BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Oversee the Resource Adequacy Program, Consider Program Refinements, and Establish Annual Local Procurement Obligations	Rulemaking 11-10-023

CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION SUBMISSION OF PRELIMINARY 2014 FLEXIBLE CAPACITY NEEDS ASSESSMENT

In accordance with the Phase 3 Scoping Memo and Ruling of the Assigned Commissioner and Administrative Law Judge, issued on August 2, 2013, and the notice of submittal date change by the California Independent System Operator Corporation ("ISO") on April 1, 2014, the ISO respectfully serves its Preliminary 2014 Flexible Capacity Needs Assessment in this proceeding.

The ISO will be prepared to discuss this assessment at the CPUC resource adequacy workshop scheduled for April 9, 2014

Respectfully submitted,

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Date: April 4, 2014

ATTACHMENT

California ISO

Preliminary 2014 Flexible Capacity Needs Assessment

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1. Introduction

The ISO committed in its Flexible Resource Adequacy Criteria and Must-Offer Obligation ("FRAC-MOO") stakeholder initiative and in the CPUC annual Resource Adequacy proceeding (R.11-10-023) to conduct an annual flexible capacity needs assessment. In fulfillment of this commitment, the ISO presents this preliminary flexible capacity needs assessment. This report details the preliminary system flexible capacity needs as well as the flexible capacity needs attributable to CPUC jurisdictional load serving entities ("LSEs"). The ISO will present these preliminary findings at the CPUC's April 9, 2014 Resource Adequacy workshop and will also host a conference call to review the results with all stakeholders on April 15, 2014.

In this assessment, the ISO calculates preliminary flexible capacity needs and the relative contributions to the flexible capacity need of each local regulatory authority ("LRA"). The ISO used these results to allocate shares of the system flexible capacity need to each of the LRAs responsible for load in the ISO balancing authority area consistent with the allocation methodology detailed in the ISO's FRAC-MOO Revised Draft Final Proposal, section 5.1.2.[1]

The ISO will address stakeholder comments about this preliminary study, and will provide the final flexible capacity needs to each local regulatory authority along with the final Local Capacity Requirements study.

2. Determination of the ISO System-Wide Flexible Capacity Need

The ISO's preliminary flexible capacity needs assessment, at this time, details only the CPUC jurisdictional LSEs' contribution to the forecasted 2015 flexible capacity needs.[2] However, the ISO will provide to each LRA its respective preliminary flexible capacity allocation. The methodology employed by the ISO to assess the flexible capacity need for 2014 is comparable to the methodology proposed in the 2013 assessment. This methodology is described in detail in the ISO's Initial Comments on Workshop issues filed in this proceeding on April 5, 2013.[3] Based on experience gained through the previous iteration of this study process, the ISO has made minor enhancements to the 2014 assessment. The following section details the methodology employed by the ISO as well as the enhancements and their implication on the results.

2.1 Building the Forecasted Variable Energy Resource Portfolio

The first step in developing the flexible capacity needs assessment was to collect the

[1] The FRAC-MOO revised Draft Final Proposal is available at http://www.caiso.com/Documents/RevisedDraftFinalProposal-FlexibleRACriteriaMustOfferObligation-Clean.pdf

[2] Other LRAs are not discussed due to confidentiality concerns.

[3] http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M064/K140/64140277.PDF

requisite information about the expected build-out of the fleet of variable energy resources. In order to collect this data, the ISO sent a data request to the scheduling coordinators all LSEs on March 6, 2014. This data request asked for information on all contracted wind and solar capacity by on-line date and location. The ISO received responses from PG&E, SDG&E, SCE, Noble Americas Energy Solutions, Shell Energy North America, Tiger Natural Gas, Liberty Power Holdings, Anaheim, Banning, Bear Valley Electric Services, CDWR, Riverside, and Valley Electric Association. The ISO is still in the process of validating the data submissions with the scheduling coordinators for the LSEs and following-up with those scheduling coordinators that did not reply to the data request. The ISO does not anticipate any significant changes to these results, but will re-run the assessment if warranted.

Using the LSEs' data, the ISO was able to construct a fleet of variable energy resources needed to produce forecasted minute-by-minute net-load curves for 2015 and 2016. The forecasted aggregated variable energy resource fleet numbers are provided in Table 1.

