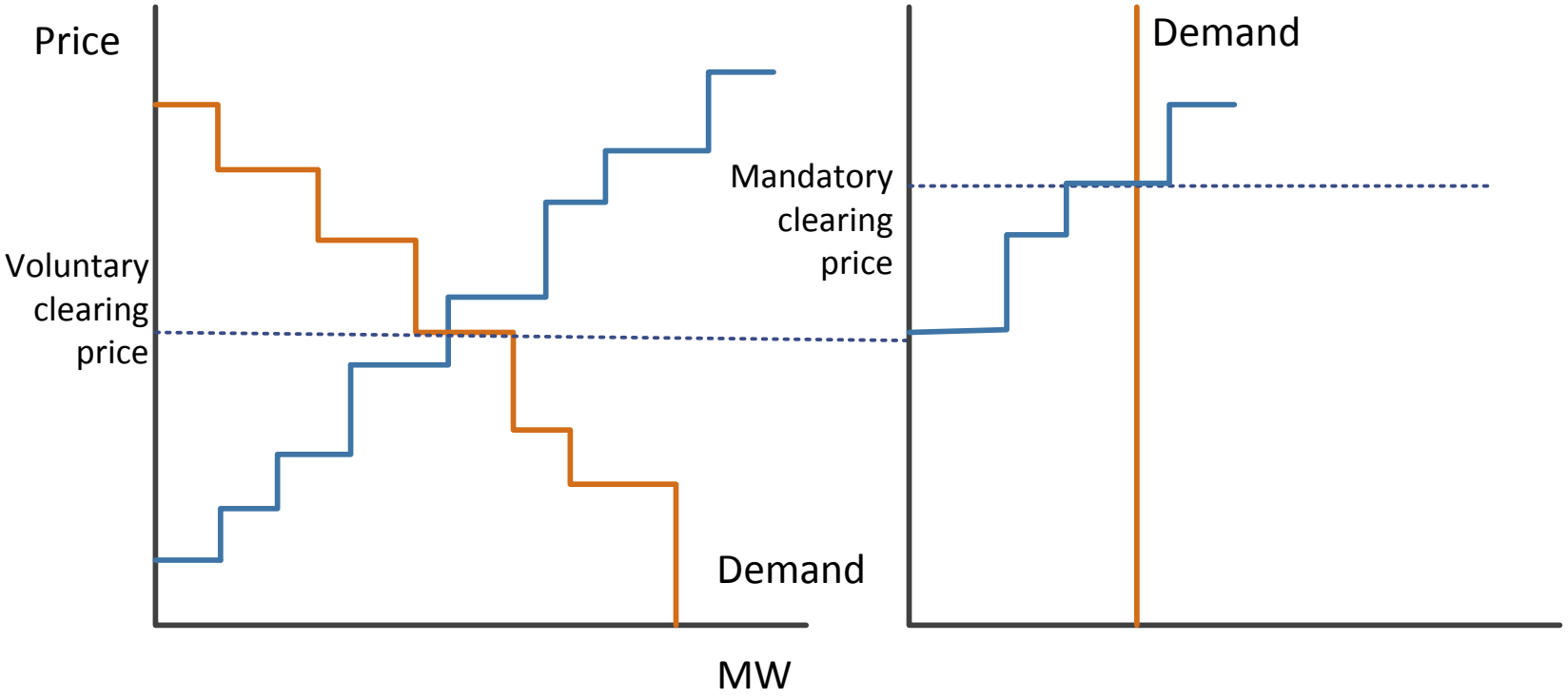
MONTHLY RESIDUAL PROCUREMENT MARKET MECHANISM

Monthly auction could address shortages and deficiencies



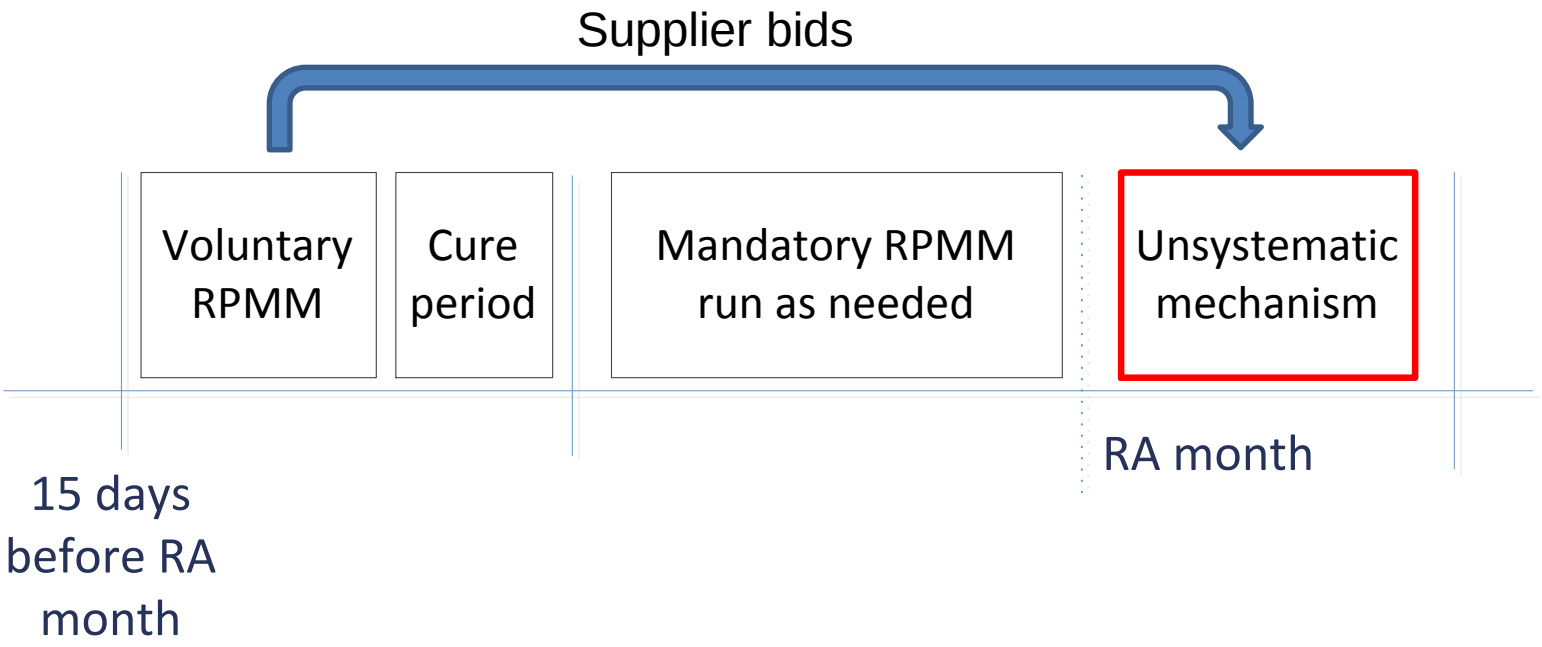
- Voluntary and mandatory residual procurement market mechanism

