Flexible Resource Adequacy Criteria and Must-Offer Obligation

Market and Infrastructure Policy
Draft Final Proposal

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Draft Final Proposal

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1 Introduction

Integrating a 33 percent Renewable Portfolio Standard (RPS), maintaining local reliability, meeting California's goals to eliminate generation using once-through-cooling and increased distributed generation creates several operational challenges for maintaining grid reliability. Among these challenges is ensuring that there is sufficient flexible capacity to address the added variability and uncertainty of variable energy resources. The ISO is working with the California Public Utilities Commission (CPUC) and other local regulatory authorities (LRAs) to meet these challenges. Moreover, with any challenge comes opportunity. Reliably operating the grid with a 33 percent RPS requires re-evaluating how resources are dispatched, as well as resources' operating capabilities. Consequently, this stakeholder initiative seeks to create opportunities for all types of flexible capacity, including demand response, storage, and renewable resources that are willing and able to adjust their output to meet system needs. Adding flexible capacity procurement targets to the CPUC's Resource Adequacy (RA) program and more widespread flexible capacity requirements that extend to all load serving entities (LSEs) participating in the ISO market will provide an opportunity for resources that are both able and willing to provide flexible capabilities needed to operate the grid to have those capabilities appropriately valued and compensated.[1]

Additionally, the ISO will, as part of its flexible capacity requirement assessment, use a study methodology that captures the flexible capacity needed to reliably operate the system while properly considering the resources that have the potential to modify the net-load curve such as load modifying demand-side management (i.e. energy efficiency and demand response that is not bid into the ISO market).[2] To that end, the ISO, California Energy Commission and CPUC are working collaboratively to determine how demand-side management programs, such as energy efficiency, can be targeted towards reducing the need for flexible resources by modifying the net-load shape that is driving the ramping requirements. This holistic approach of using clean preferred technologies to either reduce the requirements for flexibility (e.g., modify the net-load curve) or count towards meeting those requirements will ensure that the reliability challenges of the California's clean energy policies are addressed to the maximum extent practical by the very clean technologies behind those policies.

The ISO and the CPUC are pursuing a more forward looking approach to ensure the flexible capacity needed to reliably integrate a large fleet of renewable resources is secured on a multi-year ahead basis and operationally available to the ISO markets. To be operationally available to the ISO markets, resources must submit economic bids, as opposed to self-scheduling. The ISO is also actively participating in both the CPUC's Resource Adequacy and Long-Term Procurement Plan proceedings to

[1] The ISO is striving to coordinate with all LRAs so that the ISO's flexible capacity requirements are consistent with load serving entities' procurement obligations established by the applicable LRA.

[2] The specific assumptions that will be used in the flexible capacity needs assessment is beyond the scope of the Flexible Resource Adequacy Criteria and Must-Offer obligation stakeholder initiative. However, the ISO will conduct an annual stakeholder process, as is done with the Local Capacity Requirements, to discuss the appropriate assumptions to consider in determining the flexible capacity requirement.

help inform decisions regarding the flexible capacity, both new and existing, needed to reliably operate the grid. In the ISO's real-time energy market, the implementation of the flexible ramping constraint has improved the ISO's ability to optimize the available resource fleet for ISO market operations by valuing the real-time ramping capabilities of resources. The proposed flexible ramping product should improve this further. The ISO is lowering the energy bid price floor in its markets and modifying its bid-cost recovery rules to encourage more economic bidding by all resources. Further, planned market changes in conjunction with FERC's Order 764 to better integrate renewable resources will increase the dispatch frequency at the interties by allowing intertie resources to bid and schedule in 15-minute intervals in the real-time market.

On July 10, 2013, the ISO and CPUC issued their Joint Reliability Plan, which describes three key elements that advance resource adequacy planning and procurement efforts.[3] As part of the plan, the CPUC will establish a multi-year resource adequacy forward procurement obligation, and the ISO will develop a market-based backstop capacity procurement mechanism and refine resource eligibility criteria as part of the ISO's recently initiated Reliability Services initiative. Close coordination is imperative between this FRACMOO initiative and the new ISO and CPUC initiatives outlined in the Joint Reliability Plan. For instance, the must-offer obligation developed in this stakeholder initiative will serve as a critical input into the CPUC's multi-year forward resource adequacy procurement mechanism.

In summary, this stakeholder initiative, which is narrowly focused on how to consider and operationally utilize flexible capabilities in the ISO market, represents only a portion of the ISO's overall efforts to ensure California's energy policy mandates are reached while maintaining or further enhancing system reliability. The ISO is committed to a holistic solution to these challenges that includes both conventional and preferred resources in such a way that ensures state policy mandates are met and the reliability of the grid is maintained.

2 Overview

The ISO is planning to complete this stakeholder initiative by March 2014 so that the key "flexible capacity" measures described above, along with the necessary tariff revisions, can be in place for the 2015 RA compliance year. Under this initiative, the ISO has been working with stakeholders to implement the following six measures necessary to satisfy the balancing area's growing flexible capacity needs:

- **Requirement Determination:** A methodology and process by which the ISO determines the overall flexible capacity requirement for the ISO system. The ISO proposes conducting an annual assessment of flexibility needs using the most current Renewable Portfolio Standard contracts and load forecasts to determine the ISO system's flexible capacity requirement for the upcoming year. The timeline of this study process will mirror that of the current Local Capacity Requirement (LCR) schedule.

[3] http://www.caiso.com/informed/Pages/StakeholderProcesses/Multi-YearReliabilityFramework.aspx

- **Allocation Methodology:** A flexible capacity allocation methodology that applies to all LRAs in the ISO balancing area. The ISO will allocate the proportion of the system flexible capacity requirement to each LRA based on its jurisdictional LSEs' contribution to the ISO's largest 3 hour net-load ramp change each month. The ISO will calculate each LSE's contribution to the net-load change using historic changes in load and forecasted changes in wind output and solar output, and distributed generation. The ISO will incorporate data provided by each LSE into these calculations and will provide the results to each LRA at the same time as the annual LCR study results.

- **Flexible Capacity RA Showings:** Requirements for SCs for LSEs to provide RA showings to the ISO demonstrating adequate flexible capacity procurement. Similar to the current RA program, each SC for an LSE will include a showing of its flexible capacity procurement in its RA showing submitted to the ISO. Resources used by SCs for LSEs to meet their flexible capacity requirements will make submissions confirming they have agreed to supply flexible capacity. Both LSEs and resources will make annual and monthly submissions. Also, the ISO would not procure backstop flexible capacity unless SCs for LSEs have not listed in aggregate 90 percent[4] of the system flexible capacity requirement for each month as indicated in the year-ahead submission and 100 percent of the aggregate system flexible capacity requirement as indicated in the month-ahead RA submission.

- **Showing Assessment and Resource Counting**: An assessment of the adequacy of an SC for an LSE's flexible capacity showing towards meeting its flexible capacity requirement, based on the ISO's allocation of its overall requirement to an LSE's LRA and the LRA's allocation of its share to the LSE. This assessment will use a flexible capacity counting methodology established in the ISO tariff. This counting methodology is not inconsistent with that recently established by the CPUC and will consider each resource's net qualifying capacity, minimum operating level, start-up time, and ramp rate.

- **Must-Offer Obligations:** Must-offer obligations for flexible capacity resources that generally require resources used to meet flexible capacity requirements to submit economic energy bids into the ISO's day-ahead and real-time markets for the time period from 5:00 a.m. through 10:00 p.m. These offer-obligations are technology neutral and specifically designed to address the ISO reliability needs.

- **Backstop Procurement:** ISO backstop procurement authority that allows the ISO to procure flexible capacity on a one-year forward basis based on deficiencies in LSE's annual or monthly flexible capacity procurement that result in cumulative deficiencies in the overall supply of flexible capacity made available to the ISO.

2.1 Changes from the Fifth Revised Straw Proposal

The ISO has made the following revisions to the fifth revised straw proposal:

[4] The ISO is proposing 90 percent at this time. However, as with local capacity requirements, future needs may require LSEs, in their year-ahead flexible capacity showings, to demonstrate that 100 percent of their flexible capacity has been procured.

1) Sections 5.4 and 5.5. – The ISO has consolidated the four flexible capacity categories it previously proposed into three categories. This change combines the originally proposed "unlimited" and "limited flexibility" categories into a single category, named "base flexibility." The ISO proposes resources must have the following characteristics to be included in the base flexibility category:

- Have flexible capacity that can be available to the ISO market through economic energy and ancillary service bids submitted daily for the period from 5:00 a.m. through 10:00 p.m.

- Meet minimum start requirements of either two starts per day or the number of starts allowed by a resource's minimum up and minimum down time operational limits.[5] For example, a resource may have a minimum up time of 24 hours and therefore only be able to start once per day. This resource would be eligible to provide category 1 capacity as long as it can ramp through its effective flexible capacity (EFC) range as directed by ISO dispatch.

- Be able to provide the equivalent of six hours of energy at the full EFC.

The ISO has combined the previous "unlimited" and "limited" categories into a single category for two reasons. First, after reviewing the 2014 RA showings from CPUC jurisdictional LSEs, which are the only LSEs that provided their LRA with a flexible capacity showing for 2014, the ISO believes that it is not necessary to include an explicit category with 17 hour energy requirements at this time. Although it would result in operational concerns if all resources in the new base flexibility category had a six hour energy limit, there were a limited number of energy limited resources provided in the 2014 showings that would qualify for the new base flexibility category. Therefore, the ISO believes that the proposal can be simplified at this time by combining the unlimited and limited flexibility categories. Second, and closely related, while the ISO expects that there will be a need for an explicit provision for resources that can provide greater than six hours of energy, at this time there is insufficient information available to specifically define such a requirement.

2) Section 5.5 – Going forward, the ISO will conduct on-going assessments to determine how well the categories function to meet flexible capacity needs for reliable grid operations. The ISO will initiate a stakeholder process in the first quarter of 2016 to discuss with stakeholders the findings of these ongoing assessments as well as any recommendations for potential modifications to the flexible capacity requirements. At this time we expect that additional information will be available on system needs as well as new procurement policies developed by

[5] To be a category 1 resource, the resource must have at least the following number of starts listed in the Master File: Min { 2, Max(1, number of starts allowed in 24 hours taking into account the resources minimum up time and minimum down time) }.

the CPUC and ISO related to the Joint Reliability Plan developed in 2013 which will provide the basis for potential changes to the proposed flexible capacity product definition.

3) Sections 5.4 and 5.5 – The ISO has provided additional clarity regarding the minimum eligibility criteria and must-offer obligations for each of the flexible capacity categories.

4) Section 6 – The ISO proposes to calculate the EFC of combined heat and power (CHP) resources in the same manner as proposed for other conventional resources. CHP resources, along with any generating resource, will have the ability to designate or sell any portion of its designated EFC as "generic capacity" based on the underlying industrial processes. Any CHP sold as flexible capacity, along with any generating resource, that chooses to self-schedule during the flexible capacity must-offer obligation window may be subject to charges under the availability incentive mechanism (after it is in place). The ISO believes that the reliability-must-take portion of these resources' should be considered by the CHP resource when determining how much of its flexible capacity it wishes to list as flexible capacity.

5) Section 6 – The ISO will determine the EFC of energy storage resources selecting the full flexible capacity option based on the MW output the resource can deliver after three hours of discharge at a constantly increasing discharge rate (i.e. ramp rate). Storage resources selecting the full flexible capacity option will be required to submit economic energy and ancillary service bids for the time period applicable to the category for which they are shown for flexible capacity. The ISO will continue to review the appropriateness of this approach in the recently opened Reliability Services initiative as well as in coordination with the CPUC in the current RA proceeding (R.11-10-023). The regulation energy management option has not been changed.

