Flexible Resource Adequacy Criteria and Must-Offer Obligation

Market and Infrastructure Policy
Revised Straw Proposal

June 13, 2013

Straw Proposal

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1 Introduction

The ISO, in collaboration with the California Public Utilities Commission (CPUC) and other local regulatory authorities (LRAs), must ensure the resource fleet has sufficient flexibility, including ramping and load following capabilities, to satisfy ramping and multi-hour and intra-hour variability needs, while also having sufficient contingency reserves to ensure the security and safety of the grid. 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 Renewable Portfolio Standard.[1] 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 area authority must consider its operational needs beyond what historically has been satisfied by system, often termed "generic capacity," and local capacity.

On May 28, 2013, the CPUC released the proposed decision in its Resource Adequacy (RA) proceeding,[2] which would put in place an interim mechanism that establishes flexible capacity procurement obligations as part of the CPUC's RA program. The proposed 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 proposed decision also outlines the counting conventions the CPUC will use for counting conventional resources towards meeting flexible capacity procurement obligations and highlights outstanding issues to resolve in the next RA cycle. The ISO appreciates that the list of priority issues in the proposed decision includes a recommendation made by the ISO to focus on establishing counting rules for use-limited resources like demand response, storage, and resources with environmental restrictions.

The ISO supports the CPUC proposed decision as an appropriate interim solution to address the system's need for flexible capacity while a more enduring and holistic solution that 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. Addressing these needs will require more precise and forward looking capacity procurement. 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.

[1] For a more detailed discussion of these studies, see http://www.caiso.com/Documents/SecondRevisedDraftFinalProposal-FlexibleCapacityProcurement.pdf.
[2] The CPUC's RA Proposed Decision is available at http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M065/K705/65705989.PDF.

With the addition of flexible capacity procurement targets in the CPUC's RA program and the on-going discussions with non-CPUC jurisdictional LRAs, the ISO must make tariff changes to equitably allocate the ISO system's flexible capacity requirements to the various scheduling coordinators with load in the ISO system. The ISO is striving to coordinate with all LRAs so that the ISO's flexible capacity requirements are consistent with load serving entity's procurement obligation established by the applicable LRA.

As outlined in this straw proposal, the ISO proposes the equitable way to allocate monthly flexible capacity procurement requirements to each load serving entity in proportion to its contribution to the 3-hour net-load ramp.[3] The ISO must also make other tariff changes to enable it to be able to effectively use this flexible capacity, such as establishing a bidding (or "must-offer") requirement and associated availability metrics.

The ISO began work on some of these issues as part of this stakeholder process, initiated in December 2012. Since then, these issues have been further developed and the proposal has been updated. In this stakeholder initiative, to implement the flexible capacity requirements for 2015 RA compliance, the ISO will work with stakeholders to implement the following measures:

- A 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.

- A flexible capacity allocation methodology that applies to scheduling coordinators for load serving entities (LSE SC) in the ISO balancing area. The ISO will allocate the proportion of the system flexible capacity requirement to each LSE SC based on its contribution to the ISO's largest 3 hour net-load ramp change each month. The ISO will calculate each LSE SC's contribution to the net load change using changes in load, wind output, solar output, and distributed generation. The ISO will perform these calculations using data provided by each LSE SC for use in the ISO's annual flexible capacity needs assessment and will provide the results to each LRA at the same time as the annual LCR study results.

- Requirements for LSE SC's to provide RA showings to the ISO demonstrating adequate and timely flexible capacity procurement. Similar to the current RA program, each LSE SC will include a showing of its flexible capacity procurement to the ISO that lists its flexible capacity. The flexible capacity resources listed will make a similar showing confirming they have agreed to supply the listed flexible capacity. This will consist of both annual and monthly showings. Also, LSE SC's will be expected demonstrate that they have procured 90 percent[4] of their flexible capacity requirement for the year-ahead plan and 100 percent of their flexible capacity requirement in the month-ahead RA plan.

[3] Net-load is defined as load minus wind and solar output.

[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.

- An assessment of the adequacy of an LSE SC's flexible capacity showing towards meeting its flexible capacity requirement using a flexible capacity counting methodology that considers each resource's start-up time and weighted average ramp rate.

- Availability requirements for flexible capacity resources that require all resources included as flexible capacity resources in RA plans to submit economic energy bids into the ISO's day-ahead and real-time markets from 5:00 AM through 10:00 PM in addition to the existing availability requirements for generic RA capacity. We anticipate that the majority of use-limitations for thermal, hydro, and demand response resources can be managed, while still requiring bidding during all of these hours, through constraints modeled in the ISO market or through appropriate default energy bids or start-up costs that reflect these constraints.

- ISO backstop procurement authority that allows the ISO to procure flexible capacity on a one-year forward basis based on deficiencies in LSE SC's annual of monthly flexible capacity procurement relative to the system requirement.

- A flexible capacity availability incentive mechanism that maximizes the incentive to make flexible capacity resources used for flexible capacity forward procurement requirements available to the ISO markets. Because such an incentive mechanism should also consider bidding behavior in addition to forced outage rates, the ISO will revisit designing the flexible capacity availability incentive mechanism after market participants have more experience with the new bidding rules.

