2009 CAISO LCR Study Criteria, Methodology and Assumptions

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California ISO
Your Link to Power

CAISO Stakeholder Meeting
October 11, 2007

Agenda

- Introductions
- General Resource Adequacy (RA) concepts
- General interpretation of the existing criteria
- Applicable ratings
- Deliverability of generation and imports
- Definition of load pockets
- Transparency of operating solutions
- Contingencies
- Load forecast
- Summary of all assumptions for summer peak LCR study
- Temporal and Seasonal LCR concepts
- Next Steps

Agreed Upon Need to Refine the LCR Study Process

- D.07-06-029 – "concerns about timing and transparency issues continue to vex the LCR study process"
  - Transparency - increase information on assumptions, inputs, methodology to enhance study verifiability
  - Timing - increase coordination between CAISO and CPUC processes to enable careful review
- D.07-06-029 – Workshop should address, at a minimum:
  - The need for timely submission of operating solutions
  - Opportunities for stakeholders to review, discuss and have input to the LCR study input assumptions and methodology prior to the actual conducting of the study
  - Opportunities for stakeholders to provide input on the draft LCR study well in advance of the final LCR study report

Future Steps

- Methodology, criteria, and assumptions for 2009 LCR study finalized by early-December
  - CPUC and the CAISO have determined overall timeline
  - Base case development will start in December 2007
  - Receive base cases from PTOs January 1, 2008
  - Publish base cases January 15, 2008 – comments by the 22nd
  - Draft study completed by March 1, 2008
  - CAISO Stakeholder meeting March 8, 2008
  - CAISO receives new operating procedures March 21, 2008
  - Review and validate op. proc. – publish draft final report April 7, 2008
  - CAISO Stakeholder meeting April 14, 2008 – comments by the 21th
  - Final report May 1, 2007
- Long-term LCR evaluations
  - CAISO expansion plan will include evaluations of future LCR needs as well as transmission proposals required in order to reduce reliance on local generation in the most economic way possible
  - PTOs to also include these type of studies in their evaluation of future grid needs

Improvements to LCR Transparency

- Base Case Disclosure
  - CAISO will provide base cases to WECC Members via E-mail
  - Non-members will be required to execute WECC/CAISO non-disclosure agreements
- Creation and Publication of Study Manual (Plan)
  - Provide clarity on methods to allow for study verification
- Description of Proposed Operating Solutions
  - Subject to established CAISO Confidentiality Rules
  - Will not indicate specific operational impact on particular generating facilities during identified contingencies
- CAISO to Respond in Writing to Questions Raised (also in writing) During Stakeholder Process

General Resource Adequacy (RA) concepts and General Interpretation of the CAISO (including NERC & WECC) Standards

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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 plus planning reserve (every month in the month ahead timeframe)
  - Generally LSEs will demonstrate, in the year ahead timeframe, they have secured minimum 90% of the next summer's peak load needs including planning reserve
  - All resources participating in the CAISO markets under an RA contract will have an RA must-offer-obligation to the CAISO

General Resource Adequacy Concepts

- FERC Must-Offer-Obligation
  - Currently applies to all available units that participate in the CAISO markets (with small exemptions like hydro, QF and nuclear)
  - Will be discontinued after implementation of the MRTU and RA programs

- CAISO MRTU Tariff
  - FERC approved and compliance fillings in progress
  - CAISO can determine minimum local resource requirements on LSEs in order to maintained reliability standards
  - If LSE procurement falls short of CAISO's identified need, CAISO may engage in backstop procurement role to assure reliability standards are met in local areas