6) In instances where there are simultaneous collective deficiencies in both system RA and flexible RA, each caused by different LSEs (i.e. one LSE SC is deficient system capacity and another LSE SC's is deficient flexible capacity), the ISO will backstop for the flexible capacity deficiency first and allocate costs consistent the cost allocation methodology described in this proposal. Resources accepting this designation would be subject to both the generic and flexible capacity must-offer obligations.[6] The ISO will count this capacity towards the collective system deficiency and determine if it is sufficient to cover the collective capacity deficiency. If it does, then there will be no additional backstop procurement. If additional backstop procurement is need to address any remaining collective system capacity, the ISO will procure any additional system capacity and allocate costs according to the existing backstop procurement provisions. The ISO will only issue backstop procurement to non-RA capacity to avoid double payments to the same capacity.

Other clarifying changes have been made throughout the proposal

[6] As with any CPM designation, acceptance by a resource is voluntary.

3 Background

ISO studies have shown the need for flexible capacity resources will increase as large amounts of intermittent renewable resources come online to meet California's 33 percent RPS.[7] In addition, the future retirement of significant amounts of once-through cooling generation units and the rapidly growing levels of distributed resources will further increase the need for flexible resources. Given the growing intermittency of the supply fleet and the potential retirement of once-through-cooled resources, the ISO, as the Balancing Authority Area operator, must consider its operational needs beyond what historically has been satisfied by system, often termed "generic," capacity, and local capacity.

There are at least three key items that the ISO believes must be in place to ensure California is attracting and sustaining investment in the right type and mix of resources while meeting California's goal to increase energy efficiency, demand response, and renewable energy. These issues are:

1) Obligations for flexible capacity procurement.

2) New rules addressing the ability of use-limited resources, like demand response, storage, renewable resources and resources with environmental restrictions, to provide flexibility, local, and system resource adequacy services.

3) Multi-year forward resource adequacy requirements.

This stakeholder initiative addresses the first two of these items.[8]

The ISO believes that reliably integrating intermittent resources depends on implementing explicit procurement requirements for multiple flexible capacity products. At the August 13, 2012 CPUC resource adequacy workshop, the ISO presented a conceptual proposal on how the flexible capacity attributes of maximum continuous ramping, load following, and regulation could be addressed for an interim 2014-2017 period as a single "dispatchability" attribute that could be woven into the existing bi-lateral resource adequacy procurement paradigm.[9] On October 29, 2012, the ISO, with co-signatories, San Diego Gas and Electric and Southern California Edison, submitted the Joint Parties Proposal to the CPUC's Energy Division in the RA proceeding (R.11-10-023).[10] The Joint Parties Proposal detailed an interim solution to addressing the ISO's flexible capacity needs while a long term solution is devised.[11] After submitting the Joint Parties Proposal to the CPUC, the ISO continued to work with parties in the RA

[7] For a more detailed discussion of these studies, see http://www.caiso.com/Documents/SecondRevisedDraftFinalProposal-FlexibleCapacityProcurement.pdf.
[8] Additional work must also be done in the CPUC's RA proceeding as well as with other LRAs.
[9] The ISO believes future procurement must consider how to implement separate procurement requirements for multiple flexible capacity products.
[10] The documents and data the ISO submitted in CPUC Docket No. R.11-10-023 are available at http://www.caiso.com/Documents/R.11-10-023%20(Order%20instituting%20rulemaking%20to%20oversee%20RA%20program).
[11] The CPUC has included the Joint Parties Proposal in the Scoping Memo issues in R.11-10-023 on December 6, 2012.

proceeding to refine the treatment of hydro from the methodology originally proposed in the Joint Parties Proposal. As a result of this effort, the ISO, in collaboration with PG&E, SCE, and SDG&E, agreed to a revised methodology designed to address the hydro resources and submitted this proposal to the CPUC's Energy Division. The revised Joint Parties' Proposal that included the new hydro proposal was supported by the ISO, PG&E, SCE, and SDG&E. Additionally, CPUC Energy Division used the Revised Joint Parties' proposal as the basis for their recommendation, which included additional refinements.

On June 27, 2013, the CPUC approved the final decision in its RA proceeding,[12] which establishes interim flexible capacity procurement obligations as part of the CPUC's RA program. The decision calls for CPUC jurisdictional load serving entities to meet a flexible capacity procurement target for RA compliance year 2014, with these targets becoming procurement obligations in RA compliance year 2015. The decision also outlines the rules the CPUC will use for counting conventional resources towards meeting flexible capacity procurement obligations and highlights outstanding issues to resolve in the upcoming RA proceeding. The ISO appreciates that the issues highlighted in the decision incorporated the ISO's recommendation to focus on establishing counting rules for use-limited resources such as demand response, storage, and resources with environmental restrictions.[13]

The ISO supports the CPUC decision as an appropriate interim solution to address the system's need for flexible capacity while a more enduring and holistic solution that also accommodates alternatives to conventional generation is designed. In addition to the RA process underway at the CPUC, the ISO is working with other LRAs to implement workable flexible capacity programs. As more renewable resources come on line, not only will the net load curve look substantially different than it does today but so will the need for regulation and load following. Due to the intermittency of renewable resources the potential for inter-hour variations requiring load following and regulation will also increase. Addressing these needs will require more precise and forward looking capacity procurement that includes specific requirements for load following and regulation, in addition to the current requirement based on each day's maximum overall net-load ramp. For these reason, the ISO believes this must be an interim solution to address the system's need for flexible capacity while a permanent and more holistic solution is designed.

3.1 Schedule

The ISO plans to complete this stakeholder process by March 2014 so that the CPUC's upcoming RA proceeding can consider the outcomes and all appropriate rules and systems can be in-place in time for the 2015 RA compliance year. As such, the ISO offers the following updated schedule for this stakeholder process:

[12] The CPUC's RA Final Decision is available at http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M070/K423/70423172.PDF.

[13] The CPUC has issued a proposal for demand response and storage resources providing flexible capacity. This proposal was sent to the service list of R.11-10-023 on September 13, 2013.

Date	Action
December 14, 2012	Draft straw proposal
December 20, 2012	Stakeholder Meeting
January 9, 2013	Stakeholder comments due
June 13, 2013	Revised Straw Proposal posted
June 19, 2013	Stakeholder meeting
June 26, 2013	Stakeholder comments on Revised Straw Proposal due
July 25, 2013	Second Revised Straw Proposal posted
August 1, 2013	Stakeholder Meeting
August 15, 2013	Stakeholder comments on Second Revised Straw Proposal due
October 3, 2013	Third Revised Straw Proposal posted
October 9, 2013	Stakeholder Meeting
October 16, 2013	Stakeholder comments on Third Revised Straw Proposal due
November 6, 2013	Fourth Revised Straw Proposal Posted
November 13, 2013	Stakeholder Meeting
November 27, 2013	Stakeholder Comments Due on Fourth Revised Straw Proposal
December 13, 2013	Working group meeting
January 17, 2013	Fifth Revised Straw Proposal Posted
January 23, 2014	Stakeholder Meeting
January 31, 2014	Stakeholder comments on Fifth Revised Straw Proposal due
February 7, 2014	Draft Final Proposal posted

Date	Action
February 12, 2014	Stakeholder phone call
February 21, 2014	Stakeholder comments due on Draft Final Proposal
March 19, 2014	Board decision

4 Determining the Requirement: The ISO's Flexible Capacity Requirement Assessment

Each year, the ISO will determine the system's flexible capacity requirement for the upcoming RA compliance year. The ISO will undertake this flexible capacity requirement assessment on a schedule that mirrors its local capacity requirement study schedule. As discussed below, this process will be transparent and include numerous opportunities for stakeholder input. The process will include stakeholder meetings where the ISO will present and discuss the inputs and assumptions used in its assessments. Stakeholders will have an opportunity to provide comments on the specific methodology and assumptions over the course of the process described below.

Upon completion of its flexible capacity assessment, the ISO will use the results to allocate shares of the system flexible capacity requirement to each of the LRAs responsible for load in the ISO balancing authority area. The ISO will determine the allocation to each LRA by summing the contribution to the maximum 3-hour net-load ramp of each LSE under the jurisdiction of each respective LRA. The ISO will also provide each LRA with a breakdown of each of its individual jurisdictional LSEs' contribution based on the allocation methodology described in section 5.

The ISO will provide the final results of its flexible capacity requirement assessment by May 1 to each LRA in the ISO balancing authority area. The ISO will provide each LRA with (1) the total system requirement, (2) the LRA's share of the total system requirement, and (3) each of the LRA's jurisdictional LSEs' contribution to the net-load ramp that were used to calculate the LRA's share of the total system requirement.

The ISO proposes the flexible capacity requirement assessment utilize the following process:

Month/Timing	Event
January	Receive CEC load forecast used for Transmission Planning Process expansion plan
	Receive updated RPS build-out data from the IOUs
	Publish annual Flexible Capacity Requirements assumptions paper
February	ISO stakeholder meeting to discuss assumptions, stakeholder comments, and posting of comments with ISO response
March	Draft LCR and FCR study completed followed by local & flexible capacity requirement stakeholder meeting
	Publish draft final LCR & FCR needs study (including determination of the error term)
April	ISO stakeholder meeting to discuss LCR / FCR / error term results followed by stakeholder comments
May/June	Final 2014 LCR & FCR study posted
	CPUC annual RA decision incorporating LCR and FCR procurement obligations
July	LSEs receive year-ahead flexible capacity procurement obligation from LRA
August	Revised load forecasts and renewable build-outs for following RA compliance year
September	LSEs receive revised RA and flexible capacity obligation. Final effective flexible capacity (EFC) list of eligible flexible capacity resources issued by the ISO.
October	SCs for LSEs provide Year-ahead showing of system, local, and flexible capacity to ISO and LRA (show 100% local and 90% system and flexible)
Monthly	T-45 days: Month-ahead showings, including local and flexible true-up capacity to ISO and LRA
	T-25 days: ISO notifies SCs for LSEs and suppliers of any deficiencies of system, local, and or flexible capacity or discrepancies in showings
	T-11 days: Final opportunity for LSEs to demonstrate to the ISO that any identified deficiencies have been cured

The proposed process for the flexible capacity requirement assessment methodology for determining each LSE's contribution to the flexible capacity requirement extends the method

established by the CPUC's recent decision in its RA proceeding (D.13-06-024) in that the requirement is based on each month's projected maximum daily three hour net load ramp. However, while the CPUC decision determines the overall requirement based on each month's maximum net load ramp, it allocates this overall requirement to LSEs based on peak load share. In contrast, the ISO is proposing to allocate the overall system requirement to LRAs in proportion to the sum of their jurisdictional LSEs contribution to the maximum net-load ramp.

The ISO's flexible capacity requirement assessment will use the most current full year of actual load data and the most current California Energy Commission (CEC) approved load forecast to produce a data set of minute-by-minute load forecast for the upcoming RA compliance year.

Additionally, all SCs for LSEs will submit to the ISO two lists detailing existing contracts with intermittent resources for the relevant RA compliance year as well as details about planned intermittent resources that they expect to come on line in the next five years.[14]

- The first list, which will be made publically available, will include aggregated data regarding all contracts with intermittent resources, both existing and planned. This list shall include the total contracted installed capacity (not Net Qualifying Capacity) in each Certified Renewable Energy Zone (CREZ) by technology type. The SC for the LSE will be required to state whether the resources are existing or include the expected on-line date of each resource. If an LSE has confidentiality concerns they will be allowed to aggregate multiple adjacent CREZs to mask confidential information. Additionally, the SC for the LSE will be required to inform the ISO how much of the balancing services for dynamically scheduled or pseudo-tied intermittent resources from each non-ISO CREZ are provided by an another balance authority area and if there any special provisions associated with contracted resource (i.e. any curtailment or dispatch provisions).

- The second list, which the ISO will consider to be confidential, will be used to validate the aggregated figures. This list will be based on the same information as the aggregated list, but SCs for LSEs should provide the data on a resource-by-resource basis. The ISO will use these data to generate minute-by-minute net load data that will be used to determine the maximum three-hour net load curve for each month.

