California ISO

LOCAL CAPACITY TECHNICAL ANALYSIS

OVERVIEW OF STUDY REPORT AND Revised RESULTS

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I. Executive Summary

As part of the Phase 2 workshops on the implementation of Resource Adequacy Requirements ("RAR"), the California Public Utilities Commission ("CPUC") asked the California Independent System Operator Corporation ("CAISO") to perform a technical analysis on the amount of generation capacity that is necessary within transmission constrained areas of the grid. This overview summarizes how the CAISO analysis was conducted and the preliminary results of this analysis.

Generally, the results of this study produced MW requirements within Local Capacity Areas that are significantly higher than the amount of Reliability Must Run ("RMR") contracts that have been signed utilizing the CAISO's Local Area Reliability Service ("LARS") technical analysis. The difference in MW requirements between this Local Capacity Area technical study and LARS arises from the goal of local RAR to permit the CAISO to meet its operational and planning requirements within areas with severely limited transmission capability. The scope of LARS is more limited. The current RMR Criteria is basically a subset of the Grid Planning Standards that includes only single contingencies (NERC Category B). The criteria for this study expand the subset of contingencies to include simultaneous and overlapping double contingencies (NERC Category C). In addition, the current RMR criteria requires an assessment of the system with 1 in 5 summer peak load level, while this study assumes a 1 in 10 summer peak load level.

As an example, under this Local Capacity Area analysis the CAISO must operate the grid with an ability to recover from overlapping contingencies in which a major facility is lost from service, the system is then readjusted, and then another major facility (N-1 or common mode N-2) is lost from service. The modification of assumptions to more closely reflect the CAISO's operational requirements results in higher MW needs within the affected Local Capacity Areas compared to previous LARS studies. These are the actual conditions under which the CAISO must plan and operate the CAISO Controlled grid. Therefore, the CAISO believes this study reflects the necessary and appropriate levels of resources for an effective local capacity obligation.

II. Introduction

This overview report summarizes the CAISO study methodology, criteria and revised results for the "CAISO Controlled Grid Local Capacity Technical Study." This revised study is intended to provide the technical basis for local capacity requirements that must be met for an effective Resource Adequacy program.

The parameters of the study were initially presented and discussed with stakeholders at a CPUC workshop conducted at the CAISO on January 25, 2005. The proposed methodology and criteria for this Local Capacity Area technical study were published as part of a "Straw Proposal" document that was distributed to the CPUC service list of workshop participants. This document has since been posted on the CAISO website at:

http://www.caiso.com/docs/2005/06/22/2005062214371421107.pdf

The preliminary results of this study were presented to stakeholders at a meeting on June 29, 2005. These preliminary results are posted on the CAISO website at:

http://www.caiso.com/docs/2005/06/24/2005062408465116859.pdf

Based on these discussions and suggestions with stakeholders, this improved overview includes the revised results of the study, expressed in MWs that are meant to define the minimum amount of capacity that is needed in each Local Capacity Area for reliable operation of the CAISO Controlled Grid.

This overview also identifies the transmission lines into these Local Capacity Areas and the substation facilities that encircle or are included within each Local Capacity Area. The CAISO believes this information can be used to geographically define each Local Capacity Area and to assign specific local capacity obligations to the load serving entities ("LSEs") that serve load within these geographic boundaries. The CAISO anticipates that the CPUC will establish such an allocation mechanism through the CPUC's upcoming orders on Resource Adequacy.

III. Background and Description of Local Area Requirements under Resource Adequacy

The regulatory framework adopted by the CPUC in the October 28th 2004 decision on resource adequacy includes three distinct categories by which generators would be assessed for their ability to deliver the output of electricity, and thereby count toward meeting an LSE's resource adequacy obligation.

The deliverability of generation to the aggregate of load measures the ability of generators to provide energy to the CAISO transmission system at peak load and not be limited by the transmission system or dispatch of other resources in the vicinity. The CAISO conducted a baseline study assessing the deliverability of existing generators and presented the preliminary results to stakeholders on May 9, 2005. An additional phase of this baseline study will be conducted soon to account for new generation projects with approved interconnection studies. Thereafter the deliverability of new resources will be assessed incrementally as part of the CAISO's technical studies to ensure the safe and reliable interconnection of new generators.

The deliverability of imports identifies the MW amounts that should be considered deliverable from outside the CAISO Controlled Grid through import paths. For this initial assessment, the CAISO analyzed data that reflected the historical use of intertie points between the CAISO's system and neighboring systems. The preliminary results for the deliverability of imports category also were presented to stakeholders on May 9, 2005.

The third leg of deliverability is the focus of this study and overview report. The deliverability to load within transmission constrained areas identifies the MW amounts of generating capacity that must be procured within load sub-area to reliably serve the load located within these areas of the CAISO Controlled Grid.