Monthly mechanisms could be the same as annual mechanisms

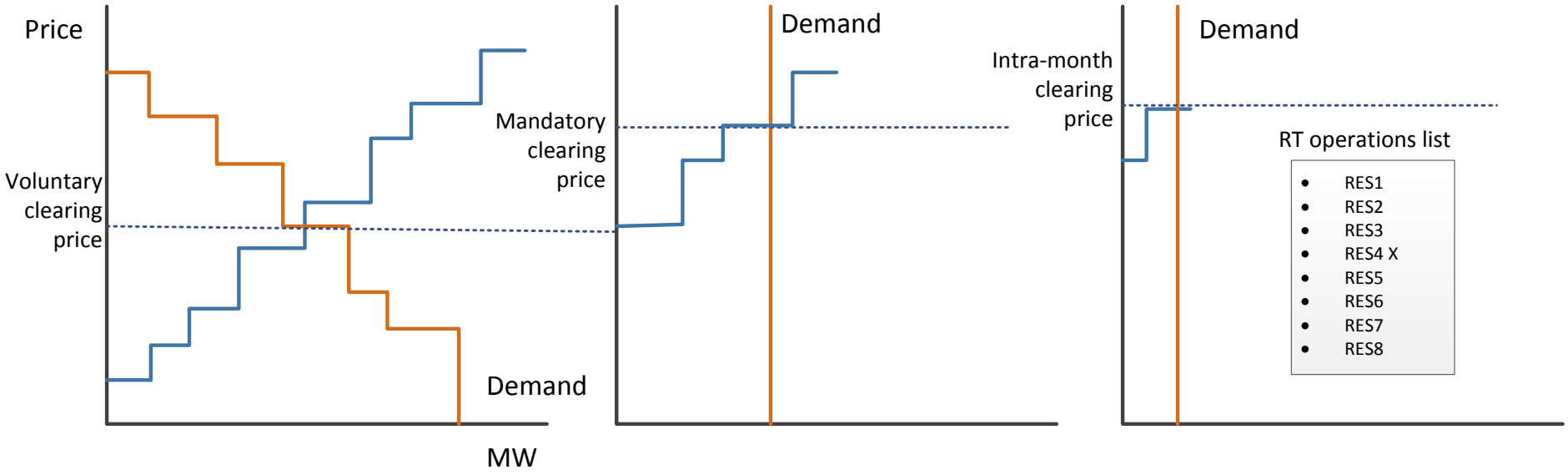


UNSYSTEMATIC MARKET MECHANISM

Unsystematic residual procurement market mechanism



Unsystematic residual procurement market mechanism



MARKET POWER

Market power

- The existence of a market mechanism does not create market power
  - If it exists in the residual bilateral market it has the potential to exist in the residual capacity market
- Market power can be on the demand or supply side
- The design will have to include market power mitigation features

COMMENTS

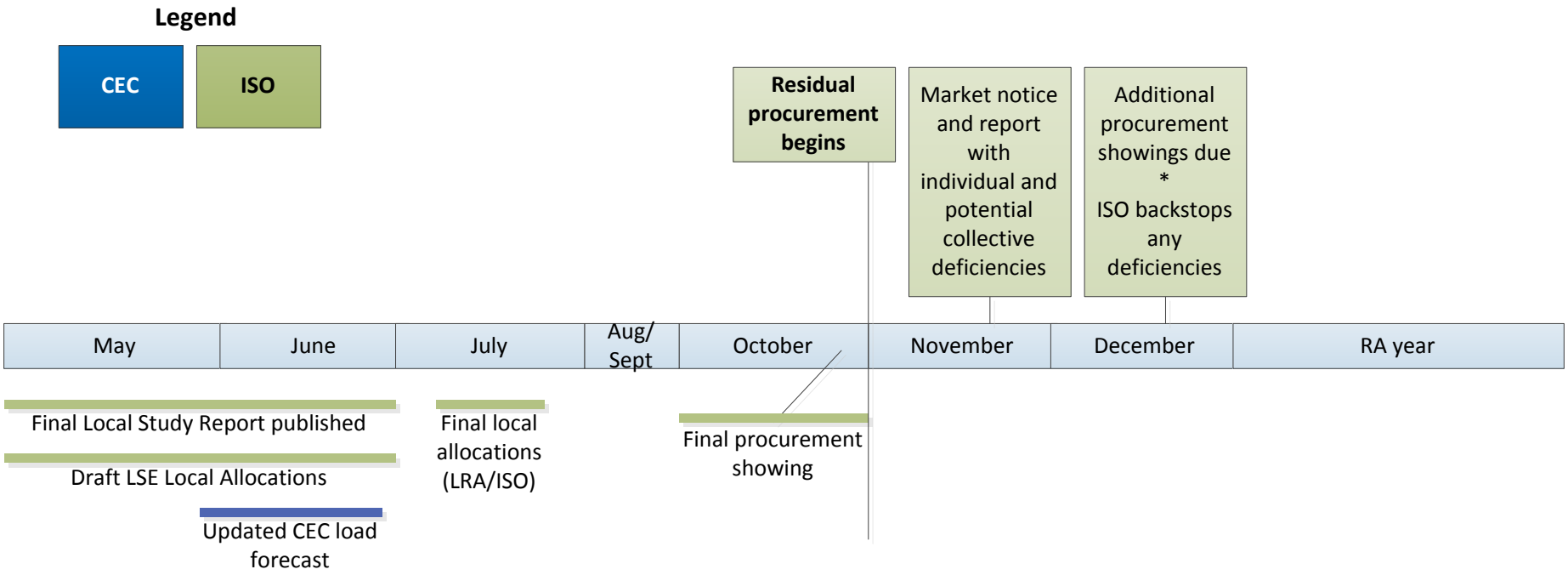
Comments

- We would like comments on:
  - the scope related to the residual procurement section
  - whether the ISO should initially move forward with one idea or move forward with several ideas concurrently in draft straw proposal
  - which mechanisms the ISO should continue exploring
  - analysis that would be helpful to have when designing a durable residual procurement framework
  - anything else, including additional or more specific mechanism proposals