The accuracy of the data submitted by each SC for an LSE will be critically important because the contractual information will be used by the ISO to determine the flexible capacity requirement and the allocation of this requirement to LRAs. If an SC for an LSE submits inaccurate data, it may result in an inaccurate calculation and allocation of flexible capacity requirements. If an SC for an LSE submits inaccurate data, the ISO, upon discovering the inaccuracy, may rerun the flexible capacity requirement assessment during the year and recalculate flexible capacity requirement for the entire year to

[14] Until there is a multi-year forward procurement obligation, the data for years two through five will be used to provide advisory procurement requirements. There will only be binding procurement requirements for the upcoming year.

determine the impact of the inaccuracy. The SC for the LSE that submitted the inaccurate data will be charged the applicable backstop price for flexible capacity for any flexible capacity allocation they would have received under the corrected flexible capacity requirement assessment. The ISO will allocate the proceeds to SCs for LSEs that procured too much flexible capacity because of the inaccurate data. If the inaccurate data result yields a lower flexible capacity requirement allocation, for the LSE, then no change in the flexible capacity allocation will be made and no additional charges imposed.

The ISO will issue the draft EFC list by September 1 each year. In determining what resources make the draft EFC list, the ISO will apply a very low threshold test. The test requires that a resource placed at least one economic bid in the real-time market for ten or more days in the previous year. If the resource passes this test, then its EFC is calculated using the relevant counting conventions discussed in section 6. If an SC for a resource believes that they should be included on the list, but are not, or that the EFC provided in the draft EFC list is incorrect, then they will have two weeks after the draft EFC is released to notify the ISO of the correction. The ISO will review all requests and either grant the correction or provide the SC with a reason why their request was denied.

4.1 The ISO's Proposed Study Methodology

The ISO conducted a study to determine the flexible capacity requirement for the entire ISO footprint for 2014-2016 as part of the CPUC's RA proceeding. The ISO proposes using a similar methodology for the annual flexible capacity requirement assessment. The methodology used in that proceeding is outlined here. Additionally, the inputs and results of the 2014 assessment are discussed to provide an example of the proposed methodology.

First, the flexible capacity requirement is calculated for each month using the following formula:

$$Flexibility\ Requirment_{MTH_y=}\ Max\left[\left(3RR_{HR_x}\right)_{MTH_y}\right] + Max\left(MSSC, 3.5\% * E\left(PL_{MTH_y}\right)\right) + \varepsilon$$

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

The ISO utilized the renewable resource profiles used in the base case scenario from the CPUC's 2012 Long Term Procurement Planning proceeding to conduct this assessment, not individual profiles submitted by LSEs. The ISO will update the RPS build-out data annually based the contracted RPS

capacity data collected from all LSEs in the ISOs Balancing Area Authority as discussed above.[15] A breakout of the RPS build-outs and load assumptions used by the ISO for the 2014 flexible capacity requirement assessment is provided in Table 1. The RPS build-out data shown in Table 1 is listed by IOU, however, the ISO also received the CREZ for each project. This allowed the ISO to use a locationally representative energy profile for each project. As noted above, the ISO will look to collect that data from all LSEs for future assessments.

Table 1: RPS Build out by IOU and technology 2014-2016

R.12-03-014 (Replicating Base Case) Load		**Existing (2012)**	**2013**	**2014**	**2015**	**2016**	**2017**
Load (Replicating Base Case Scenario from R.12-03-014)			48,870	49,577	50,240	50,951	51,625
	Total by Technology		**2013**	**2014**	**2015**	**2016**	**2017**
PG&E	Solar PV		1,026	1,646	1,929	2,131	2,202
PG&E	Solar Thermal		373	748	968	1,718	1,918
PG&E	Wind		29	29	42	52	52
Subtotal of PG&E New Additions			1,428	2,423	2,940	3,901	4,173
Incremental PG&E Additions			1,428	995	517	961	272
SCE	Solar PV - Ground mount		0	381	468	578	1,378
SCE	Solar PV - Rooftop		0	43	43	43	43
SCE	Wind		0	0	270	270	270
Subtotal of SCE New Additions			0	423	780	890	1,690
Incremental SCE Additions in Each Year			0	423	357	110	800
SDGE	Solar PV		619	1,123	1,288	1,454	1,454
SDGE	Wind		1,195	1,373	1,373	1,373	1,373
Subtotal of SDG&E New Additions			1,814	2,496	2,661	2,827	2,827
Incremental SDGE Additions in Each Year			1,814	682	165	166	0

[15] The ISO will also include all non-IOU data in the 2015 Assessment.

R.12-03-014 (Replicating Base Case) Load		**Existing (2012)**	**2013**	**2014**	**2015**	**2016**	**2017**
Total Small PV (Demand Side) 2010 LTPP Assumptions*		367	733	1,100	1,467	1,833	2,200
Solar PV*		1,345	1,645	3,193	3,727	4,205	5,076
Solar Thermal*		419	373	748	968	1,718	1,918
Wind*		5,800	1,224	1,402	1,685	1,695	1,695
Subtotal of Intermittent Resources		***7,931***	***11,906***	***14,374***	***15,779***	***17,382***	***18,821***
Incremental New Additions in Each Year			3,975	2,468	1,405	1,603	1,439

* Shows incremental annual additions after 2012.

** After 2012, equal previous year subtotal plus incremental additions in that year

Once the updated RPS data is added into the base case scenario, the ISO will generate minute-by-minute load and net-load forecasts for the upcoming five years. In accordance with the methodology proposed in the Joint Parties Proposal and adopted by the CPUC, the ISO will determine the maximum forecasted 3-hour net-load ramp for each month. The ISO will calculate the 3-hour net-load ramp as the quantity of MWs the ISO must ramp resources or curtail demand across a 3-hour period.

4.2 Results of the ISO's Flexible Capacity Requirement Assessment for 2014

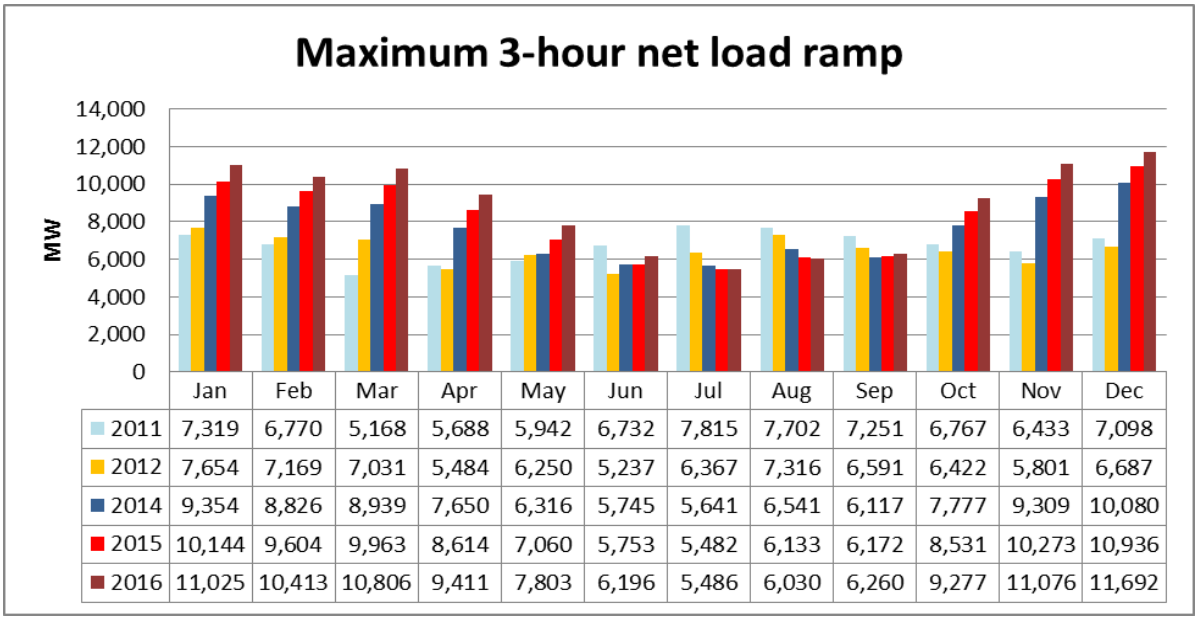
The maximum 3-hour net load ramps produced using the methodology described above are shown in Figure 1. In addition to assessing forecasted ramps, the ISO used this methodology to determine what the flexibility needs would have been for 2011 and 2012. As shown in Figure 1, the ISO expects to see an increase in the amount of net load that must be met by flexible resources in non-peak months. This is particularly evident in January through March and November and December. The ISO expects the 3-hour net load ramp in non-peak months to increase by about 800 – 1,000 MW year-over-year through 2016.

Finally, the ISO calculated the total flexible capacity requirement[16] for 2014-2016 using the formula descibed in section 4.1, above. The results of this calculation are shown in Figure 2. Flexible capacity requirments are greatest in the non-peak months and are consistent with increases in the maximum 3-hour net load ramps.[17]

[16] Note that the Joint Parties' Proposal refers to this as the "flexibility need." The terminology is changed here to consistent with the language used in the CPUC's LTPP.

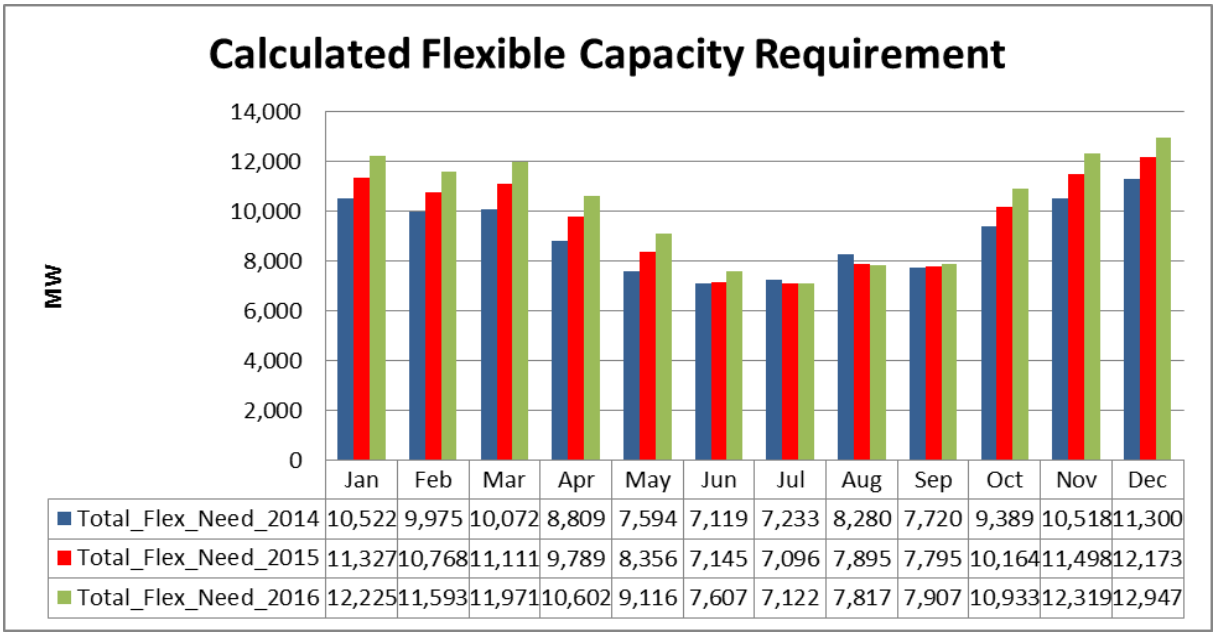
[17] This indicates that much of the increase in flexibile capacity requirements is driven by the increase in the 3-hour net load ramp and not by load growth.