All three categories of deliverability are assumed to be part of the resource adequacy rules that will be implemented in June 2006. It is expected the CPUC will require that specific resources must be deliverable to the aggregate of load in order to count as qualified capacity meeting an LSE's overall resource adequacy obligation. Generating units within load sub-area that qualify as deliverable to load within a transmission constrained Local Area could count both toward the Local Capacity Area obligation and the overall RA obligation for an LSE.

As part of this report the CAISO identifies the generating resources that are eligible for meeting the MW amount that must be procured within each transmission constrained area. These Local Capacity Areas very closely resemble the areas where the CAISO has been procuring RMR resources. This occurs because local generation must be used to serve load due to the limited ability of transmission lines to deliver output from resources located outside the transmission constrained area.

The CAISO intends to phase out RMR. In an accompanying White Paper that was discussed at the June 29, 2005 stakeholder meeting, the CAISO describes the necessary operational requirements for LSE procured resources. In addition, the CAISO proposes a process for transitioning to the Local Capacity that is procured by LSEs under new rules established in the CPUC's RA proceeding.

It is possible that the flexibility in LSE procurement may result in a set of resources that meets the MW obligation, but does not fully ensure the CAISO's ability to respond to all contingencies. Therefore, the CAISO expects to develop a Local Area Reliability Contract ("LARC") where the CAISO may enter into a contract in a limited or "backstop" role to ensure the reliable operation of the CAISO Controlled Grid within the redesigned market and Resource Adequacy paradigm.[1]

As indicated in documents reviewed at previous CPUC workshops,[2] the CAISO's study for determining capacity requirements in transmission constrained areas

[1] LARC may also serve as a backstop mechanism to address the exercise of market power for local capacity.

[2] http://www.caiso.com/docs/2005/06/22/2005062214371421107.pdf

includes analysis of the 500 kV system between three major zones: NP15, NP15+ZP26, and SP26. The determination of these zonal requirements is intended to ensure that sufficient capacity exists within each large zone so that transmission constraints between zones do not threaten reliability.

Finally, the CAISO intends to perform this Local Capacity Area technical analysis annually. However, the transmission constraints that give rise to the Local Capacity requirement may be relieved with the introduction of additional transmission infrastructure. While this is certainly feasible, the CAISO anticipates that the boundaries of Local Capacity Areas will be fairly static over a 3-5 year time horizon and the minimum amount of capacity procured within each Local Capacity Area should remain reasonably stable. In short, the Local Capacity requirement for each Local Capacity Area may decline as transmission improvements relieve constraints, or increase proportionally as load grows; however, LSEs should be able to anticipate these changes over the long-term in order to strategically plan how to reach their procurement targets.

IV. The Study

A. Objectives

The purpose of this annual study is to determine which specific areas within the CAISO Controlled Grid exhibit local reliability problems and what MW amount should be targeted to provide the capacity needed to mitigate these local reliability problems. The results of this overview will show:

A. The minimum generation capacity (in MWs) that must be available within each Local Area or Zone.

B. A list of the transmission lines and substations that encircle each Local Area, from which a geographical description can be drawn to identify which load is encompassed within each sub-area.

In addition, an attachment to this study report includes a list of generating units that are located within each Local Capacity Area and therefore eligible to count toward meeting the local requirement. Generator deficiencies in Local Areas also are described to highlight areas where some generating units exist, yet the reliability criteria are not met due to the insufficiency of these resources.

B. Key Study Assumptions

The CAISO utilized the “2006 CAISO Controlled Grid – Summer Peak” as the base case for the local area power flows. This base case was adjusted to reflect a one-in-

ten-year peak load forecast that was provided by the Participating Transmission Owners ("PTOs"). The forecasted zonal loads level would reflect a 1 in 5 year peak conditions (more specifically e.g. zonal area "coincident" peak).

The CAISO also utilized electronic contingency files provided by the PTOs. This information includes remedial action and special protection schemes that are expected to be in operation during 2006.

The assumptions related to generation adopted for this study are similar to the assumptions made for RMR studies, including the availability of "Must Take" resources at their contract ratings, the dispatch of hydro generation and the explicit representation of municipal, state, federal and QF generating units in the power flow base cases.

C. Methodology and Criteria

This study applies the established planning and operating standards of the CAISO to determine the necessary reliability standards within Local Capacity Areas. These planning and operating criteria are consistent with the NERC/WECC standards that address system performance levels A, B and C.

Performance Level A is a normal operating condition with no overloads and all voltages within their normal operating limits.

Performance Level B incorporates N-1 contingencies that could include the loss of a single generator, a single transmission line or a single transformer bank. This standard requires enough generation so that the system avoids voltage collapse or transient instability as a result of these potential N-1 scenarios. The transmission system also should remain within emergency thermal limits and acceptable voltage limits. Following this N-1 contingency the generation must be sufficient to allow for operators to bring the system back to within acceptable (normal) operating range (voltage and loading) and/or appropriate OTC.

