2018 ISO LCR Study Criteria, Methodology, and Assumptions

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Stakeholder Web Conference

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Agenda

- Introductions
- General Resource Adequacy (RA) concepts
- General interpretation of existing standards
- Applicable ratings
- Deliverability of generation and imports
- Definition of load pockets
- Transparency of operating solutions
- Contingencies
- Load forecast
- Summary of all LCR assumptions
- Next Steps
- Improvement to the process, other stakeholder input
- Action Items

General LCR Transparency

- Base Case Disclosure
  - ISO will publish the base cases on the ISO protected web site (https://mpp.caiso.com/tp/Pages/default.aspx)
  - Remember to execute WECC/ISO non-disclosure agreements (http://www.caiso.com/1f42/1f42d6e628ce0.html)
- Publication of Study Manual (Plan)
  - Provides clarity and allows for study verification
- Description of Proposed Operating Solutions
  - Subject to established ISO Confidentiality Rules
  - Will not indicate specific operational impact on particular generating facilities during identified contingencies
- ISO to respond in writing to questions raised (also in writing) during stakeholder process

General RA Concepts and Interpretation of Applicable Standards

General Resource Adequacy Concepts

- Resource Adequacy (RA)
  - Ensure that capacity exists and is under contract in order for all load to be served by responsible Load Serving Entities (LSEs)
  - Generally, LSEs will demonstrate that they have secured adequate qualified capacity to serve their peak load including planning reserve (every month in the month ahead timeframe).
  - Generally, LSEs will demonstrate, in the year ahead timeframe that they have secured minimum 90% of the next summer's peak load needs including planning reserve.
  - All resources participating in the ISO markets under an RA contract will have an RA must-offer-obligation to the ISO.

General Resource Adequacy Concepts

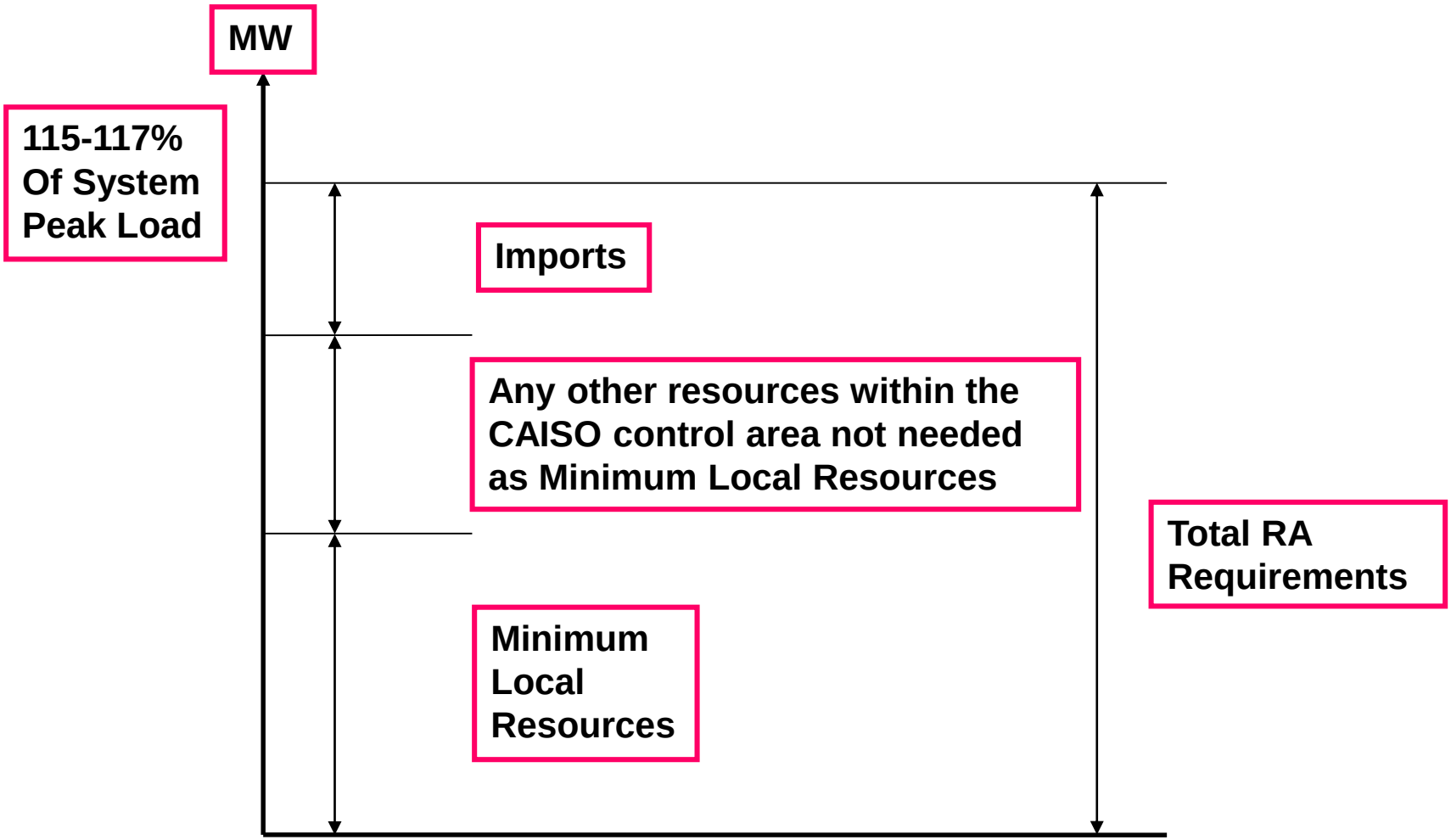
- ISO Tariff
  - ISO can determine minimum local resource requirements on LSEs in order to maintain reliability standards
  - If LSE procurement falls short of ISO's identified needs then ISO may engage in backstop procurement role to assure reliability standards are met in local areas