Table 1. Aggregate RPS Build-Out By Year And Technology[4]

R.12-03-014 (Replicating Base Case) Load		**Existing (2013)**	**2014**	**2015**	**2016**
ISO Resource	Solar PV[5]	4,173	4,504	5,700	6,200
ISO Resource	Solar Thermal	419	1,058	1,183	1,183
ISO Resource	Wind	5,351	5,728	5,578	5,578
ISO Resource	Distributed PV	1,280	1,971	2,353	2,740
Sub Total of Intermittent Resources		11,223	13,261	14,814	15,701
Non-ISO Resources	All external variable energy treated as dynamically scheduled in the ISO	127	127	317	467
Non ISO Resources	All external variable energy resources firmed by adjacent BAA	398	398	398	398
Total ISO and Non-ISO Resources		11,621	13,659	15,212	16,099
Incremental New Additions in Each Year			2,038	1,553	887
Estimated build out from 2013 Flexible capacity needs assessment		11,906	14,374	15,779	17,382

[4] Data shown is for December of the corresponding year. Variable energy resources have been aggregated across the ISO system to avoid concerns regarding the release of confidential information.

[5] For 2014, the data collected showed that solar PV tracking went from 20% of the total solar PV in 2014 to 35% in 2015 and 2016.

While Table 1 aggregates the variable energy resources system wide, the ISO has conducted the assessment using location-specific information for each resource. This ensures that the assessment captures the geographic diversity benefits. Additionally, for existing solar and wind resources, the ISO used the most recent full year of actual solar output data available, which was 2013. For future wind resources, the overall wind production for each minute of the most recent year was simply scaled by the expected future capacity divided by the installed wind capacity of the most recent year. In the case of solar resources production profiles, for future years, the ISO assumptions were primarily based on the location of the new resources. If a resource is located in a Competitive Renewable Energy Zone ("CREZ") where similar technologies exist, then the ISO developed an output profile for the new resource that mirrors the output demonstrated by the most current actual solar output data. For example, if there is an existing 50 MW solar PV resource in a CREZ, and a new 25 MW solar PV is scheduled to come on-line during the assessment year in the same CREZ, then the ISO scaled up the output of the 50 MW resources by an additional 50% to account for the new resource. For solar resources located in new CREZs, the ISO developed production profiles using NRELs dataset for specific locations based on expected installed capacity. The ISO used this methodology to maximize the correlation between the load and wind production profiles for a particular year for the vast majority of variable energy resources.

As part of the data request, the ISO asked for information on resources internal and external to the ISO. For resources that are external to the ISO, additional information was requested regarding the firming of the resource. Resources that are firmed by an adjacent balancing authority area are treated as firm imports and are not included in the flexible capacity requirements assessment. Those that are not firmed are treated as a dynamically scheduled resource, comparably to an internal ISO resource. In the 2013 flexible capacity assessment, the ISO assumed all external variable energy resources were dynamically scheduled into the ISO. Finally, as noted above, a number of small LSEs did not provide a response to the ISO's data request. It is not clear to the ISO if these LSEs did not provide a response because they are able to meet their RPS requirements through contracts with non-variable resources (i.e. landfill gas or geothermal resources) or for some other reason. The ISO assumed no additional growth of variable energy resources for the LSEs that did not submit a response to the ISO's data request.

2.2 Building Minute-by-Minute Net Load Curves

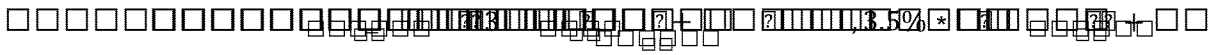
The ISO used the CEC load 2013 Integrated Energy Policy Report 1-in-2 monthly peak load forecast (Mid Demand Scenario, with no additional achievable energy efficiency) to develop minute-by-minute load forecasts for each month. The ISO scaled the actual load for each minute of each month of 2013 using an expected load growth factor of the monthly peak

forecast divided by the actual 2013 monthly peak. This is slightly different from the previous methodology in which the same growth rate was applied to each minute of each month. The current methodology results in a lower growth of peak load in the shoulder months as opposed to the same growth rate as the peak month.

With this information, the ISO developed the minute-by-minute load, wind, and solar profiles. These profiles are aligned and the output of the wind and solar resources is subtracted from the load to generate the minute-by-minute net load curves necessary to conduct the flexible capacity needs assessment.