The ISO plans to complete this stakeholder initiative by December 2013 and have these measures in place for 2015 RA compliance.

1.1 Schedule

It is critical that the ISO complete the stakeholder process by December 2013 in order to allow the ISO and market participants to complete all the necessary implementation processes in time for the 2015 RA compliance year. As such, the ISO offers the following updated schedule for this stakeholder process:

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

Date	Action
June 26, 2013	Stakeholder comments on Revised Straw Proposal due
July 17, 2013	Second Revised Straw Proposal posted
July 24, 2013	Stakeholder Meeting
July 31, 2013	Stakeholder comments on Second Revised Straw Proposal due
August 15, 2013	Third Revised Straw Proposal posted
August 22, 2013	Stakeholder meeting
August 29, 2013	Stakeholder comments on Third Revised Straw Proposal due
September 18, 2013	Draft Final Proposal
September 26, 2013	Stakeholder call
October 8, 2013	Stakeholder comments on Draft Final Proposal due
December 18, 2013	Board decision

2 Background

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) Multi-year forward resource adequacy requirements, and

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

This stakeholder initiative addresses the first of these items.

The ISO believes that reliability 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.[5] 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).[6] The Joint Parties Proposal detailed an interim solution to addressing the ISO's flexible capacity needs while a long term solution is devised.[7] After submitting the Joint Parties Proposal to the CPUC, the ISO continued to work with parties in the RA 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.[8] 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.

The ISO began work on some of the issues addressed in this straw proposal as part of the initial steps taken in December 2012. Originally, the ISO planned to run a two phased stakeholder initiative that would conclude at the end of 2013. However, this initiative was delayed while the ISO worked with the CPUC to include flexible capacity procurement obligation in the RA program. With this proposal, the ISO is combining the two phases into one, with the goal of completing the stakeholder process by the end of 2013 to support implementation for the 2015 RA compliance year.

3 Determining Flexible Capacity Needs: The ISO's Flexible Capacity Needs Assessment

Each year, the ISO will conduct an annual assessment to determine the flexible capacity needs for the upcoming RA compliance year. The ISO's flexible capacity needs assessment will be undertaken on a schedule that mirrors the ISO's LCR study schedule for the local capacity requirement. 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 the assessment. Stakeholders will have an opportunity to provide comments on this methodology. Upon completion of this assessment, the ISO will provide the final results of flexible capacity needs assessment by May 1 to each LRA and LSE SC in the ISO balancing area.

[5] The ISO believes future procurement must consider how to implement separate procurement requirements for multiple flexible capacity products.
[6] 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).
[7] The CPUC has included the Joint Parties Proposal in the Scoping Memo issues in R.11-10-023 on December 6, 2012.
[8] The proposed methodology for assessing hydro resources flexibility is included as an attachment to this revised straw proposal.

The proposed flexible capacity needs assessment methodology for determining each LSE SC's contribution mirrors the method used in the CPUC's RA proceeding (R.11-10-023). The flexible capacity needs 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 year upcoming RA compliance year. Additionally, all LSE SCs will submit to the ISO two lists detailing existing contracts with intermittent resources for the RA compliance year in question as well as details about additional intermittent resources that they expect to come on line in the next five years. The first list, which will be made publically available, must 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 LSE SC should also state whether the resources are existing or include the expected on-line date of each resource. If an LSE SC has any confidentiality concerns they may aggregate multiple adjacent CREZs to mask any confidential information. Additionally, the LSE should inform the ISO how much of the balancing services for intermittent resources from each non-ISO CREZ are provided by an adjacent balance area authority. The second list, which the ISO will consider to be confidential, will be used to validate the aggregated figures. This list should be based on the same information as the aggregated list, but should provide the data on a resource-by-resource basis. The ISO will use these data to generate minute-by-minute net load data and will be used to determine the maximum 3-hour net load curve for each month.

The accuracy of the data submitted by each LSE is critically important because the contractual information will be used by the ISO to determine the flexible capacity requirement and allocation of this requirement to LSE SCs. If an LSE SC submits inaccurate data, it may result in an inaccurate calculation and allocation of flexible capacity requirements. If an LSE SC submits inaccurate data, the ISO, upon discovering the inaccuracy, may rerun the flexible capacity needs assessment and recalculate flexible capacity requirement for the entire year to determine the impact of the inaccuracy. 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 needs assessment. The ISO will allocate the proceeds to LSEs that procured too much flexible capacity because of the inaccurate data. If the inaccurate data result yields a lower flexible capacity requirement allocation, then result for the LSE, then no change in the flexible capacity allocation will be made and no additional charges imposed.