Performance Level C requires sufficient generation for the system to absorb the loss of a generating unit or transmission facility, readjust to a normal operating state, and then suffer the loss of another transmission facility. This standard requires a MW amount within that Local Capacity Area sufficient to keep the system within emergency thermal limits and acceptable voltage limits, as well as avoiding voltage collapse and transient instability.

Performance Level C also incorporates common mode failure N-2 contingencies that could include the simultaneous loss of two transmission lines or two generating units. This standard requires enough generation so that the system avoids voltage collapse or transient instability as a result of these potential N-2 scenarios. The transmission system also should remain within emergency thermal limits and acceptable voltage limits.

Finally, this study incorporates operating requirements, needed in order to prevent voltage collapse or transient instability for "N-1, followed by N-2" contingencies. This would include contingencies where the system suffers the loss of a single generating unit or transmission line, the system is readjusted and then the simultaneous loss (common mode failure)[3] of two transmission lines occurs.

Consistent with NERC standards, after the second N-1 or immediately after the common mode N-2 load shed[4] is allowed as long as all criteria (thermal, voltage, transient, reactive margin) are respected.

Hundreds of thousands of simulations were run to determine the potentially largest operating contingencies within each zone or Local Capacity Area. These contingencies were measured against these standards to determine the minimal amount of capacity need in the zone or Local Capacity Area.

The CAISO conducted this Study using the GE PSLF power flow/stability program.

Power Flow Assessment:

Contingencies	Thermal Criteria[3]	Voltage Criteria[4]
Generating unit [1, 6]	A/R	A/R
Transmission line [1, 6]	A/R	A/R
Transformer [1, 6]	A/R [5]	A/R [5]
(G-1)(L-1) [2, 6]	A/R	A/R
Overlapping [6, 7]	A/R	A/R

1 All single contingency outages (i.e. generating unit, transmission line or transformer) will be simulated on Participating Transmission Owners' local area systems.

2 Key generating unit out, system readjusted, followed by a line outage. This over-lapping outage is considered a single contingency within the ISO Grid Planning Criteria. Therefore, load dropping for an overlapping G-1, L-1 scenario is not permitted.

3 Applicable Rating – Based on ISO Transmission Register or facility upgrade plans.

4 Applicable Rating – ISO Grid Planning Criteria or facility owner criteria as appropriate.

5 A thermal or voltage criterion violation resulting from a transformer outage may not be cause for a local area reliability requirement if the violation is considered marginal (e.g. acceptable loss of facility life or low voltage), otherwise, such a violation will necessitate creation of a requirement.

[3] These failures include a double circuit tower and the loss of two 500kv lines that are located in the same corridor.

[4] While the CAISO criteria generally allows for load shedding for the N-1, N-2 contingencies, the CAISO also maintains the level of reliability that existed prior to its formation. As such, to the extent a PTO's pre-CAISO standards did not allow for load shedding, the CAISO will also not allow load shedding in that area or corridor.

[6] Following the first contingency (N-1), the generation must be sufficient to allow the operators to bring the system back to within acceptable (normal) operating range (voltage and loading) and/or appropriate OTC following the studied outage conditions.

[7] During normal operation or following the first contingency (N-1), the generation must be sufficient to allow the operators to prepare for the next worst N-1 or common mode N-2 without pre-contingency interruptible or firm load shedding. SPS/RAS/Safety Nets may be utilized to satisfy the criteria after the second N-1 or common mode N-2 except if the problem is of a thermal nature such that short-term ratings could be utilized to provide the operators time to shed either interruptible or firm load. T-2s (two transformer bank outages) would be excluded from the criteria.

Post Transient Load Flow Assessment:

Contingencies	Reactive Margin Criteria [2]
Selected [1]	*A/R*

[1] If power flow results indicate significant low voltages for a given power flow contingency, simulate that outage using the post transient load flow program. The post-transient assessment will develop appropriate Q/V and/or P/V curves.

[2] Applicable Rating – positive margin based on the higher of imports or load increase by 5% for N-1 contingencies, and 2.5% for N-2 contingencies.

Stability Assessment:

Contingencies	Stability Criteria [2]
Selected [1]	*A/R*

[1] Base on historical information, engineering judgment and/or if power flow or post transient study results indicate significant low voltages or marginal reactive margin for a given contingency.

[2] Applicable Rating – ISO Grid Planning Criteria or facility owner criteria as appropriate.