3. ISO System Flexible Capacity Needs

Based on the methodology described in the ISO's FRAC-MOO Revised Draft Final Proposal and the ISO's April 5, 2013 filing in the current proceeding, the ISO calculated the preliminary ISO system-wide flexible capacity needs as follows:



Where:

$Max[(3RR_{HRx})_{MTHy}]$ = Largest three hour contiguous ramp starting in hour x for month y
E(PL) = Expected peak load

MTHy = Month y

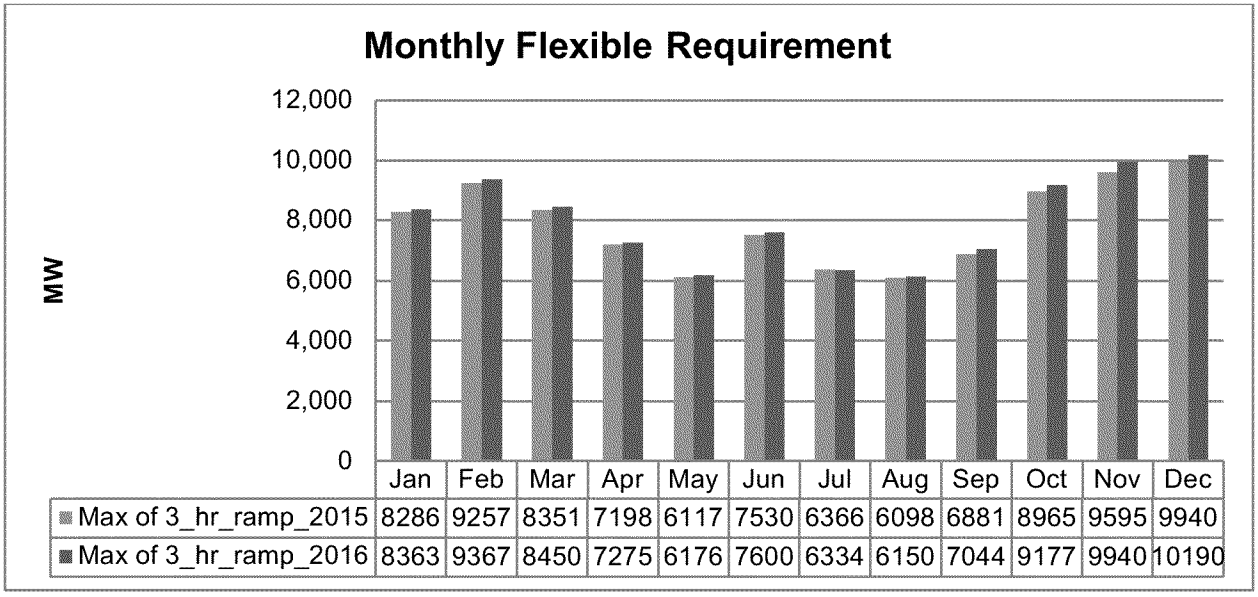
MSSC = Most Severe Single Contingency

ε = Annually adjustable error term to account for load forecast errors and variability methodology

For the 2015 RA compliance year, the ISO will continue to set ε equal to zero.

The ISO system-wide, largest three-hour contiguous ramps for each month are detailed in Figure 1.

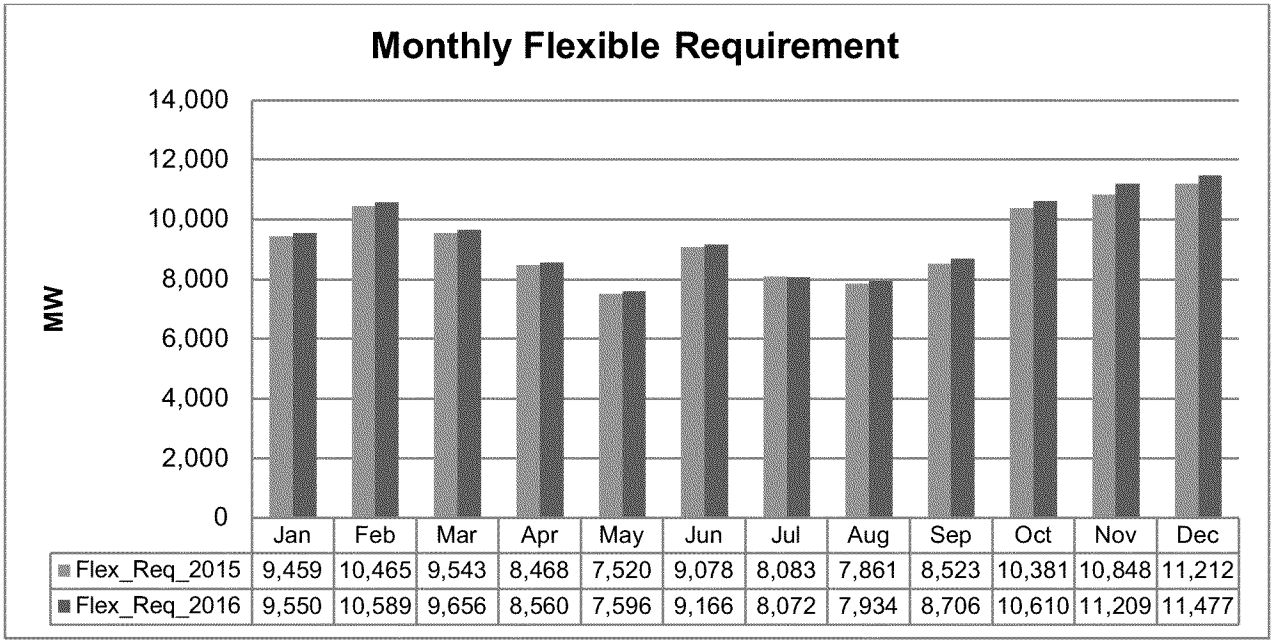
Figure 1: ISO System Maximum 3-hour Net-Load Ramps



