BEFORE THE
PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

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

CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION INITIAL COMMENTS ON WORKSHOP ISSUES

The California Independent System Operator Corporation ("ISO") respectfully submits its comments on the proposals and issues discussed workshops held by the California Public Utilities Commission ("Commission" or "CPUC") on January 23, 2013 and March 20, 2013.[1] The ISO recommends that the Commission incorporate a flexible capacity procurement obligation into its resource adequacy program for the 2014 compliance year, consistent with the ISO's proposal presented at the March 20, 2013 workshop.[2]

I. SUMMARY

It is appropriate and timely for the Commission to implement a flexible capacity requirement for the 2014 resource adequacy compliance year. The ISO has clearly demonstrated, and the Commission has recognized, [3] that the operational need for flexible capacity is growing. It is imperative to ensure that sufficient flexible capacity is

[1] The ISO submits its comments and response pursuant to the Phase 2 Scoping Memo and Ruling of Assigned Commissioner and Administrative Law Judge, issued on December 6, 2012 ("Phase 2 Scoping Memo"), as modified by the Administrative Law Judge's Ruling Resetting Schedule for Comments on Phase 2 Resource Adequacy Issues and Scheduling a Prehearing Conference, issued on March 11, 2013, and as further discussed at the Prehearing Conference held on March 20, 2013.

[2] A copy of the ISO's presentation is attached to these comments as Attachment A and should be included as part of the record in this proceeding.

[3] Decision 12-06-025 (June 21, 2012), p. 17.

maintained on the system and is obligated to be operationally available to the ISO to meet what will be an urgent need for flexible capacity in the very near future. The time is ripe for the Commission to incorporate, yet still have time to refine, an interim flexible capacity requirement into the existing resource adequacy program.

Given the need to ensure that required amounts of flexible capacity are procured through the resource adequacy program, it is prudent for the Commission to implement a flexible capacity obligation for the 2014 resource adequacy compliance year and ensure that it works efficiently and effectively before flexible capacity is absolutely critical to maintaining reliability in the balancing area in the following years.

The Joint Parties' Proposal provides the Commission with the framework needed to implement flexible capacity procurement obligations for its jurisdictional load serving entities for 2014. This framework was enhanced with the addition of the proposal by Pacific Gas and Electric Company ("PG&E") for the treatment of hydro resources. Energy Division's revised proposal is highly aligned with the Joint Parties Proposal and adds important implementation details as well. With this foundation, the ISO requests that the Commission, in its decision in this proceeding, approve the following modifications to the resource adequacy program[4] in order to implement a flexible capacity requirement for the 2014 resource adequacy compliance year:

- Establish flexible capacity procurement obligations for all CPUC jurisdictional load serving entities for 2014,
- Accept the methodology the ISO used to determine the monthly flexible capacity requirement, and allocate the monthly obligation to its

[4] In accordance with the request made to the parties by Administrative Law Judge Gamson at the March 20, 2013 prehearing conference, the ISO has prepared findings of fact, conclusions of law, and ordering paragraphs that would adopt the ISO's recommendations in this proceeding. They are attached to these comments as Attachment B.

jurisdictional load serving entities based on the ISO's calculation of their contribution to peak load ratio share,

- Adopt the flexible capacity requirement for 2014 as calculated and proposed by the ISO in this proceeding,

- Adopt the differentiated capacity proposed by the Joint Parties and Energy Division,

- Adopt the "bundling" principle linking flexible and generic capacity and explicitly state that a resource's effective flexible capacity cannot exceed its net qualifying capacity,

- Adopt the formulas and criteria for counting the effective flexible capacity of resources (except hydro) toward meeting flexible capacity procurement obligations as set forth in the Joint Parties Proposal,

- Adopt the PG&E proposal for qualifying and counting hydro resources' effective flexible capacity toward meeting flexible capacity procurement obligations, and

- Require each CPUC jurisdictional load serving entity to make a 90% year-ahead and 100% month-ahead showing of flexible capacity for each month of the compliance year.

In addition, the Commission should identify the following matters as issues to be addressed in the resource adequacy proceeding, which should start as soon as possible, for compliance year 2015:

- Establishing counting rules, criteria, and qualifications for use-limited resources like those with start-up or environmental restrictions, demand response, and storage devices, and

- Develop penalties and enforcement provisions applicable to jurisdictional load serving entities that are deficient in the flexible capacity procurement obligations.

II. JOINT PARTIES' PROPOSAL AND ENERGY DIVISION PROPOSAL SHOULD BE ADOPTED WITH MINOR CLARIFICATIONS

The Energy Division issued its revised interim flexible capacity proposal on March 11, 2013. The revised proposal is highly aligned with the Joint Parties' Proposal, and adopts, among other key elements, the more efficient "differentiated-capacity" counting convention as originally outlined in the Joint Parties' Proposal. As the Energy Division Proposal states:

> A major advantage of the differentiated capacity approach is the marginal economic incentive that would apply to existing and future resources to optimize a resource's capability to operate flexibly. This option can incentivize existing plants to manage their operating characteristics to squeeze out more flexibility, such as decrease their start up times or decrease their PMin.[5]

With these latest modifications, the two proposals are largely consistent, with some additional implementation details appropriately included in Energy Division's proposal. The ISO applauds the Energy Division for their due diligence and for the further refinements made to the interim flexible capacity proposal. The ISO supports adoption of the Joint Parties' Proposal and Energy Division Proposal, and offers only a few minor clarifications, discussed below, that should be incorporated into the final implementation of a flexible capacity procurement obligation for 2014.

A. EFC Calculation Using ISO Master File Data

The Energy Division Proposal states that "[t]he effective flexible capacity value is calculated based on operational characteristics of individual generating units and is calculated by the CPUC analysis of the ISO master file data."[6] The ISO offers the clarification that on April 1, 2013, using its master file data, the ISO calculated the

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[5] Energy Division Proposal, p. 3.

[6] Id. at 3.

effective flexible capacity by resource and published this data on the ISO website for public access and review.[7] For the period covered by the interim flexible capacity proposal, the ISO would deliver the effective flexible capacity value annually around May 1st, in coordination with, and similar to, the submission of the local resource adequacy capacity study to the CPUC for approval of the local capacity requirement.

B. Flexible Capacity Allocation Based On Peak Load Ratio Share For 2014

For the 2014 resource adequacy compliance year, the ISO and the Energy Division agree that the flexible capacity procurement obligation is best allocated to local regulatory authorities based on the local regulatory authorities' respective monthly peak-load ratio share. This is a simple and familiar allocation methodology used in the CPUC's resource adequacy program. For 2015 and beyond, the ISO notes that the calculation of a local regulatory authority's contribution to the three-hour net load ramp may be calculated differently, based on the methodology that results from the ISO's Flexible Resource Adequacy Criteria and Must Offer Obligation stakeholder initiative. The ISO will continue to work with the CPUC and other parties to address the allocation for 2015 and beyond. Any issues about how to calculate the CPUC jurisdictional load serving entities' contribution to the flexible capacity needs and how the CPUC allocates the flexible capacity requirement to its jurisdictional load serving entities could then be revisited in the next phase of the resource adequacy proceeding.

C. Hydro Proposal

The ISO supports the Energy Division's adoption of PG&E's proposal for the

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[7] See http://www.caiso.com/Documents/R.11-10-023%20(Order%20instituting%20rulemaking%20to%20oversee%20RA%20program)

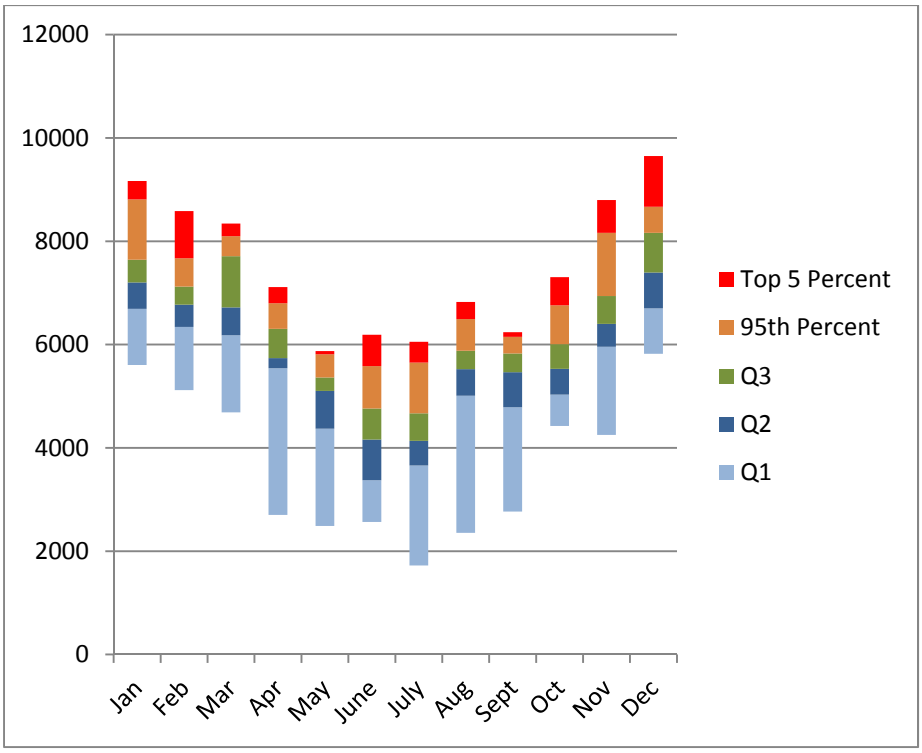
flexible capacity counting and treatment of hydro resources.[8] The ISO supports this method instead of the original concept for hydro resources outlined in the Joint Parties' Proposal. PG&E's proposal provides a more straightforward method for determining whether or not a hydro resource can qualify as a flexible resource and ensures that the resource owner only shows an amount of flexible capacity the resource is expected to deliver based on hydro conditions and use-limitations. The PG&E proposal allows operators of flexible hydro resources to balance the operational needs for ramping during a day with hydrological and environmental constraints.