Figure 1: Maximum 3-hour Ramps: 2011, 2012, and 2014-2016



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011	7,319	6,770	5,168	5,688	5,942	6,732	7,815	7,702	7,251	6,767	6,433	7,098
2012	7,654	7,169	7,031	5,484	6,250	5,237	6,367	7,316	6,591	6,422	5,801	6,687
2014	9,354	8,826	8,939	7,650	6,316	5,745	5,641	6,541	6,117	7,777	9,309	10,080
2015	10,144	9,604	9,963	8,614	7,060	5,753	5,482	6,133	6,172	8,531	10,273	10,936
2016	11,025	10,413	10,806	9,411	7,803	6,196	5,486	6,030	6,260	9,277	11,076	11,692

Figure 2: Forecasted Flexible Capacity Requirement 2014-2016



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Total_Flex_Need_2014	10,522	9,975	10,072	8,809	7,594	7,119	7,233	8,280	7,720	9,389	10,518	11,300
Total_Flex_Need_2015	11,327	10,768	11,111	9,789	8,356	7,145	7,096	7,895	7,795	10,164	11,498	12,173
Total_Flex_Need_2016	12,225	11,593	11,971	10,602	9,116	7,607	7,122	7,817	7,907	10,933	12,319	12,947

5 Proposed Allocation of Flexible Capacity Requirement

For the purpose of allocating backstop procurement costs in the event of a collective system deficiency in flexible capacity, the ISO proposes to allocate the ISO systems overall flexible capacity requirement to each LRA with jurisdiction over load in the ISO's balancing authority area. The amount allocated to each LRA will be the sum each LRA's jurisdictional LSEs' contribution to the overall system

flexible capacity requirement each month. The ISO will provide to each LRA its jurisdictional LSEs' individual contribution and the total requirement for all its jurisdictional LSEs. Allocating procurement obligations to individual LSEs is the responsibility of each LRA. If a LRA allocates the flexible capacity requirement to its jurisdictional LSEs using a different allocation methodology, then the ISO will use that LRA's allocation methodology when allocating backstop costs in the event that there is a flexible capacity shortfall by one or more of the LRAs load serving entities. This section describes the methodology the ISO will use to determine each LSE's contribution to the system flexible capacity requirement as part of determining each LRA's allocation.

The flexible capacity allocation requirement for MSS load-following LSEs will follow the current resource adequacy allocation requirement rules. While MSS load-following LSEs will receive an allocation from the ISO, they will not be required to provide a flexible capacity showing to the ISO. The ISO tariff already requires MSS load-following LSE's to match their generation with their load in each settlement interval. If capacity they have contracted with produces variable energy, they are responsible for ensuring their load is met with flexible resources under their control. MSS load-following LSE's allocation portion will be subtracted from the total allocation for purposes of backstop procurement.

5.1 LSE share of System Flexible Capacity Requirement

The ISO's proposed method for determining each LSE's share of the system flexible capacity requirement reflects the various components creating the overall requirement. As noted above, the flexible capacity requirement is comprised of three parts:

1. The maximum of the most severe single contingency or 3.5 percent of forecasted peak load
2. The maximum 3-hour net load ramp
3. The ε or error term

The specific allocation of each of these components to LRAs is discussed in greater detail in the following sub-sections.

5.1.1 *Allocating the Maximum of the Most Severe Single Contingency or 3.5 Percent of Forecasted Peak Load*

The ISO proposes to calculate the maximum of the most severe single contingency or 3.5 percent of forecasted peak load for each LSE based on its peak load ratio share. Some stakeholders have asserted that is not necessary to include this component in the flexible capacity. The ISO proposed, and the CPUC approved, the inclusion of the maximum of the most severe single contingency or 3.5 percent of forecasted peak load in the flexible capacity requirement in the RA proceeding. The reason for including this component is to account for the fact that much of the same capacity that provides contingency reserves will be the same capacity that the ISO will need to meet ramping needs. If the contingency reserves are not included in the flexible capacity requirement, then the ISO would not be assured of having access to sufficient flexible capacity to both maintain required contingency reserves and address

flexibility needs. For example, assume the flexible capacity requirement is set at only the maximum 3-hour continuous net-load ramp of 10,000 MW and there is a forecasted peak load is 35,000 MW. In this instance then the ISO would be required to maintain 1,225 MW of contingency reserves. This 1,225 MW of capacity would almost certainly be flexible capacity. However, if 1,225 MW of flexible capacity is committed to meeting these contingency reserves, then the ISO would not be assured of having sufficient flexible capacity to meet the other ramping needs, including a 10,000 MW ramp.

5.1.2 *Allocating the Maximum 3-hour Net Load Ramp*

The maximum 3-hour net-load ramp will be broken out to capture each LSE's contribution. The ISO must assess the proper level of granularity to use when determining the allocation to each LSE. The ISO has considered several levels of granularity, including a single measurement such as peak load ratio share as well as very detailed measurement that looks at each LSE's specific portfolio of load and resources. In the RA proceeding, the ISO released multiple data sets that show five individual components of the maximum 3-hour net-load ramp at a system level. These components are measured over the three hour period and include:

1) Changes in load
2) Changes in wind output
3) Changes in solar PV[18]
4) Changes in solar thermal
5) Changes in distributed energy resources[19]

The aggregate load impacts of these five components are used to assess the total 3-hour net-load change used in determining ISO's flexibility capacity requirement. To allocate the total flexible capacity requirement, it is important to determine each LSE's relative contribution to each one of these four components. The ISO proposes to use the following methodology to establish each LSE's contribution to each component.

1) 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.
2) 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
3) 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

[18] This includes distributed energy resources on the distribution system such as small solar installations of 20 MW or less.
[19] This includes customer side distributed energy resources such as roof-top solar.

4) 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 ISO's current proposal for allocating the Δ Load component is consistent with the methodology proposed in the previous straw proposal. The current proposal is based on each LSE's average percent contribution to load change during the daily peak net-load ramps for the five largest daily three-hour net-load ramps in a month,[20] not maximum load ramps. Based on the ISO's assessment of the data, this change did not result in a significant change in the flexible requirement allocation because the peak load ramps and peak net-load ramps occurred at similar times. However, this may not be the case over time as more intermittent resources come on line. The ISO has moved from using an LSE's average contribution to using the LSE's contribution during the five maximum 3-hour net-load ramps. The ISO proposes to allocate Δ Wind Output, Δ Solar PV, and Δ Solar Thermal solar thermal components in a manner that mirrors this allocation, except that these components will use forecasted data, not historic data. This represents minor modifications to the previous straw proposal and is designed to mitigate the impact of anomalous wind and solar outputs. Just as resource adequacy requirements are based on an LSE's contribution to the peak load (i.e. peak-load ratio share), so should flexibility requirements. However, the ISO believes that using an average contribution of an LRA to five largest daily maximum 3-hour continuous net-load ramps will help address uncertainty in forecasting and anomalous load changes. For example, if the single largest 3-hour net-load ramp occurs in the morning because wind output suddenly drops and the next for largest net load ramps occur in evening because of the sunset, using the top five daily maximum 3-hour net-load ramps will be capture the fact this anomaly. This type of event is common in months were the maximum 3-hour net-load ramp shifts from the morning to the afternoon or vice-versa.

The ISO has reviewed numerous other potential allocation methodologies, including those identified in previous straw proposals[21] and one proffered by PG&E in comments to the third revised straw proposal.[22] Additionally, given the ISO's proposed flexible capacity offer-obligation categories outlined in section 5.2, the ISO conducted a preliminary analysis to determine if additional granularity was required to account for LRAs' contributions to each category. In short, the ISO looked at LRAs' contributions to each of the identified categories to determine if a more complicated approach to allocating flexible capacity needs would be more consistent with causation principles. Based on the ISO's preliminary assessment there does not appear to be a significant difference between the proposed

[20] Methodologically, this similar to the CEC's use of the median coincidence factor of the top 1% of system peak hours when determining generic RA peak-load ratio share.
[21] In the previous straw proposals for this stakeholder initiative, the ISO proposed using contribution to 3-hour maximum load ramps, peak-load ratio share, and monthly load factors to allocate changes in load.
[22] PG&E's proposal looks to shift the ramping requirement to address load ramps that occur in non-peak ramping times, asserting that such a shift eliminates a free-ridership problem. However, the ISO believes that such a proposal actually encourages a free-ridership problem. The PG&E proposal can be found at http://www.caiso.com/Documents/PG_E-Comments-FlexibleResourceAdequacyCriteriaMustOfferObligation-ThirdRevisedStrawProposal.pdf.

methodology and a methodology that examines a specific LSE's contribution to a particular category. As such, the ISO believes that its proposed allocation methodology is consistent with the causation principles and avoids unnecessary complexity.

The ISO's above proposed allocation methodology allocates the flexible capacity requirement caused by change in load to each LRA based on its peak-ramp ratio share (i.e. the percent contribution of an LSE to load change during historic five monthly maximum three hour net load ramp x total change in ISO load during the historic maximum 3-hout net-load ramp). The ISO's proposed methodology is also consistent with how generic RA is currently allocated and reasonably reflects general cost causation principles. As a result, ISO will not adopt the PG&E proposal and proposes to allocate the Δ Load component based on an LSE's percent contribution to load change during the historic top five daily maximum three hour net load ramps in a month as described above.

By using historic 3-hour net-load data, the ISO will be able to allocate changes in load based on empirical data that is more statistically robust and yields an allocation metric that is specifically designed to measure each LSE's contribution to load variability. Additionally, the ISO has eliminated the use of the Δ Distributed Energy Resources variable from the allocation methodology that was included in previous straw proposals. The reason for deleting this component of the allocation methodology is directly tied with the use of historic metered load. The ISO will capture the impact of behind the meter distributed energy resources by using actual metered load because distributed energy resources are behind the meter so their variability is reflected in load variability. For the calculations used for Δ Wind, Δ Solar PV, and Δ Solar Thermal Output, the ISO understands that these calculations assume that all resources of a given technology type are treated the same for allocation purpose, but not for modeling purposes.[23] The ISO believes that this is the appropriate level of granularity.

Finally, these changes are combined using the equation below to determine a LRA's contribution to the flexible capacity requirement.

Contribution = Δ Load – Δ Wind Output – Δ Solar PV – Δ Solar Thermal

Additionally, the flexible capacity requirement is a forecast and attempting to determine each contracted resource's contribution is unlikely to yield a more accurate estimate of a LRA's actual after the fact contribution to the flexible capacity requirement.

The ISO is currently proposing to determine a LRA's contribution to each component monthly. However, some stakeholders have suggested that seasonal contributions may work as well as monthly and would simplify the allocation process and avoid monthly allocations based on a single observation. If there is little variation in the contribution to each component, then another potential benefit of such an approach would be larger and more robust data sets that would improve the confidence regarding the contribution to the 3-hour net load change by each of the components considered. The ISO has

[23] Solar and wind resources that are firmed outside of the ISO balancing area will not be included in the allocation calculation.

considered this approach and believes that the use of the top five daily maximum 3-hour net load ramp addresses the concerns from relying on a single observation to establish flexible capacity requirement allocations. The ISO will continue to assess the potential of seasonal allocations, but does not believe that such this allocation methodology is appropriate at this time.

Example 2 demonstrates how this methodology would allocate flexible capacity requirements when the forecasted monthly maximum 3-hour net load ramp occurs in the evening.

Example 2: Allocation when the forecasted monthly maximum 3-hour net load ramp occurs in the evening

ISO flexible capacity requirement assessment	
Δ load	4,500
Δ wind	-2,000
Δ solar PV	-2,500
Δ solar thermal	-1,000
Total flexible capacity need	10,000

LRA	LRA's percent contribution to load change during historic top five daily maximum three hour net load ramp in a month
LRA 1	35%
LRA 2	30%
LRA 3	20%
LRA 4	15%

LRA	Average percent contribution to change in wind output during the five largest forecasted net load changes in a month	Average percent contribution to change in solar PV output during the five largest forecasted net load changes in a month	Average percent contribution to change in solar thermal output during the five largest forecasted net load changes in a month
LRA 1	40%	30%	70%
LRA 2	20%	35%	20%
LRA 3	25%	15%	0%
LRA 4	15%	20%	10%

LRA	Load contribution	Wind contribution	Solar PV contribution	Solar Thermal contribution	Total contribution
LRA 1	.35 x 4,500 = 1,575 MW	.40 x -2,000 = -800 MW	.30 x -2,500 = -750 MW	.70 x -1,000 = -700 MW	3,825
LRA 2	.30 x 4,500 = 1,350 MW	.20 x -2,000 = -400 MW	.35 x -2,500 = -875 MW	.20 x -1,000 = -200 MW	2,825
LRA 3	.20 x 4,500 = 900 MW	.25 x -2,000 = -500 MW	.15 x -2,500 = -375 MW	.00 x -1,000 = 0 MW	1,775
LRA 4	.15 x 4,500 = 675 MW	.15 x -2,000 = -300 MW	.20 x -2,500 = -500 MW	.10 x -1,000 = -100 MW	1,575
Total	4,500	-2,000	-2,500	-1,000	10,000

While Example 2 uses an evening 3-hour ramp, the proposed methodology holds for morning ramps as well. The methodology would appropriately reflect that a LRA's jurisdictional LSEs' contracted solar resources would reduce a morning's 3-hour net-load ramp. Example 3 demonstrates how this methodology would be used for a maximum net load ramp set in the morning.