- Minimize ISO Backstop Procurement
  - General agreement exists that ISO reliability back-stop procurement role should be minimized
  - The ISO methodology meets reliability requirements and minimizes its backstop procurement
  - Existing LCR methodology is based on the existing applicable reliability standards used by the ISO to measure its own compliance

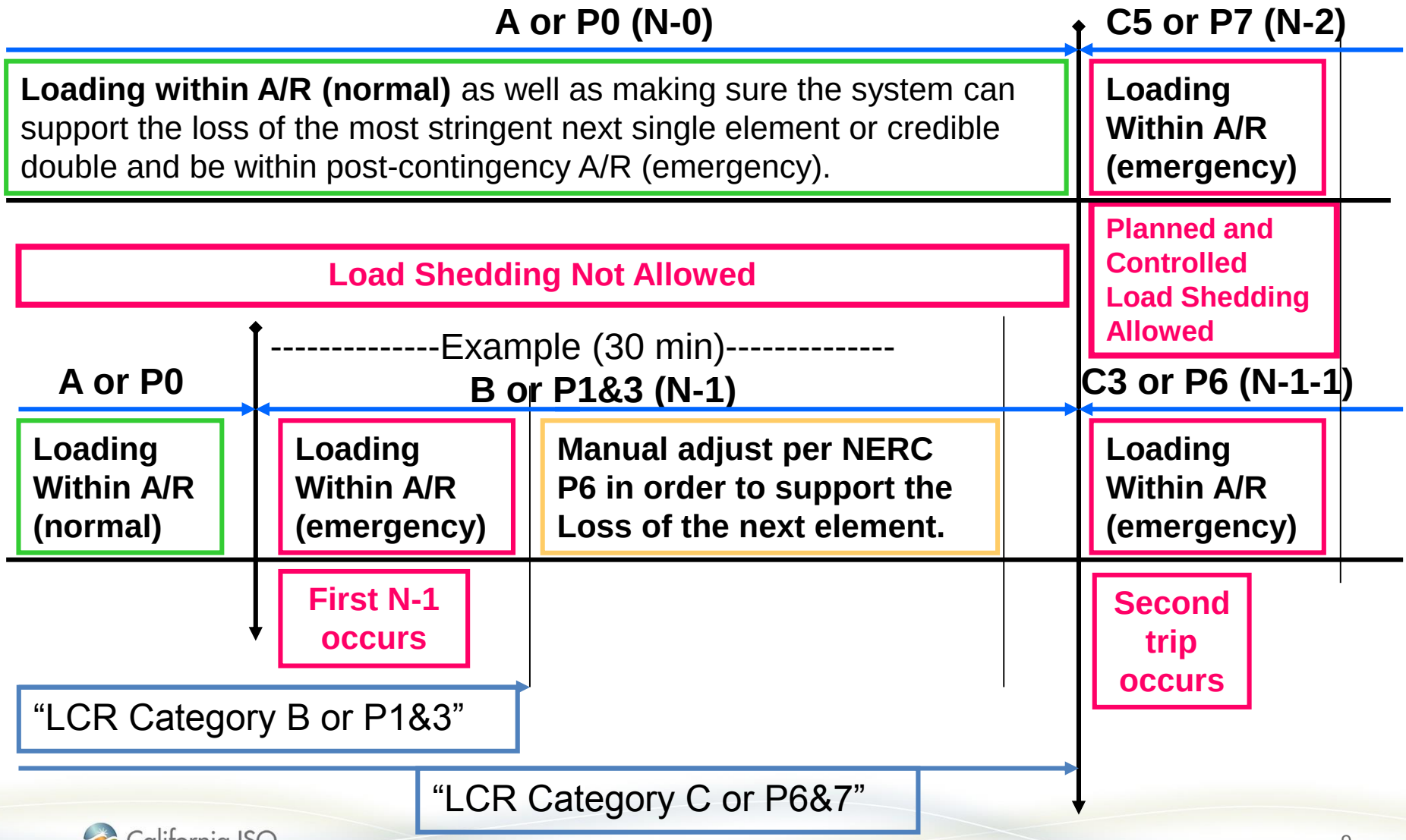
General Resource Adequacy Concepts

- Year ahead Resource Adequacy & Reliability Planning
  - If a resource is not under an RA type contract or otherwise retained by the ISO for reliability services, it will be considered off-line and will not be available to meet reliability needs of the ISO because:
    - These resources will have no must-offer-obligation to the ISO; therefore, they are not obligated to have bids in the ISO markets. ISO could be forced to go out-of-market and these resources may be unavailable or unwilling to respond to the ISO reliability calls.
  - As a result, all units under RA contract + those retained by the ISO for reliability reasons can be used to meet applicable reliability standards.

Total Resource Adequacy Procurement



Minimum Local Capacity Requirements



Terms

- A or P0 (N-0) normal system conditions; use normal ratings
- C5 or P7 (N-2) common mode (same tower or right-of-way); use emergency ratings
- B or P1 (N-1) single or P3 (G-1) generator out followed by another P1 (N-1) contingency conditions; use emergency ratings
- Manual Adjustment – any adjustment done by operators (other than load drop) in order to assure that the system is in a safe operating zone and can support the loss of the next most stringent single contingency
- C3 or P6 (N-1-1) double contingency conditions specifically a single – non-generator (B or P1) followed by manual readjustment and then another single contingency (B or P1); use emergency ratings
- Planned load drop means that the most limiting equipment has a higher short-term emergency rating (i.e., 30 min) AND the operators have a operating procedure that clearly describes the actions needed to be taken in order to shed load
- Controlled load drop means the use of a Special Protection Scheme