The results for non-summer months are lower than predicted in the 2013 assessment. This is due, at least in part, to lower than forecasted variable energy resource build-outs as shown in Table 1, above. This reduced expansion has also reduced the year-over-year increases shown relative to the 2013 assessment. As noted above in section 2.2, the ISO used the CEC load 2013 Integrated Energy Policy Report ("IEPR") 1-in-2 monthly peak load forecast to develop minute-by-minute load forecasts for each month. The 2013 IEPR forecast shows increased peak summer load in 2015 relative to the 2012 IEPR forecast. This increase in the forecasted peak load during summer months shows a corresponding increase in the largest 3-hour contiguous ramps. Additionally, the ISO system experience extreme temperatures in late June 2013. The flexible capacity needs for June are set based on extreme morning ramping needs to address steep increases in load during this heat wave. As such, June, in particular, shows a significant increase from the 2013 flexible capacity assessment.

Finally, the ISO summed the monthly largest three hour contiguous ramps and 3.5 percent of the expected peak-load forecast for each month. This sum yields the ISO system-wide flexible capacity needs for 2015 and 2016. These needs are shown in Figure 2 below.

Figure 2: ISO System-Wide Flexible Capacity Need



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flex_Req_2015	9,459	10,465	9,543	8,468	7,520	9,078	8,083	7,861	8,523	10,381	10,848	11,212
Flex_Req_2016	9,550	10,589	9,656	8,560	7,596	9,166	8,072	7,934	8,706	10,610	11,209	11,477

Both the ISO's draft final proposal in the FRAC-MOO stakeholder initiative and the Energy Division proposal in this proceeding include the use of categories of flexible capacity. The ISO believes that these proposals align. However, since the ISO has not submitted its FRAC-MOO proposal to FERC for approval and the CPUC has not issued a decision in this matter, the ISO has included its category assessments as preliminary results in the appendix to this assessment.

4. Allocating the Flexible Capacity Needs to Local Regulatory Authorities

The ISO developed, as part of the FRAC-MOO stakeholder initiative, a methodology for determining the contribution of each local regulatory authority to the flexible capacity need. The ISO's proposed allocation methodology is based on the contribution of a local regulatory authority's load serving entities to the 3-hour net-load ramp. The ISO applied the allocation methodology developed, and recently approved by the ISO Board of Governors, in the FRAC-MOO stakeholder initiative.

Specifically, the ISO calculated an local regulatory authority's contribution to the flexible capacity needs using the following inputs:

1) The maximum of the most severe single contingency or 3.5 percent of forecasted peak load for each LRA based on its jurisdictional LSEs' peak load ratio share.

2) Δ Load – LRA's average contribution to load change during top five daily maximum three-hour net-load ramps within a given month from the previous year x total change in ISO load.

3) Δ Wind Output – LRA's average percent contribution to changes in wind output during the five greatest forecasted 3-hour net load changes x ISO total change in wind output during the largest 3-hour net load change

4) Δ Solar PV – LRA's average percent contribution to changes in solar PV output during the five greatest forecasted 3-hour net load changes x total change in solar PV output during the largest 3-hour net load change

5) Δ Solar Thermal – LRA's average percent contribution to changes in solar PV output during the five greatest forecasted 3-hour net load changes x total change in solar thermal output during the largest 3-hour net load change

The deltas are combined using the equation below to determine the CPUC's contribution to the flexible capacity need.