Example 3: Allocation when the forecasted monthly maximum 3-hour net load ramp occurs in the morning

ISO flexible capacity requirement assessment	
Δ load	7,500
Δ wind	-2,000
Δ solar PV	2,500
Δ solar thermal	1,000
Total flexible capacity need	6,000

LRA	LRA's percent contribution to load change during historic top five daily maximum three hour net load ramp in a month
LRA 1	35%
LRA 2	30%
LRA 3	20%
LRA 4	15%

LRA	Average percent contribution to change in wind output during the five largest forecasted net load changes in a month	Average percent contribution to change in solar PV output during the five largest forecasted net load changes in a month	Average percent contribution to change in solar thermal output during the five largest forecasted net load changes in a month
LRA 1	40%	30%	70%
LRA 2	20%	35%	20%
LRA 3	25%	15%	0%
LRA 4	15%	20%	10%

LRA	Load contribution	Wind contribution	Solar PV contribution	Solar Thermal contribution	Total contribution
LRA 1	.35 x 7,500 = 2,625 MW	.40 x -2,000 = -800 MW	.30 x 2,500 = 750 MW	.70 x 1,000 = 700 MW	1,975
LRA 2	.30 x 7,500 = 2,250 MW	.20 x -2,000 = -400 MW	.35 x 2,500 = 875 MW	.20 x 1,000 = 200 MW	1,575
LRA 3	.20 x 7,500 = 1,500 MW	.25 x -2,000 = -500 MW	.15 x 2,500 = 375 MW	.00 x 1,000 = 0 MW	1,625
LRA 4	.15 x 7,500 = 1,125 MW	.15 x -2,000 = -300 MW	.20 x 2,500 = 500 MW	.10 x 1,000 = 100 MW	825
Total	7,500	-2,000	2,500	1,000	6,000

These calculations will be made using the data provided by each LSE for use in the ISO's annual flexible capacity requirement assessment and provided to each LRA at the same time as the annual LCR study results.

5.1.3 *Determining the Error Term (ε)*

Several stakeholders have requested details regarding the criteria the ISO will use to determine the error term. The ISO set this term to zero for the 2014 RA compliance year assessment. As the ISO conducts the flexible capacity requirement assessment each year based on the formula presented in section 4, the ISO will determine how well the first two components in the formula actually reflect the ISO's real-world flexible capacity needs, which include satisfying both 5-minute and 3-hour ramps experienced by the system. Based on this assessment, the ISO may adjust the error term up or down so that the requirement determined by the formula more accurately reflects the ISO's actual flexible capacity needs. If the ISO's assessment identifies a need that requires modification to the flexible capacity requirements (i.e. ε different than 0), then it will, as part of the annual assessment, explain why a modification to the ε term is justified and provide as much detail as possible regarding this cause and allocation of this changed need. Stakeholder will have an opportunity to ask questions of the ISO and discuss and comment on this addition or reduction to the requirement based on the error term in greater detail in the ISO's annual flexible capacity requirements assessment stakeholder process.

The error term, by definition, is not known. However, there may be several factors that contribute to the need for additional procurement. For example, the current RA program allows for a 15 percent planning reserve margin. This margin is designed to include seven percent operating reserves, forecast error, and system outage rate. The current flexible capacity requirement does not have a similar added margin for outages of flexible capacity resource, or other eventualities. Alternatively, the ISO's assessment may show there was more than enough flexible capacity available to address flexible capacity needs and, therefore, flexible capacity requirements could be reduced.

It is not possible to pinpoint all of the specific factors that could contribute to the error term. However, the ISO also understands that stakeholders may have to manage procurement risk. For example, if the error term exceeds the other two components or varies too widely from year-to-year, it may create excessive procurement risks for LSEs. Therefore, the ISO is seeking stakeholder comments regarding appropriate bounds for the error term. Specifically, the ISO is seeking comments regarding appropriate bounds for the maximum and minimum for the error term as well as how to address year-to-year variability. Finally, the ISO is seeking stakeholder comment regarding appropriate actions if such bounds are reached.

5.2 Technology Agnostic Flexible Capacity Must-Offer Obligation

The ultimate reason for implementing a flexible capacity procurement obligation is to ensure that sufficient flexible capacity resources are available to the ISO for dispatch when needed. To ensure this occurs, the ISO proposes a specific flexible capacity must-offer obligation for resources providing flexible RA capacity. These flexible capacity must-offer obligations will be in addition to the ISO's existing

generic capacity must-offer obligations for system and local RA resources and for capacity procured under the ISO's Capacity Procurement Mechanism.

The current must-offer obligations for RA and Capacity Procurement Mechanism capacity ensure the ISO has sufficient capacity to meet peak-load and local requirements, but do not fully address system flexibility needs. A resource can fulfill its RA must-offer obligations by either self-scheduling or economically bidding into the ISO's energy markets. However, many of these resources self-schedule in the day-ahead market, real-time market, or both. When RA resources meet their must-offer obligation by self-scheduling, they are not actually available for dispatch by the ISO without adjusting the self-schedule, and, therefore, are not flexible. This can hinder the ISO's ability to meet its operational needs through optimizing the dispatch of flexible resources to help integrate variable energy resources. Thus, self-scheduling can lead to higher costs and inefficient market dispatch. Requiring flexible capacity resources to submit economic bids will allow the ISO to efficiently dispatch flexible resources in an optimal manner. Therefore, increasing the pool of resources with economic bids in the ISO markets will improve the ISO's ability to maintain grid reliability through the efficient dispatch of flexible resources.

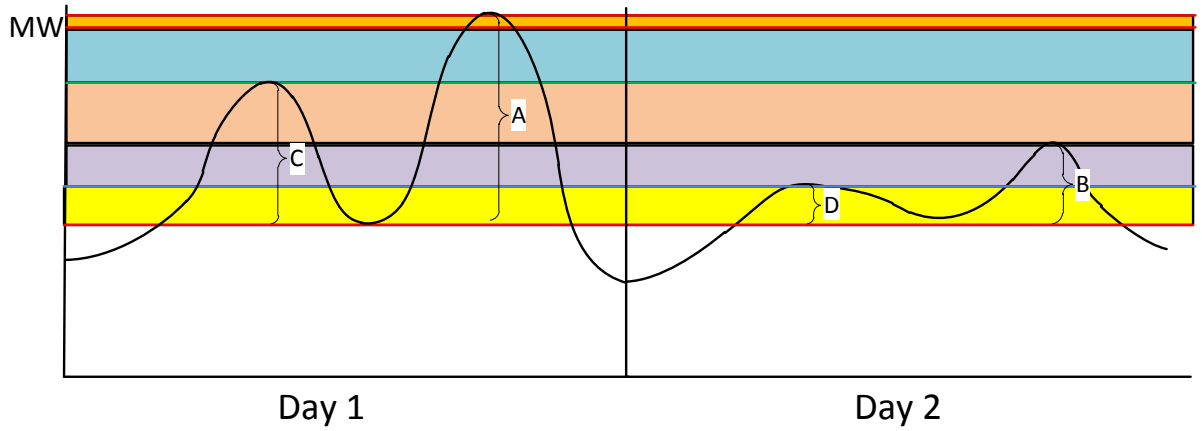
The CPUC's RA decision (D.13-06-024) in the RA proceeding proposes an interim solution designed to simultaneously meet the longest continuous upward ramps and load following needs. The ISO's flexible capacity must-offer obligations include reducing resource self-scheduling as a means of increasing the pool of resources available for economic dispatch to meet the net-load.

The ISO has proposed must-offer obligations for resources that are shown as flexible on LSE's RA showings. In previous versions of this proposal, the ISO put forward must-offer obligations that were based on the operating characteristics of various resource types. The ISO expects that the variety of resource types and technologies will continue to grow over time. Attempting to design flexible capacity must-offer obligations to satisfy each new technology type will become increasingly unwieldy and confusing. Additionally, the ISO believes that focusing offer-obligations on specific technology types is not a technology agnostic approach and does not, without additional constraints, ensure there will be adequate flexible capacity available to ensure system reliability. Therefore, the ISO proposes to develop technology agnostic flexible capacity categories that are designed to meet the flexible capacity needs of the system versus the needs of a particular technology type. The categories are designed using broad ISO operational needs. Additionally, because the must-offer obligations for some categories do not require 17 hour availability requirements, the categories should still provide opportunities for resources such as demand response, storage, and variable energy resources to provide flexible capacity because .

5.3 Establishing Needs-Based Must-Offer Categories

The ISO has conducted a needs-based approach to determine what categories of flexible capacity are needed to reliably operate the system. The ISO has elected to take a generalized approach that focuses on the changes to the net-load curve. Figure 3 is a simplified depiction of several the flexibility needs the ISO is looked to address in this assessment.

Figure 3: A two day month representing three hour ramping needs



The magnitude of the ramp labeled A represents the maximum 3-hour net-load ramp for the month. It is this ramp that would define the overall flexible capacity need for the month. The magnitude of the ramp labeled B shows the smallest daily maximum 3-hour net load ramp for the month. The difference between the magnitude of ramps A and B shows that not every flexible capacity resource will be dispatched to address every ramp. The daily maximum secondary 3-hour net-load ramp is defined as the largest net load ramp that does not correspond with the daily maximum net-load ramp. For example, if the daily maximum 3-hour net-load ramp occurs between 5:00 p.m. and 8:00 p.m., then the largest secondary ramp would be determined by the largest morning 3-hour net-load ramp. This represents an important data point. The magnitude of the ramp labeled C is the largest secondary 3-hour net load ramp for the month. The magnitude of the ramp labeled D is the smallest secondary 3-hour net load ramp for the month. Thus, in a given month, the ISO must be able to address

1) At least one net-load ramp a day that is greater than or equal to Item B every day,

2) No net-load ramps larger than Item A in the month,

3) Days with two 3-hour net-load ramping periods where the secondary ramp is at least as large as Item D, but not larger than Item C and may have to address secondary ramps that are between Items B and C.

Therefore, the ISO has determined both the categories and the quantity of ramping capacity within each category needed to meet these ramping requirements.[24]

In conducting this assessment, the ISO's goal was to balance the complexity of having multiple categories while ensuring the ISO has sufficient flexible capacity to address each of these needs. For example, the ISO could ensure all flexible capacity requirements are addressed by having several very

[24] The ISO must also address load following needs, however, at this time, the flexible capacity product contemplated here will simultaneously address 3-hour net-load ramps and load-following needs.

specific categories. However, this would result in an overly complex flexible capacity requirement with the potential for illiquid procurement in some categories. Alternatively, the ISO could propose a single category, but would not be assured all flexibility needs are addressed and would also preclude preferred resources from providing flexible capacity. As such, the ISO is proposing a limited set of categories as needed to reasonably ensure all flexible capacity needs are addressed.

5.4 Designing Flexible Capacity Requirement Categories

As a starting point for designing flexible capacity must-offer obligation categories, the ISO used the same 2014 and 2016 net-load data sets that were used to derive the study results discussed above in in section 4. Due to the size of the data set, the data set is simplified and only five-minute data is used. From this data, the ISO computed the following:

- Daily maximum 3-hour net-load ramp[25] – Used to assess to the distribution of daily maximum 3-hour net-load curve.
- Daily maximum and minimum secondary 3-hour net load ramp – Used to assess to the basis of bimodal ramping days and magnitude and distribution of the secondary ramps
- 15-minute, 60-minute, and 90-minute net-load changes[26] – Used to determine if it was possible to ensure three hour flexible needs would be met if flexible capacity requirement categories were defined using a sub-three flexibility measure

The results of this assessment using the 2014 data are provided in Table 2.