Satisfying the Minimum Reliability Need

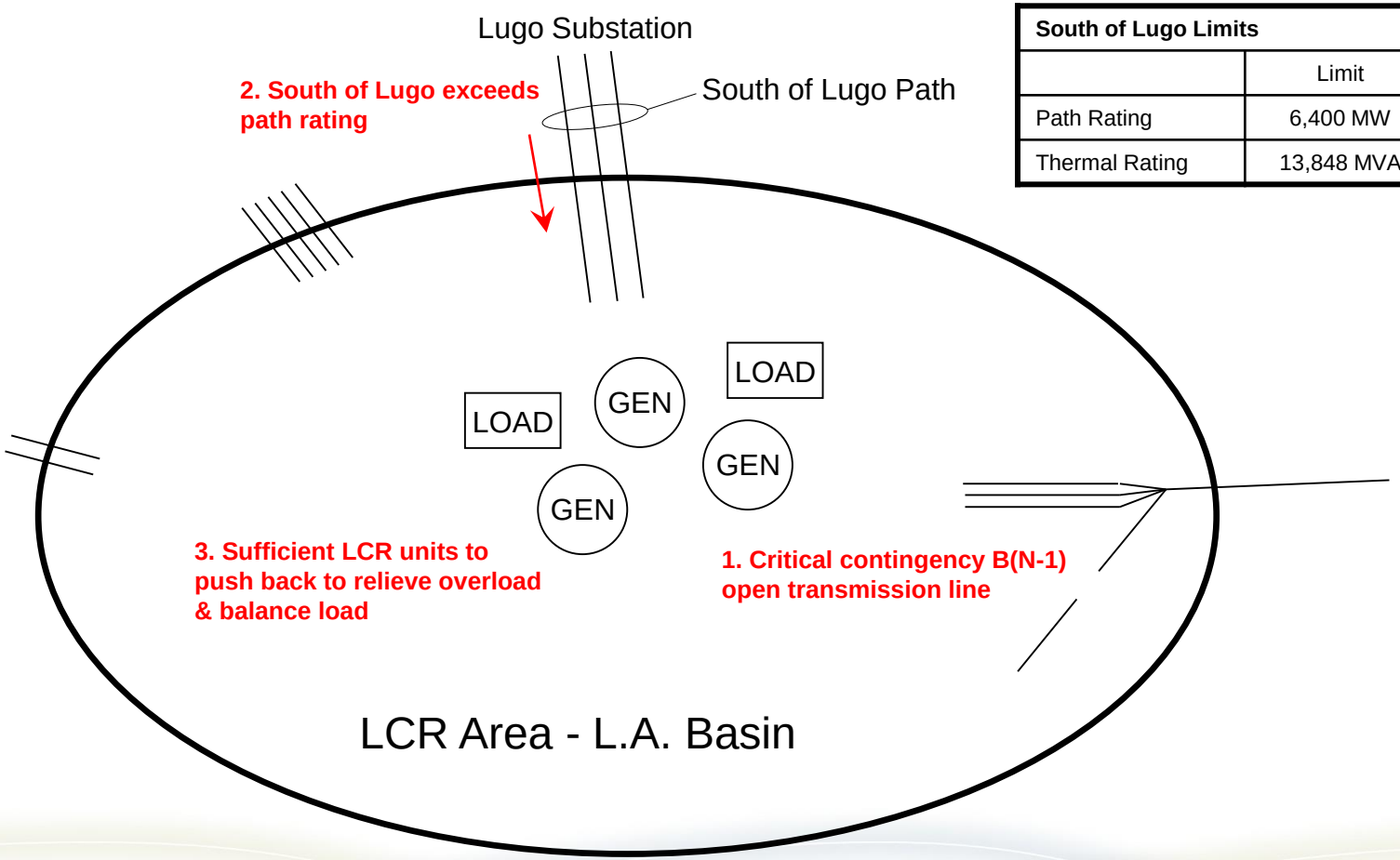
- ISO has an obligation to assure compliance with its Tariff, including ISO/NERC/WECC reliability standards
- Requirements appropriately established based on Option 2:
  - LCR Category C or P6&7 significantly satisfies the above mandate
  - Given minimum required resources are available at peak time
  - Minimizes potential for ISO backstop procurement
- Option 1 (LCR Category B or P1&3) is inadequate because:
  - It does not consider Category C or P6&7 contingencies therefore, would be non-compliant in meeting reliability standards
  - It increases the probability that additional backstop procurement would be required to be compliant with reliability standards

What is an Applicable Rating?

LCR Criteria

- The LCR study is a planning function that currently forecasts local operational needs one year in advance
- The LCR study relies on both:
  - ISO/NERC/WECC Planning Standards
  - WECC Operating Reliability Criteria (ORC)
- Applicable Ratings Incorporate:
  - ISO/NERC/WECC Planning Standards – Thermal Rating
  - WECC ORC – Path Rating

Example – South of Lugo



South of Lugo Limits		
	Limit	LCR
Path Rating	6,400 MW	10,589 MW
Thermal Rating	13,848 MVA	?