The flexible capacity counting and treatment of other use-limited resources, including demand response and energy storage, should be a priority issue to be considered in the next resource adequacy proceeding for implementation in the 2015 resource adequacy compliance year. Figure 1 shows the distribution of the daily maximum three-hour net load ramps for 2014.

[8] Energy Division Proposal, Section 6.

Figure 1

Distribution of 2014 Daily Maximum 3-Hour Net Load Ramps by Month



As this figure shows, not every flexible capacity resource needs to be available for every single instance of flexibility. Prioritizing the flexible capacity counting and treatment of other use-limited resources for 2015 will expand the opportunities for these resources to provide flexible capacity, and allow for a more precise calculation of the flexible capably they provide.

D. EFC Should Never Exceed NQC

A core principle of the Joint Parties' Proposal is the concept of "bundling" the flexibility attribute with the underlying capacity. This principle is described as follows:

> For procurement purposes, the flexible capacity a resource offers must remain "bundled" with the generic capacity for the specific megawatt. In other words, in this interim proposal, flexible capability of that megawatt of capacity cannot be stripped off and sold as a separate product. For

> example, a resource, for the same megawatt, may not sell the system capacity to one LSE and its flexible capability of that megawatt of capacity to another.[9]

One of the implications of this bundling principle is that a resource cannot provide more flexible capacity than generic capacity (i.e. it cannot sell more flexible capacity than its net qualifying capacity). Further, using a resource's maximum output or PMax has never been the appropriate metric for how much resource adequacy capacity is eligible from a particular resource. In the Energy Division Proposal, the ISO would clarify that the effective flexible capacity of a resource should never exceed the resource's net qualifying capacity rating. Specifically, the Energy Division Proposal should be amended to state: "2. The proposed EFC should not exceed the NQC ~~or the Pmax~~ of the resource."[10]

III. THE ISO RECOMMENDED FLEXIBLE CAPACITY NEEDS ASSESSMENT AND DETERMINATION OF 2014 REQUIREMENT

The ISO's flexible capacity needs assessment is based on a methodology that is well-suited to analyze the forecasted minute-by-minute net-load for the upcoming year. The forecast of net load is developed based on a forecast 1-in-2 year load profile minus aggregate minute-to-minute production profiles of wind and solar. The assessment uses a sound methodology that incorporates assumptions from the CPUC and the California Energy Commission ("CEC"), uses the most current data available, and includes reasonable assumptions regarding load and renewable output. The ISO described this methodology in presentations and discussions during the workshops, and provided the data underlying the assessments to the parties in this proceeding. The elements of the methodology and related issues raised during the workshops are discussed below.

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[9] Joint Parties' Proposal, p.12.

[10] Energy Division Proposal, p. 6.

A. The ISO Flexibility Capacity Requirement Assessment Is Based On The Most Current RPS Build-Out Data, A Methodology Developed In The CPUC LTPP Proceeding, And Use Of Conservative Estimates For Load And Tracking Solar

In determining the flexible capacity requirement, the first step the ISO took was to generate net load profiles for 2014-2016. The ISO used the most current data available regarding the renewable portfolio standard ("RPS") build-out, pulled directly from the 2012 RPS compliance filings by the investor owned utilities. Using this data, the ISO developed the final aggregated RPS build-out numbers provided in Table 1.[11]

Table 1

Aggregate RPS Build-Out By Year And Technology

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

Next, the ISO used the renewable resource profiles for different locations developed in the CPUC's long-term procurement plans ("LTPP') proceeding and the RPS data for the investor owned utilities to develop minute-by-minute load in order to develop minute-by-minute net-load data. The renewable profiles used by the ISO account for both technology type and the location of the resources modeled. The load

[11] Additional detail regarding the RPS build out for each investor owned utility is provided on Slide 26 of the ISO's presentation material from the March 20, 2013 workshop, which is attached these comments as at Appendix A.

data shape was modeled based on 2012 actual load. The ISO adjusted the load data to align the peak loads to the 1-in-2 load forecasts contained in the 2011 CEC Integrated Energy Policy Report and to use a ratio of fixed-tilt solar to solar tracking of 80-20 for the solar PV.[12] These adjustments are all consistent with the assumptions the ISO used to calculate the flexible capacity need. By using the 1-in-2 peak load, as opposed to 1-in-5 that is used for local or 1-in-10 as is used in LTPP, the ISO's calculation is more conservative and shows lower peak loads in peak months as well as shoulder months. Additionally, the use of a high percentage of fixed tilt solar typically results in a more gradual increase and decrease of solar output in the morning and evening respectively.[13] Using these inputs, the ISO generated minute-by-minute forecasts of 2014-2016 load and net-load.

As a result, the minute-by-minute load and net-load curves developed by the ISO are reasonable and conservative, and use CPUC vetted renewable profiles. This is data that the Commission can confidently use to set the flexible capacity requirements for 2014.

B. The ISO's Formula Used To Calculate Need And The Counting Criteria For Resources

Once the minute-by-minute data was generated, the ISO used formulas from the Joint Parties proposal to calculate the flexible capacity requirement and is as follows:

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[12] The 80-20 ratio used by the ISO is consistent with recommendations provided by Sierra Club and Vote Solar in their December 26, 2012 comments in this proceeding.

[13] Actual solar output also depends on weather conditions and cloud cover. It is possible that weather conditions could result in changes in output from fixed-tilt solar resources that more closely resembles a solar tracking resource on any particular day.

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

Where:

$\text{Max}[(3RR_{HRx})_{MTHy}]$ = 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

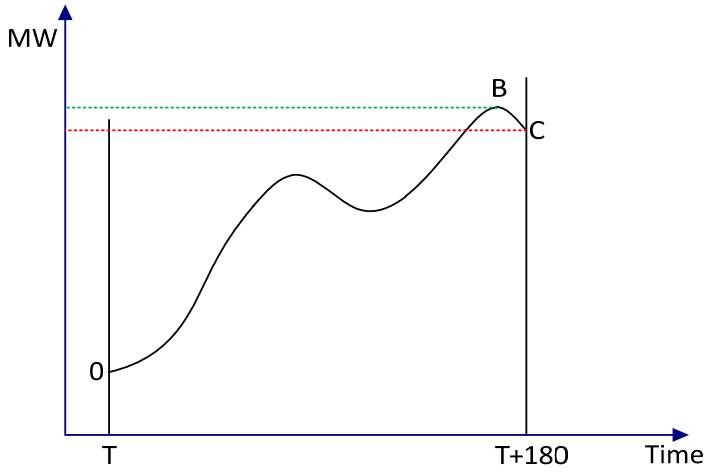
ε = Annually adjustable error term to account for load forecast errors and variability

As is the accepted practice in the ISO's other renewable integration studies, the ISO calculated the ramping needs using the net-load ramp. The change in the net-load (demand minus wind and solar generation) is used as a metric for evaluating the need for additional flexibility that results from higher levels of installed wind and solar generation.[14] Specifically, the ISO assessed the largest net-load ramp that occurred within any three-hour period. As an additional verification measure, the ISO assessed the largest three-hour net load ramp across all three-hour periods for each month. Figure 2 clarifies the distinction between these two methodologies.

[14] See http://www.nerc.com/docs/pc/ivgtf/IVGTF_Task_1_4_Final.pdf.