[25] The use of five-minute data instead of minute-to-minute data leads to results that are slightly different than those provided in section 4. Additionally, March 14, March 15, and November 4 have been removed due to anomalous data caused by day-light savings time.
[26] This difference is the difference between the net-load at each of each rolling 15, 60, or 90 minute interval.

Table 2: Assessment of Various 2014 Forecasted Net-Load Deviations

Month	Monthly Maximum 3-hour Net-Load Ramp	Smallest Daily Maximum 3-hour Net-Load Ramp of the Month	Largest Secondary 3-hour Net-Load Ramp	Smallest Secondary 3-hour Net-Load Ramp	Largest 15-Minute Net-Load Change	Largest 60-minute Net-Load Change	Largest 90-minute Net-Load Change
Jan	9,148	5,561	7,517	1,453	1,942	5,389	7,113
Feb	8,555	5,054	6,866	1,923	1,639	4,665	5,873
Mar	8,324	4,684	6,723	340	1,400	4,525	6,022
Apr	7,102	2,655	5,985	1,778	1,505	3,750	4,878
May	5,843	2,477	5,276	932	1,282	3,005	3,953
Jun	6,161	2,529	3,088	995	994	2,921	4,033
Jul	6,038	1,688	4,133	1,336	1,073	3,104	3,850
Aug	6,812	2,319	4,325	1,944	1,364	2,752	3,978
Sep	6,239	2,767	5,038	1,655	1,256	3,401	4,221
Oct	7,304	4,412	6,014	2,147	1,393	3,940	5,432
Nov	8,789	4,219	6,297	1,380	1,593	4,820	6,417
Dec	9,635	5,777	7,115	1,391	2,118	5,434	7,275

The ISO then assessed each of these data points relative to the generalized flexible capacity needs of the system. For example, the ISO compared the maximum secondary 3-hour net load ramp in a month to the maximum 3-hour net-load ramp in that same month. Based on these initial comparisons, the ISO determined that developing categories based on 15, 60, and 90 minute net-load changes had two problems. First, such a measurement would not ensure a portfolio of resources that could address the ISO flexibility needs, particularly when it came to days with significant secondary ramps as well as load following needs or intervals of less than 3-hours. For example, in a paradigm where a resource's flexible capacity is measured on a 3-hour weighted average ramp rate, it is not clear that such a category would ensure the ability to cover this ramp rate in 90 minutes. Second, designing flexible capacity categories based on a time period that differed from the defined 3-hour ramp creates an inconsistency between the product procured and the requirement being addressed by that procurement. Therefore, the ISO focused on designing categories that considered both the primary and secondary 3-hour net-load ramps, magnitude of bimodal ramping days, such as the one shown in day 1 of Figure 3, and the difference between the maximum secondary ramps and the maximum primary ramp. This approach has the benefit of providing the ISO with a pool of resources to meet flexible capacity needs while maintaining categories that are consistently defined using the 3-hour ramping metric.

To determine the proper levels of each flexible capacity requirement category and its associated must-offer obligation described above, the ISO reviewed the threshold points for each of the defined needs (i.e. the magnitudes of ramps A-D in figure 3, above) and proposes to set the total quantity of each category as follows:

Category 1 (Base Flexibility): Set at the magnitude of the largest 3-hour secondary net-load ramp

This category should simultaneously address the smallest secondary ramp, largest secondary ramp and the smallest primary ramp. For example, in every month, the largest secondary ramps (item C) are larger than the smallest primary ramps (Item B). This implies that the design of category 2 flexible capacity offer obligations should provide enough flexible capacity to address ramps of the magnitudes of both B and C, above. Hence, the ISO proposes to set the limit on category 2 flexible capacity resources as the difference between the smallest and largest secondary 3-hour net load ramp. Category 1 flexible capacity resources can be used for category 2 and 3 requirements.

Category 2 (Peak Flexibility): Set at the difference between 95 percent of the maximum 3-hour net-load ramp and the largest 3-hour secondary net-load ramp

The remaining flexible capacity offer-obligations are designed to meet larger daily maximum 3-hour net load ramps. The sum total of categories 2 and 3 should ensure that the remainder of the flexible capacity needs is addressed. The ISO proposes to set category 2 as the difference between 95 percent of the monthly maximum flexible capacity requirement and the largest secondary 3-hour net load ramp in recognition that there are only a few super extraordinary ramps in a given month and not every single resource needs to be available for every other ramp. Additionally, category 3 resources can be used to meet category 4 requirements.

Category 3 (Super-Peak Flexibility): Set at five percent of the maximum 3-hour net-load ramp of the month

Category 3 is designed to address the largest monthly ramp needs. As such, the ISO proposes setting category 3 at a maximum of five percent of the total flexible capacity shown in RA showings.

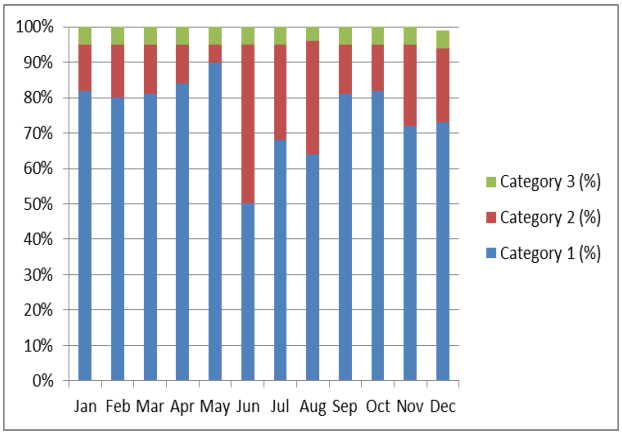
The SC for the LSE can select the category in which a resource is shown as long as the resource meets the category's criteria. For example, a resource that is capable of providing category 1 or 2 capacity could be shown in either or have some portion of the capacity in each depending on the LSE SC's flexible capacity showing.

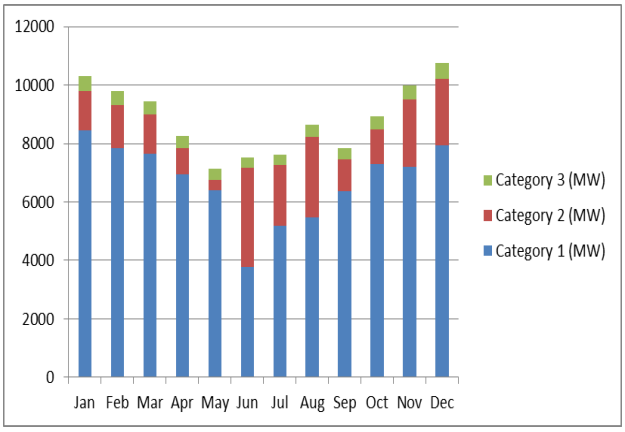
The flexible capacity requirements also include the maximum of 3.5 percent expected peak load or most significant single contingency. The ISO proposes to allocate this piece of the flexible capacity requirement proportionately to each of the flexible capacity categories. This allocation is reasonable because the ISO cannot determine what resources will be used for addressing flexible capacity needs and as opposed to ancillary services. Therefore, the ISO has assumed that it is equally likely that a resource from any given category could provide either.

Figure 4 shows how these categories and needs would be broken down based on the needs and categories defined above using 2014 and 2016 estimates.

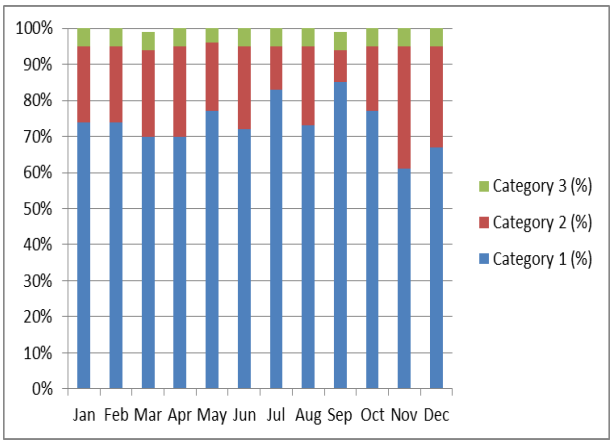
Figure 4: System-Wide ISO Forecasted Flexible Capacity Category Requirements, 2014 and 2016

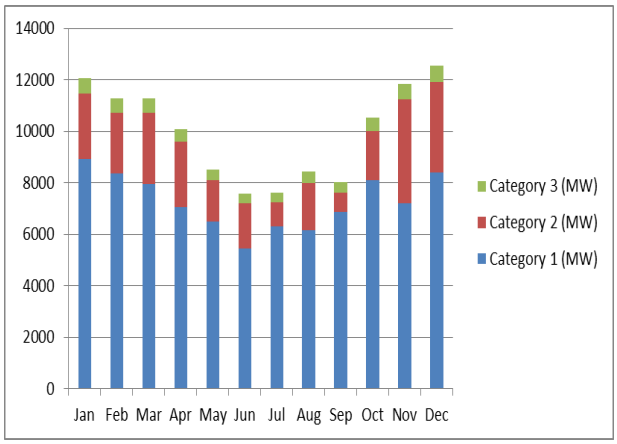
2014





2016





The ISO has combined the previous “unlimited” and “limited” categories into a single category for two reasons. First, after reviewing the 2014 RA showings from CPUC jurisdictional LSEs, which are the only LSEs that provided their LRA with a flexible capacity showing for 2014, the ISO believes that it is not necessary to include an explicit category with 17 hour energy requirements at this time. Although it would result in operational concerns if all resources in the new base flexibility category had a six hour energy limit, there were a limited number of energy limited resources provided in the 2014 showings

that would qualify for the new base flexibility category. Therefore, the ISO believes that the proposal can be simplified at this time by combining the unlimited and limited flexibility categories. Second, and closely related, while the ISO expects that there will be a need for an explicit provision for resources that can provide greater than six hours of energy, at this time there is insufficient information available to specifically define such a requirement.

Going forward, the ISO will conduct on-going assessments to determine how well the categories function to provide the flexible capacity required to address the ISO's flexible capacity needs. At this time we expect that additional information will be available on system needs as well as new procurement policies developed by the CPUC and ISO related to the Joint Reliability Plan developed in 2013 which will provide the basis for potential changes to the proposed flexible capacity product definition. Given the significance of these changes, continued assessment is important to ensure that this addition to the RA construct procures sufficient flexible capacity to address the flexible capacity needs. Second, because the flexible capacity categories and required procurement are new, the on-going assessments will provide information about how well the designed categories are providing flexible capacity that meets the system's operational needs and may identify areas where adjustments or improvements could be made. For example, with actual experience under the three-categories, the ISO may determine that an additional flexible capacity category requiring more than six hours of energy is necessary or there may be opportunities to refine the categories to better accommodate opportunities for preferred resource participation.

The ISO will initiate a stakeholder process in the first quarter of 2016 to discuss with stakeholders the findings of these ongoing assessments as well as any recommendations for potential improvements in the flexible capacity categories or process.

5.5 Must-Offer obligations for flexible capacity categories

Based on this assessment, the ISO proposes four flexible capacity requirement categories, which are based on an assessment of the ISO system's upward flexible capacity requirements,[27] as follows:[28]

Category 1 (Base Flexibility):

- Have flexible capacity that can be available to the ISO market through economic energy and ancillary service bids submitted daily for the period from 5:00 a.m. through 10:00 p.m.
- Resources may be use-limited resources provided they meet the other criteria for the category.

[27] While the basis of the flexible capacity requirement is based on the maximum 3-hour upward ramp, the data the ISO presented at the March 20, 2013 CPUC RA workshop shows downward ramping needs are a quickly growing concern. The ISO will continue to assess the need for an explicit downward flexibility requirement.
[28] Once the ISO's flexible ramping product is implemented, additional must-offer obligations for flexible capacity resources to bid into the flexible ramping market may apply.