Loss of Load Probability:

Loss of Load Probability ("LOLP") is a study methodology that can be used to establish the level of capacity required in each local area by performing a probabilistic analysis to achieve a specified probability for loss of load. In the established Eastern markets a one-event in ten years LOLP methodology is used to determine LSE capacity obligations. The LOLP approach provides a potentially more uniform reliability result than the proposed deterministic approach. In the future, if the LOLP approach is determined to be a more desirable approach, then the LOLP analysis will be incorporated into the criteria if and when a criteria and methodology for applying it has been developed. Any LOLP criteria and methodology will need to be reviewed by stakeholders and approved by the CPUC. Until such time, the LOLP

approach will not be used to establish LSE capacity requirements, and the deterministic approach defined above will be used.

Criteria Comparison:

Contingency Component(s)	ISO Grid Planning Criteria	Existing RMR Criteria	Locational Capacity Criteria
A – No Contingencies	X	X	X
B – Loss of a single element			
1. Generator (G-1)	X	X	X[1]
2. Transmission Circuit (L-1)	X	X	X[1]
3. Transformer (T-1)	X	X[2]	X[1,2]
4. Single Pole (dc) Line	X	X	X[1]
5. G-1 system readjusted L-1	X		X
C – Loss of two or more elements			
1. Bus Section	X		
2. Breaker (failure or internal fault)	X		
3. L-1 system readjusted G-1	X		X
3. G-1 system readjusted T-1 or T-1 system readjusted G-1	X		X
3. L-1 system readjusted T-1 or T-1 system readjusted L-1	X		X
3. G-1 system readjusted G-1	X		X
3. L-1 system readjusted L-1	X		X
3. T-1 system readjusted T-1	X		
4. Bipolar (dc) Line	X		X
5. Two circuits (Common Mode) L-2	X		X
6. SLG fault (stuck breaker or protection failure) for G-1	X		
7. SLG fault (stuck breaker or protection failure) for L-1	X		
8. SLG fault (stuck breaker or protection failure) for T-1	X		
9. SLG fault (stuck breaker or protection failure) for Bus section	X		
WECC-S3. Two generators (Common Mode) G-2	X[3]		X
D – Extreme event – loss of two or more elements			
Any B1-4 system readjusted (Common Mode) L-2	X[4]		X[3]
All other extreme combinations D1-14.	X[4]		

1 System must be able to readjust to normal limits.

2 A thermal or voltage criterion violation resulting from a transformer outage may not be cause for a local area reliability requirement if the violation is considered marginal (e.g. acceptable loss of facility life or low voltage), otherwise, such a violation will necessitate creation of a requirement.

3 Evaluate for risks and consequence, per NERC standards. No voltage collapse or dynamic instability allowed.

4 Evaluate for risks and consequence, per NERC standards.

V. Summary of Revised Study Results

Local Area Name	2005 RMR*/MO*	2006 RMR*/MO*	2006 LCR without Muni & QFs*	2006 LCR*
Humboldt	124	125	126	162
North Coast / North Bay	517	273	518	658
Sierra	384	468	808	1770**
Stockton	57	100	154	348
Greater Bay	4000	4000	4600	6009
Greater Fresno	1558	1691	2529	2837 **
Kern	N/A	N/A	171	797**
LA Basin	1390	2120***	5300****	8627
	4700	2930		
San Diego	2019	2369	2434	2620
Total	**14749**	**14076**	**16640**	**23828**

* Values shown in MW
** Generation deficient areas – deficiency included in LCR
*** Requirement could be revised per LARS generator unit designations
**** Without San Onofre NPP

Local Capacity Requirements vs. Peak Load and Local Area Generation

Local Area Name	2006 LCR	Peak Load (1 in10) (MW)	2006 LCR as % of Peak Load	Total Dependable Local Area Gen. (MW)	2006 LCR as % of Total Area Gen.
Humboldt	162	195	83	168	96
North Coast/North Bay	658	1494	44	888	74
Sierra	1770	1791	99	1713	103**
Stockton	348	755	46	431	81
Greater Bay	6009	9485	63	7591	79
Greater Fresno	2837	3117	91	2651	107**
Kern	797	1209	66	839	95**
LA Basin	8627	18839	46	10309	84
San Diego	2620	4578	57	2957	89
Total	**23828**	**41463***	**57***	**27547**	**86**

* Value shown has no meaning since these local areas peak at different times.
** Generation deficient areas (or with sub-area that are deficient) – deficiency included in LCR.

Generator deficient area it implies that in order to comply with the criteria, at summer peak, load must be shed immediately after the first contingency.

A. Humboldt Area

The most critical contingency for the Humboldt area is the outage of the Bridgeville-Cottonwood 115 kV line over-lapping with an outage of one Humboldt Bay Power Plant. The local area limitation is low voltage and reactive power margin. This multiple contingency establishes a Local Capacity Requirement of 162 MW (includes 36 MW of QF and Muni generation) as the minimum capacity necessary for reliable load serving capability within this area.