3.1.1 *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 needs 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 using the following formula:

$$\text{Flexibility Requirement}_{MTHy} = \text{Max}[(3RR_{HRx})_{MTHy}] + \text{Max}(MSSC, 3.5\%*E(PL_{MTHy})) + \varepsilon$$

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 will utilize the renewable resource profiles used in the base case scenario from the CPUC's 2012 Long Term Procurement Planning proceeding to conduct this assessment. The ISO will update the RPS build-out data annually based the contracted RPS capacity data used in the investor owned utilities' (IOUs') December 2012 RPS Compliance Reports to the CPUC.[9] A breakout of the RPS build-outs and load assumptions used by the ISO for the 2014 flexible capacity needs 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.

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

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

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
ISO	Solar PV	1,345	1,645	3,193	3,727	4,205	5,076
ISO	Solar Thermal	419	373	748	968	1,718	1,918
ISO	Wind	5,800	1,224	1,402	1,685	1,695	1,695
Sub Total 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

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, the ISO determined the maximum forecasted 3-hour net load ramp for each month. The ISO will calculate the 3-hour ramp as the quantity of MWs the ISO must ramp across a three hour period.

3.1.2 *The Results of the ISO's Flexible Capacity Needs Assessment for 2014*

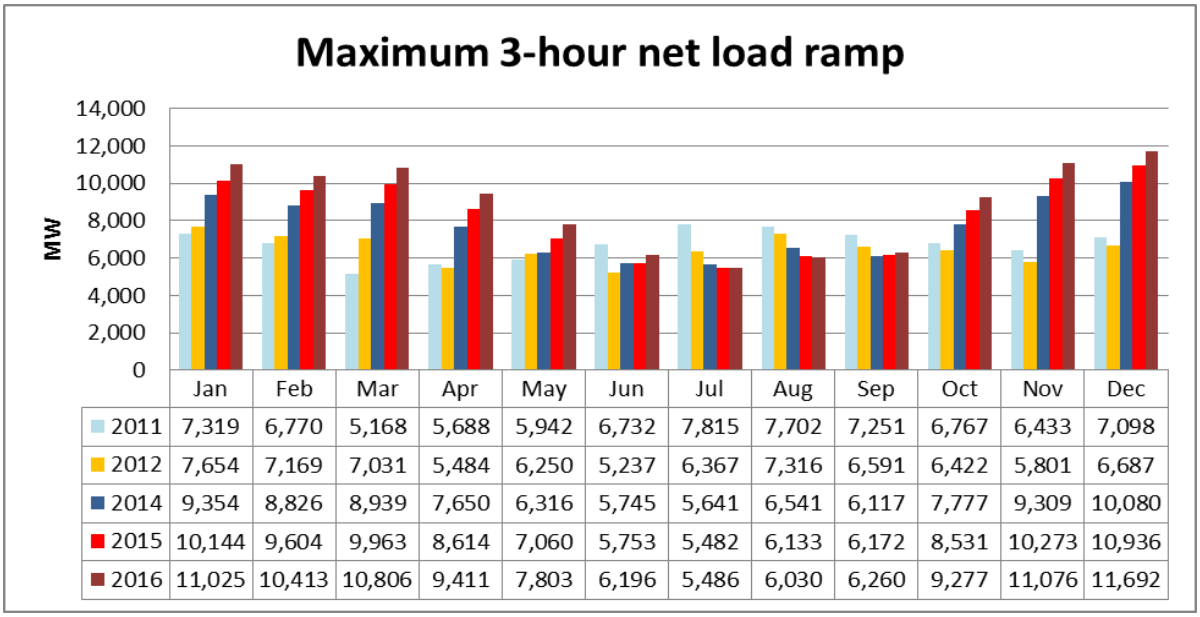
The maximum 3-hour net load ramps produced using this methodology are shown in Figure 2. In addition to assessing forecasted ramps, the ISO used this methodology to determine what the flexibility needs for 2011 and 2012 would have been for 2011 and 2012. As shown in Figure 2, in the ISO expects to see an increase in the amount of net load that must be met by flexible resources 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 – 1000 MW year-over-year through 2016.

Finally, the ISO calculated the total flexible capacity requirement[10] for 2014-2016 using the formula descibed in section 3.1.1, above. The results of this calculation are shown in Figure 3. Flexible capacity requirments are greatest in the non-peak months and consistent with the increase in the maximum 3-hour net load ramps.[11]

[10] 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.