Summary

- Traditionally, transmission planning does not incorporate ORC in developing expansion plans
- LCR Criteria includes both ISO/NERC/WECC Planning Standards and ORC
- ISO and PTO transmission expansion plans will need to recognize ORC in order to propose transmission projects which would reduce LCR

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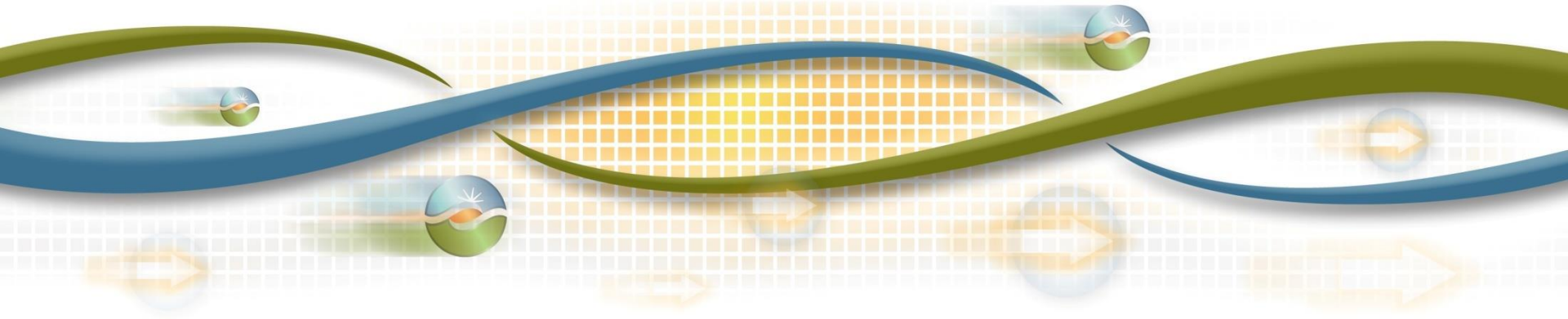
Enforcing Deliverability



Deliverability Recap

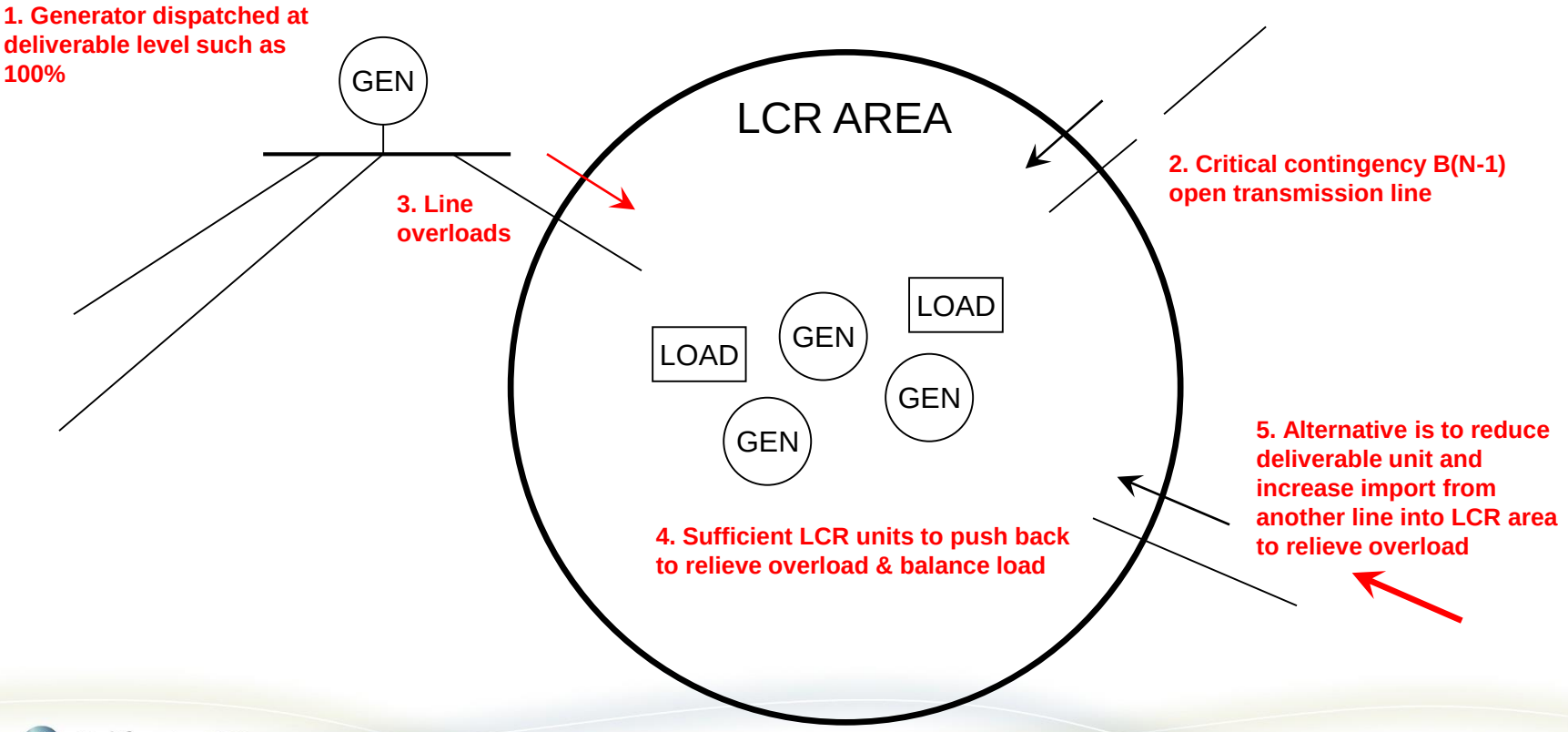
- **Basics**
  - A resource must be deemed “deliverable” to count for RA
  - Being deemed “deliverable” conveys no priority rights when a resource utilizes the ISO controlled grid
- **Study Methodology**
  - Peak load condition
  - “Generation Pocket” concept - generation in an area may exceed the transmission capacity available to deliver resource outside the area
- **Resources**
  - Imports (into the control area) – deliverable amount determined based on average of highest historical usage during summer peak conditions
  - Generation – deliverable amount determined based on studies with deliverable imports enforced