The transmission tie lines into the area include:

1) Bridgeville-Cottonwood 115 kV line #1
2) Humboldt-Trinity 115 kV line #1
3) Willits-Garberville 60 kV line #1
4) Trinity-Maple Creek 60 kV line #1

The substations that delineate the Humboldt Area are:

1) Bridgeville 115 kV
2) Humboldt 115 kV
3) Kekawaka 60 kV
4) Ridge Cabin 60 kV

B. North Coast / North Bay Area

The North Coast/North Bay Area is composed of two sub-areas and the generation requirements within them. The most critical contingency for the Eagle Rock-Fulton Sub-area is described by the outage of the Fulton-Ignacio 230 kV line #1 and the Fulton-Lakeville 230 kV line #1. The sub-area area limitation is thermal overloading of the Corona-Penngrove section of the Corona-Lakeville 115 kV line #1. This limiting contingency establishes a Local Capacity Requirement of 319 MW (includes 79 MW of QF and Muni generation) as the minimum capacity necessary for reliable load serving capability within this sub-area.

The transmission tie facilities coming into this sub-area are:

1) Fulton-Lakeville 230 kV line #1
2) Fulton-Ignacio 230kV line #1
3) Cortina 230/115 kV Transformer #1
4) Lakeville-Sonoma 115 kV line #1
5) Corona-Lakeville 115 kV line #1
6) Willits-Garberville 60 kV line #1

The substations that delineate the Eagle Rock-Fulton sub-area are:

1) Fulton 230 kV
2) Corona 115 kV
3) Sonoma 115 kV
4) Cortina 115 kV
5) Laytonville 60 kV

The most critical contingency for the Lakeville Sub-area would be outages on Vaca-Dixon-Lakeville 230 kV line #1 and the Crockett-Sobrante 230 kV line #1. The sub-area area limitation is thermal overloading of the Tulucay-Vaca Dixon 230 kV line #1. This limiting contingency establishes a Local Capacity Requirement of 658 MW (includes 140 MW of QF and Muni generation) as the minimum capacity necessary for reliable load serving capability within this sub-area. The LCR requirement for Eagle Rock/Fulton sub-area can be counted toward fulfilling the requirement of Lakeville sub-area.

The transmission tie lines into this sub-area are:

1) Vaca Dixon-Lakeville 230 kV line #1
2) Tulucay-Vaca Dixon 230 kV line #1
3) Lakeville-Sobrante 230 kV line #1
4) Ignacio-Sobrante 230 kV line #1
5) Ignacio-Fulton 230 kV line #1
6) Lakeville-Fulton 230 kV line #1
7) Lakeville-Corona 115 kV line #1
8) Lakeville-Sonoma 115 kV line #1

The substations that delineate the Lakeville sub-area are:

1) Lakeville 230 kV
2) Ignacio 230 kV
3) Tulucay 230 kV
4) Lakeville 115 kV

C. Sierra Area

The most critical contingencies in the Sierra Area are 1) the loss of the Poe-Rio Oso 230 kV line #1 and the Colgate – Rio Oso 230 kV line #1, and 2) the loss of the Cresta-Rio Oso 230 kV line #1 and the Colgate – Rio Oso 230 kV line #1. The area limitation is thermal overloading of the Table Mt-Rio Oso 230 kV line #1. This limiting contingency establishes a Local Capacity Requirement of 1770 MW (includes 962 MW of QF and Muni generation and an LCR Deficiency of 143 MW) as the minimum capacity necessary for reliable load serving capability within this area.

This area has numerous sub-areas (minimum six – see RMR report), however since all units are needed to maintain the overall requirement, no additional detailed sub-area analysis is needed at this time.

The transmission tie lines into the Sierra Area are:

1) Table Mountain-Rio Oso 230 kV line
2) Table Mountain-Palermo 230 kV line
3) Table Mt-Pease 60 kV line
4) Caribou-Palermo 115 kV line
5) Drum-Summit 115 kV line #1
6) Drum-Summit 115 kV line #2
7) Spaulding-Summit 60 kV line
8) Brighton-Bellota 230 kV line
9) Rio Oso-Lockeford 230 kV line
10) Gold Hill-Eight Mile Road 230 kV line
11) Gold Hill-Lodi Stig 230 kV line
12) Gold Hill-Lake 230 kV line

The substations that delineate the Sierra Area are:

1) Table Mountain 60 kV
2) Table Mountain 230 kV
3) Big Bend 115 kV
4) Drum 115 kV
5) Tamarack 60 kV
6) Brighton 230 kV
7) Rio Oso 230 kV
8) Gold Hill 230 kV

D. Stockton Area

The requirement for this area is driven by the requirement for the Tesla-Bellota Sub-area. The critical contingency for the Tesla-Bellota Sub-area is the loss of Tesla-Tracy 115 kV and Tesla-Schulte 115 kV #1. The capacity needed for the Stockton area is 449 MWs. The area limitation is thermal overloading of the Tesla-AEC section of Tesla-Kasson-Manteca 115 kV line . This limiting contingency establishes a Local Capacity Requirement of 449 MW (includes 229 MW of QF and Muni generation) as the minimum capacity necessary for reliable load serving capability within this area.