Figure 2

Ramp Needs Within a Three-Hour Period vs. Across a Three Hour Period

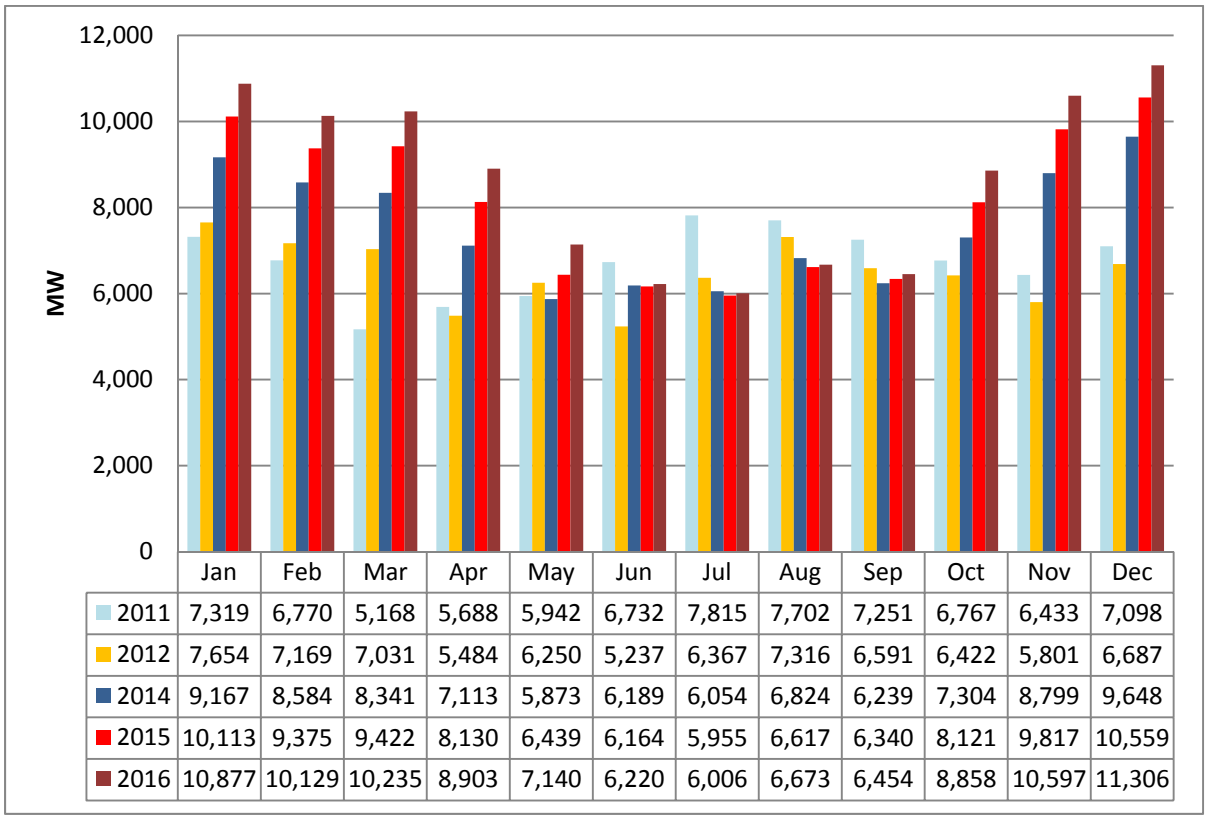


In this figure, the MW of flexible capacity required to go from point 0 at time T to point B (which may occur at a time of three hours or less) represents the three-hour net load ramp within a three-hour period. The MW of flexible capacity required to go from point 0 at time T to point C (which always occurs at three hours) represents the three-hour net load ramp at the end of each three-hour period. As Figure 2 shows, the maximum three-hour net load ramp within a three-hour period should always be the highest MW value reached within any three-hour period.

For the years assessed, the ISO found that the two evaluation tools yielded the same result. Further, the ISO assessed any anomalous data and verified that the maximum monthly three-hour net-load ramp is never set on a day were outlying data points were at issue. Using the methodology described above, and as illustrated by Figure 2, the ISO calculated the largest three-hour net load ramp for each month for 2011 and 2012 using actual data and then forecasted the same for each year 2014-2016 using the minute-by-minute load data. The results are provided in Figure 3.

Figure 3

Maximum Three-Hour Net Load Ramp 2011, 2012, and 2014-2015



	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	9,167	8,584	8,341	7,113	5,873	6,189	6,054	6,824	6,239	7,304	8,799	9,648
2015	10,113	9,375	9,422	8,130	6,439	6,164	5,955	6,617	6,340	8,121	9,817	10,559
2016	10,877	10,129	10,235	8,903	7,140	6,220	6,006	6,673	6,454	8,858	10,597	11,306

As Figure 3 demonstrates, the largest number of three-hour net load ramps occurs in non-summer months.[15] Furthermore, the figure shows that the year-to-year requirements for 3-hour ramping flexibility is increasing at about 800-1000MW/year as a result of the increased amount of expected wind and solar production.

However, there is an important interaction between flexible capacity and contingency reserves that requires sufficient capability to exist to manage the expected net load ramps plus to be prepared for the unexpected loss of the single largest

[15] The use of the three-hour net-load ramp represents a compromise. The ISO recognizes that there are longer ramps than three hours and shorter but steeper ramps that require faster ramp capability for shorter periods than those reflected in the 3-hour ramp.

resource. Currently, the ISO maintains contingency reserves of approximately seven percent of "load responsibility," with 50 percent of the reserves, or approximately 3.5%, required to be spinning or synchronized to the grid. Specifically, to meet WECC and NERC reliability needs, the ISO must have contingency reserves equal to the greater of 1) the most severe single contingency ("MSSC") (at least half of which must be spinning reserves) or 2) the sum of five percent of the load responsibility served by hydro generation and seven percent of load responsibility served by thermal generation (at least half of which must be spinning reserve).

The Joint Parties' Proposal, therefore, appropriately incorporated a portion of the contingency reserves need into the flexible capacity procurement calculation. The capacity held as contingency reserves can only be exercised for emergencies and cannot be dispatched to provide ramping capability. For example, consider a day where the largest 3-hour ramp is 5,000 MW and the MSSC is 1,150 MW. Simply setting a flexible capacity procurement requirement at 5,000 MW would mean the ISO could not be assured of meeting both the ramping capability and the MSSC. For example, the ISO would not be assured of having any contingency reserves during that ramp. Once provided with a pool of resources capable of providing both flexible capacity and contingency reserves, the ISO would be responsible for dispatching those resources to meet system needs in real-time. Therefore, it is reasonable to also include contingency reserves as part of this calculation.

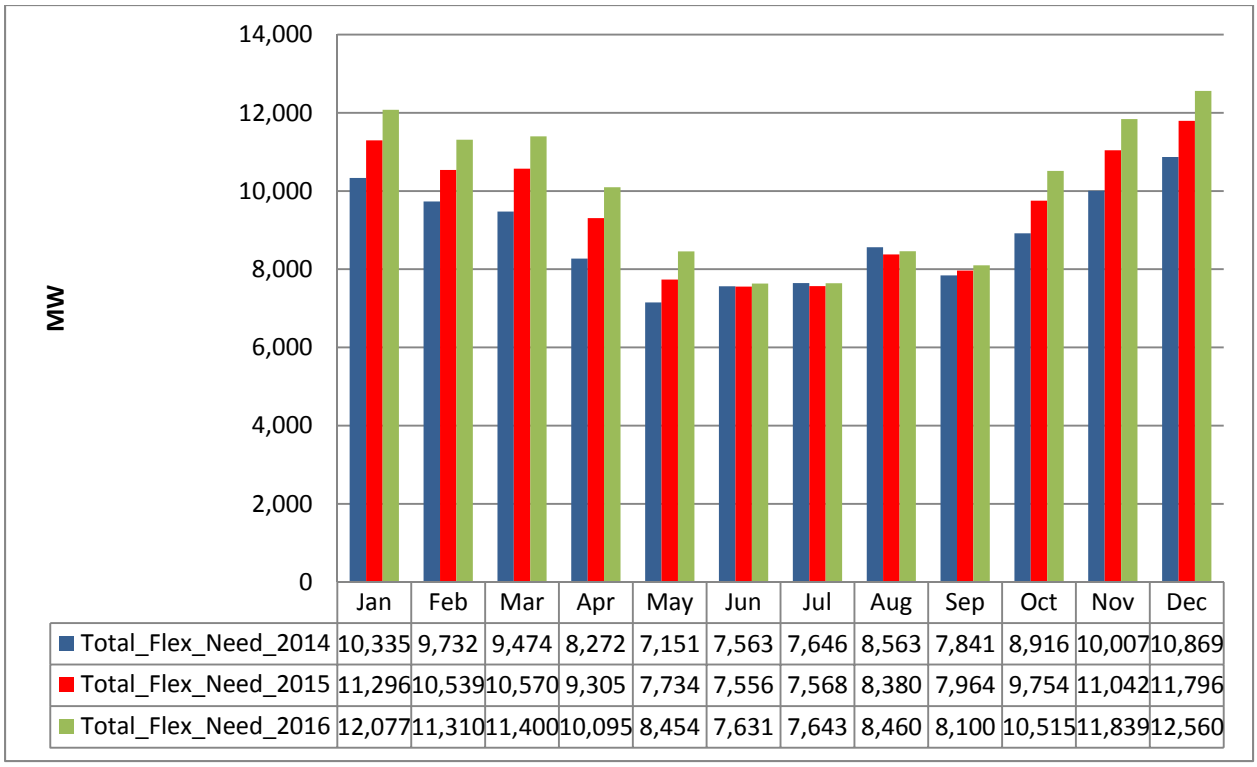
Finally, the ISO calculated the maximum of the MSSC or 3.5 percent of the forecasted monthly peak load to reflect the amount of the operating reserve requirement that must be synchronized as spinning reserve, which was then added to the maximum

three-hour net load ramp as calculated above.[16] Because 50%, or approximately 3.5% of the ISO's contingency reserves must be spinning, and because the MSSC is always less than this amount, it is appropriate to add 3.5% of the monthly peak demand to the monthly flexible capacity requirement values to cover a minimum of the ISO's required contingency reserves. The end result is the final ISO flexible capacity requirement. This requirement is detailed in Figure 4. The portion of this number attributable to the CPUC jurisdictional load serving entities based on peak-load ratio share is the flexible capacity requirement that the ISO proposes the Commission adopt and allocate to its jurisdictional load serving entities for resource adequacy compliance year 2014. This allocation is discussed in greater detail below.

[16] By comparison, a contingency reserve of 4% is used in the Western Electricity Coordinating Council study entitled, "*Balancing Authority Cooperation Concepts to Reduce Variable Generation Costs in the Western Interconnection: Intra Hour Scheduling*" funded by the Department of Energy. See http://www.wecc.biz/committees/StandingCommittees/JGC/VGS/Shared%20Documents/BA%20Cooperation%20Study/Final%20Report/Balancing%20Authority%20Cooperation%20Concepts%20-%20Intra-Hour%20Scheduling.pdf.