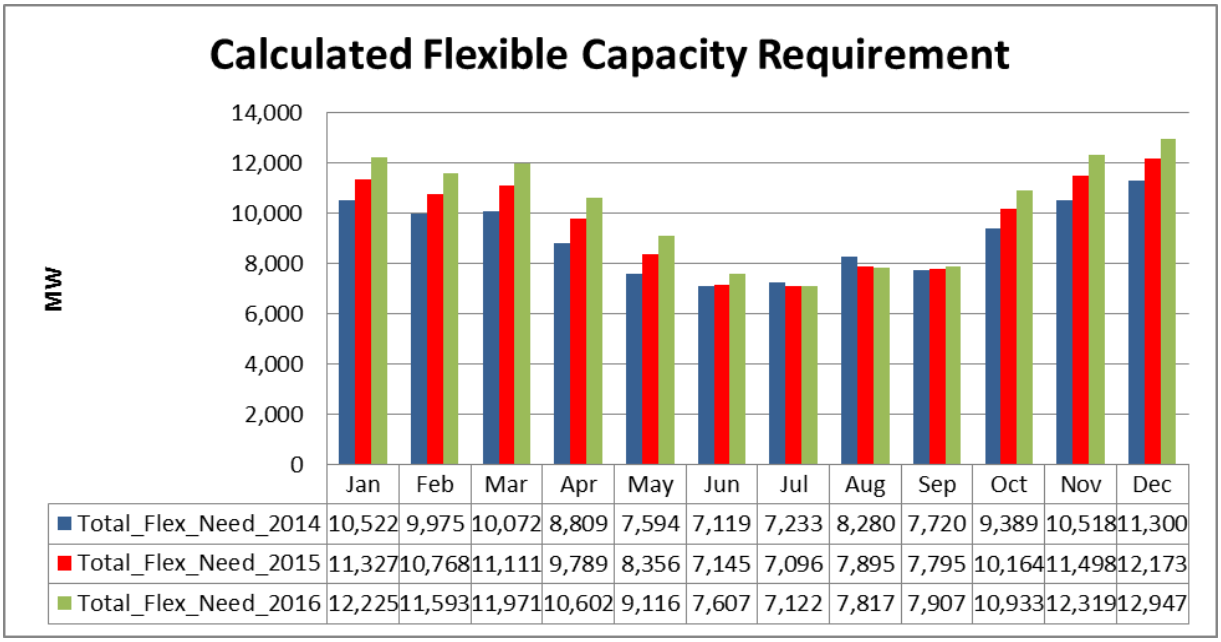
[11] This indicates that much of the increase in flexibility requirements is driven by the increase in the 3-hour net load ramp and not by load growth.

Figure 2: 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 3: 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

4 Proposed Allocation of Flexible Capacity Requirement

The allocation of the flexible capacity procurement obligations will be done at the LSE level and based on the LSE's contribution to the overall system flexible capacity requirement. While the ISO will allocate flexible capacity requirements to each LSE (through their SC), the ISO will also calculate and

provide to each LRA its jurisdictional LSEs individual requirement and the total requirement for all its jurisdictional LSEs. As noted above, the flexible capacity requirement is comprised of two 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.

The ISO proposes to calculate the maximum of the MSSC or 3.5 percent of forecasted peak load for each LSE based on its peak load ratio share. The maximum 3-hour net load ramp will be broken out to try to capture the 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 very specifically 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
4) Changes in solar thermal
5) Changes in distributed energy resources

These five components, when combined, yield the total 3-hour net load change used in the ISO's flexibility needs assessment. In order to allocate the total flexible capacity need, it is important to determine each LSE's relative contribution to each of these components. The ISO proposes to use the following methodology to establish each LSE's contribution to each component.

1) Δ Load – Peak load ratio share x total change in load
2) Δ Wind Output – Percent of total wind contracted x total change in wind output
3) Δ Solar PV – Percent of total solar PV contracted x total change in solar PV output
4) Δ Solar Thermal – Percent of total solar thermal contracted x total change in solar thermal output
5) Δ Distributed Energy Resources – Peak load ratio share x total change in DG output

For items 1 and 5, above, the ISO proposes to allocate changes in load and distributed generation by peak load ratio share. However, the ISO seeks stakeholder input to assess other measurements that might be used for these items. For the calculations used for items 2 through 4, 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.[12] However, the ISO believes that this is the appropriate level of granularity. While the flexibility needs are calculated using a single metric, the ISO will have to address flexibility needs outside of this three hour period. Additionally, the flexible capacity

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

requirement is a forecast and attempting to determine each contracted resource's contribution is unlikely to yield a more accurate estimate of an LSE SC's actual after the fact contribution to the flexible capacity need. However, the ISO seeks stakeholder input as to whether this proposed allocation methodology provides the right level of detail, or if more or less detail is required.

Finally, these changes are combined, using the equation below to determine to determine an LSE SC's flexible capacity requirement allocation.

Allocation = Δ Load – Δ Wind Output – Δ Solar PV – Δ Solar Thermal – Δ Distributed Energy Resources

Example 1 demonstrates how this methodology would allocate flexible capacity procurement when the forecasted monthly maximum 3-hour net load ramp occurs in the evening.

Example 1: Allocation when the forecasted monthly maximum 3-hour net load ramp occurs in the evening

ISO flexible capacity needs assessment	
Δ load	4000
Δ wind	-2000
Δ solar PV	-2500
Δ solar thermal	-1000
Δ DG output	-500
Total flexible capacity need	10000

LSE	Peak Load Ratio Share
LSE 1	35%
LSE 2	30%
LSE 3	20%
LSE 4	15%

LSE	Percent of total wind contracted	Percent of total Solar PV contracted	Percent of total Solar Thermal contracted
LSE 1	40%	30%	70%
LSE 2	20%	35%	20%
LSE 3	25%	15%	0%
LSE 4	15%	20%	10%