LCR Recap

- **Basics**
  - It is a subset of the System RA requirements and represents the capacity that needs to be procured in specific local areas
  - Represents the minimum resource capacity needed and available in a local area to safely operate the grid
- **Study Methodology**
  - Peak load condition
  - “Load Pocket” concept - load within a local area may exceed the maximum transmission capacity available to deliver resources into that area
- **Resources**
  - Any resources that are considered deliverable within the defined local area

Deliverable Generation Enforced

Deliverability of generator outside the LCR area is enforced under normal A or P0 (N-0), single B or P1 (N-1), and common mode C5 or P7 (N-2) contingencies. For C3 or P3&P6 (N-1-1), immediately after the first contingency <u>any unit</u> (subject to maximum MW number) can be decremented as part of the manual adjustment.



Deliverable Import (into the control area) Enforced

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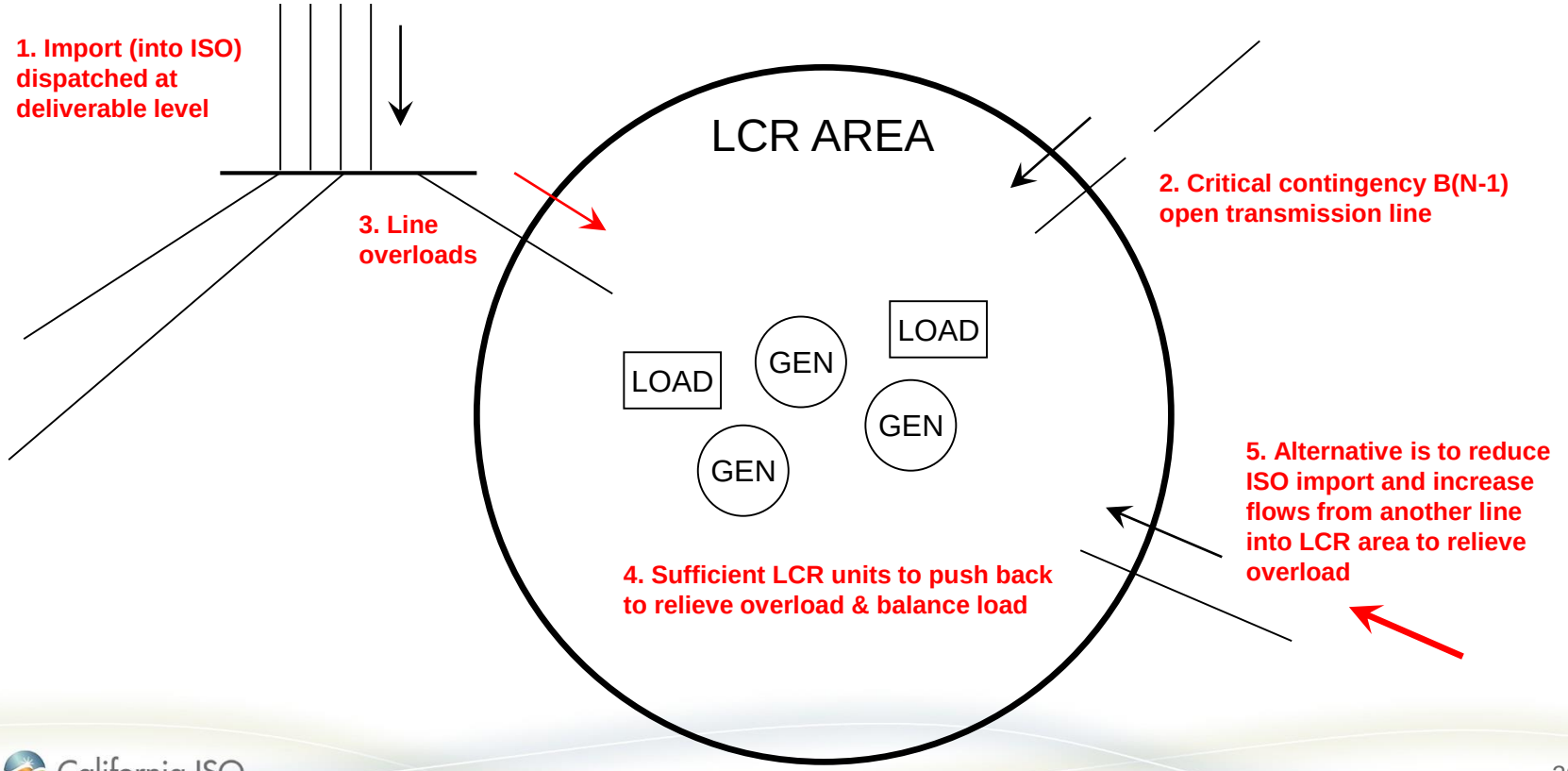

If Deliverability is not enforced in the LCR Analysis

- Minimum LCR requirements will be reduced or remain the same
- Potentially there will be an insufficient amount of LCR to ensure deliverability of import/generation
- Could result in less procurement if the “deliverable resources” (imports/generation) are not procured for RA or otherwise extensively used in real-time
- ISO would NEED to rely on other tools like:
  - Using it’s year ahead back stop procurement authority for requirements beyond those published in the LCR requirements
  - Day ahead and real time use market units without an RA contract with potential of engaging the backstop procurement authority
  - Load shedding if local area uncontracted units retire and are needed

Actual Examples . . .

- Local areas most impacted are Sierra and Fresno