Figure 4

The Calculated Flexible Capacity Requirement



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Total_Flex_Need_2014	10,335	9,732	9,474	8,272	7,151	7,563	7,646	8,563	7,841	8,916	10,007	10,869
Total_Flex_Need_2015	11,296	10,539	10,570	9,305	7,734	7,556	7,568	8,380	7,964	9,754	11,042	11,796
Total_Flex_Need_2016	12,077	11,310	11,400	10,095	8,454	7,631	7,643	8,460	8,100	10,515	11,839	12,560

The ISO'S calculated flexible capacity requirement is greatest in the shoulder months. This is of particular concern to the ISO because the fleet of resource adequacy resources procured in these months is substantially smaller in comparison to the peak summer months. This means that there is a greater probability that there could be flexible capacity deficiencies under the existing resource adequacy program. There are two reasons for this: 1) the higher the quantity of flexible capacity needed, the higher the chance of deficiency, and 2) the percentage of the resource adequacy fleet that must be flexible is a concern. Without a flexible capacity procurement obligation, it is possible that the pool of resource adequacy resources may provide too much non-dispatchable capacity and not enough flexible capacity. For example, if the resource

adequacy program requires procurement of 30,000 MW of capacity and the final procurement portfolio includes 25,000 MW of inflexible capacity, the ISO has only 5,000 MW of flexible capacity. If the ISO requires 10,000 MW of flexible capacity to address net-load ramping needs, then it might not be able to meet these ramps by relying on the procured resource adequacy fleet. In short, load serving entities will need to procure a greater percentage of their resource adequacy capacity from flexible capacity in the shoulder months compared to the peak summer months.

The above formula for calculating the flexible capacity requirement that ISO used in its flexible capacity assessment has now been a part of the CPUC record for almost four months.[17] No party has demonstrated that the formula inaccurately measures the ISO's balancing authority area's flexible capacity requirement. Nor has any party presented an alternative methodology for assessing the flexible capacity requirements. The ISO recommends that CPUC accept the calculation and determination of the flexible capacity requirements, as discussed above and in the Joint Parties' Proposal.

The flexible capacity requirements detailed in Figure 4 are for the entire ISO balancing authority area. For the 2014 resource adequacy compliance year, the ISO will allocate the flexible capacity need based on peak-load ratio share. Using the most current estimates from CEC data, the contribution to peak load by CPUC jurisdictional load serving entities is 91%. Based on this contribution, the cumulative flexible capacity requirement for CPUC jurisdictional load serving entities is provided in Table 2 below. The ISO will calculate and provide to each individual load serving entity its flexible capacity procurement obligation for 2014.

[17] The ISO originally issued the Joint Parties Proposal on October 29, 2012, and it was included in the record through the CPUC ruling on December 6, 2012.

Table 2

CPUC's 2014 Cumulative Flexible Capacity Requirement

Month	2014 Flexible Capacity Requirement (MW)
Jan	9406
Feb	8857
Mar	8622
Apr	7528
May	6508
Jun	6883
Jul	6959
Aug	7793
Sep	7136
Oct	8115
Nov	9108
Dec	9892

The three-hour net load formula developed in the Joint Parties' Proposal for determining the flexible capacity need should ensure that the ISO will have sufficient flexible capacity to meet both the load-following and longest continuous ramps though the 2016 resource adequacy compliance year. It is important, however, for the CPUC to recognize that the flexible capacity needs of the ISO will continue to evolve and that additional specificity regarding resources' operational attributes will be needed after the 2016 compliance year to address load-following and regulation needs. In the first phase of this proceeding, the ISO provided evidence that in order to meet the challenges of integrating intermittent resources it will need capacity capable of helping provide for regulation, load following, and the longest continuous net-load ramps. The ISO will in the future request that the CPUC consider improvements to the resource program to address these additional operational attributes.

C. The ISO Demonstrated Reasonable Likelihood Of Operational Flexible Capacity Deficiency Starting As Early As 2014

The ISO is not asserting that there is insufficient flexible capacity in the ISO Balancing Authority Area in 2014. However, a primary objective of the resource adequacy program is to ensure that sufficient resources are planned and available in advance to reliably operate the grid. Parties that claim non-resource adequacy resources will be available to the ISO to address flexibility needs as a reason to reject flexible capacity procurement obligations miss this important and primary principle of the resource adequacy program which ensures sufficient capacity is obligated to be available for operational purposes. However, other parties have asserted that even without non-resource adequacy resources there is no risk of a deficiency of flexible capacity in 2014. If the CPUC agreed with this logic there would be no resource adequacy program. The resource adequacy program was not created because there was insufficient installed capacity. Rather the resource adequacy procurement obligation was created to ensure the sufficient capacity was obligated to be available for operational purposes. This same logic should be applied to implementing flexible capacity procurement obligations. In order to address these concerns, the ISO has conducted an assessment of all resources located with the ISO balancing authority area to determine if there is a reasonable potential for deficiency of flexible capacity in 2014 using the 2012 resource adequacy showings.

The ISO's deficiency assessment focused on the months of March, July, October, and December. The ISO's analysis started with the pool of all resources in the ISO balancing authority area and then calculated the effective flexible capacity of all

resources using the formula provided in the Joint Parties Proposal.[18] The ISO next compiled a pool of resources that self-identifed as "dispatchable" in the ISO master file. This produced a total calculated effective flexible capacity in the system between about 28,000 MW and 31,000 MW depending on the month. This pool of dispatchable effective flexible capacity resources was then further honed to reflect the calculated effective flexible capacity of resources procured in the resource adequacy program in 2012.[19] The calculated effective flexible capacity of the dispatchable resource adequacy fleet was between about 18,000 MW and 27,000 MW.

As discussed above, the potential for flexible capacity shortfalls in resource adequacy showings is greatest in the shoulder months. For example, the flexible capacity requirement for March of 2014, is just under 9,500 MW, compared to just under 7,650 in July. Based on the forecasted requirements, there is not likely to be a *calculated* deficiency of the effective flexible capacity from resource adequacy resources. However, not every resource that has a calculated effective flexible capacity may want to provide flexibility or may only wish to have a portion of their capacity shown as flexible. Figure 5 provides an illustrative example of this.

In the illustration below, the red "PMin" portion represents a start-up time of greater than 90 minutes. Thus, the effective flexible capacity of the resource would be less than the net qualifying capacity of the resource and it would not be eligible to provide effective flexible capacity for that portion of its net qualifying capacity.

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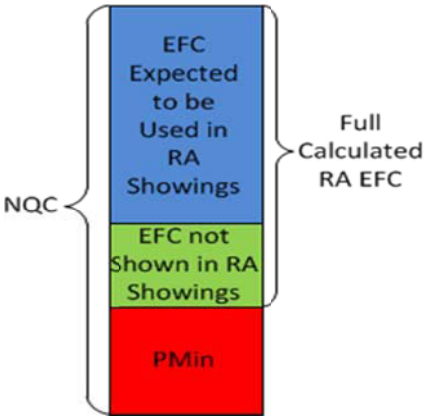
[18] The ISO did not utilize special counting conventions or qualifications for hydro resources. Instead, the effective flexible capacity of hydro resources was calculated using the same methodology as thermal resources. This would result in a higher calculated cumulative effective flexible capacity because not all hydro resources would qualify as flexible under the Energy Division proposal. Further, if a run-of-river resource has self-identified as dispatchable, the ISO did not remove the resource from the data set.

[19] It is assumed that procurement practices in 2014 will remain similar to those used in 2012 in the absence flexible capacity procurement obligations.

Figure 5



Additionally, there are many reasons why a resource may not wish to be considered flexible for its entire calculated effective flexible capacity. For example, resources may not be operationally available to the ISO in the real-time market for any of the following reasons: hydro conditions (either must-run conditions in spring run-off or lack of water in a low hydro year), self-scheduling, outages, or election by the resource owner not to provide flexible capacity because of the challenges and costs of frequent dispatches or redispatches.

The green block in Figure 5, "EFC Not Shown in RA", illustrates how a resource's calculated effective flexible capacity could be reduced once these considerations a taken into account. The remaining effective flexible capacity, shown as the blue block in Figure 5, "EFC Expected to be Used in RA Showings", is the portion the effective flexible capacity that is shown in resource adequacy showings and assumed to operationally available to the ISO to meet ramping needs.

While this shows how the calculated effective flexible capacity of the resource adequacy fleet might differ from the effective flexible capacity ultimately shown as flexible in resource adequacy showings, there are several other reasons why the

composition of the resource adequacy fleet will differ from that of the 2012 resource adequacy fleet. For example, as shown in Table 1, the ISO expects over 6,000 MW of newly installed wind and solar capacity by the end of 2014. Due to the resource adequacy counting rules, the net qualifying capacity for resource adequacy resources will be less that the installed capacity. However, even if these new additions were to only count for 2,000 MW of net qualifying capacity, that is 2000 MW of new resource adequacy capacity that is not dispatchable. While this new resource adequacy capacity may replace some otherwise already inflexible generation, without flexible capacity procurement obligations, it is equally likely to replace or "crowd out" flexible capacity. For the purposes of the deficiency assessment, the ISO assumes that soon to be retiring once-through-cooling resources would be resources that would be "crowded out" by these new intermittent resources.[20] Further, considering the large quantity of intermittent resources scheduled to come on line, the ISO still uses a conservative assumption about how much flexible once-through-cooling capacity would be crowded out from the program. For the purposes of the deficiency assessment, the ISO used simple assumptions and evaluated several cases of how the calculated effective flexible capacity of the resource adequacy fleet might differ from the shown effective flexible capacity of the resource adequacy fleet. As shown in Table 2 below, the ISO considered reductions from the calculated effective flexible capacity to account for:

- Any run-of-river or other hydro resources that have self-identified as dispatchable, but would not qualify to provide effective flexible capacity,
- Additional hydro reductions to account for the need for water and other environmental considerations,

[20] Once-through-cooling resources are used only for demonstrative purposes. Resources that are not procured as resource adequacy capacity due to the influx of intermittent resources could be non-once-through-cooling resources as well.