The transmission facilities that establish the boundary of the Tesla-Bellota Sub-area are:

1) Bellota 230/115 kV Transformer #1
2) Bellota 230/115 kV Transformer #2

3) Tesla-Tracy 115 kV Line
4) Tesla-Salado 115 kV Line
5) Tesla-Salado-Manteca 115 kV line
6) Tesla-Shulte 115 kV Line
7) Tesla-Manteca 115 kV Line

The substations that delineate the Tesla-Bellota Sub-area are:

1) Tesla 115 kV
2) Bellota 115 kV

E. Greater Bay Area

The most limiting contingencies within the Greater Bay Area are an over-lapping outage of the Tesla-Metcalf 500 kV line with the Tesla-Newark #1 230 kV line. The amount of generation required within the Greater Bay Area is predicated on staying within the emergency rating of the Tesla-Newark #2 230 kV line and specifically that portion of the line consisting of bundled 1113 AL conductor emanating from Newark Substation. This requires 6,009 MW of generation resources (includes 1409 MW of QF and Muni generation) within the Greater Bay area.

There are four sub-areas within this area where there is dependence on specific generation facilities to mitigate a reliability problem. These areas are:

San Francisco Sub-area - Per the CAISO Revised Action Plan for SF, all Potrero units (365 MW) will continued to be required until completion of the plan as it is presently described.

Oakland Sub-area - The most critical contingency is an outage of either the C-X 115 kV cable or the D-L 115 kV cable (with one of the Oakland CT's off-line). The sub-area area limitation is thermal overloading of either the C-X 115 kV cable or the D-L 115 kV cable . This limiting contingency establishes a Local Capacity Requirement of 100 MW (includes 50 MW of Muni generation) as the minimum capacity necessary for reliable load serving capability within this sub-area.

San Jose Sub-area - The most critical contingency is an outage between Metcalf and Morgan Hill 115 kV (with one of the Gilroy Peaker off-line). The sub-area area limitation is thermal overloading of the Metcalf-Llagas 115 kV line. As documented within an CAISO Operating Procedure, this limitation is dependent on power flowing in the direction from Metcalf to Llagas/Morgan Hill. This limiting contingency establishes a Local Capacity Requirement of 100 MW as the minimum capacity necessary for reliable load serving capability within this sub-area.

Pittsburg Sub-area - The most critical contingency is an outage of the Pittsburg-Tesla #1 or #2 230 kV line (with Delta Energy Center off-line). The sub-area area

limitation is thermal overloading of the parallel Pittsburg-Tesla 230 kV line. This limiting contingency establishes a Local Capacity Requirement of 2363 MW (includes 763 MW of QF generation) as the minimum capacity necessary for reliable load serving capability within this sub-area.

The transmission tie lines into the Greater Bay Area are:

1) Lakeville-Sobrante 230 kV
2) Ignacio-Sobrante 230 kV
3) Parkway-Moraga 230 kV
4) Bahia-Moraga 230 kV
5) Lambie SW Sta-Contra Costa Sub 230 kV
6) Peabody-Contra Costa P.P. 230 kV
7) Kelso-Brentwood 230 kV
8) Tesla-Delta Switching Yard 230 kV
9) Tesla-Pittsburg #1 230 kV
10) Tesla-Pittsburg #2 230 kV
11) Tesla-Newark #1 230 kV
12) Tesla-Newark #2 230 kV
13) Tesla-Tracy #1 230 kV
14) Tesla-Tracy #2 230 kV
15) Tesla-Ravenswood 230 kV
16) Tesla-Metcalf 500 kV
17) Moss Landing-Metcalf 500 kV
18) Moss Landing-Metcalf #1 230 kV
19) Moss Landing-Metcalf #2 230 kV
20) Green Valley-Morgan Hill #1 115 kV
21) Green Valley-Morgan Hill #2 115 kV
22) Oakdale TID-Newark #1 115 kV
23) Oakdale TID-Newark #2 115 kV

The substations that delineate the Greater Bay Area are:

1) Lakeville 230 kV
2) Ignacio 230 kV
3) Moraga 230 kV
4) Lambie SW Sta 230 kV
5) Kelso 230 kV
6) Contra Costa P.P. 230 kV
7) Pittsburg 230 kV
8) Tesla 230 kV
9) Metcalf 500 kV
10) Moss Landing 500 kV
11) Morgan Hill 115 kV
12) Newark 115 kV

F. Greater Fresno Area

Wilson Sub-area: The most critical contingency for the Wilson sub-area is the loss of the Wilson - Melones 230 kV line, which would thermally overload the Wilson - Warnerville 230 kV line. This limiting contingency establishes a Local Capacity Requirement of 1560 MW (which includes 105 MW of muni generation and 203 MW of QF generation) as the minimum generation capacity necessary for reliable load serving capability within this sub-area.
At least 120 MWs of the 1560 MW must come from the Helms generating units.