Contribution = Δ Load – Δ Wind Output – Δ Solar PV – Δ Solar Thermal + (3.5% * Expected Peak * Peak Load Ratio Share)

Table 2 shows the preliminary calculations of the individual contributions of each of these items at a system level. Because virtually all of the solar resources used in the study were provided by CPUC jurisdictional LSEs, the solar PV and solar thermal components are combined. The ISO will continue to assess the impact of this combination as part of the final flexible capacity needs assessment.

Table 2: Contribution to Maximum 3-hour Continuous Net-Load Ramp

	Average of Load contribution 2015	Average of solar contribution 2015	Average of Wind contribution 2015	Average of Load contribution 2016	Average of solar contribution 2016	Average of Wind contribution 2016
January	79%	17%	4%	79%	17%	4%
February	71%	27%	3%	71%	27%	3%
March	64%	25%	10%	64%	25%	10%
April	62%	30%	8%	62%	30%	8%
May	53%	35%	12%	53%	35%	12%
June	96%	-8%	13%	96%	-8%	13%
July	111%	-28%	18%	112%	-29%	17%
August	99%	-6%	7%	99%	-5%	7%
September	51%	52%	-3%	51%	52%	-3%
October	62%	32%	6%	65%	28%	8%
November	61%	38%	1%	59%	40%	1%
December	68%	31%	1%	67%	31%	1%

As Table 2 shows, Δ Load is the largest contributor to the flexible capacity needs during the summer months, where solar resources help to mitigate the need. This is because the most significant net-load ramps occur in the morning during summer months. However, in non-summer months, when the largest 3-hour net-load ramps tend to occur in the evenings, solar resources contribution to the 3-hour net load ramps can be significant.

Consistent with the ISO's flexible capacity needs allocation methodology, the ISO used 2013 actual load data to determine each local regulatory authority's contribution to the Δ load component. The ISO calculated minute-by-minute net load curves for the 2013. Then, using the same methodology used for determining the maximum 3-hour continuous net-load ramp described above, the ISO calculated the maximum three-hour net load ramps for 2013 and applied the Δ load calculation methodology described above. The ISO used settlements data to determine the LRA's contribution the Δ load component. This data is generated in 10-minute increments. This number may be the same for some LSEs over the entire hour. The ISO smoothed these observations by using a 60-minute rolling average of the load data. This allowed the ISO to simulate a continuous ramp using actual settled load data.

Based on this calculation methodology, the ISO has determined the preliminary flexible capacity need caused by CPUC jurisdictional LSEs. Because the Energy Division proposal states that the CPUC will allocate flexible capacity requirements to its jurisdictional LSEs based on peak load ratio share, the ISO has not calculated the individual contribution of each LSE. Table 3 shows the CPUC jurisdictional LSEs' relative contribution to each of the each of the factors (Δ load, Δ wind output, Δ solar PV, and Δ solar thermal) included in the allocation methodology.