LSE	Load contribution	Wind contribution	Solar PV contribution	Solar Thermal contribution	DG contribution	Total contribution
LSE 1	.35 x 4,000 = 1,400 MW	.40 x -2,000 = -800 MW	.30 x -2,500 = -750 MW	.70 x -1,000 = -700 MW	.35 x -500 = -175 MW	3,825
LSE 2	.30 x 4,000 = 1,200 MW	.20 x -2,000 = -400 MW	.35 x -2,500 = -875 MW	.20 x -1,000 = -200 MW	.30 x -500 = -150 MW	2,825
LSE 3	.20 x 4,000 = 800 MW	.25 x -2,000 = -500 MW	.15 x -2,500 = -375 MW	.00 x -1,000 = 0 MW	.20 x -500 = -100 MW	1,775
LSE 4	.15 x 4,000 = 600 MW	.15 x -2,000 = -300 MW	.20 x -2,500 = -500 MW	.10 x -1,000 = -100 MW	.15 x -500 = -75 MW	1,575
Total	4,000	-2,000	-2,500	-1,000	-500	10,000

While Example 1 uses an evening 3-hour ramp, the proposed methodology also holds for morning ramps. The methodology would appropriately reflect that an LSE SC's contracted solar resources would reduce a morning's 3-hour net-load ramp. Example 2 demonstrates how this methodology would be used for a maximum net load ramp set in the morning.

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

ISO flexible capacity needs assessment	
Δ load	8,000
Δ wind	-2,000
Δ solar PV	2,500
Δ solar thermal	1,000
Δ DG output	500
Total flexible capacity need	6,000

LSE	Peak Load Ratio Share
LSE 1	35%
LSE 2	30%
LSE 3	20%
LSE 4	15%

LSE	Percent of total wind contracted	Percent of total Solar PV contracted	Percent of total Solar Thermal contracted
LSE 1	40%	30%	70%
LSE 2	20%	35%	20%
LSE 3	25%	15%	0%
LSE 4	15%	20%	10%

LSE	Load contribution	Wind contribution	Solar PV contribution	Solar Thermal contribution	DG contribution	Total contribution
LSE 1	.35 x 8,000 = 2,800 MW	.40 x -2,000 = -800 MW	.30 x 2,500 = 750 MW	.70 x 1,000 = 700 MW	.35 x 500 = 175 MW	1,975
LSE 2	.30 x 8,000 = 2,400 MW	.20 x -2,000 = -400 MW	.35 x 2,500 = 875 MW	.20 x 1,000 = 200 MW	.30 x 500 = 150 MW	1,575
LSE 3	.20 x 8,000 = 1,600 MW	.25 x -2,000 = -500 MW	.15 x 2,500 = 375 MW	.00 x 1,000 = 0 MW	.20 x 500 = 100 MW	1,625
LSE 4	.15 x 8,000 = 1,200 MW	.15 x -2,000 = -300 MW	.20 x 2,500 = 500 MW	.10 x 1,000 = 100 MW	.15 x 500 = 75 MW	825
Total	8,000	-2,000	2,500	1,000	500	6,000

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

5 RA showings and Replacement

Currently, the ISO conducts an annual and monthly RA process wherein both LSEs and suppliers, through their scheduling coordinators, submit RA plans and supply plans, respectively. These 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 ISO will integrate the flexible capacity requirement allocations into the existing annual and monthly RA processes. As discussed in section 5.2 of the Joint Parties Proposal and Appendix A of the CPUC's May 28, 2013 Proposed Decision, the ISO will require both the flexible and generic capacity to remain bundled in the annual and monthly RA process. In other words, in this interim proposal, flexible capability of a MW of capacity cannot be partitioned off and sold as a separate product. Allowing such a partition could lead to conflicts between LSE SC s that could be the scheduling coordinator for the same capacity and would likely require complicated and time consuming resource capacity tracking solutions.

As in the current RA framework, LSE SCs must submit 90 percent of their allocated flexible capacity requirement by the last business day of October. Additionally, LSE SCs must submit to the ISO a demonstration that it has fulfilled 100 percent of its flexible capacity requirement by 45 days prior to the compliance month. LSE SCs will be permitted to substitute resources from their year ahead flexible RA showing with other resources in their month-ahead showings. The ISO will update all RA templates to include flexible capacity showings. The ISO will then verify and validate that each LSE SC has met all flexible capacity showing requirements.

The ISO will use the following formulas for counting the flexible capacity provided by an LSE to determining if an LSE has provided sufficient flexible capacity to meet their flexible capacity requirements:

<u>If start-up time 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 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 if it has physical storage capacity to provide energy equivalent to output at Pmax for 6 hours. The ISO is seeking comments from stakeholders to assess if

similar minimum energy limits should be applied to other use-limited resources. Further, if such limitations are appropriate, what might they look like?

For 2015 RA compliance, the ISO will not propose a mechanism to manage replacement of intra-month outages of flexible capacity resources. However, the ISO will monitor outages of flexible capacity resources to determine if such a mechanism is required to manage intra-month outages.