- A low level of self-scheduling of effective flexible capacity qualified capacity,
- Retiring once-through-cooling resources replaced with inflexible intermittent generic capacity,
- Resources with start-up times of greater than six-hours that elect not to be flexible due to the costs and challenges of frequent dispatches and the risk of more frequent starts and stops, and
- An assumed outage rate of 8 percent for all resource adequacy resources.

Table 2

Reductions To Effective Flexible Capacity Used In ISO Case Assessments Using 2012 Month-Ahead RA Showings

	Run-of-River Hydro Reductions	Reduction in Hydro based on Hydro conditions**	Reductions for continued Self Scheduling	EFC OTC retirement in 2015	Reductions based on election of inflexibility elections	Assumed outage rate of all remaining resources
Basic Reduction Case	1000	1000	2000	500	0	8%
Basic Reduction with Low Hydro Case	1000	2000	2000	500	0	8%
Limited Long Start Resources	1000	1000	2000	500	2000	8%

As with the needs assessment, the ISO used conservative estimates in this assessment. For example, the ISO assumed only 2,000 MW of self-scheduling of otherwise flexible capability in the real-time market. However, as the data the ISO provided to the parties shows, it would not be uncommon for the ISO to have 10,000 MW or more of self-schedules coming out the effective flexible capacity range of the fleet. Additionally, as noted in the PG&E presentation at the March 20, 2013 workshop, because of hydro conditions and environmental considerations, it is unlikely that a load

serving entity would elect to show all of its hydro capacity as flexible, even though it may be eligible. Figure 6 shows the calculated effective flexible capacity of the entire fleet within the ISO, the calculated effective flexible capacity of the resource adequacy fleet, and the results of the limited long-start case described in Table 2.[21] These calculations are then compared with the flexible capacity requirements for 2014-2016.

Figure 6

Deficiency Assessment Comparing Calculated EFC to Operationally Available EFC

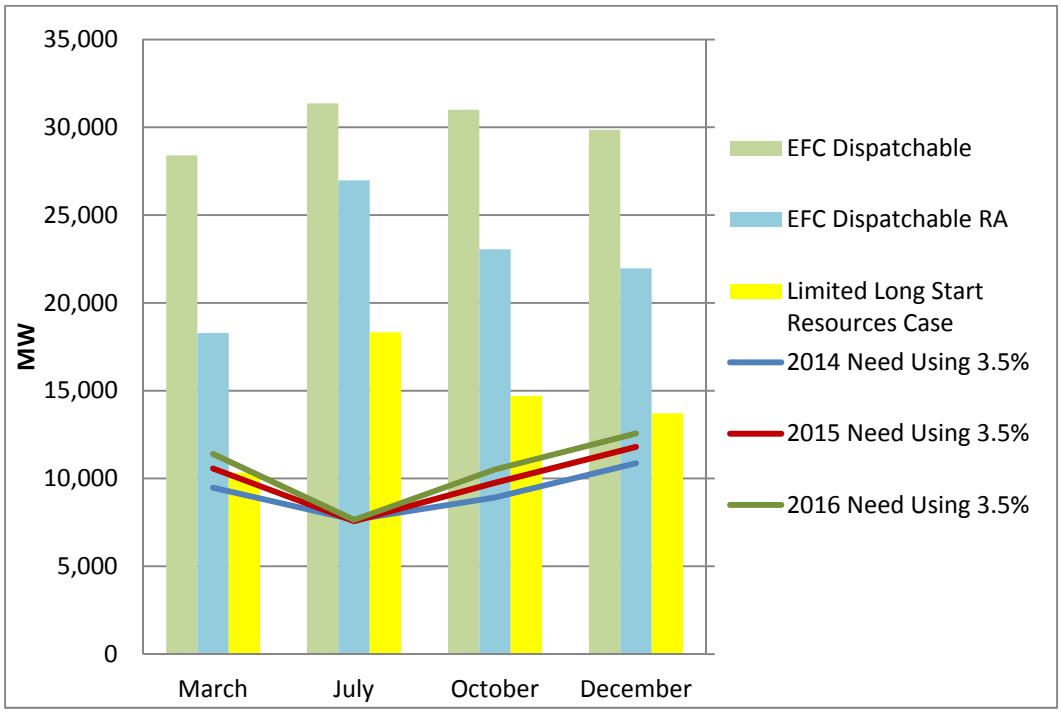


Figure 6 shows that, without flexible capacity procurement obligations and using conservative reductions to the calculated effective flexible capacity of the procured resource adequacy fleet, there is a risk that the resource adequacy program would not provide the ISO with sufficient flexible capacity in 2014. This risk becomes much

[21] The results for additional cases reviewed are provided on Slide 28 of the ISO's presentation at the March 28, 2013 resource adequacy workshop, attached to these comments as Attachment A.

greater in 2015 and beyond. Also, this risk is greatest in the shoulder months. The ISO believes that this simple and conservative assessment demonstrates sufficient risk of insufficient flexible capacity from resource adequacy procured resources and requests the CPUC to implement flexible capacity procurement obligations for 2014 and beyond.

D. Experience Through Flexible Capacity Requirement for 2014

In D.12-06-025, the Commission committed to address flexible capacity "to adopt a framework by or near the end of 2012, for implementation in the 2014 resource adequacy compliance year."[22] Consistent with this decision, the ISO believes that it has again demonstrated with updated data that there is a need to implement flexible capacity procurement obligations for 2014 to address potential deficiencies of flexible capacity from resource adequacy resources. The ISO also believes that implementation of the flexible capacity procurement obligations in 2014 will allow load serving entities and resources to gain significant and meaningful experience with procurement, showings, bidding, and operations of resources under the flexible capacity paradigm before serious reliability conditions exists.

The best time to incorporate flexible capacity into the resource adequacy program is before a sizeable deficiency of flexible capacity exists. Although Figure 6 shows sufficient effective flexible capacity available to meet the flexible capacity requirement in 2014, the implementation of flexible capacity procurement obligations is a step in a new direction that will likely require additional refinements as we gain experience with the procurement and dispatch of flexible capacity resources. For example, many hydro resources are typically used to manage or shave peak demand. The use of hydro resources to address ramps and manage new energy limits will

[22] D.12-06-025 at p.20.

require significant effort to effectively, efficiently, and economically bid these resources into the ISO real-time market to address ramping needs. Additionally, all entities including the CPUC, ISO, load serving entities, and flexible capacity resources will have to go through a learning curve to address resource adequacy showings and validate the flexible capacity identified in the monthly plans. Energy Division's proposal points to some of the challenges of this transition.[23] Such transitions, though never easy, are necessary and best done at a time when the risks are lowest in order to minimize the procurement costs and market power concerns. The longer the CPUC waits to implement flexible capacity procurement obligations, the greater the risk to reliability and the greater the potential cost to address flexible capacity needs.

IV. ISSUES RAISED BY OTHER PARTIES

A. The "Duck Graph"

Sierra Club and TURN claim that the ISO "is now using the duck graph … as visual justification for its proposal for the immediate adoption of flexible capacity procurement by this Commission and the need [sic] for a forward capacity market."[24] Sierra Club and TURN appear to misunderstand the purpose of the so-called "duck graph," is simply to illustrate that the system will experience growing net-load ramps and potential over-generation in the near future. The ISO's justification for flexible capacity comes, not from this visual aide, but from an in-depth and detailed analysis of minute-by-minute load and net-load data, using the latest RPS build out by technology and location, and renewable resource profiles previously vetted in the CPUC LTPP case, to demonstrate the real need for flexible capacity. The ISO hopes that no party views the

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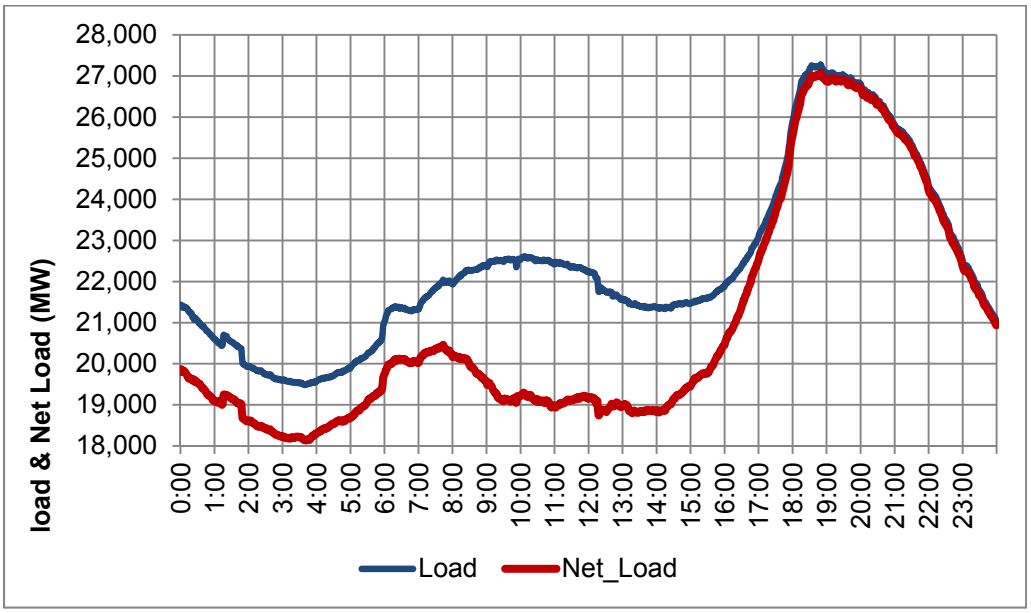
[23] Energy Division Flexible Capacity Procurement Revised Proposal March 11, 2013.