- For Sierra, the impact is driven by COI imports as well as PG&E-owned Northern Hydro River System and the State Water Projects
- For the most part, there will be rather large decreases in import allocations and generation deliverability for rather small decreases in local area LCR requirements
- Showings will likely rely on the above mentioned resources. As such, the ISO would need to account for their full RA capacity

In Summary:

- Deliverability of allocated RA Imports and existing generation should be maintained under normal A or P0 (N-0), single contingency B or P1 (N-1), and common mode C5 or P7 (N-2) contingency conditions

Major path flows that influence LCR

- **General rule**
  - If a major path (that does not flow directly into a local area) influences the LCR evaluation then, it should be chosen such that the resulting local generation can support any major path flow
  - This will assure that the local area problem will not exacerbate into a zonal or system problem because of insufficient local generation

- **Path 15**
  - Path 15 flow will be set at 1275 MW North to South flow when studying Fresno LCR

Definition of Load Pockets

Technical versus Commercial Issues

- Technical definition of load pocket:
  - Based on a transmission constraint(s), which will change as the system changes => different physical needs and different boundaries
  - Results in more frequent changes in LCR requirements and resources needed to mitigate them
  - Hard to achieve in local areas where more then one contingency drives the total requirement

- Commercial definition of load pocket:
  - Based on a fixed transmission boundary
  - Desire to enter into LT contracts where resources and load responsible for meeting LCR requirements are more stable and will continue to count towards local RA obligation for the term of the contract (even though physical needs may not be met)