6 Flexible Capacity Availability Requirements

The primary goal of implementing flexible capacity procurement obligations is to ensure that right mix of flexible capacity resources are available to the ISO for dispatch in the right places and at the right times. In order to ensure this occurs, the ISO proposes flexible capacity availability requirements for resources providing flexible RA capacity.[13] These flexible capacity availability requirements will be in addition to the existing availability requirements for generic RA resources and for capacity procured under the ISO's Capacity Procurement Mechanism.

The current RA and Capacity Procurement Mechanism availability requirements ensure the ISO has a sufficient resource pool to meet peak-load, but does not fully address the steep ramps that the balancing area will experience, particularly in the non-summer months, or the increasing amount of intra-hour net-load variability. A resource can fulfill its RA availability requirements 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 availability requirements 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. However, requiring flexible capacity resources to submit economic bids will allow the ISO to efficiently dispatch flexible resources in the 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.

6.1 Outlining Issues of the Flexible Capacity Availability Requirement for Different Resource Types

The proposed decision in the RA proceeding recently issued by the CPUC proposes an interim solution designed to meet the longest continuous upward ramps and load following needs. The ISO's flexible capacity availability requirements include reducing resource self-scheduling as a means of increasing the pool of resources available for dispatch.

Therefore, the ISO proposes a must-offer obligation for flexible capacity resources that generally requires the submission of economic bids from 5:00 AM through 10:00 pm for every day (including all

[13] Flexible capacity availability requirements may also be thought of as the must-offer obligation for flexible capacity resources.

holidays and weekends). These are the hours in which significant ramps and intra-hour variability are most likely to occur.[14] Further, the ISO believes the flexible capacity availability requirements should, at a minimum, include all of the same availability requirements as a generic RA resource. Therefore, resources used to meet both generic RA and flexible RA requirements will be subject to both availability requirements. For example, a flexible RA resource also used for generic RA will be required to submit economic bids from 5:00 AM to 10:00 PM, but must also be available to the ISO from 10:00 PM through 5:00 AM as required by section 40 of the ISO's tariff (though the resource may self-schedule between 10:00 PM through 5:00 AM). This requirement would be effective beginning for 2015 RA compliance. The availability criteria for flexible capacity resources are discussed section 8, below.

The ISO is currently assessing the appropriate bid validation rules that would automatically generate economic bids for flexible capacity resources in the event they are not submitted by the scheduling coordinator and the feasibility of including these rules in the ISO system by 2015. The ISO is seeking stakeholder input regarding how these rules should be applied. There are numerous permutations of potential bid validation rules. For example, how should ISO apply bid validation rules in the following examples?

Example 3: A 150 MW resource is procured for 150 MW of RA, 50 MW of which is flexible capacity. In the real-time market the resource attempts to submit a self-schedule for 125 MW and an economic bid for 25 MW. Should the ISO reject both the self-schedule and economic bid?

Example 4: A 150 MW resource is procured for 100 MW of RA, 25 MW of which is flexible capacity. In the real-time market the resource attempts to submit a self-schedule for 80 MW and an economic bid for 20 MW. Should the ISO

a) Reject the both the self-schedule and economic bid

b) Reject the economic bid only because it does not comply with the flexible capacity availability requirements, or

c) Reject neither bid, but automatically generate an economic bid for an additional 5 MW?

If bid validation rules are created, the ISO envisions these rules will apply to almost all flexible capacity resources, including most use-limited resources. As described further below, the ISO believes there are mechanisms for the ISO market to respect most use-limitations while still requiring the resource to submit economic bids from 5:00 am to 10:00 pm. However, there may be certain use-limitations that require a different treatment.

[14] 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.

6.1.1 *Flexible Capacity Availability Requirement – Thermal Resources with No Use-Limitations*

As noted above, in addition to the current RA availability requirements, the ISO proposes requiring flexible capacity resources to submit economic bids in both the day-ahead and real-time energy markets for their flexible capacity used to meet RA requirements. For example, if a resource is listed on an RA supply plan as providing 50 MW of flexible capacity, the resource would be required to submit economic bids for at least 50 MW in both the day-ahead and real-time energy markets. Requiring flexible capacity resources to submit economic bids during this set of hours gives the ISO the ability to economically dispatch resources and meet ramping and contingency requirements at least cost. Having an adequate supply of economic bids will reduce the frequency with which the ISO is forced to curtail self-schedules.

Further, all flexible capacity resources that are certified to provide ancillary services must bid or self-schedule into ancillary service markets on a non-contingent dispatch basis[15] for ancillary service for which they are certified. However, flexible capacity resources certified to provide ancillary service may still be used to self-provide ancillary service.