[24] Request for Evidentiary Hearings of Sierra Club and the Utility Reform Network, R.11-10-023, March 7, 2013, at p. 1.

"duck graph" as the ISO's primary or substantive justification or quantification for a flexible capacity requirement. The justification is in the detailed data produced and presented in this proceeding by the ISO and shared with parties. However, the ISO has reviewed the minute-by-minute data for 2014-2016 and has identified numerous days that reflect the net-load shapes illustrated by the "duck graph." Additionally, Figure 7 shows that the ramps illustrated by the "duck graph" already exist. This figure is based on actual load and net load data for February 24, 2013. Ramps such as those shown on the graph will become larger and more pronounced as more wind and solar resources are added to the grid.[25]

Figure 7

Load, Wind, Solar and Net Load - 2/24/2013



[25] Additional examples of the actual net-load ramps in the ISO are contained in Appendix A

B. Resource Ramp Rates

In its comments on the Joint Parties' Flexible Capacity Proposal, Sierra Club and Vote Solar criticized the ISO for its assumptions about resource ramp rates, asserting that the ISO has artificially created a perceived need for new flexible resources by being overly conservative about the ramp rates of existing resources.[26] This assertion is incorrect for the following reasons.

The ISO has used the ramp rates of resources from the ISO's master file. In other words, the only assumption the ISO has made with regard to ramp rates is that the data provided to the master file by the resources is correct.[27] The Sierra Club's analysis assumes the fleet's inherent ramping capability, as defined by the highest ramps rates shown in the manufacturer's specification, will always be fully available when needed. While it may be technically possible for resources to ramp at faster rates, driving resources to design limits is associated with greater wear and tear, resulting in higher forced outage rates and higher resource maintenance costs. In real-life scenarios, sustained ramping needs will arise at times when certain flexible resources are already loaded to provide energy and, therefore, will not have full upward ramping capacity available, while other resources will be constrained by water management requirements (hydro), and emissions permit limitations (combustion turbines). Responsibly, the ISO's studies take such realistic scenarios into account.

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[26] Sierra Club and Vote Solar Initiative Comments on the Resource Adequacy and Flexible Capacity Procurement Joint Parties Proposal, Section C., pp. 6-10.

[27] ISO Tariff Section 4.6.4 requires that all resource information submitted to the ISO be accurate.

C. Relationship Of Loading Order And Flexible Capacity Requirement

The Commission will not jeopardize the loading order by implementing a flexible capacity requirement for the 2014 resource adequacy compliance year. Preferred resources, like demand response, will continue to count as resource adequacy resources in 2014, and the foreseeable future, as they always have under the CPUC's resource adequacy program. Implementing a flexible capacity procurement obligation does not eliminate the opportunity for resources to continue to qualify and count toward system and local resource adequacy capacity. Instead, adding a flexible capacity procurement obligation opens up additional opportunities for preferred resources to offer a new attribute, and possible additional revenues, for resource adequacy capacity.

The ISO has stated in this proceeding its desire for preferred resources, like demand response, to provide flexible capacity, which is also clearly contemplated under the Joint Parties' Proposal. Importantly, to provide flexible capacity in this interim period, a resource must be dispatchable by the ISO. Fortunately, the opportunity for demand response to participate in the ISO market is very near as the Commission will lift its prohibition and allow for the direct participation of demand response in the ISO market with the completion and approval of Rule 24 this year. Thus, the timing to further vet the participation of preferred resources, like demand response, as flexible capacity in 2014 for the 2015 resource adequacy compliance year is very timely given Rule 24 is nearing completion. Thus, a 2014 flexible capacity requirement will not violate the loading order, and discussion about preferred resources as flexible capacity will be ripe for further discussion in the next phase of the resource adequacy proceeding.

V. CONCLUSION

For the foregoing reasons, the ISO respectfully requests that the CPUC issue an order enacting a flexible capacity procurement obligation in the 2014 resource adequacy compliance year.

Respectfully submitted,
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Date: April 5, 2013

APPENDIX A

ISO Materials Presented at the CPUC Resource Adequacy Workshop

March 20, 2013

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Methodology for Determining Flexible Capacity Procurement Requirements

Presented at the CPUC RA Workshop
March 20, 2013 (Revised March 22, 2013 to reflect 80% fixed tilt solar fleet)

Mark Rothleder – VP Market Quality and Renewable Integration
John Goodin – Regulatory Policy Manager
Clyde Loutan – Senior Advisor – Renewable Energy Integration
Karl Meeusen – Market Design and Regulatory Policy Lead

Overview

- Review of Actual Operational Observations from 2013
- Data Collection and Study Methodology for Calculating the Flexible Capacity Requirements
- 3-hour ramping requirements: Results for 2014-2016 assessments
- Calculating and Assessing Effective Flexible Capacity (EFC) of the Fleet
- Flexible RA Capacity Procurement Requirement Process Timeline

Key Takeaways

- Net Load Ramps have already exceeded 7,500 MW in 3-Hours
- The ISO is using an established and CPUC vetted methodology
- The most significant ramping needs occur in off-peak months and exceed 10,000 MW in 3-hours
- Ramps exceeding 3-hour length will continue to occur
- While there is enough EFC, the current RA procurement framework may not ensure that flexibility is available to the ISO when needed
- A flexible capacity procurement obligation will enhance operational certainty as early as 2014
- It is feasible and necessary to implement a Flexible Capacity procurement obligation for 2014

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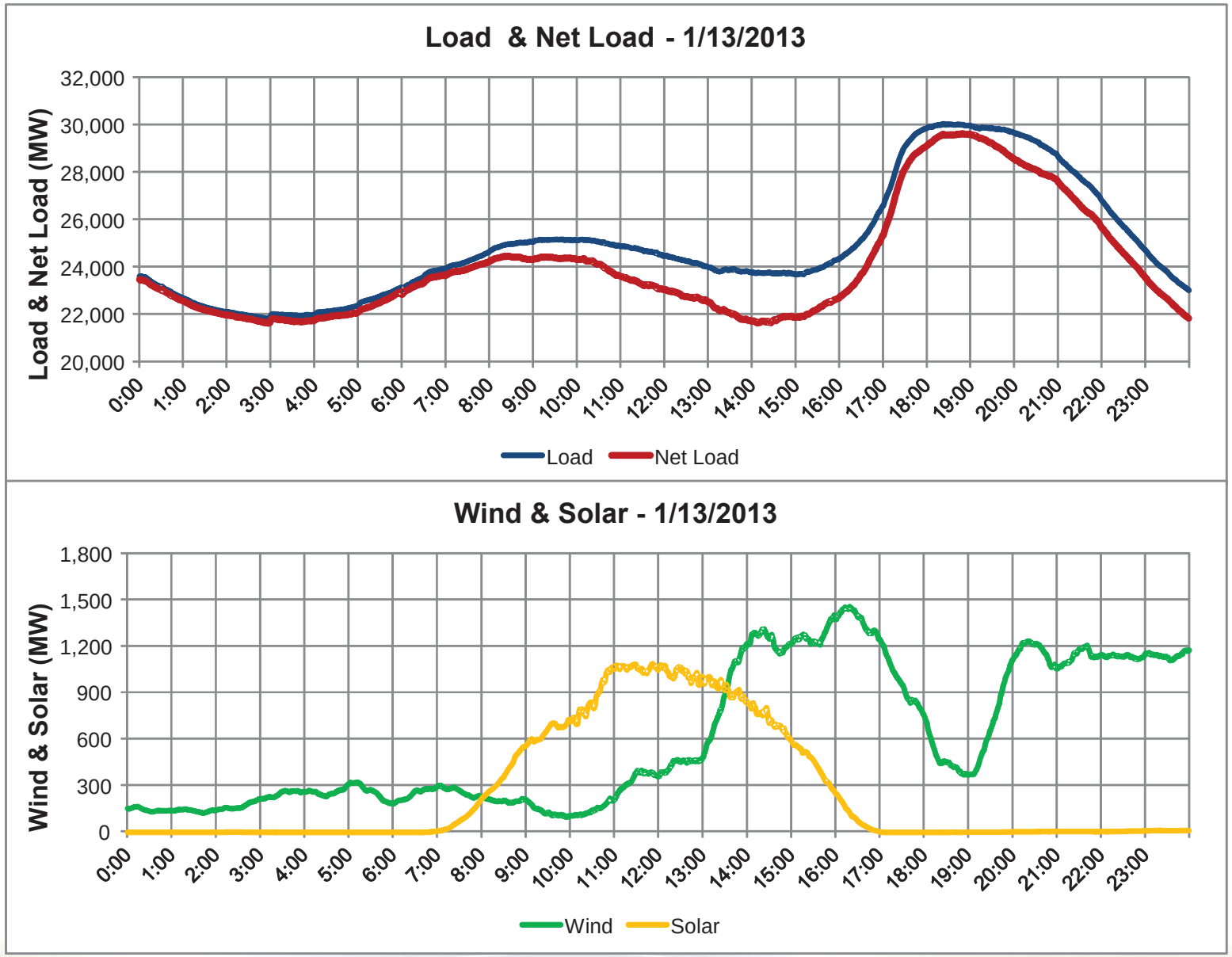
Review of Actual Operational Observations from 2013*