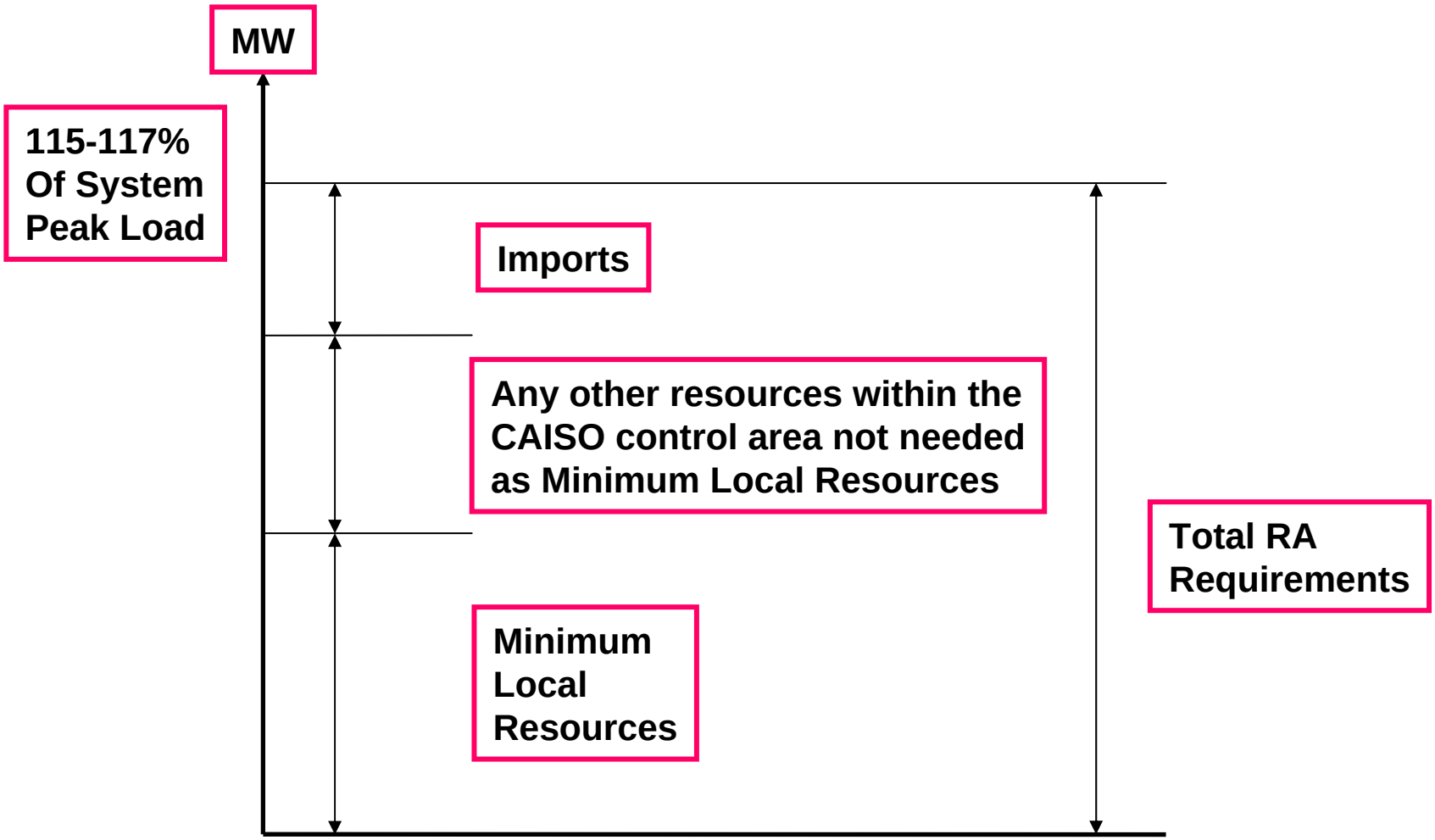
General Resource Adequacy Concepts

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

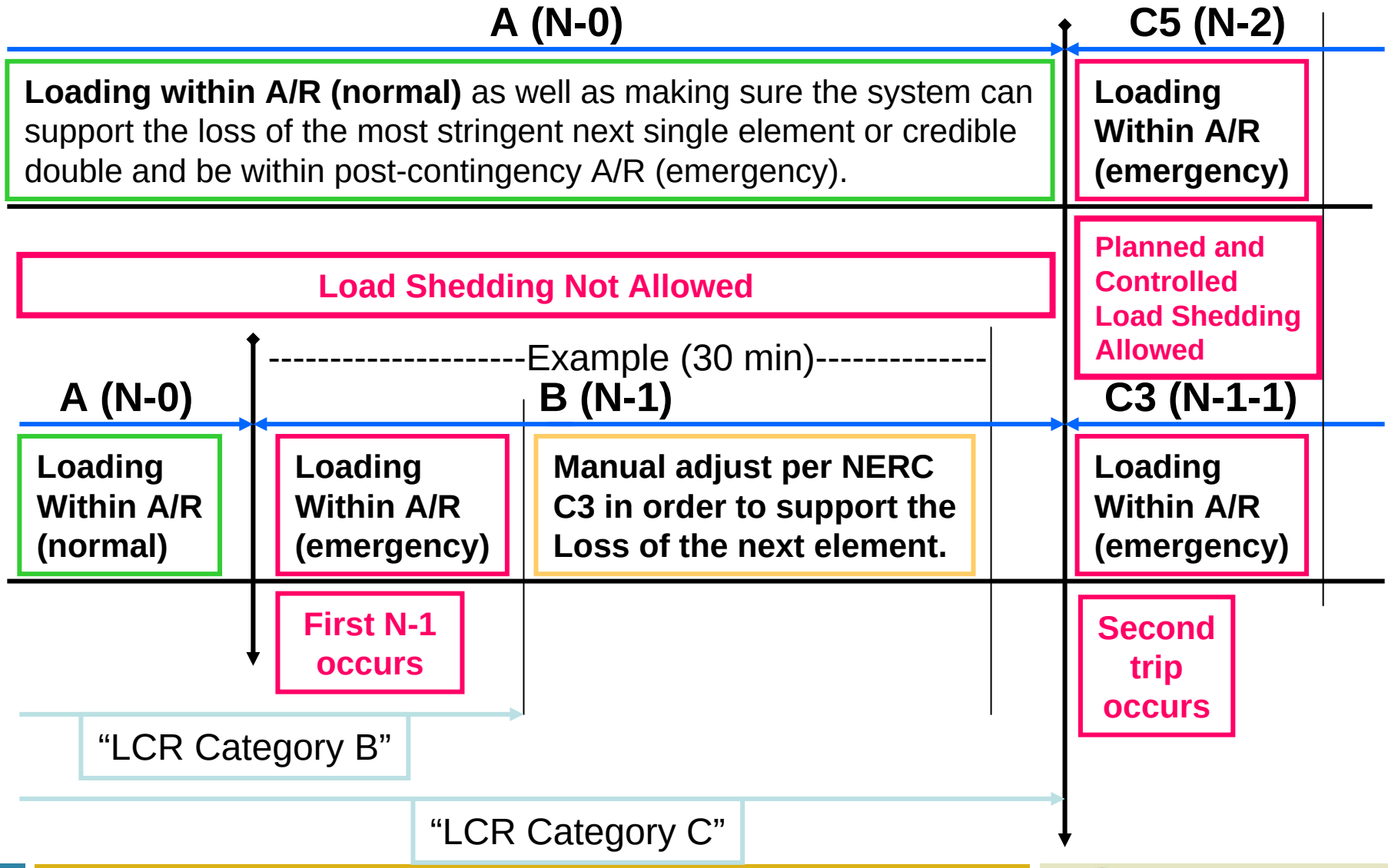
Overview of LCR Methodology

- Minimize CAISO Backstop Procurement
  - General agreement exists that CAISO reliability back-stop procurement role should be minimized
  - The CAISO methodology meets reliability requirements and minimized its backstop procurement
  - Existing Local Capacity Requirement methodology is based on the existing applicable reliability standards used by the CAISO to measure its own compliance
  - Other methodology proposals will be evaluated on their own technical and economic merits and are not the subject of this meeting

Total Resource Adequacy Procurement



Minimum Local Capacity Requirements



Terms

- A (N-0) normal system conditions; use normal ratings
- C5 (N-2) common mode (same tower or right-of-way); use emergency ratings
- B (N-1) single contingency conditions; use emergency ratings
- Manual Adjustment – any adjustment done by operators (other then 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 (N-1-1) double contingency conditions (specifically a single (B) followed by manual readjustment and then another single contingency (B); use emergency ratings
- Planned load drop means that the most limiting equipment has a higher short-term emergency rating (example - 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

- CAISO has an obligation to assure compliance with its Tariff, including CAISO/NERC/WECC reliability standards

- Requirements appropriately established based on Option 2:
  - LCR Category C significantly satisfy the above mandate
  - Given minimum required resources are available at peak time
  - Minimizes potential for CAISO backstop procurement

- Option 1 (LCR Category B) is inadequate because:
  - It does not consider Category C contingencies and, 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?