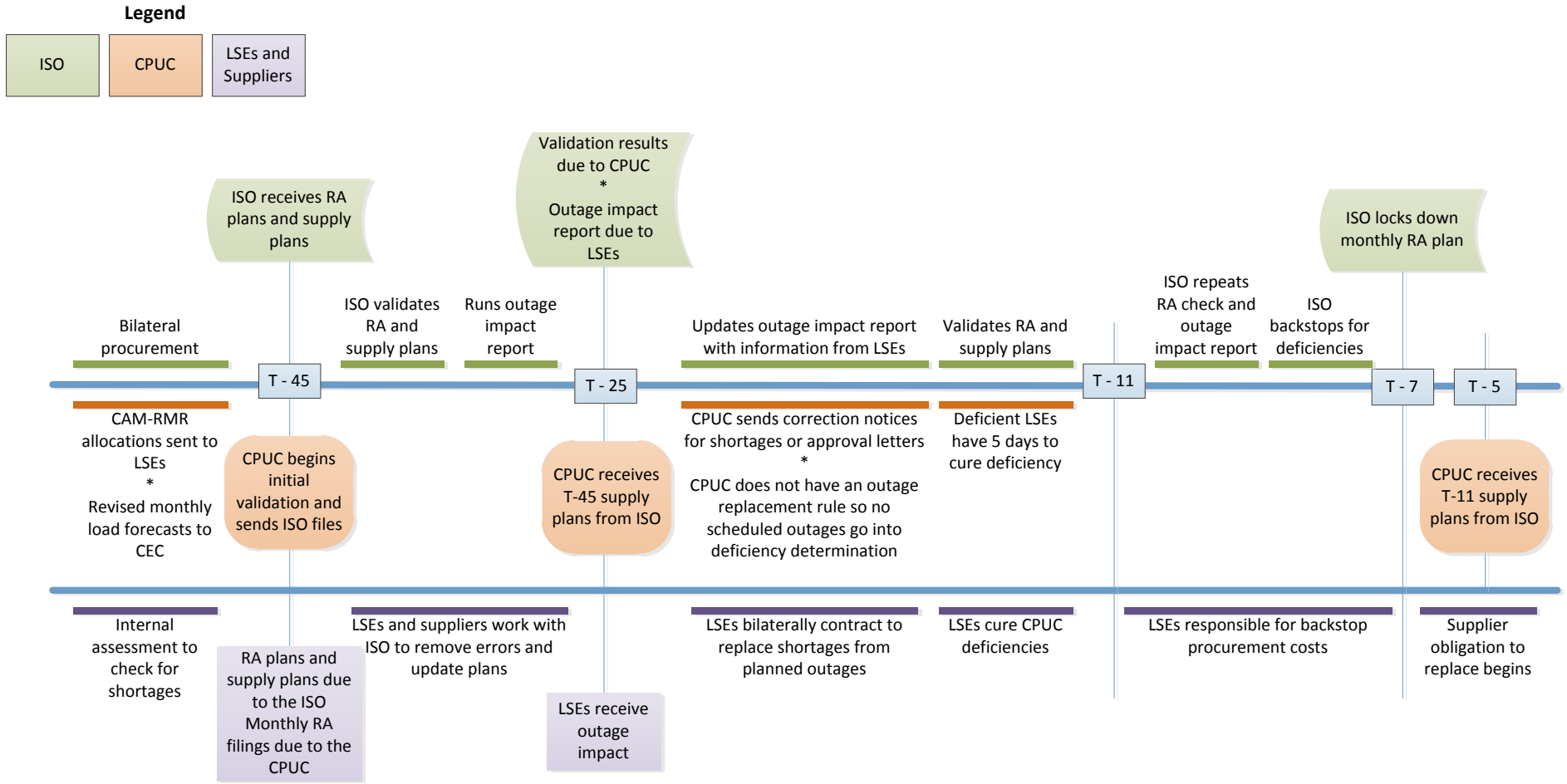
Please submit comments to RSA@caiso.com by March 7th