Table 3: CPUC Jurisdictional LSEs' Contribution to Flexible Capacity Needs

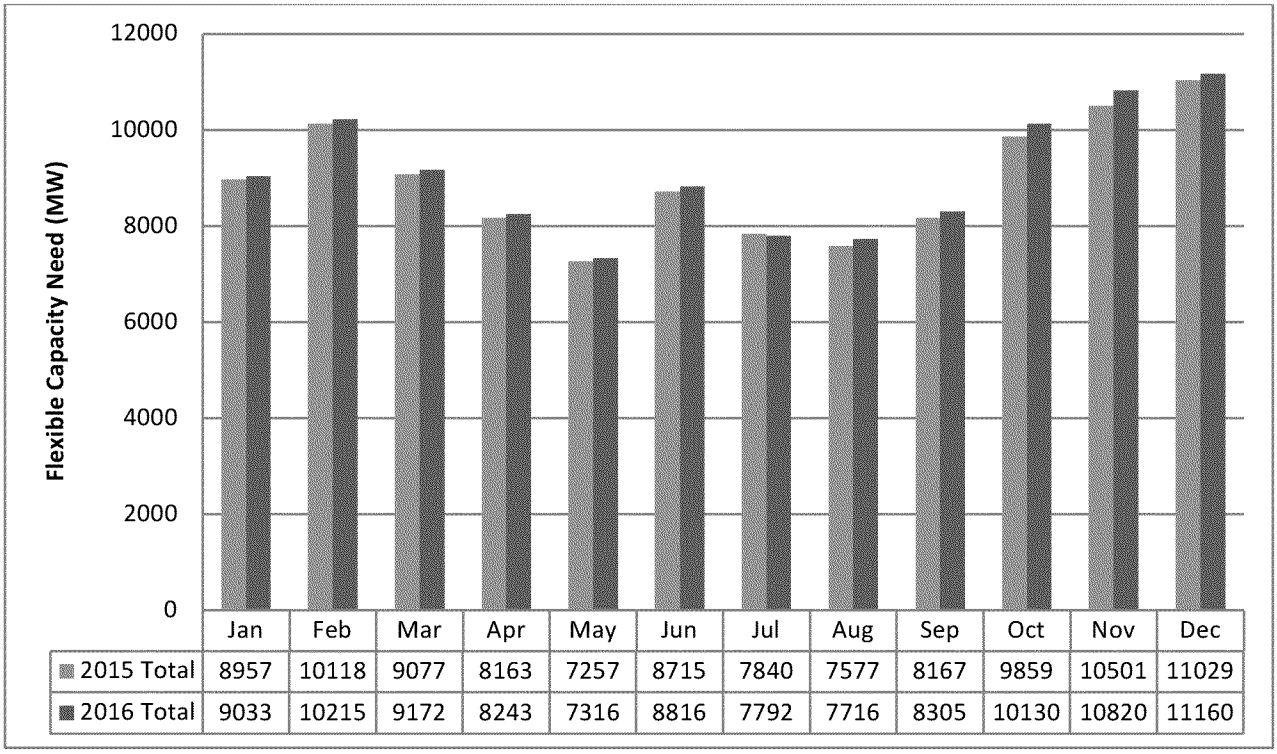
		2015			2016		
	Δ Load	Δ PV Fixed	Δ Solar Thermal	Δ Wind	Δ PV Fixed	Δ Solar Thermal	Δ Wind
January	94%	100%	100%	99%	99%	100%	98%
February	95%	100%	100%	99%	99%	100%	98%
March	95%	100%	100%	99%	99%	100%	98%
April	96%	100%	100%	99%	99%	100%	98%
May	96%	100%	100%	99%	99%	100%	98%
June	96%	100%	100%	99%	99%	100%	98%
July	98%	100%	100%	99%	99%	100%	98%
August	98%	100%	100%	99%	99%	100%	98%
September	94%	100%	100%	99%	99%	100%	98%
October	93%	100%	100%	99%	99%	100%	98%
November	96%	100%	100%	99%	99%	100%	98%
December	99%	100%	100%	99%	99%	100%	98%

Finally, the ISO multiplied the flexible capacity needs from Figure 2 and the contribution to each factor to determine the relative contribution of each component at a system level. The resultant numbers are then multiplied by the Local Regulatory Authority's calculated contribution to each individual component. Finally, the 3.5 percent expected peak load times the LRA's peak load ratio share is added. The preliminary results for the CPUC jurisdictional LSEs are provided in Table 4 and Figure 3.

Table 4: Preliminary CPUC Jurisdictional LSEs' Contribution to Flexible Capacity Needs

	2015					2016				
	Δ Load	Δ PV Fixed	Δ Solar Thermal	3.5% expected Peak Load	2015 Total	Δ Load	Δ PV Fixed	Δ Solar Thermal	3.5% expected Peak Load	2016 Total
Jan	6153	1409	328	1067	8957	6210	1407	335	1080	9033
Feb	6244	2499	275	1100	10118	6318	2504	281	1112	10215
Mar	5077	2088	827	1085	9077	5138	2091	845	1098	9172
Apr	4225	2129	562	1247	8163	4330	2161	582	1170	8243
May	3112	2141	727	1277	7257	3142	2140	741	1293	7316
Jun	6940	-602	969	1409	8715	7004	-602	988	1426	8816
Jul	6925	-1782	1134	1563	7840	6952	-1818	1077	1582	7792
Aug	5916	-366	423	1604	7577	5967	-304	431	1624	7716
Sep	3299	3578	-204	1495	8167	3377	3626	-211	1513	8305
Oct	5169	2869	533	1289	9859	5547	2544	734	1304	10130
Nov	5619	3646	95	1141	10501	5630	3936	99	1155	10820
Dec	6692	3081	98	1158	11029	6759	3127	102	1171	11160

Figure 3: Preliminary CPUC Jurisdictional LSEs' Contribution to Flexible Capacity Needs



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015 Total	8957	10118	9077	8163	7257	8715	7840	7577	8167	9859	10501	11029
2016 Total	9033	10215	9172	8243	7316	8816	7792	7716	8305	10130	10820	11160

5. Next Steps

The ISO will present the preliminary findings at the CPUC RA workshop on April 9, 2014 and will host a follow-up stakeholder conference call. The ISO will then provide LRAs with their final contribution to the ISO's flexible capacity need.