* Additional Actual 2013 operational observations are contained in the Appendix

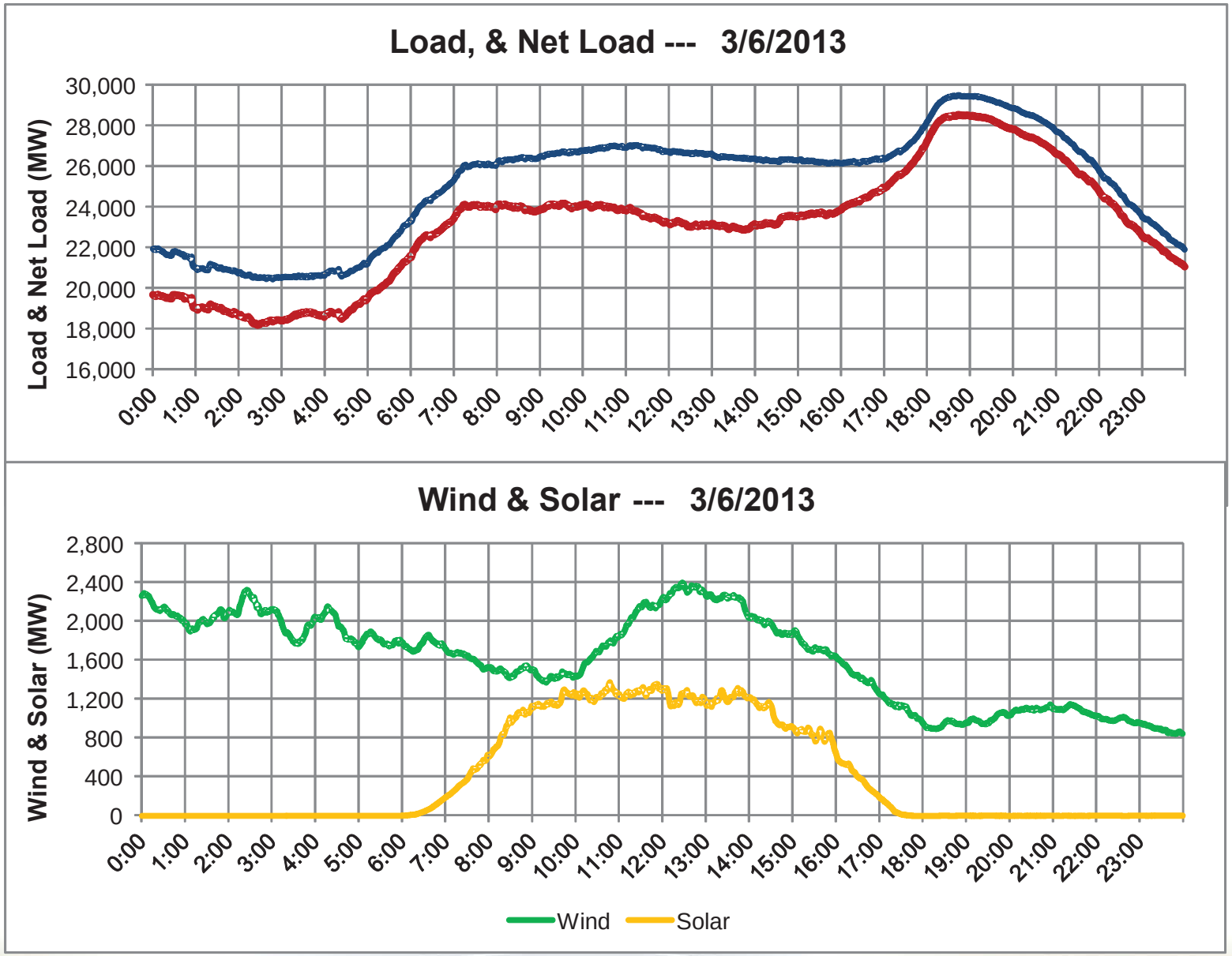
Wind and solar output drop simultaneously, resulting in a 7,500 MW 3-Hour Net Load ramp: January 13, 2013

- Maximum 3-Hour Load ramp was 6,285 MW
- Maximum 3-Hour Net Load ramp was 7,524 MW
- From 13:00, 807 MW of wind increased in 70 minutes during declining demand
- During the evening load ramp, wind dropped of by 991 MW and solar by 118 MW in 2 hours starting at 16:19



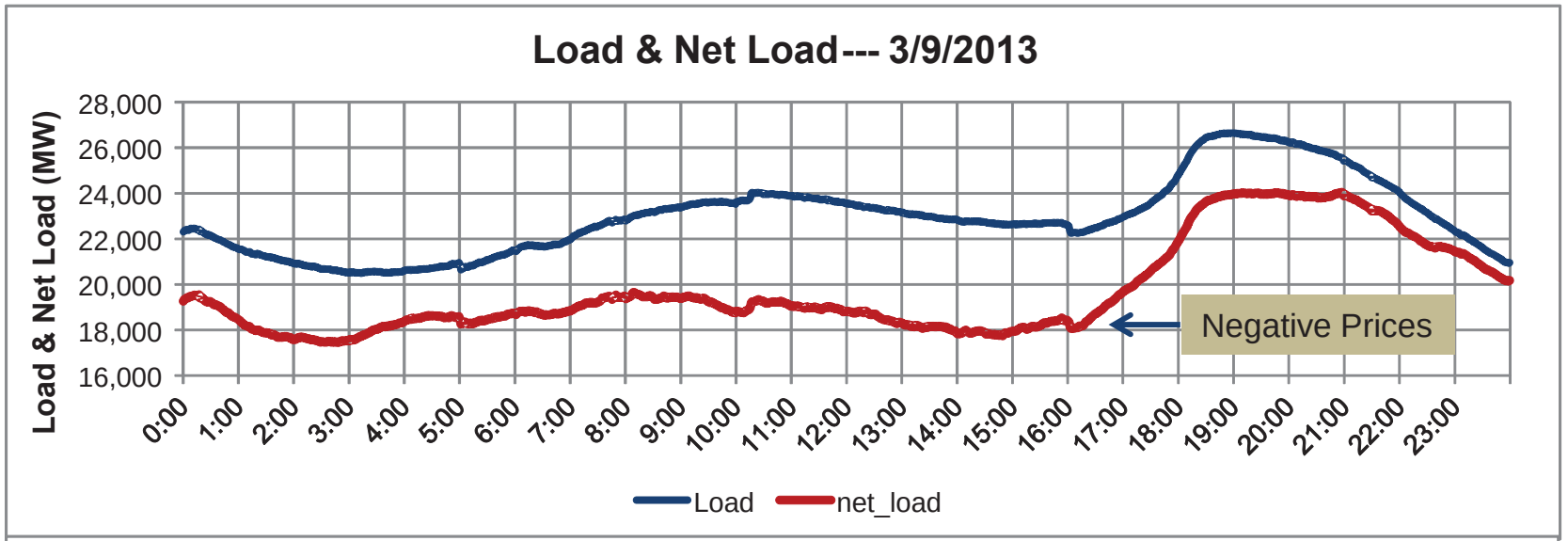
Wind and solar peaked and dropped simultaneously resulting in two distinct ramp-up periods

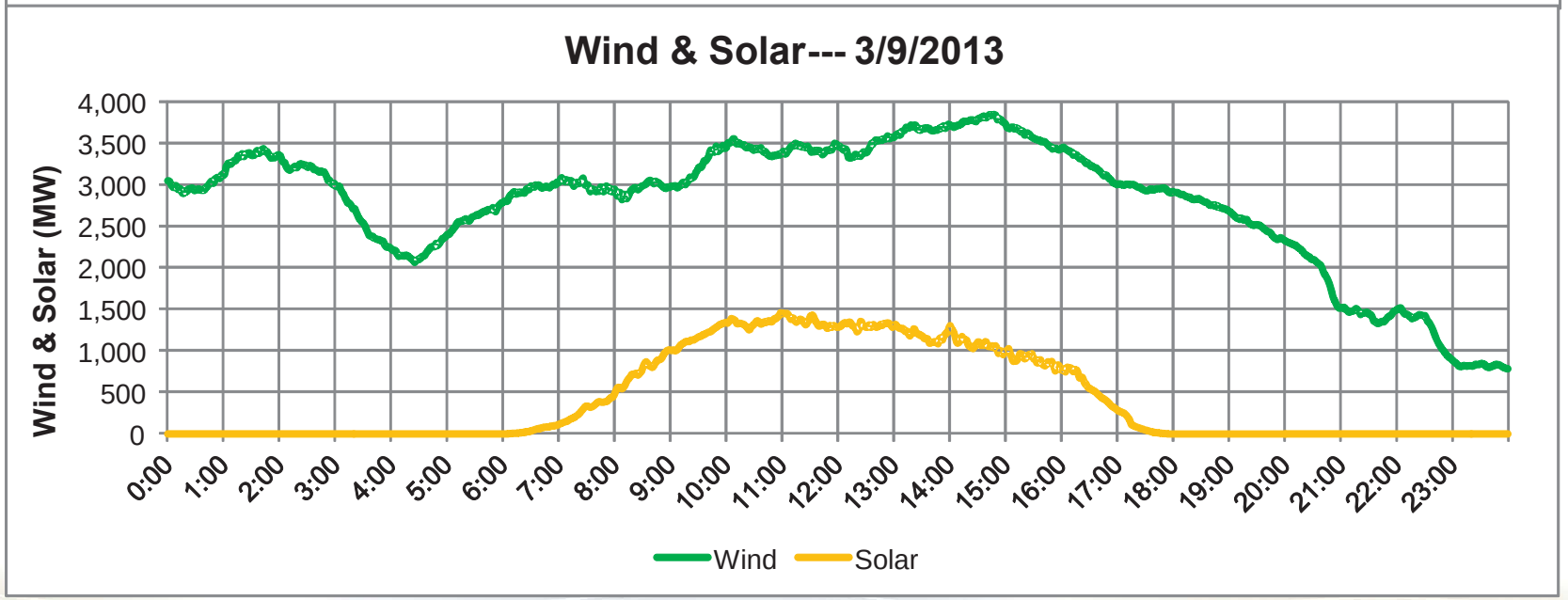
- Wind peaked at 2,391 MW @ 12:27
- Solar peaked at 1,367 MW @ 10:47
- Noticeable change in load and net load shape across mid-day
- Load increased by 3,500 MW in 2.5 hours
- Net Load increased by 5,000 MW in 3.5 hours