APPENDIX
WORKING DOCUMENTS

Annual residual procurement

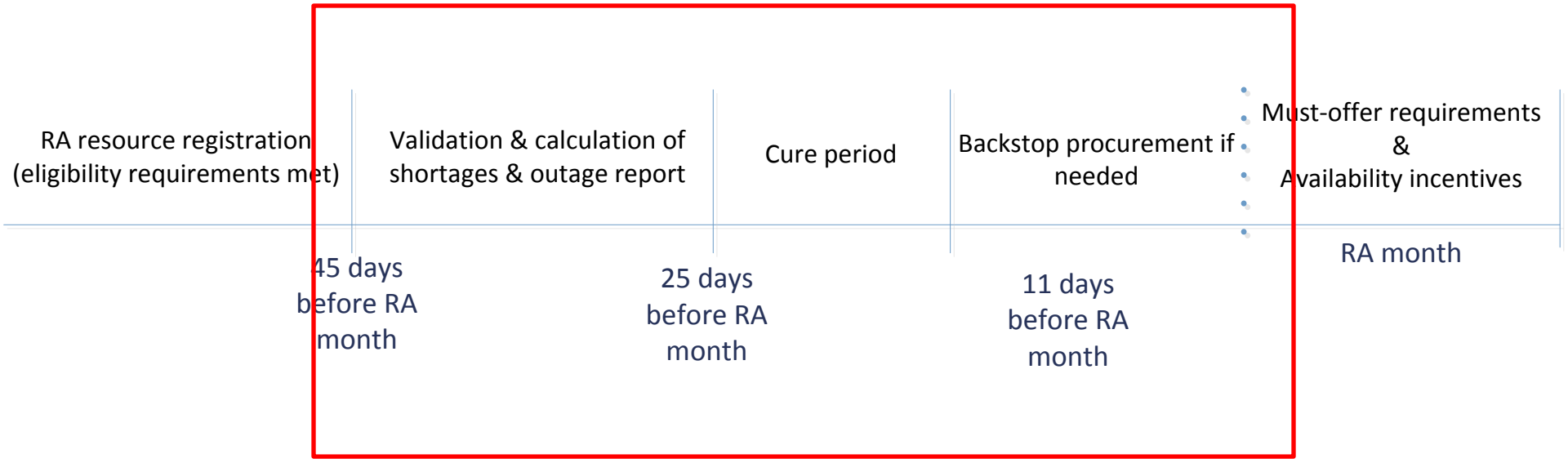


Monthly residual procurement

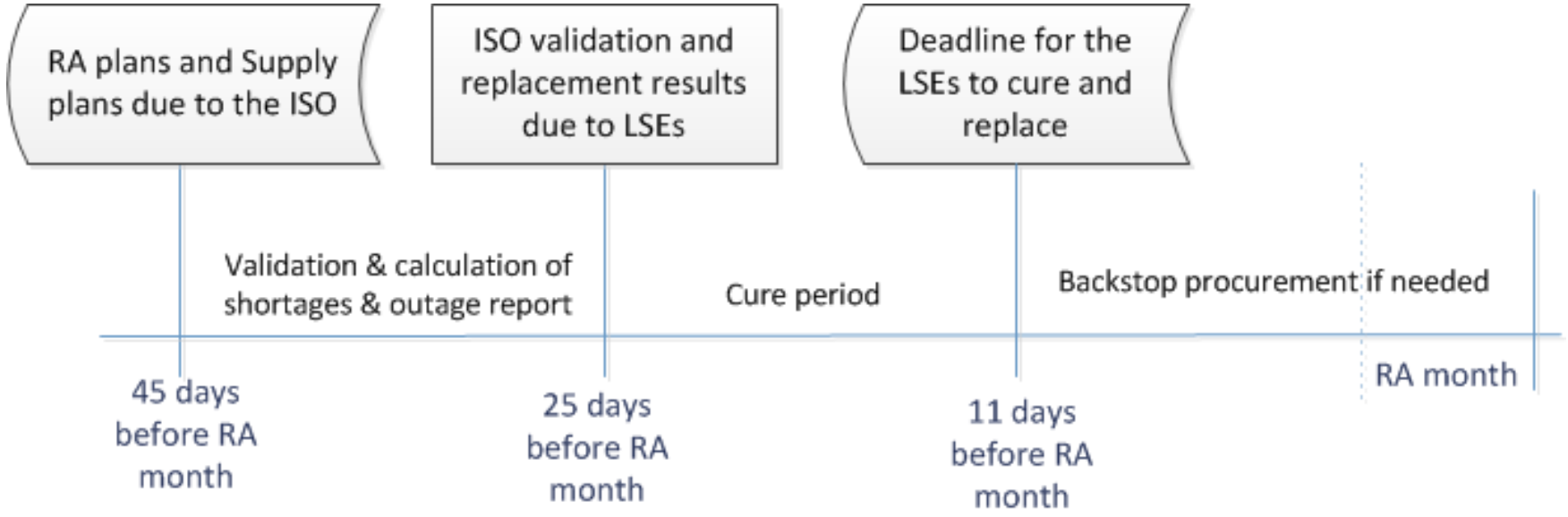


MONTHLY RESIDUAL PROCUREMENT MARKET MECHANISM WALK-THROUGH

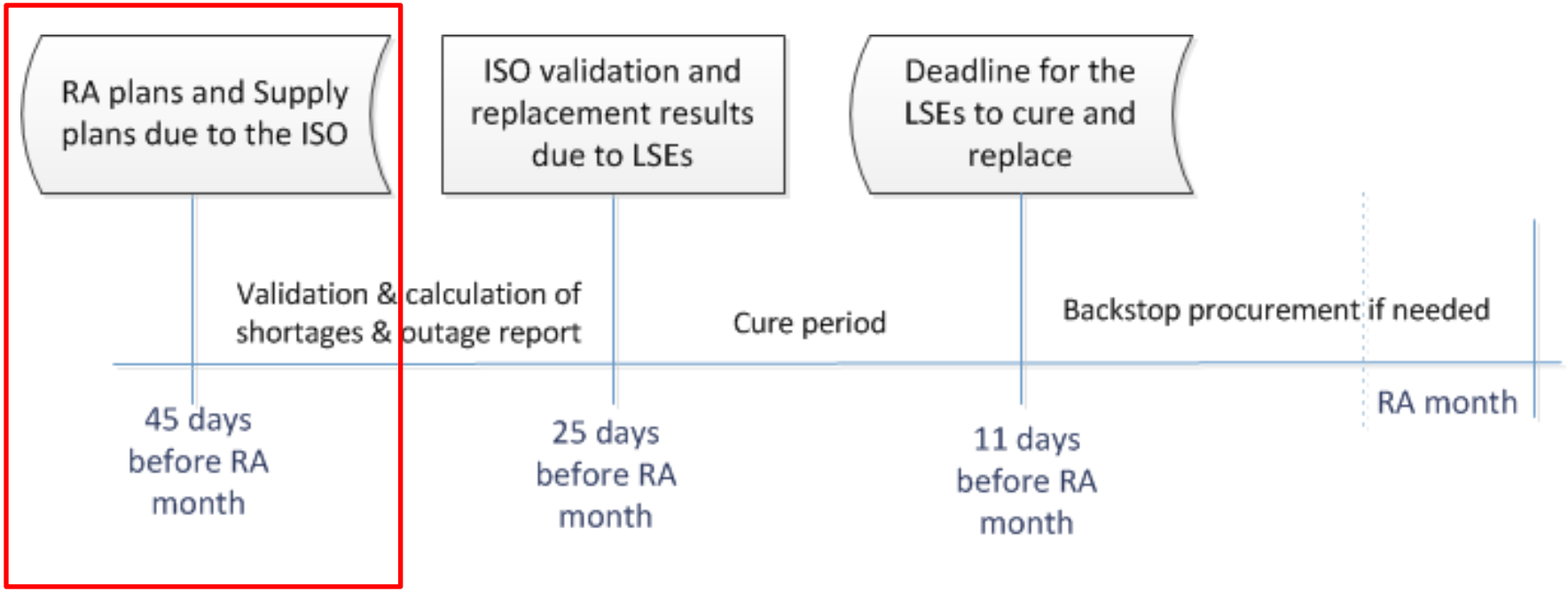
RA process (monthly view)