Herndon Sub-area: The most critical contingency for the Herndon sub-area is the loss of the Herndon 230/115 kV bank 1, which would thermally overload the parallel Herndon 230/115 kV bank 2. This limiting contingency establishes a Local Capacity Requirement of 1,207 MW (which includes 153 MW of QF generation and 50 MW of area deficiency) as the minimum generation capacity necessary for reliable load serving capability within this sub-area.

McCall Sub-area: The most critical contingency for the McCall sub-area is the loss of Kings River – Sanger – Reedley 115 kV line, which would thermally overload the McCall – Wahtoke 115 kV line. This limiting contingency establishes a Local Capacity Requirement of 1,346 MW (which includes 60 MW of QF generation and 36 MW of area deficiency) as the minimum generation capacity necessary for reliable load serving capability within this sub-area.

Henrietta Sub-area: Within the Henrietta sub-area a minimum 40 MW generation capacity is needed to mitigate the Henrietta 230/70 kV bank overload.

Merced Sub-area: The most critical contingencies for the Merced sub-area is the double line outage of the Wilson – Atwater 115 kV #1 and #2 lines, which would thermally overload the Wilson – Merced 115 kV #1 and #2 lines. This limiting contingency establishes a Local Capacity Requirement of 172 MW (which includes 105 MW of muni generation, 4 MW of QF generation and 60 MW of area deficiency) as the minimum generation capacity necessary for reliable load serving capability within this sub-area.

In conclusion for the Greater Fresno Area, the total accumulative Local Capacity Requirement for the five sub-areas is 4323 MW. Because of the overlapping LCR MWs requirements among the sub-areas, the total aggregate LCR requirement for the Greater Fresno Area is 2837 MW (includes 105 MW of muni generation, 203 MW of QF generation and 146 MW of total three sub-area deficiency).

The transmission facilities coming into the Greater Fresno area are:

1) Gates-Henrietta Tap 1 230 kV
2) Gates-Henrietta Tap 2 230 kV

3) Gates #1 230/115 kV Transformer Bank
4) Los Banos #3 230/70 Transformer Bank
5) Los Banos #4 230/70 Transformer Bank
6) Panoche-Gates #1 230 kV
7) Panoche-Gates #2 230 kV
8) Panoche-Coburn 230 kV
9) Panoche-Moss Landing 230 kV
10) Panoche-Los Banos #1 230 kV
11) Panoche-Los Banos #2 230 kV
12) Panoche-Dos Amigos 230 kV
13) Warnerville-Wilson 230 kV
14) Wilson-Melones 230 kV
15) Corcoran – Alpaugh - Smyrna 115 kV
16) Coalinga #1-San Miguel 70 kV

The substations that delineate the Greater Fresno area are:

1) Los Banos 230 kV
2) Gates 230 kV
3) Panoche 230 kV
4) Wilson 230 kV
5) Alpaugh 115 kV
6) Coalinga 70 kV

G. Kern Area

Kern PP Sub-area: The most critical contingency for the Kern PP sub-area is the outage of the Kern PP 230/115 kV transformer Bank 5 and the Kern PP – Kern Front 115 kV line, which would thermally overload the parallel Kern PP 230/115 kV Bank 3 and Bank 3a. This limiting contingency establishes a Local Capacity Requirement of 771 MW (which includes 618 MW of QF generation and 132 MW of area deficiency) as the minimum generation capacity necessary for reliable load serving capability within this sub-area.

Weedpatch Sub-area: The most critical contingency is the loss of the Wheeler Ridge – San Bernard 70 kV line and the Wheeler Ridge – Tejon 70 kV line, which would thermally overload the Wheeler Ridge – Weedparch 70 kV line and cause low voltage problem at the local 70 kV transmission system. This limiting contingency establishes a Local Capacity Requirement of 26 MW (which includes 8 MW of QF generation and 10 MW of area deficiency) as the minimum generation capacity necessary for reliable load serving capability within this sub-area.

In conclusion, for the Kern Area, the total accumulative and aggregate Local Capacity Requirement for the two sub-areas is 797 MW (which includes 626 MW of QF generation and 142 MW of total two sub-area deficiency).