6.1.2 *Flexible Capacity Availability Requirement – Use-limited Resources*

Peaking and hydro units typically are fast ramping resources that can meet flexibility needs. However, many of them are subject to daily, monthly, or annual limits to energy production or start-ups, or subject to other environmental or operational limitations. These limitations require the ISO to consider if there is a need for separate performance and availability requirements for resources with use limitations. After careful consideration of each type of use-limitation, the ISO believes that, in the majority of circumstances, these limitations can be properly managed through the ISO markets. As such, the ISO proposes that use-limited resources will also be required to submit economic bids into both the day-ahead and real-time markets for all hours for the time period from 5:00 AM through 10:00 PM. The following sections outline each of the use limitations and how the ISO proposes to manage each within the context of the proposed economic must-offer obligation. The ISO understands that demand response resources may require special consideration, and therefore addresses them in a separate section

6.1.2.1 Flexible Capacity Availability Requirement– Daily Energy, Environmental, or Start Limited Resources

The ISO markets ensure resources are dispatched efficiently and in a manner that ensures grid reliability while also ensuring resources daily operational limits are respected. For example, the ISO will not dispatch a resource with a maximum run-time of six hours beyond that time. Similarly, the ISO will not look to start a resource twice in a day if it is limited to a single start. This approach is fully consistent with the treatment of hydro resources described above and the ISO recommended the CPUC ultimately adopt in its RA proceeding. Specifically, all hydro capacity that is used as flexible would have to demonstrate the capability of producing a six hour energy equivalent and must submit economic bids

[15] Currently, RA resources may bid as a contingency only ancillary service product.

for the time period from 5:00 AM through 10:00 PM. Once the resource reaches its use limitation, it is no longer subject to the flexible capacity availability requirement.

Similar requirements will apply to other types of resources with daily operational limitations that can be respected by the ISO market. This approach allows the ISO to manage the flexible capacity resources with daily use-limitation consistently and in a manner that ensures efficient dispatch and maintains grid reliability.

6.1.2.2 Flexible Capacity Availability Requirement – Monthly or Annual Energy or Environmentally Limited Resources

The ISO and market participants must manage resources that are limited to operating for a limited number of hours per month or year. This is to avoid excessively operating the resource early in the month or year, and consequently having it not available later. For example, the ISO does not want to exhaust a resource's run-time by the end of March, only to later discover the resource was needed in July.

Fortunately, the ISO currently has a mechanism in place that it can leverage to allow the ISO and the flexible capacity resource to manage these monthly or annual limitations. Currently, the ISO allows a resource to establish a default energy bid, used in local market power mitigation, that reflects the resources opportunity cost of being dispatched because it can only run in a limited number of hours over a year. The opportunity cost reflects its potential earnings in the hours with the highest prices.

This approach can be leveraged to manage annual energy limits by including an opportunity cost component to a use-limited resource's default energy bid. For example, if a resource is limited to 500 hours of operation per year, the the resource can work with the independent entity that establishes default energy bids for the ISO to forecast the 500th highest LMP at the resource's node for the upcoming year and include this opportunity cost. This mechanism allows the SC to bid the resource into the ISO market all for all hours covered by the flexible capacity availability requirement while managing concerns that the resource will be dispatched more frequently than is optimal. The ISO markets would then only dispatch the resource in the hours with the greatest need as reflected in the LMP. This same mechanism can be applied to resources with annual energy or environmental resources that are flexible capacity resources.

6.1.2.3 Flexible Capacity Availability Requirement – Monthly or Annual Start Limited Resources

Some flexible capacity resources may be limited by the number of times it may be started per month or per year due to environmental rules or other constraints. Similar to the method proposed above in which the opportunity cost of operating in a limited number of hours per year can be reflected in default energy bids, the ISO believes the opportunity cost of limited starts per year can be incorporated into resource start-up costs used by the ISO market. For example, the ISO could, using a resources minimum run time, assess and determine the opportunity cost of starting a resource. The resource would then be able to account for this opportunity cost in its registered start-up cost. The ISO

is seeking stakeholder input regarding how to calculate this opportunity cost and the feasibility of this approach.

6.1.3 *Flexible Capacity Must-Offer Obligation – Long-start Resources*

While a long-start resource may not be able to provide flexible capacity for zero through its Pmin, it may be able to supply flexible capacity from its Pmin to its NQC. However, if a long start resource is not dispatched to at least Pmin in the day-ahead market, then it will not be able to provide its flexible capacity in the real-time. Therefore, the ISO has two options when considering long-start units.

1) Impose a start time cap for flexible capacity resources. For example, if a resource cannot start in less than 4 hours, then it is not eligible to provide flexible capacity. This would ensure that the ISO is able to rely on a full fleet of resources excluding resources that are not available in real-time if they were not committed by the day-ahead market.[16]

2) Consider a resource's availability requirement fulfilled if it not scheduled in the IFM. If the resource is not scheduled in the IFM, then the resource is presumed to have fulfilled its must-offer obligation and would not be required to bid into the real-time market. Though, this is similar to the current treatment for long start RA resources it may leave the ISO with fewer resources to resolve real-time flexibility needs, potentially leading to increased exception dispatch.

The ISO proposes that option 2, with modifications, presents the superior option. Resources with long start times must be available to the ISO up until the ISO's dispatch instructions cannot place the resource at Pmin. For example, a resource with a four hour start time could still be set to Pmin through the ISO's short-term unit commitment process. However, if this resource does receive an instruction to start in the short-term unit commitment process then the ISO will consider the resource to have fulfilled its must-offer obligation for that time interval.