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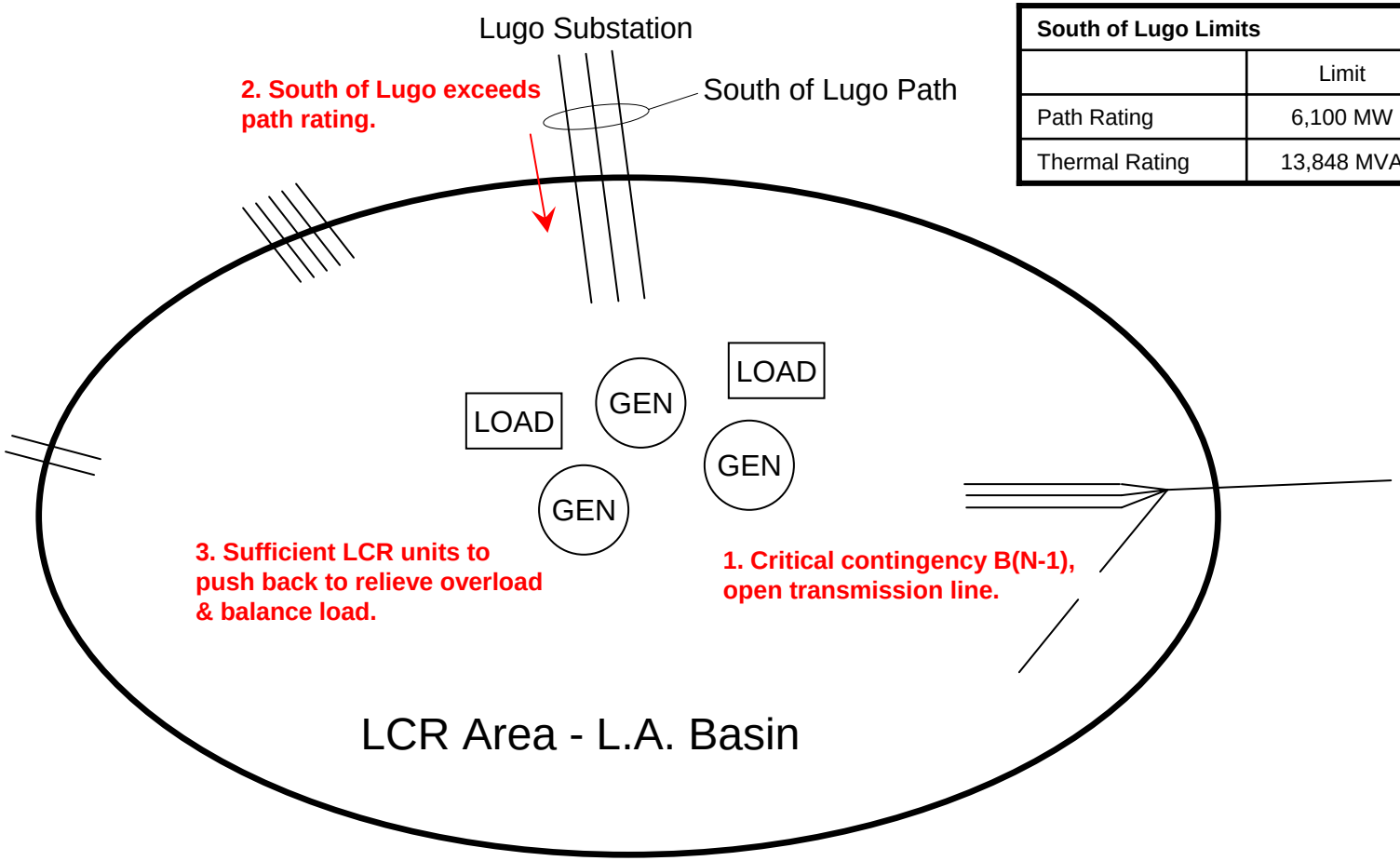
LCR Criteria

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

Example – South of Lugo



South of Lugo Limits		
	Limit	2008 LCR
Path Rating	6,100 MW	10,130 MW
Thermal Rating	13,848 MVA	?