Timeline of monthly submission, validation, and backstop process

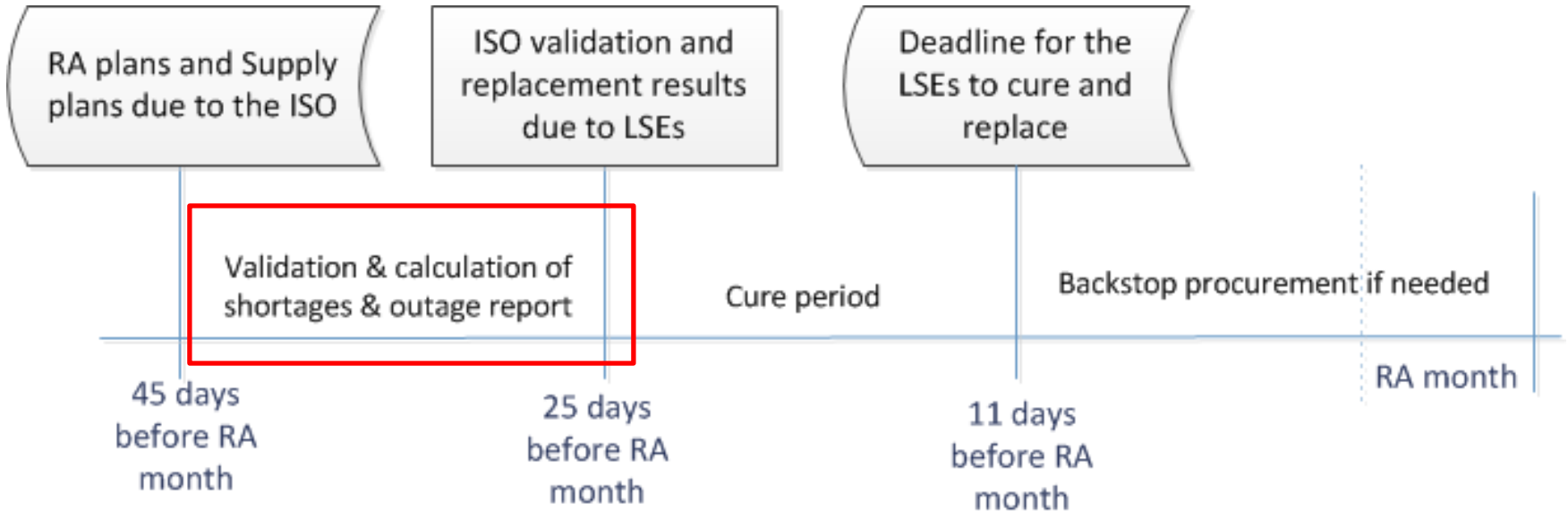


RA and supply plans due to the ISO



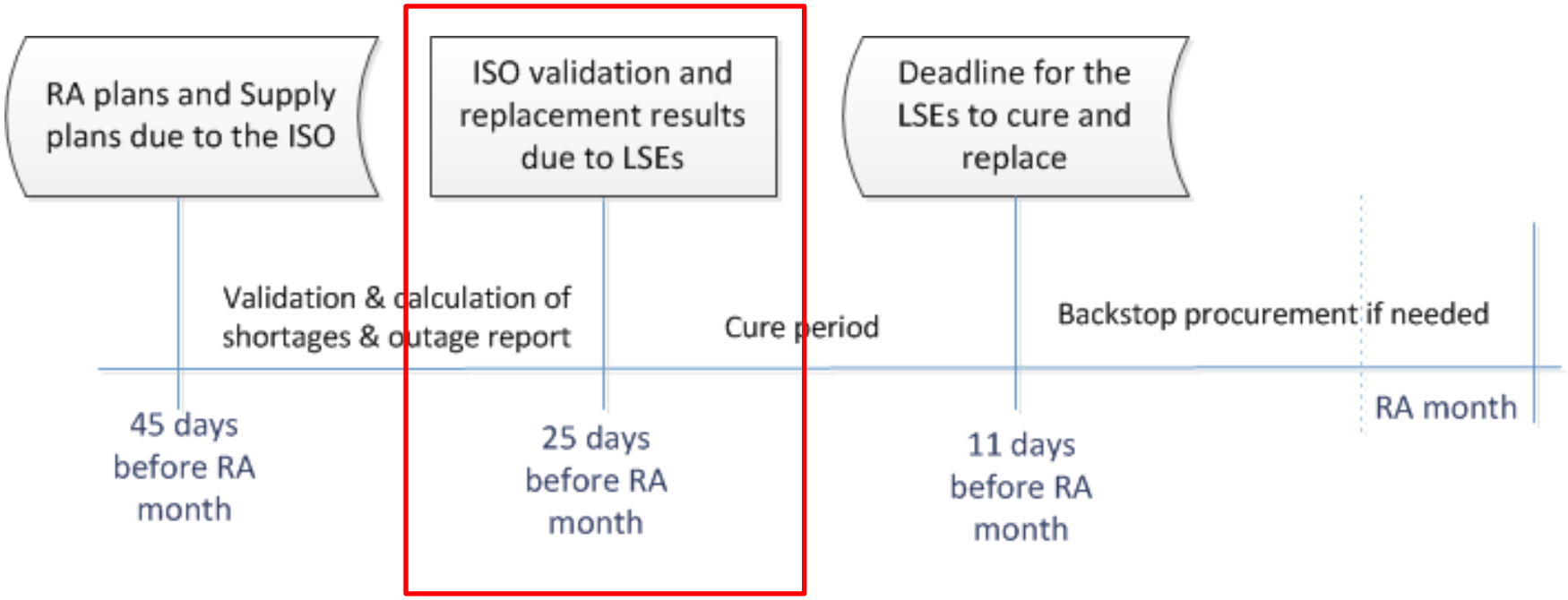
- This is when the ISO takes a snapshot of prompt month resource adequacy expectations