6.1.4 *Flexible Capacity Must-Offer Obligation – Demand Response Resources*

As noted above, flexible capacity must be bid into the ISO market. Demand response is able to bid into the ISO markets as participating load (PL) and proxy demand resource (PDR).[17] Demand response resources, like many resources, are subject to daily and annual use-limitations including number of events, maximum length of event per day, and hours available. As noted in 6.1.2, above, the ISO believes that most applicable use-limitations can be reasonably addressed.

The ISO is committed to working with DR providers to ensure that all necessary use-limitations of DR resources are identified and properly addressed. Some demand response resources may be use-limited based on the hours in which they can be called. A demand response resource may not be able to be called upon until the underlying load has sufficient discretionary load to reduce or cannot be called

[16] If such an approach is used, the ISO would work with LRAs to facilitate parallel changes to their flexible capacity requirements.

[17] Reliability Demand Response Resources are available to the ISO only to allow the ISO to avoid issuing a stage 1 or greater emergency. As such, the ISO believes this type of resource is best suited for emergency dispatch rather than meeting day-to-day flexibility needs.

during certain hours. For example, the same PDR may only be able to drop 5 MW when the underlying demand is operating at baseload levels but 10 MW when the underlying demand has increased and includes more discretionary load. The ISO does not want to constrain demand response resources based on their ability to drop load from baseline levels (i.e. at 5:00 AM or 10:00 PM). Therefore, the ISO is seeking comments from stakeholders regarding the best way to manage DR resources' use-limitations based on the hours in which they can be called. The goal is a to allow a demand response resource to count towards flexible capacity for what it is able to drop over a three hour period instead of looking at a single moment in-time. At the same time these resources must comply with an availability requirement that is consistent ISO's flexible capacity needs. Lastly, the ISO is seeking input regarding any other demand response use-limitations and how the ISO can account for them.

A PDR or PL resource listed as flexible capacity in a supply plan would be responsible for providing the ISO with the appropriate use-limitations through the PDR or PL product registration and bids, similar to other use-limited resources. The supplier would be able to use whatever portion of the demand resources that comprise a PDR or PL resource to provide the load drop needed to meet a specific ISO dispatch. For example, a PDR may be comprised of 50 demand resources (grocery stores, warehouses, etc.). The SC for the PDR could call 10 customers one day and 10 different customers on another day. This should help the SC for that PDR from over-burdening a single enrollee.

7 Backstop Procurement

In the initial straw proposal the ISO proposed to modify its authority to procure capacity in the event a LSE did not procure sufficient capacity under the RA process to also allow the ISO to procure flexible capacity in the event an LSE did not procure sufficient flexible capacity in its annual of monthly flexible capacity procurement relative to the system requirement. 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.

Further the ISO tariff specifies that the ISO may issue a capacity procurement mechanism designation if

> [A] Scheduling Coordinator fails to demonstrate in an annual or monthly Resource Adequacy Plan, submitted separately for each represented LSE, procurement of sufficient Resource Adequacy Resources to comply with each LSE's annual and monthly Demand and Reserve Margin requirements under Section 40.

The ISO proposes to include a Scheduling Coordinator failure to demonstrate sufficient flexible capacity, for each represented LSE, as per annual and monthly requirements to the list reasons the ISO may issue a capacity procurement mechanism designation. 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 LSE SC's that are deficient in their flexibility requirement as calculated by the ISO and discussed in section 4, above.

Finally, the ISO's backstop Capacity Procurement Mechanism expires at the end of March 2015. The ISO proposes to conduct a stakeholder initiative either later this year or early next year that will design a replacement for the ISO's existing Capacity Procurement Mechanism. If any additional changes to the ISO's flexible capacity backstop procurement authority are required, the ISO will address them in this upcoming stakeholder process.

8 Flexibility Capacity Availability Incentive Mechanism

The ISO's existing availability incentive mechanism that applies a charge or incentive payment based on an RA resource's availability relative to the RA fleet average (i.e. standard capacity product) is based on a resource's availability 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. Therefore, the ISO may have to 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.

The ISO believes that much of the existing availability incentives could be modified to incorporate the availability of flexible capacity. The fundamental difference between generic capacity and flexible capacity is the requirement to submit economic bids into the ISO day-ahead and real-time markets. Therefore, the ISO believes that a flexible capacity availability incentive mechanism should incorporate a resource's submission of economic bids between the 5:00 AM and 10:00PM and be subject to the resources operational characteristics and use-limitations.

Consequently, a flexible capacity availability incentive mechanism should also consider bidding behavior in addition to forced outage rates. Thus, it is appropriate to gain experience with new bidding requirement under the new flexible capacity availability requirements before designing the flexible capacity availability incentive mechanism. Therefore, the ISO will revisit this issue after market participants have more experience with the new bidding rules.

9 Next Steps

The ISO will host a stakeholder meeting on meeting on June 19, 2013 to discuss the contents of this straw proposal. Stakeholder comments on this straw proposal will be due June 26, 2013. The ISO anticipates seeking ISO Board approval at the December 2013 Board Meeting.