Summary

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

Enforcing Deliverability

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Deliverability Recap

- **Basics**
  - A resource must be deemed Deliverable to count for Resource Adequacy
  - Being deemed Deliverable conveys no priority rights when a resource utilizes the CAISO 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

Local Capacity Requirement Recap

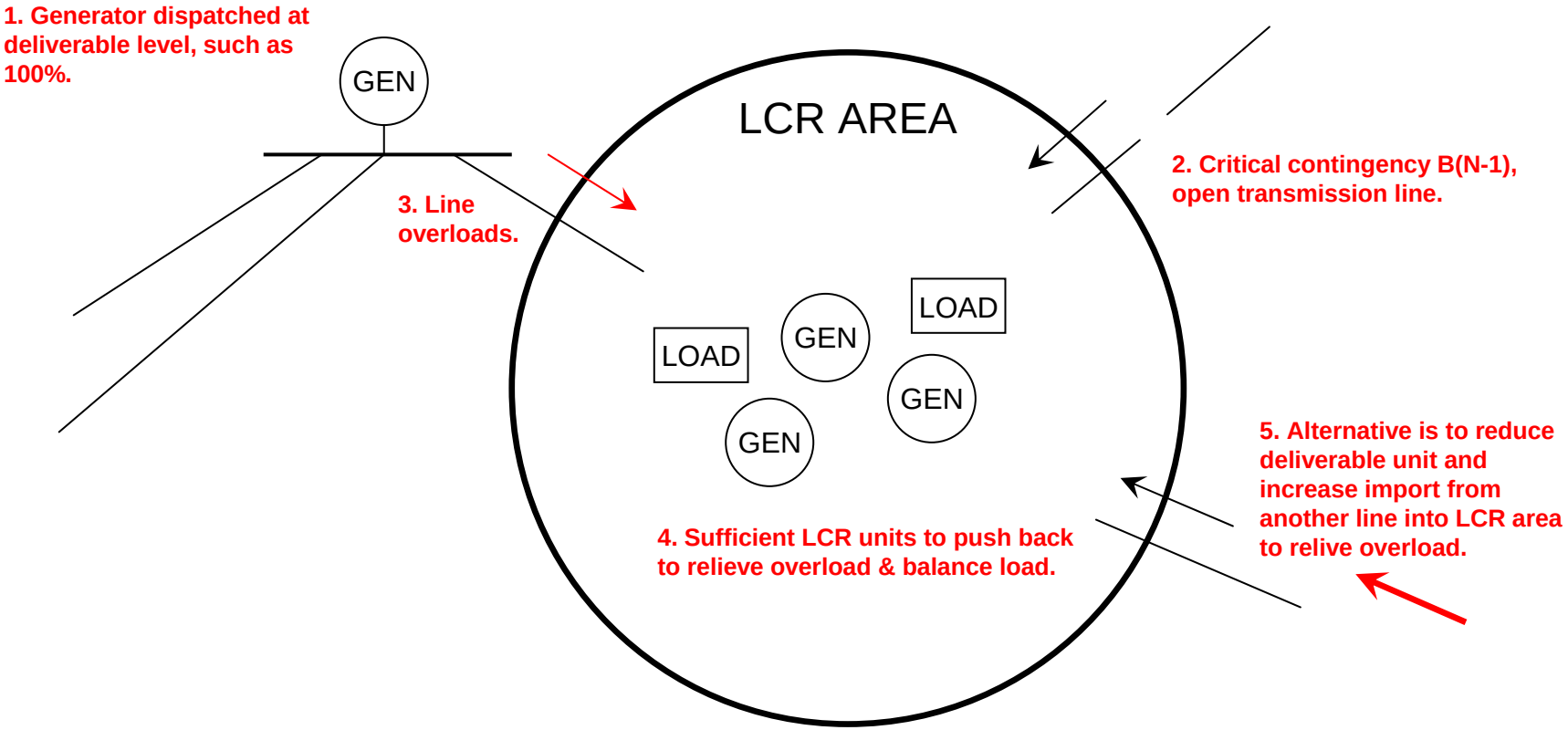
- **Basics**
  - It is a subset of the System RA requirements and represents the capacity that needs to be procured in specific local areas
  - Represents the minimum resource capacity needed and available in a local area to safely operate the grid