The transmission facilities coming into the Kern PP sub-area are:

1) Wheeler Ridge-Lamont 115 kV line
2) Kern PP 230/115 kV Bank # 3 & 3A
3) Kern PP 230/115 kV Bank # 4
4) Kern PP 230/115 kV Bank # 5
5) Midway 230/115 Bank # 1
6) Midway 230/115 Bank # 2 & 2a
7) Temblor – San Luis Obispo 115 kV line

These sub-stations form the boundary surrounding the Kern PP sub-area:

1) Midway 115 kV
2) Kern PP 115 kV
3) Wheeler Ridge 115 kV
4) Temblor 115 kV

The transmission facilities coming into the Weedpatch sub-area are:

1) Wheeler Ridge 115/60 kV Bank
2) Wheeler Ridge 230/60 kV Bank

These sub-stations form the boundary surrounding the Weedpatch sub-area:

1) Wheeler Ridge 60 kV

H. LA Basin Area

The total market generation requirement for the LA Basin is 5,300 MW. This area's generation requirement is defined by two sub-areas (the Western and Eastern Sub-areas). The combined Local Area Requirement is 8627 MW of which 3327 MW includes the San Onofre Nuclear Power Plant and QF and Muni generation.

The critical contingency for the in the Western Sub-area is the loss of Vincent - Rio Hondo 230 kV line #2, followed by loss of Mesa - Vincent 230 kV line. The sub-area area limitation is thermal overloading of the Vincent - Rio Hondo 230 kV line # 1. This limiting contingency establishes a Local Capacity Requirement of 4,450 MW as the minimum capacity necessary for reliable load serving capability within this sub-area.

The critical contingencies in the Eastern Sub-area is the loss of Devers – Valley 500 kV line, followed by the loss of two Lugo – Mira Loma 500 kV lines #2 and #3. The sub-area area limitation low area post-transient voltage associated with voltage

collapse. These contingencies require 850 MW as the minimum amount of generating capacity necessary for reliable load serving capability within this sub-area.

The transmission tie lines into the LA Basin Area are:

1) San Onofre - San Luis Rey #1, #2, & #3 230 kV Lines
2) San Onofre - Talega #1 & #2 230 kV Lines
3) Lugo - Mira Loma #1, #2 & #3 500 kV Lines
4) Sylmar LA - Sylmar S #1, #2 & #3 230/230 kV Transformers
5) Sylmar S - Pardee #1 & #2 230 kV Lines
6) Vincent - Mesa Cal #1 230 kV Line
7) Antelope - Mesa Cal #1 230 kV Line
8) Vincent - Rio Hondo #1 & #2 230 kV Lines
9) Eagle Rock - Pardee #1 230 kV Line
10) Devers - Valley #1 500 kV Line
11) Devers #1 & #2 500/230 kV Transformers
12) Devers - Coachelv # 1 230 kV Line
13) Mirage - Ramon # 1 230 kV Line
14) Julian Hinds-Eagle Mountain 230 kV

These sub-stations form the boundary surrounding the LA Basin area:

1) Devers 500 kV
2) Mirage 230 kV
3) Vincent 230 kV
4) San Onofre 230 kV
5) Sylmar 230 kV
6) Lugo 500 kV

I. *San Diego Area*

The most limiting contingency in the San Diego area is described by the outage of 500 kV Southwest Power Link (SWPL) between Imperial Valley and Miguel Substations over-lapping with an outage of the new Palomar Combined-Cycle Power plant (542 MW) while staying within the South of San Onofre (WECC Path 44) non-simultaneous import capability rating of 2,500 MW. Therefore the 2,620 MW (includes 186 MW of QF generation) of capacity required within this area is predicated on having sufficient generation in the San Diego Area to reduce Path 44 to its non-simultaneous rating of 2500 MW within 30 minutes.

The transmission tie lines forming a boundary around San Diego include:

1) Imperial Valley – Miguel 500 kV Line
2) Miguel – Tijuana 230 kV Line

3) San Onofre - San Luis Rey #1 230 kV Line
4) San Onofre - San Luis Rey #2 230 kV Line
5) San Onofre - San Luis Rey #3 230 kV Line
6) San Onofre – Talega #1 230 kV Line
7) San Onofre – Talega #2 230 kV Line

The boundaries for the San Diego Area can be defined by the following sub-stations:

1) Miguel 230 kV
2) San Luis Rey 230 kV
3) Talega 230 kV

J. *Zonal Capacity Requirements*

The ISO performed a preliminary assessment of the Zonal Capacity needs and compared these needs to the aggregate amount of capacity already required within the zone due to proposed local area requirements within that zone. The additional requirement for 2006 in NP15, NP15+ZP26 and SP26 appears to be minimal, and is expected to be covered by overall resource procurement requirements.

VI. Next Steps

The CAISO hopes to finalize this Revised Report by the first week of August. An additional conference call with stakeholders will be conducted to ensure their full review and guidance is incorporated into a Final Report that is presented to the CPUC.