Appendix

The ISO and Energy Division proposed to divide the flexible capacity needs into three categories. These categories are defined based in the ISO's assessment of the different types of flexible capacity needed to address the ISO's needs. Specifically, in the FRAC-MOO stakeholder initiative, the ISO proposed the following flexible capacity categories:

Category 1 (Base Flexibility): Operational needs determined by the magnitude of the largest 3-hour secondary net-load ramp

Category 2 (Peak Flexibility): Operational need determined by the difference between 95 percent of the maximum 3-hour net-load ramp and the largest 3-hour secondary net-load ramp

Category 3 (Super-Peak Flexibility): Operational need determined by five percent of the maximum 3-hour net-load ramp of the month

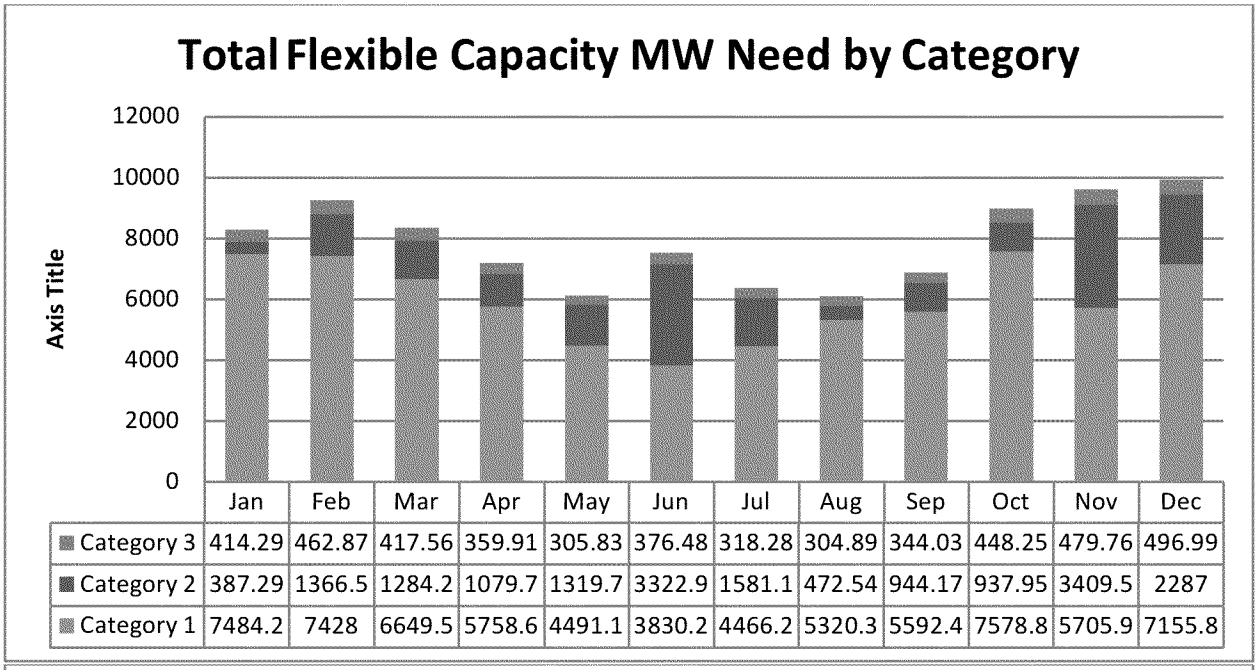
Based on these categories, the ISO has calculated the system level requirements for 2015 based only on the preliminary maximum monthly 3-hour net-load calculation from above.[6] The calculation of these categories are shown in Table 5 and Figure 4. As with the flexible capacity needs assessment, these results are preliminary and still under review by the ISO.