ISO validates plans and calculates shortages and outage report



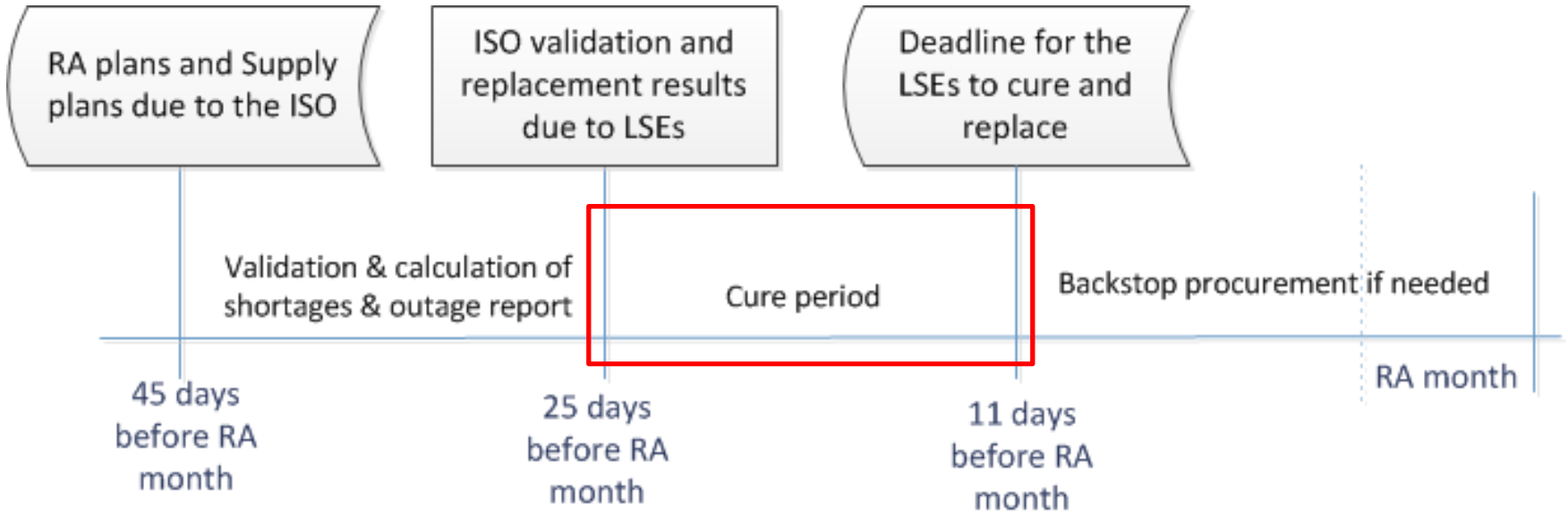
- The ISO looks at shortages and outages independently

ISO indicates shortages



- The ISO indicates any deficiencies that need to be cured either due to shortages or outages