- **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

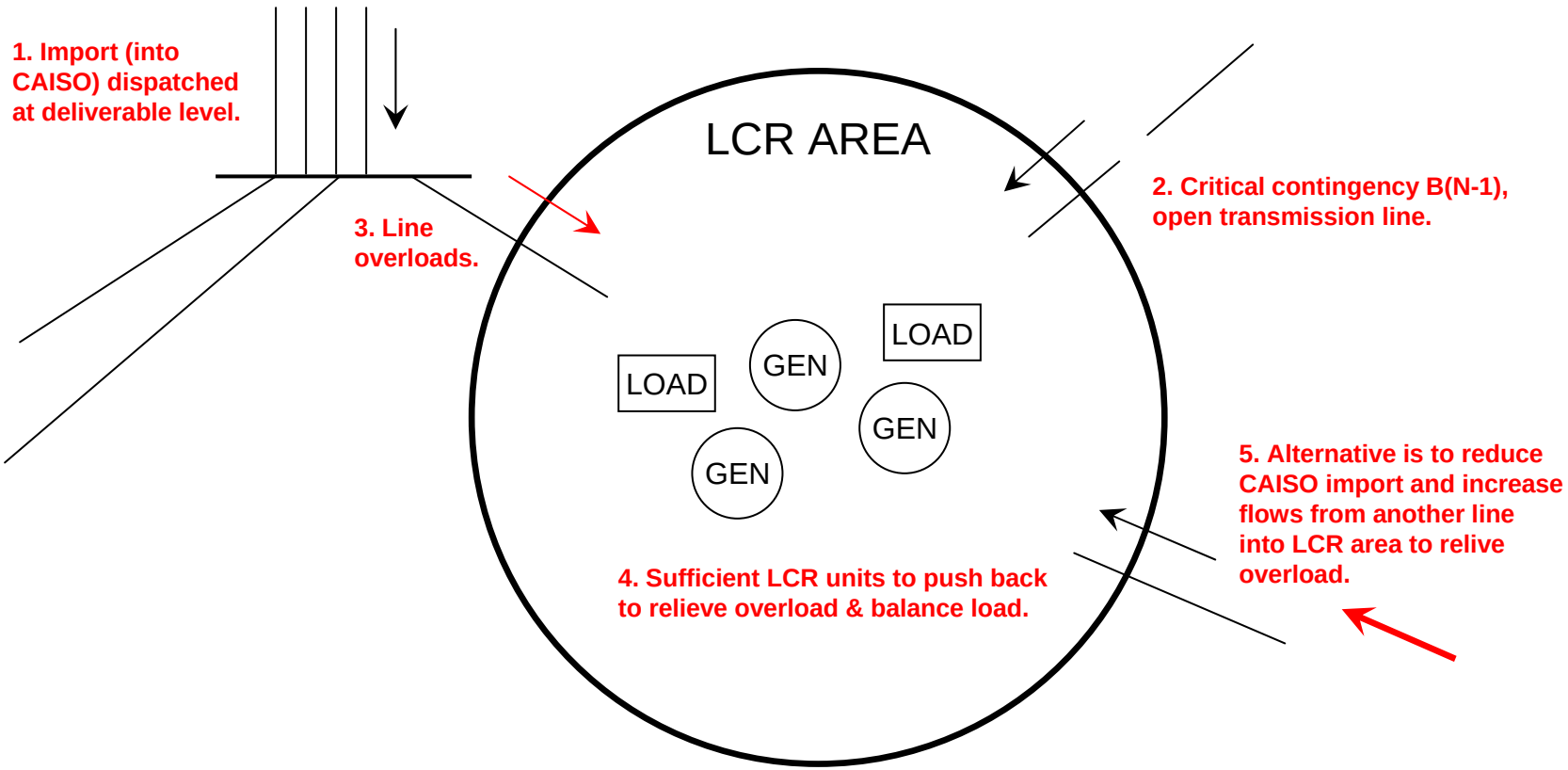
Deliverable Generation Enforced

Deliverability of generator outside the LCR area is enforced under normal A(N-0), single B(N-1) and common mode C.5 (N-2) contingencies. For C.3 (N-1-1), immediately after the first contingency any unit (subject to maximum MW number) can be decremented as part of the manual adjustment.



Deliverable Import (into the control area) Enforced

Deliverability of generator outside the LCR area is enforced under normal A(N-0), single B(N-1) and common mode C.5 (N-2) contingencies. For C.3 (N-1-1), immediately after the first contingency any import (subject to maximum MW number) can be decremented as part of the manual adjustment.