- Meet minimum start requirements of either two starts per day or the number of starts allowed by a resource's minimum up and minimum down time operational limits.[29] For example, a resource may have a minimum up time of 24 hours and therefore only be able to start once per day. This resource would be eligible to provide category 1 capacity as long as it can ramp through its EFC region as directed by ISO dispatch. Alternatively, a resource that has a minimum run time of four hours and a minimum down time of two hours would have to be able to provide at least two starts per day.

- Resources must also be able to provide the equivalent of six hours at the full EFC.

- Resources may not have monthly or annual limitations on number of starts or energy limits that translate to less than the daily requirements.

- LSEs must provide at least a set percentage of their total flexible capacity from category 1 flexible capacity resources. This percentage will differ by month based on the monthly system ramping characteristics identified in the flexible capacity requirements assessment.[30]

- Potential examples of the types of resources that might be eligible for category 1 include, but are not limited to, conventional gas fired resources, wind resources hydro resources, use-limited conventional gas fired resources and storage resources with long discharge capabilities.

Category 2 (Peak flexibility):

- Resources must have flexible capacity that can be available to the ISO market through economic bids submitted daily for at least five hours per day. The specific set of hours in which category 2 flexible capacity resources must provide economic bids resources will be determined seasonally.[31]

- Resources may be listed a use-limited resource.

- Resources may not have monthly or annual limitations on number of starts or energy limits that translate to less than the daily requirements. For example, must have at least 30 starts in a month and 90 hours of energy at EFC.

- Potential examples of the types of resources that might be eligible for category 2 include, but are not limited to, solar resources and convention gas fired peaking resources.

[29] To be a category 1 resource, the resource must have at least the following number of starts listed in the Master File: Min { 2, Max(1, number of starts allowed in 24 hours taking into account the resources minimum up time and minimum down time) }.
[30] The ISO considered fixed percentages for each month. However, even with fixed percentages, the actual flexible MW quantity will change from month to month. Therefore, the ISO does not believe there is any benefit gained by fixing the percent contribution to each category for the year.
[31] The seasonal determination will determine if category 4 resources have either an a.m. or p.m. offer-obligation.

Category 3 (Super-peak flexibility):

- Energy option:
    - Resources must have flexible capacity that can be available to the ISO market through economic bids submitted on all non-holiday weekdays for at least five hours per day.
    - The hours for which these resources will be required to submit bids will be determined seasonally.
    - Resources must have a minimum of 3 hours of run time per dispatch, and available for at least 5 flexibility based dispatches per month.
    - The specific set of hours in which category 3 flexible capacity resources must provide economic bids resources will be determined seasonally.
- Regulation Energy Management Option: Resources Must provide regulation bids from 5:00 a.m. through 10:00 p.m.
- Potential examples of the types of resources that might be eligible for category 3 include, but are not limited to, short discharge battery resources providing regulation and demand response resources.

All types of supply, regardless of technology, can be sold or committed in any of the categories provided it can meet the minimum availability requirements and is will to be available consistent with the applicable must-offer obligation. The ISO envisions the offer-obligation within each of the categories will apply to all resources shown in that category, regardless of the technology of the resource. For example, hydro resources and a use-limited gas fired resources shown as category 1 flexible capacity resources will both have the same offer and replacement requirements. Use-limited resource are required, consistent with their applicable use-limitations, submit economic bids for their flexible capacity category into the real time market. In a subsequent stakeholder initiative, the ISO will design a flexible capacity availability mechanism, the functionality to allow flexible capacity resources to include opportunity costs into start-up and minimum load costs, and additional replacement and substitution rules for flexible capacity resources. Once these tools are designed and in place, flexible capacity resources may be subject to addition to availability charges. However, as discussed below, for the 2015 RA compliance year, resources that reach monthly or annual use-limitations during a month or are on a placed or forced outage will not be subject to additional availability charges or required to provide substitute or replacement flexible capacity. However, the ISO will, for the 2014 and 2015 RA compliance years, calculate the compliance with the must offer obligation of each category and publish this list to help inform LSEs in their future flexible capacity procurement.

Table 3 provides an overview of the minimum operating characteristics and must-offer obligations for each of the categories.

Table 3: Overview of minimum operating characteristics and must-offer obligations

Parameter	Category 1 (Base Ramping)	Category 2 (Peak Ramping)	Category 3 (Super-Peak Ramping)
Economic Bid Must-Offer Obligation	5:00 a.m. – 10:00 p.m.	5 hour block (determined seasonally)	5 hour block (determined seasonally)
Energy Requirement	Minimum 6 hours at EFC	Minimum 3 hours at EFC	Minimum 3 hours at EFC
Daily Availability	7 days/week	7 days/week	Non-holiday weekdays
Daily Start-Up Capability	The minimum of two starts per day or the number of starts allowed by operational limits as determined by minimum up and down time (see examples above)	At least one start per day	At least one start per day
Maximum or Minimum Quantity of Capacity Allowed in Category	Minimum requirement set monthly based on largest secondary net load ramp	Maximum set based on difference between the 100% of the requirement and category 1	Maximum of 5% per month of the total requirement per month
Other Limitations	No monthly or annual limitations on number of starts or energy limits that translate to less than the daily requirements	No monthly or annual limitations on number of starts or energy limits that translate to less than the daily requirements	Must be capable of responding to at least 5 dispatches per month
Examples of resource Types that Could Qualify for Category	Conventional gas fired resources, wind resources hydro resources, and storage resources with long discharge capabilities	Use-limited conventional gas fired resources, solar resources and conventional gas fired peaking resources	Short discharge battery resources providing regulation and demand response resources

6 RA Showings and Replacement

Currently, the ISO conducts an annual and monthly RA evaluation process in which both LSEs and suppliers, through their scheduling coordinators, submit RA plans and supply plans, respectively. The RA plans identify the specific resources that the LSE is relying on to satisfy its forecasted monthly peak demand and reserve margin for the relevant reporting period. The supply plans confirm the suppliers' agreement to provide this capacity. The ISO uses these plans to determine whether there is a shortfall in the RA capacity that will be available to the ISO during the month and whether there is a need for the ISO to use its backstop capacity procurement mechanism.

The ISO will integrate the flexible capacity requirement evaluations into the existing annual and monthly RA evaluation processes. The scheduling coordinator for each LSE will be required to submit an annual showing to the ISO listing 90 percent of their allocated flexible capacity requirement for each month. These annual showings will be due by the last business day of October, the same time as the annual RA plans. Additionally, the scheduling coordinator for each LSE will be required to submit to the ISO a monthly demonstration that they have fulfilled 100 percent of their monthly flexible capacity requirement, which will be due by 45 days prior to each month, the same time as the monthly RA plans. Prior to 2015 implementation, the ISO will update its RA templates to allow LSEs to include flexible capacity commitments.

The ISO will require that the scheduling coordinator for each LSE submit separate showings for flexible and generic capacity procured. Resources that are shown only on the flexible capacity RA showing will be subject to the flexible capacity offer obligations and any future applicable availability charges and credits, but not the generic RA availability requirement and applicable availability charges and credits. For example, an SC for an LSE that is using a generating resource for 100 MW generic capacity and 60 MW of flexible capacity would submit a generic RA showing for 100 MW and a flexible showing for 60 MW.

The ISO will validate the annual and monthly flexible capacity showings consistent with its current validation process for the annual and monthly resource adequacy plans and supply plans. The ISO will not require that the resources listed in the year-ahead flexible RA showing be the same resources as in the month-ahead showings. The ISO will notify SCs for LSEs at least 25 days prior to the start of the month if there are any deficiencies or if replacement flexible capacity is needed to address a planned or approved outage that impacts the LSE's flexible capacity compliance. The SC for the LSE will have until 11 days prior to the month to cure any deficiencies or resolve any irregularities in the RA showing. The ISO will then verify and validate that each SC for an LSE has met its flexible capacity showing requirements for the 2015 RA compliance year. If the scheduling coordinator for the LSE does not submit a plan that meets its flexible RA capacity requirement, and does not cure the deficiency, then the ISO may exercise backstop procurement authority for flexible capacity deficiencies, discussed in detail in section 7, below.

For 2015 RA compliance, the ISO does not propose to apply its replacement requirement to flexible capacity due to intra-month outages of flexible capacity resources. However, the ISO anticipates that

functionality to substitute flexible capacity to address forced outages will be developed as part of a future stakeholder initiative compliance year when the flexible capacity availability incentive mechanism is put in place. This is discussed in greater detail in section 8, below. Finally, the ISO may issue backstop procurement for deficiencies for the 2015 RA compliance year. The ISO will not implement backstop procurement for planned and approved outage replacement (i.e. the ISO's recently approved replacement rule) flexible capacity in the 2015 RA compliance year.[32]

The ISO will use the following formulas for determining the effective flexible capacity of a resource[33] in evaluating the showing by the scheduling coordinator for an LSE against the flexible capacity requirement:

<u>If start-up time of a resource is greater than 90 minutes:</u>

EFC is limited to the MW range between Pmin and Net Qualifying Capacity (NQC) as limited by ramp rate

EFC = minimum of (NQC-Pmin) or (180 min * RRavg)

<u>If start-up time of a resource is less than or equal to 90 minutes:</u>

EFC is limited to the MW range between zero and NQC as limited by start-up time and ramp rate

EFC = minimum of (NQC) or (Pmin + (180 min – SUT) * RRavg)

Where: SUT = Longest (cold) RDT start-up time in minutes

RRavg = average MW/min ramp rate between Pmin and NQC

A hydro resource will qualify as flexible capacity for the amount of output its physical storage capacity allows it to provide as energy equivalent to output for 6 hours. Flexible capacity must be able to respond five-minute dispatch instructions. Therefore, intertie resources and imports that are not pseudo-tied or dynamically scheduled into the ISO are not eligible to provide flexible capacity at this time.[34] Currently, multistage generating resources' EFC is calculated assuming the resource is at a cold start and in a 1x1 configuration.[35]

[32] The seasonal determination will determine if category 4 resources have either an a.m. or p.m. offer-obligation.
[32] Existing rules for replacing capacity on planned outage will still apply. The ISO is continuing to assess the need to implement a rule for replacing flexible capacity on planned outage.
[33] This counting convention will be used for all resources except storage resources that are meeting the must-offer obligation by providing regulation services.
[34] The ISO will continue to assess the ability of imports to provide flexible capacity once we have had experience with 15 minute intertie schedules and individual flexible capacity products that allow for separation of the ISO's ramping and load-following needs.
[35] The ISO is working with the CPUC to determine if different counting criteria should be considered in the current RA proceeding and may revise these assumptions as appropriate based on the determination of this work.

The ISO has also reviewed the counting criteria for combined heat and power (CHP) units or similar resources that are tied to a primary industrial process where electricity is a byproduct. The ISO proposes to calculate the EFC of CHP resources in the same manner as proposed for other conventional resources. The ISO understands that there are a variety of different type of CHP resources and that using the same EFC calculation may not fully capture specific industrial considerations that might reduce the amount of EFC a CHP resource might wish to sell for a given month or year. However, CHP resources, along with any generating resource, will have the ability to designate any of its capacity EFC as "generic capacity" based on the underlying industrial processes. Such generic RA capacity would have the option to submit either self-schedules or economic bids, but would not have the flexible RA capacity must-offer obligation to submit economic bids. However, any CHP capacity listed as flexible capacity that is self-scheduled for the hours for which flexible capacity is required to submit economic bids will be subject to charges under the flexible capacity availability incentive mechanism, once put into place. Additionally, some of CHP resources have a "reliability-must-take" capacity amount listed in the ISO's master file. The reliability-must-take portion of the resource is set based on the maximum possible obligation of delivery of thermal energy from a CHP unit's thermal host. The ISO believes that the reliability must take portion of these resources' should be considered by the SC for the CHP resource when determining how much flexible capacity it wishes to list as RA flexible capacity. This could reduce the amount of EFC listed by some qualifying facilities, but would ensure that the resources are better able to maintain flexibility consistent with their underlying industrial processes. As with other resources, the EFC for combined heat and power resources will be limited by the resource's NQC.