Cure period

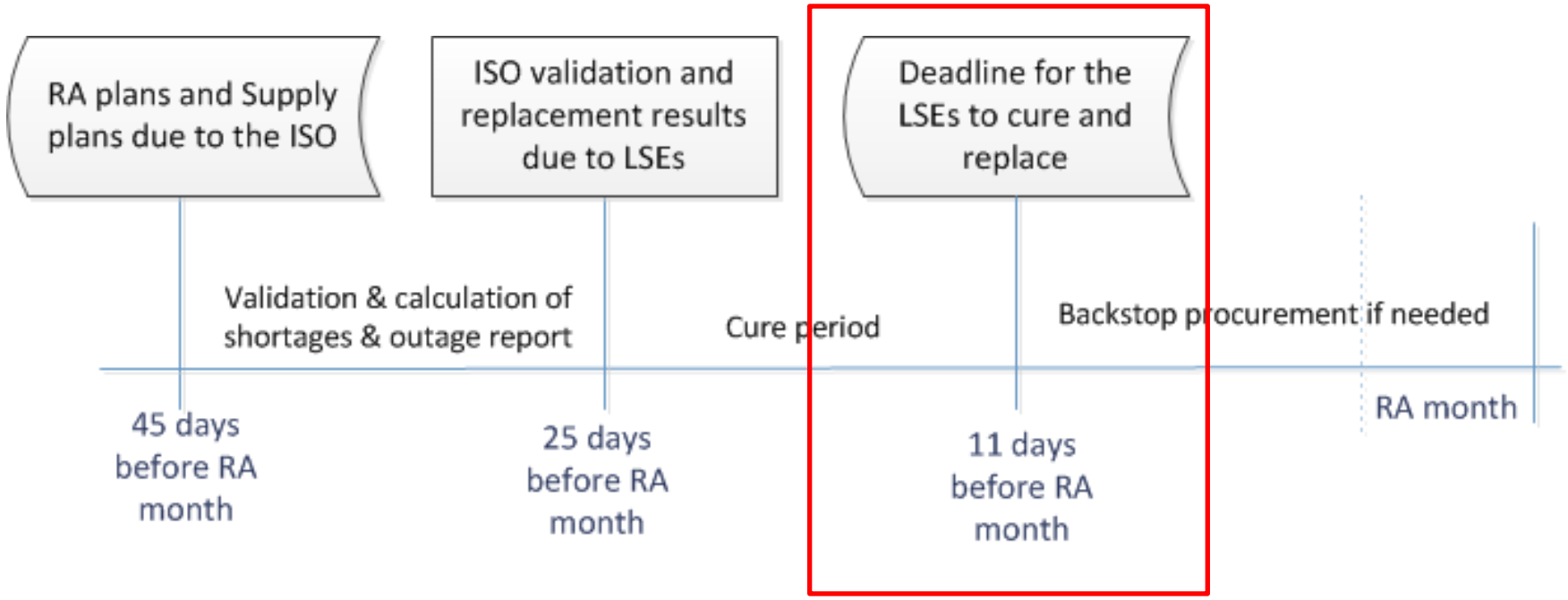


- The period where LSEs have the opportunity to cure shortages

Cure period

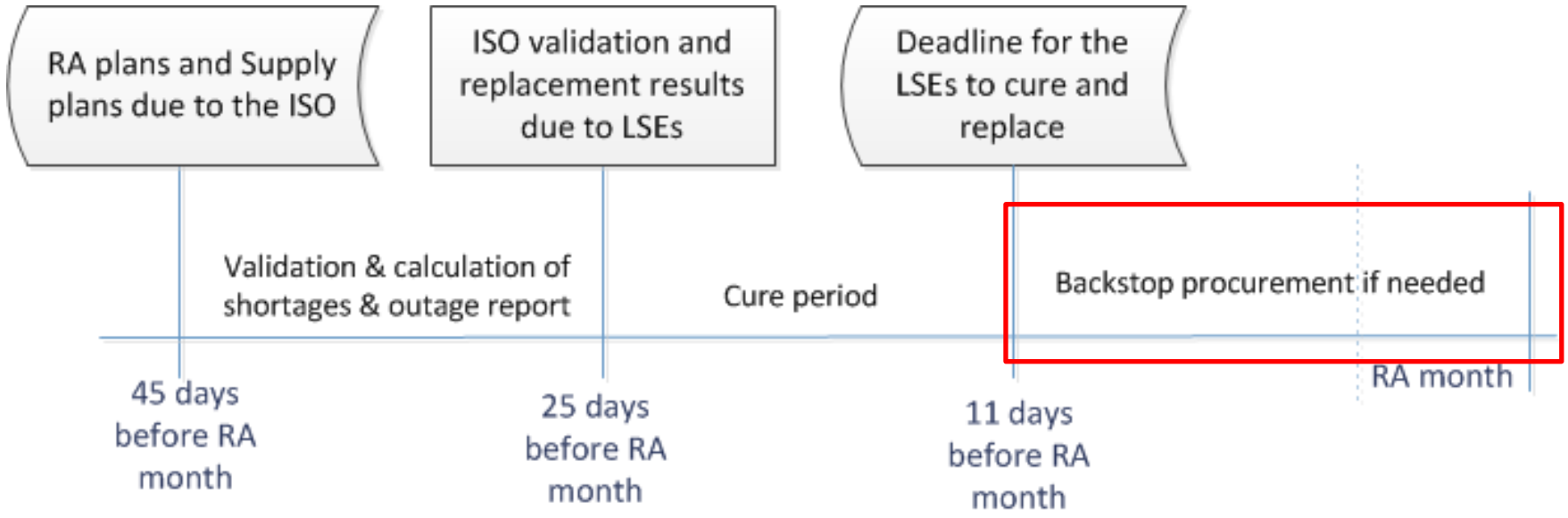
- ISO allows scheduling coordinators to cure shortages
  - LSE system shortages (monthly shortage)
  - LSE local shortages (monthly shortage)
  - Outage impact (daily to monthly shortage)
- Currently these are cured by resources already available to the scheduling coordinator or through additional procurement in the residual bilateral market

Deadline for scheduling coordinators to cure and replace



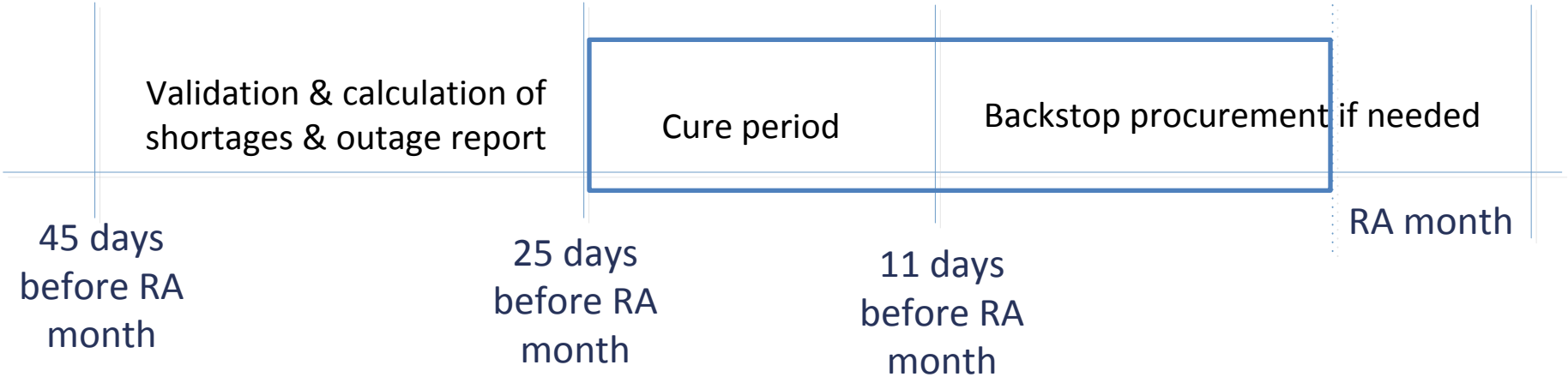
- This is when the ISO takes a snapshot of prompt month resource adequacy expectations

Backstop procurement



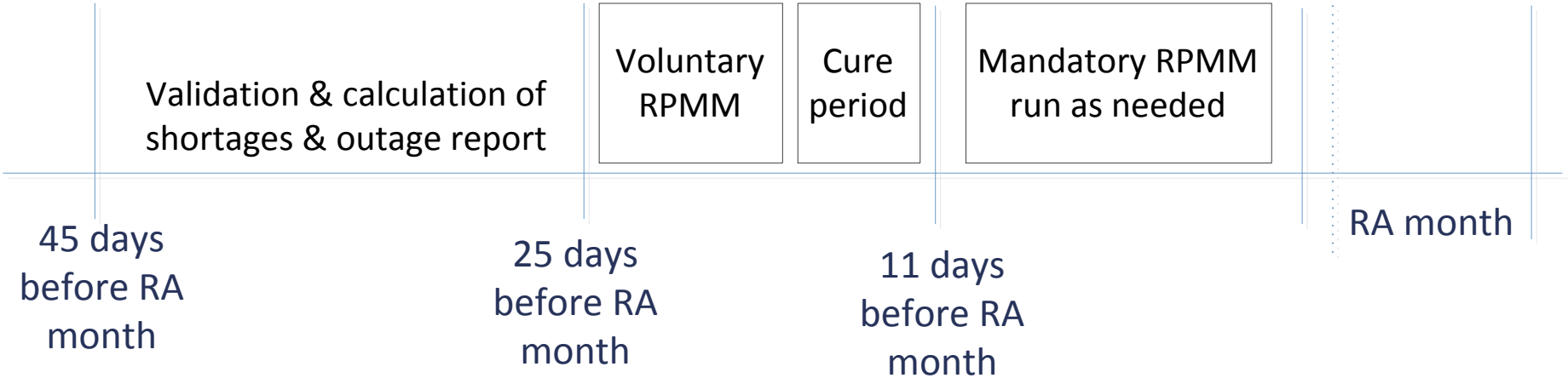
- If there is still a shortage after the cure period, the ISO has the option to CPM a resource and pay the administrative price