If Deliverability is not enforced in the LCR Analysis

- Minimum LCR requirements will be reduced or remain the same, depending upon the LCR area and the next critical contingency
- There will be an insufficient amount of LCR to ensure deliverability of import/generation should the specific load/dispatch pattern studied occur
- Could result in less procurement if the “deliverable resources” (imports/generation) are not procured for RA or otherwise extensively used in real-time
- CAISO 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 – because LSE have made showings with resources outside the local area that would increase the already published minimum LCR requirements within the local area
  - Day ahead and real time use market units without an RA contract located inside LCR area in real time in order to mitigate the same constraints and the same load levels as those listed in the report - with potential of engaging the backstop procurement authority after a few real time calls have been made to the same resources
  - 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 CAISO year ahead back-stop procurement would need to account for their full RA allocations

In Summary

- The CAISO assumes that deliverability of allocated Imports as well as deliverable generation should be maintained under normal A (N-0), single contingency B (N-1) and common mode C5 (N-2) contingency conditions

Definition of Load Pockets

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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, resources as well as loads responsible in meeting 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)

- Relieving the 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 power prices)

- Reinforcements will help relieve existing transmission constraints leading to lower number of generators required for LCR (final number also depending on load growth and available resources)

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), local area resources and loads responsible for LCR procurement

If Load Pocket Boundaries are Fixed

- When the transmission system changes, so would the transmission constraint(s) and resources outside the old pocket boundary that may effectively relieve the new constraint(s) would not be counted towards the local requirement this could increase the total procurement cost
- 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

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Stakeholder group consensus for 2008 LCR:

- If “manual” operational adjustments are used by CAISO in its studies as proposed by the PTO, CAISO or market participants, these should be fully transparent so that a stakeholder based on this information can perform studies of the limiting contingency.

- Any operational solution must be validated and implemented in real time by CAISO through the Regional Transmission engineering group. The operational solution should not be just a theoretical exercise to reduce the LCR requirements for the most limiting contingency.

- After MRTU is operational manual operational solutions should be implemented by market engineering group as best as possible by using either the built in contingency processor, modeling change, flow limits or operational nomogram; in order to assure that the solution could be run by MRTU’s SCOPF (Security Constrained Optimal Power Flow).

Contingencies

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Contingencies to be used

- Any particular contingency can result in determining the minimum LCR requirement
- Applicable rating limits 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 CAISO needs to maintain system reliability for all possible contingencies

Load Forecast and Summary of Assumptions

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Load Forecast to be used

- Use the latest available CEC load forecast
- CEC to provide the CAISO and PTO the starting data before the end of November 2007 in order to assure base case development
- An overwhelming majority of stakeholders and the CAISO have indicated that this study needs to be fully integrated into the annual transmission planning process in order to make a correct determination between solutions (transmission, generation or demand side) needed in order to solve the most stringent constraints into the local areas. The transmission planning process uses the 1-in-10 year summer peak forecast for local areas (See CAISO Planning Standards at: http://www.caiso.com/docs/09003a6080/14/37/09003a608014374a.pdf).

Summary of LCR Assumptions

- Transmission and generation modeled if on-line before June 1, 2009
- 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

Temporal and Seasonal Nature of LCR Requirements

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Enforcement of LCR Requirements for LSEs

- LCR requirements determined on an annual basis
- MRTU will eliminate the current Must-offer-waiver process and replace it with RA Must-offer into the IFM, RUC, HASP and real time markets
- Resources count towards meeting LSE local requirement even when on planned outage
- Reliability is assured through the Outage Coordination group at the CAISO

Concerns with the Current Methodology Raised by Stakeholders

- Does not recognize a temporal/seasonal nature in the LCR requirement
- Could cause over-availability of capacity when there is no need from reliability perspective
- Existing product does not allow LSEs to trade this local capacity when load migrates within the same year

Seasonal LCR Study Issues

- Granularity: monthly/seasonal, peak/off peak, etc.
- Consideration for scheduled transmission and/or generation maintenance outages: explicit modeling in the LCR process; treat them as RA resource performance issue with penalties; etc.
- Trying to achieve the right balance between granularity of local area requirements and study/regulatory expectations
- Trying to achieve the right balance between annual revenue requirements for available resources and the required expectations that the unit will be made available in the CAISO markets when needed to meet local area reliability requirements

Summary

This issue has not been vetted enough in the CAISO stakeholder meetings in order to achieve a reasonable level of agreement