Table 5: ISO Flexible Capacity Needs by category for 2015

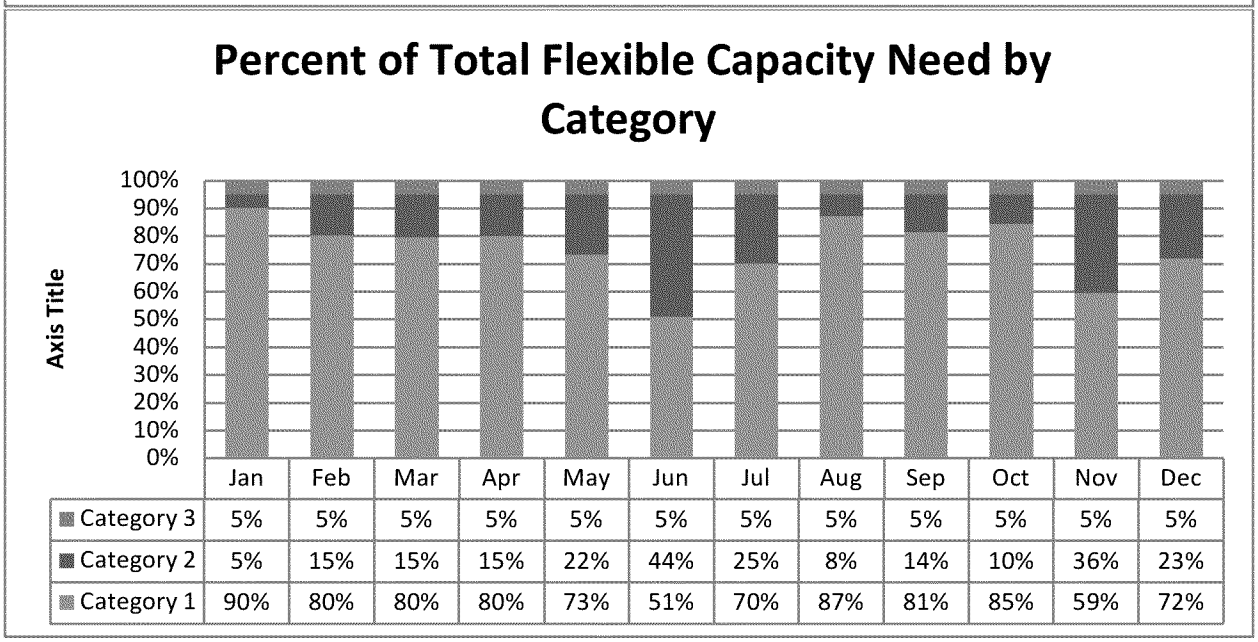
	Base Flexibility		Peak Flexibility		Super-Peak Flexibility	
	MW	Percent of Flexible Capacity Need	MW	Percent of Flexible Capacity Need	MW	Percent of Flexible Capacity Need
January	7484	90%	387	5%	414	5%
February	7428	80%	1366	15%	462	5%
March	6650	80%	1284	15%	417	5%
April	5759	80%	1079	15%	359	5%
May	4491	73%	1319	22%	305	5%
June	3830	51%	3322	44%	376	5%
July	4466	70%	1581	25%	318	5%
August	5320	87%	472	8%	304	5%
September	5592	81%	944	14%	344	5%
October	7578	85%	937	10%	448	5%
November	5705	59%	3409	36%	479	5%
December	7155	72%	2286	23%	496	5%

[6] The same percentage would apply to the 3.5 percent expected peak load portion of the flexible capacity need would also be determined by

Figure 4: ISO Flexible Capacity Needs by category for 2015



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Category 3	414.29	462.87	417.56	359.91	305.83	376.48	318.28	304.89	344.03	448.25	479.76	496.99
Category 2	387.29	1366.5	1284.2	1079.7	1319.7	3322.9	1581.1	472.54	944.17	937.95	3409.5	2287
Category 1	7484.2	7428	6649.5	5758.6	4491.1	3830.2	4466.2	5320.3	5592.4	7578.8	5705.9	7155.8



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Category 3	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Category 2	5%	15%	15%	15%	22%	44%	25%	8%	14%	10%	36%	23%
Category 1	90%	80%	80%	80%	73%	51%	70%	87%	81%	85%	59%	72%

The ISO proposed to establish the flexible capacity need in each category seasonally. However, as figure 4 shows, there is no clear demarcation of seasons that can be identified in the data.[7] The ISO will continue to assess the appropriate seasonal cut offs. These cut offs are

[7] The secondary ramp on August 18 was an anomalous secondary ramp and was removed from the calculations of the categories, reducing the amount of flexible capacity needed in category 1 for August.

important for two reasons. First, they will determine the quantity of resources an LSE must procure in a given category. Second, because the ISO will also determine the must-offer obligation of flexible capacity resources shown in the peak and super-peak flexibility categories seasonally, it may impact the portfolio of resources procured in each category. As part of the final flexible capacity needs assessment, the ISO will make a final determination regarding the appropriate seasonal breakdown for flexible capacity.