Current method to address shortages and deficiencies



- Current: bilateral cure period and backstop

Possible future method to address shortages and deficiencies



- Voluntary and mandatory residual procurement market mechanism

Voluntary residual procurement market mechanism

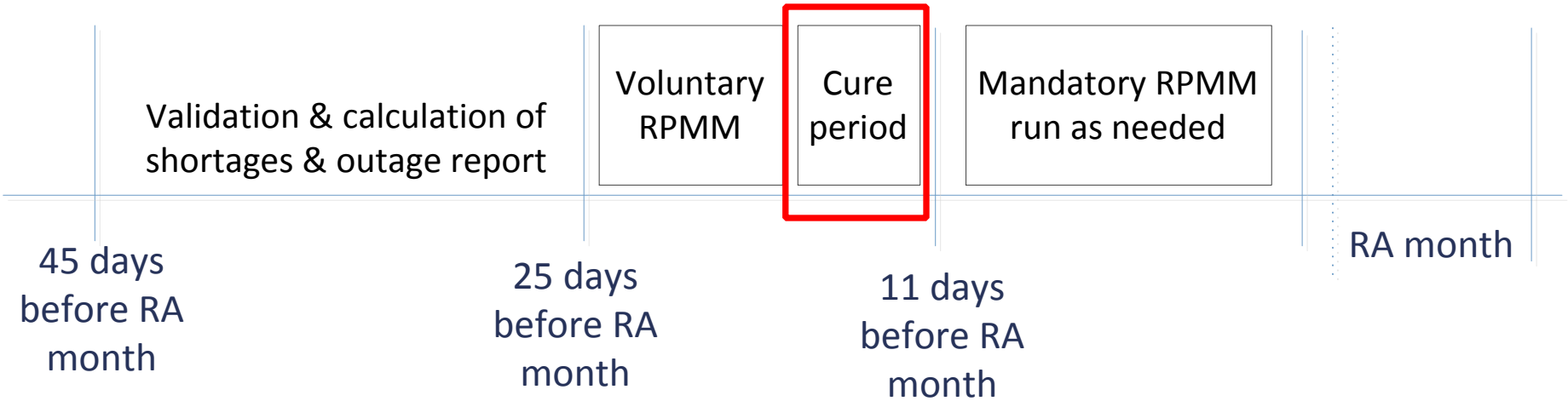
Demand Side

- Monotonically decreasing bids
- MWs (System, Flex)
- Limitations (Path-26, Import Allocations, Categories)
- Monthly Durations

Supplier Side

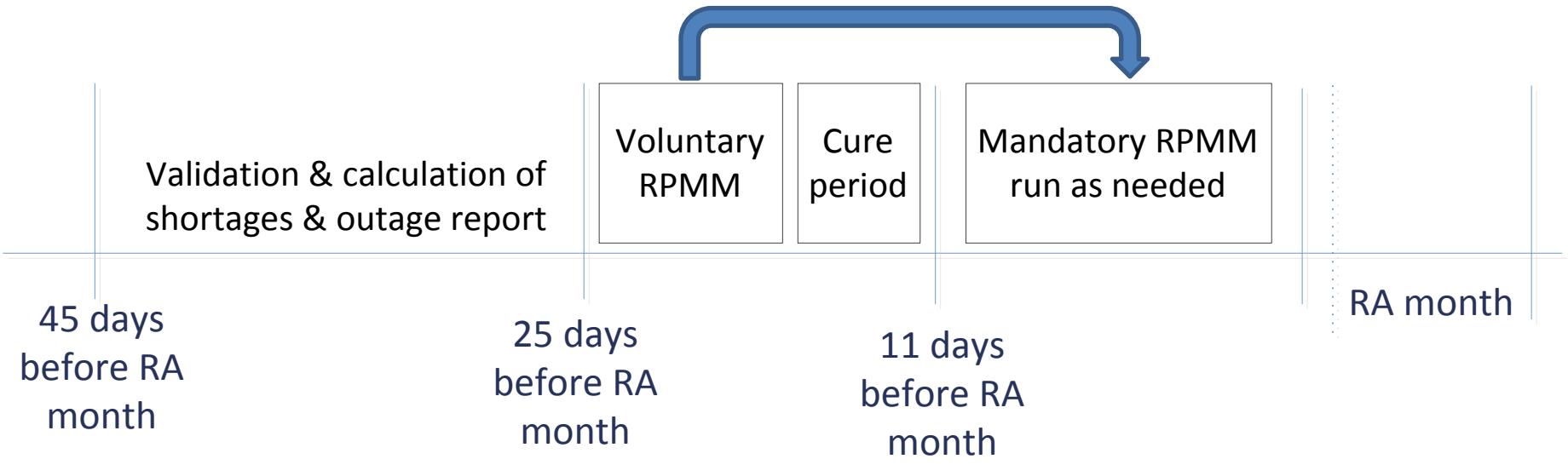
- Monotonically increasing offers
- MWs (System, Flex)
- Flexible Category
- Monthly Durations

Additional cure period



- This cure period would be to procure resources in the event still short after the voluntary market and don't want to risk being a price-taker in market

Mandatory residual procurement market mechanism



- Supply bids from voluntary RPMM would be locked
- Supply bids cleared in the voluntary auction would be removed

Mandatory market mechanism

Demand Side

- Price Taker
- MWs (System, Flex)
- Limitations (Path-26, Import Allocations, Categories)
- Monthly Durations

Supplier Side

- Cannot update prices
- Can use resources procured in cure period to self-supply