Transmission Reinforcements

- Changes in the transmission network will change:
  - The boundary of Load Pockets
  - The effectiveness of generators and/or loads to relieve the potential transmission constraint(s)
- Relief of existing transmission constraint may shift the transmission constraint outside the Load Pocket
  - Thus enlarging the Load Pocket resulting in larger number of generators to meet LCR (more generators may increase competition leading to lower prices)
- Leads to lower number of generators required for LCR

If Load Pocket Boundaries are NOT Fixed

- In general, the probability of long term Local RA contracts becoming a "stranded cost" is greater
- Hard to implement in local areas where more then one contingency drives the total LCR requirement
- When the transmission system changes, so would the transmission constraint(s) and local area resources available for LCR procurement

If Load Pocket Boundaries are Fixed

- Resources outside the old pocket boundary that may effectively relieve the new constraint(s) would not be counted towards the local requirement
- Generation that LSEs do procure in an old pocket boundary may no longer meet the local area need
- Long-term, misalignment could increase the chance of ISO back-stop procurement potentially resulting in increased cost

Transparency in Operational Solutions

Consensus:

- Any new “manual” operational adjustments used by ISO in its studies should be fully transparent such that stakeholders can perform studies of the limiting contingency.

- Any operational solution must be validated and implemented in real time by ISO.

- Manual operational solutions should be implemented by market engineering group as best as possible in order to assure that the solution could be run by SCOPF (Security Constrained Optimal Power Flow).

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Contingencies

Contingencies to be used

- Any contingency can determine the minimum LCR requirement
- Limiting equipment determine if a condition should be catalogued as local, zonal or system
  - Example: An outage of SWPL will have a local effect if the overload is on the South of Songs 230 kV path; a zonal effect for a SCIT violation or overload on path 26; and a system effect if reserves dip below minimum allowed, or if COI is overloaded
- Limiting the number of contingencies (e.g., boundary elements) would contradict with real time operations where the ISO needs to maintain system reliability for all possible contingencies

Load Forecast, Other Considerations and Summary of LCR Assumptions

Load Forecast to be used

- Use the latest available CEC load forecast
- CEC to provide the ISO and PTO the starting data before December 1, 2016
- LCR study is fully integrated into the annual transmission planning process. As such it uses the 1-in-10 year summer peak forecast for local areas.
  - See CAISO Planning Standards at: http://www.caiso.com/Documents/FinalISOPlanningStandards-April12015_v2.pdf

Other Considerations

- Peak shift (moving of actual peak hour later in the day mostly due to distributed PV installations)
  - Issue to be addressed by CEC in the 2017 IEPR
  - In the interim ISO will conduct additional scenarios
    - For the combined LA Basin and San Diego area
    - Potentially other locations (specially for requirements driven by reactive margin, voltage collapse or dynamic instability)
- Aliso Canyon gas storage outage
  - For the combined LA Basin and San Diego area

Summary of LCR Assumptions

- Transmission and generation modeled if on-line before June 1, 2018
- Use the latest CEC 1-in-10 peak load in defined load pockets
- Maximize import capability into local areas
- Maintain established path flow limits
- Units under long-term contract turned on first
- Maintain deliverability of generation and imports
- Fixed load pocket boundary
- Maintain the system into a safe operating range
- Performance criteria includes normal, single as well as double contingency conditions in order to establish the LCR requirements in a local area
- Any relevant contingency can be used if it results in a local constraint
- System adjustment applied (up to a specified limit) between two single contingencies

Next Steps

Calendar

- Methodology, criteria, and assumptions for 2018 LCR study finalized by early-December
  - CPUC and the ISO have determined overall timeline
  - Submit comments by November 14, 2016
  - Posting of comments with ISO response by the November 30, 2016
  - Base case development will start in December 2016
  - Receive base cases from PTOs January 3, 2017
  - Publish base cases January 16, 2017 – comments by the 23rd
  - Draft study completed by February 24, 2017
  - ISO Stakeholder meeting March 9, 2017 – comments by the 23rd
  - ISO receives new operating procedures March 23, 2017
  - Validate op. proc. – publish draft final report April 6, 2017
  - ISO Stakeholder meeting April 13, 2017 – comments by the 20th
  - Final report May 1, 2017

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Open discussion regarding Improvements to the Process, Other Stakeholder Input

Action Items

Thank you for your participation.