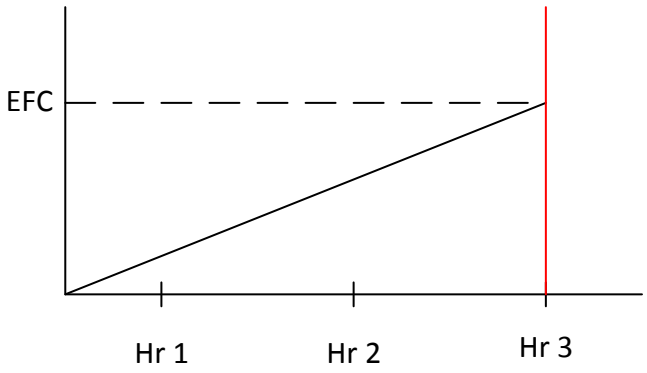
The ISO proposes to determine the EFC of demand response resources through the use of a test event during the demand response resource's selected flexible capacity must-offer obligation window. The CPUC foresaw the possibility of the need for such an option in D.10-06-036.[36] The ISO sees this as an opportunity to move demand response resources into the ISO's marketplace by providing an effective flexible capacity counting methodology that matches the resource's must-offer obligation. The test event would occur randomly and would use the previous ten days load data for the PDR resource to measure the load reduction and paid the resources bid price for the testing period. Any actual DR dispatch can be used as a measurement of the DR resource's EFC. The ISO recognizes that it will need to coordinate with the CPUC and other LRAs to coordinate this with their counting rules for demand response providing "generic" RA capacity. For example, the CPUC's current RA counting conventions for demand response resources allows demand response resources to demonstrate their ability to drop load between the hours of 1:00 p.m. and 6:00 p.m. These hours obviously do not correspond with the ISO's proposed flexible capacity must-offer obligation windows. Thus, the ISO may need to modify this flexible capacity counting rule for DR in the future.

Currently, the ISO is working with the CPUC and other parties in the RA proceeding to establish a qualifying capacity counting methodology to allow energy storage resources to count towards an LSE's

[36] On p.38 of D.10-06-036 the CPUC states "with proper economic incentives for accuracy, it is reasonable that DR resources that act like a dispatchable supply resource may appropriately have QC evaluated via a test, similar to dispatchable conventional generators."

generic RA requirements. With the intent of moving expeditiously to establish the framework for energy storage resources to provide flexible capacity, the ISO is proposing as part of this stakeholder initiative to establish an initial effective flexible capacity methodology specific to energy storage resources. Specifically, the ISO proposes that storage elect one of two options: Regulation Energy Management or fully flexible capacity. Each of these options would have a separate Effective Flexible Capacity counting criteria and associated must-offer obligations (the must-offer obligations are detailed in section 5.5). The effective flexible capacity for energy storage resources electing the regulation energy management would be set at the lesser of a resource's 15 minute energy output capability or the resource's NQC. The ISO will determine the EFC of energy storage resources selecting the full flexible capacity option based on the MW output the resource can deliver after three hours of discharge at a constantly increasing discharge rate (i.e. ramp rate). See Figure 5 for an example. Storage resources selecting the full flexible capacity option will be required to submit economic energy and ancillary service bids for the time period applicable to the category for which they are shown for flexible capacity. The ISO will continue to review the appropriateness of this approach in the recently opened Reliability Services initiative as well as in coordination with the CPUC in its current RA proceeding (R.11-10-023).

Figure 5: Example of EFC of storage resource over a 3 hour dispatch with constant ramp rate



The ISO has spent significant time considering the proper methodology for counting the charge and discharge capabilities of storage resources for flexible capacity purposes and believes that there is additional work that needs to be done to consider additional flexible capacity potential of energy storage resources in subsequent stakeholder initiatives. However, at this time, it is prudent to account for full flexible capacity storage resources based on the three hour discharge. Some will assert that this is a conservative approach. The ISO agrees. However, at this time, as we continue to learn more about the capabilities, potential, and operational characteristics of energy storage resources, it is reasonable to take a somewhat conservative approach. The ISO will continue to review the prudency of this approach in the recently opened Reliability Services initiative as well as in coordination with the CPUC in the RA proceeding (R.11-10-023).

The ISO will continue to monitor the pool of resources in each bucket to determine if there is any need to include any limitations beyond potential limits based on the bounds of the flexible capacity offer-obligation categories laid out below for either or both buckets the future.

7 Backstop Procurement

Currently, the ISO has the authority to issue a capacity procurement mechanism designation for the following reasons:

1. Insufficient Local Capacity Area Resources in an annual or monthly Resource Adequacy Plan;
2. Collective deficiency in Local Capacity Area Resources;
3. Insufficient Resource Adequacy Resources in an LSE's annual or monthly Resource Adequacy Plan;
4. A CPM Significant Event;
5. A reliability or operational need for an Exceptional Dispatch CPM; and
6. Capacity at risk of retirement within the current RA Compliance Year that will be needed for reliability by the end of the calendar year following the current RA Compliance Year.

The ISO believes that above listed reasons do not currently provide the ISO the tariff authority to issue back stop procurement for a collective deficiency in year-ahead or month-ahead flexible RA showings. Therefore, the ISO proposes to add a collective system-level deficiency in capacity shown as RA flexible capacity to the reasons the ISO may issue a capacity procurement mechanism designation. The ISO would evaluate the RA showings by category in determining if there is a collective deficiency. As the ISO's backstop Capacity Procurement Mechanism expires in February 2016, the ISO proposes to use the same price for backstop procurement of flexible as the applicable capacity procurement mechanism price.

As with other types of RA deficiencies, the ISO will only seek authority to issue a backstop designation if there is a cumulative deficiency. The ISO will measure a cumulative deficiency relative to the ISO's flexible capacity requirement. If the ISO does issue a capacity procurement mechanism designation, then the costs of the capacity procurement mechanism designation would be allocated to all LSEs within a deficient LRA, through their SC's, that are deficient in procuring flexibility capacity unless the LRA has established its own rules for allocating shortfall costs to SC for LSEs. In this event, the ISO would determine the allocation of backstop costs by first determining the LRA(s) that is (are) short based on the ISO's flexible capacity requirement allocation methodology. The ISO would then allocate the backstop costs to the SCs for the LRA's jurisdictional LSEs that are short as determined using the allocation methodology specified by the LRA.[37] If all LRAs are sufficient in their flexible capacity showings, then the ISO will not issue a CPM designation.

[37] As discussed in section 5, above, it is the CAISO's intention to use the LRA's methodology to determine the LSE's respective flexible capacity requirement allocation as the basis for determining which if any LSE is deficient in an applicable showing and for determining how to allocate any applicable backstop procurement costs. The ISO will work with LRAs to ensure that any backstop procurement cost allocations are done using the methodology applied by the LRA. For example, if the ISO's assessment shows an LRA's LSE flexible capacity requirement is 5,000MW and

In instances where there are simultaneous collective deficiencies in both system RA and flexible RA, each caused by different LSEs (i.e. one LSE SC is deficient system capacity and another LSE SC's is deficient flexible capacity), the ISO will backstop for the flexible capacity deficiency first and allocate costs consistent the cost allocation methodology described in this proposal. Resources accepting this designation would be subject to both the generic and flexible capacity must-offer obligations.[38] The ISO will count this capacity towards the collective system deficiency and determine if it is sufficient to cover the collective capacity deficiency. If it does, then there will be no additional backstop procurement. If additional backstop procurement is need to address any remaining collective system capacity, the ISO will procure any additional system capacity and allocate costs according to the existing backstop procurement provisions. The ISO will only issue backstop procurement to non-RA capacity to avoid double payments to the same capacity.

On July 10, 2103, the ISO and CPUC issued the Joint Reliability Framework.[39] Ultimately, the Joint Reliability Framework is aimed at establishing multi-year forward procurement commitments as the ISO develops a market-based backstop procurement mechanism to replace or supplement the existing Capacity Procurement Mechanism. This mechanism will be developed in the Reliability Services stakeholder initiative.[40]

8 Flexible Capacity Availability Incentive Mechanism

The ISO's existing availability incentive mechanism (i.e. standard capacity product) applies a charge or incentive payment based on an RA resource's availability relative to the RA fleet average during the peak periods of the day. However, the ISO's greatest demand for flexible capacity may not be during the times of peak demand. In addition, the standard capacity product only measures availability as measured by forced outage rates while the ISO needs economic bids for flexible capacity. Therefore, the ISO must establish a new availability incentive mechanism and measurements for flexible capacity resources that expands the current parameters established in the existing availability standards for generic RA capacity.

While the ISO believes that much of the existing availability incentives can be leveraged to help develop an availability incentive mechanism for flexible capacity, there are still critical aspect of such a mechanism that must be developed independently. In previous revisions to this straw proposal the ISO proposed various methods to price flexible capacity availability. However, there is not currently a clear

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the LRA allocates that 5,000MW based on peak-load ratio share to its jurisdictional LSEs, then the ISO will allocate backstop costs to that LRA's LSE based on peak-load ratio share.

[38] As with any CPM designation, acceptance is voluntary

[39] The CPUC authorized staff to work with the ISO on this initiative at the December 5, 2014 commission meeting. The ISO board approved this plan at the December 18, 2013 Board of Governors Meeting. The Joint Reliability framework can be found at http://www.caiso.com/informed/Pages/StakeholderProcesses/Multi-YearReliabilityFramework.aspx

[40] Information on the Reliability Services stakeholder initiative is available at http://www.caiso.com/informed/Pages/StakeholderProcesses/ReliabilityServices.aspx

basis to establish this price. As such, the ISO proposes to delay final development of this incentive mechanism to later in 2014. This would allow for the pricing of the incentive mechanism to be informed by two other related policy initiatives the Reliability Services Auction, and the Flexible Ramping Product while still allowing for the implementation to occur by 2016 as originally planned.

8.1 Use-limited Resources – Opportunity Cost Methodology

Many dispatchable gas-fired resources that the ISO relies on to meet flexible reliability requirements are subject to environmental use-limitations mandated by a regulatory entity. The ISO and market participants must manage resources that have monthly or annual use-limitations in order to efficiently allocate the available energy from use-limited resource over time. Physical use-limitations may prevent use-limited resources from operating during all the hours covered by the proposed must-offer obligation for flexible capacity resources. Without provisions to accommodate use-limited resources, a requirement to submit economic bids during these hours could result in these resources being dispatched too often and therefore unable to continue meeting the bidding requirement. This would subject these resources to potentially high incentive mechanism penalty risk and therefore most use-limited resources would not feasibly be able to participate in the flexible resource adequacy program. However, as noted above, the ISO proposes to delay the development and pricing of the Standard Flexible Capacity Product to a later date. Because there is no additional risks associated with replacement or substitution of flexible capacity, the ISO will defer further development of this aspect the straw proposal as well.

8.2 Substitution for Forced Outages

The current SCP allows RA resources that are forced out to provide the ISO with substitute capacity to maintain compliance with the SCP. This allows RA resources to mitigate the risks of non-availability charges while ensuring the ISO has access to sufficient capacity despite the forced outage. The ISO believes that having a similar tool in place for flexible capacity that is forced out will provide similar benefits, particularly once an availability incentive mechanism is implemented. However, the ISO believes that it is appropriate to defer a requirement to provide substitute flexible capacity until resources SC have a complete set of tools to effectively manage the potential outage risks. This includes an opportunity costs calculation for start-up and minimum load costs calculation for use-limited resources as outlined in section 8.1, above. Therefore, the ISO will not require flexible capacity resources that are on forced outage or use-limited resources shown on resource adequacy plans as flexible capacity but have reached a monthly or annual use-limitation to provide substitute flexible capacity for 2015. However, any resource that is shown on both the generic and flexible capacity RA showings will still be subject to generic RA substitution rules in order to avoid availability under the existing standard capacity product rules.

9 Next Steps

The ISO will host a stakeholder call on meeting on February 12, 2014 to discuss the contents of this straw proposal. Stakeholder comments on this straw proposal will be due February 21, 2014. The ISO anticipates seeking ISO Board approval at the March 2014 Board Meeting.