Wind production above 3,600 MW resulted in a net load below 18,000 MW and RTD negative prices for 11 5-minute intervals

- Wind production above 3,600 MW
- Solar production around 1,000 MW
- Net Load below 18,000 MW
- Nine 5-minute intervals of negative RTD prices for HE15
- Two 5-minute intervals of negative RTD prices for HE 16





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Data Collection and Study Methodology for Calculating the Flexible Capacity Requirements

Expected IOU RPS portfolio build-out has been updated

- The three IOUs provided their latest RPS data
  - Data based on IOU 2012 RPS Compliance Reports
  - The ISO obtained public version of contracted MW of RPS plans
- Information collected on resources included:
  - Location
  - Contracted capacity
  - On-line date
  - Technology

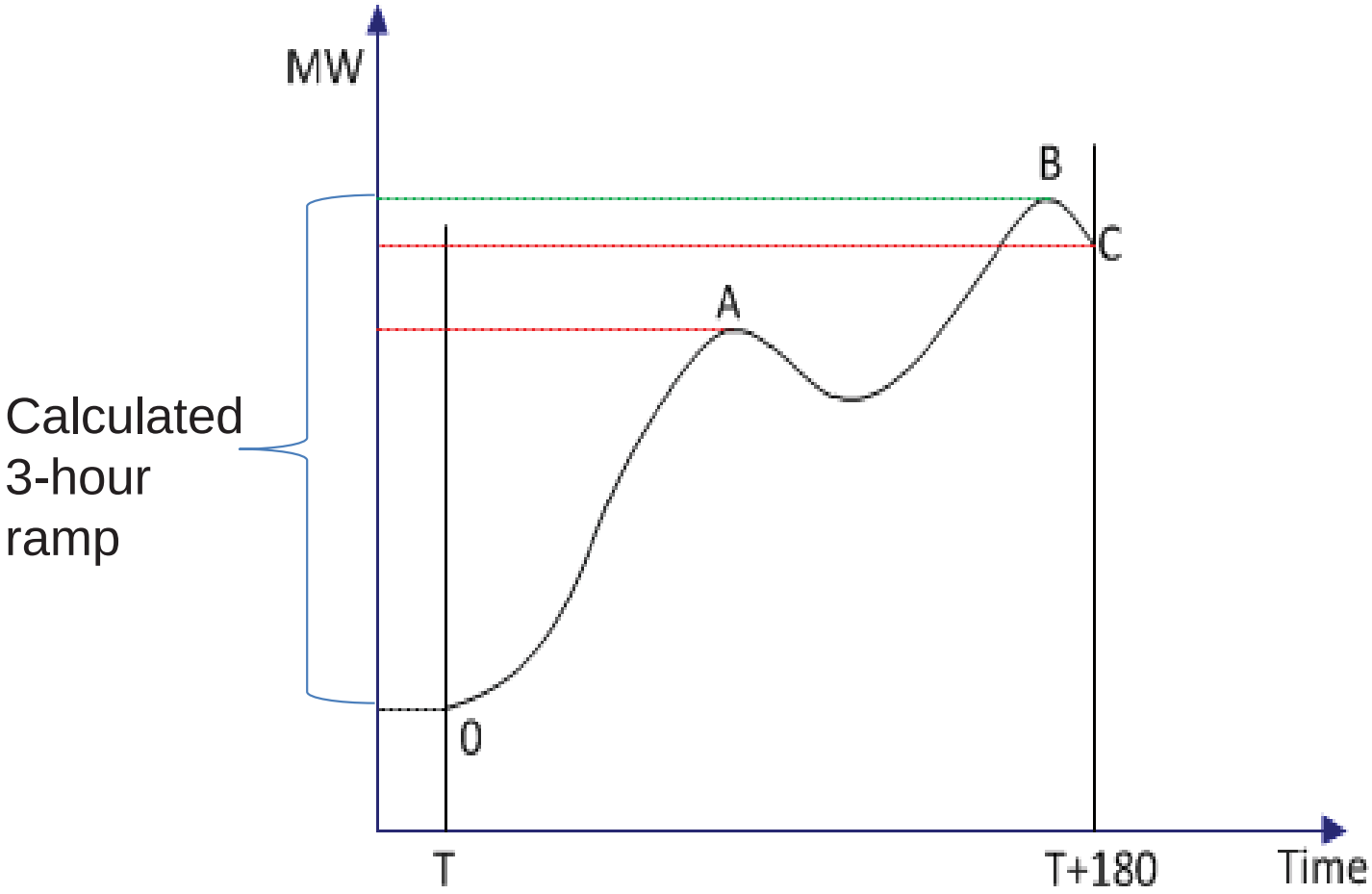
Using LTPP Base Case Assumption, Updated System-wide RPS Build-Out Shows 11,000 MW New Intermittent resources by 2017

- Relies on the same methodology and renewable profiles used in R.12-03-014
- Modified Assumptions:
  - Updated RPS data as previously defined*
  - Total Small PV figures are based on 2010 LTPP Assumptions

		Existing 2012	2013	2014	2015	2016	2017
Total Small PV (Demand Side) 2010 LTPP Assumptions		367	733	1100	1467	1833	2200
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 Intermitant Resources		***7,931***	***11,906***	***14,374***	***15,779***	***17,382***	***18,821***
Incremental New Additions in Each Year			3975	2,468	1,405	1,603	1,439

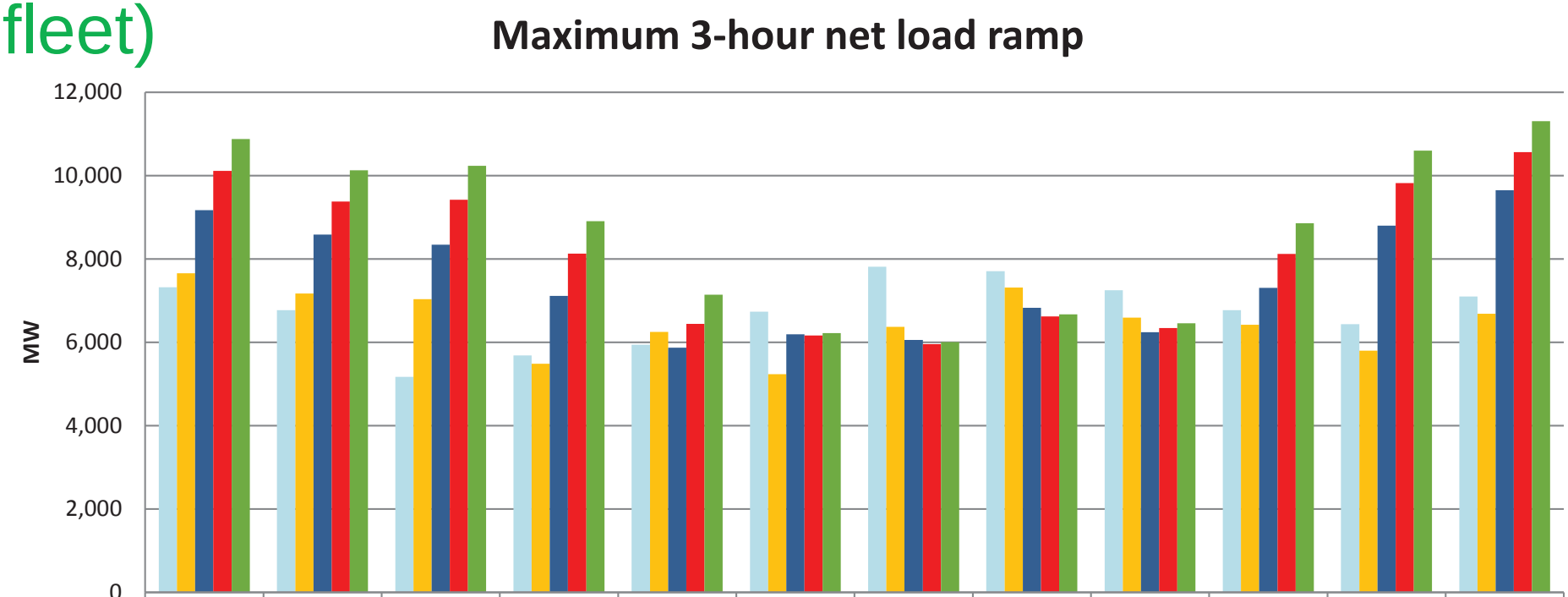
* Additional detail regarding individual IOU build out is provided in the Appendix

The 3-hour ramping need is calculated using the largest ramp during each 180 minute period



ISO tested all points using each methodology. Points B and C produced nearly identical needs for all months

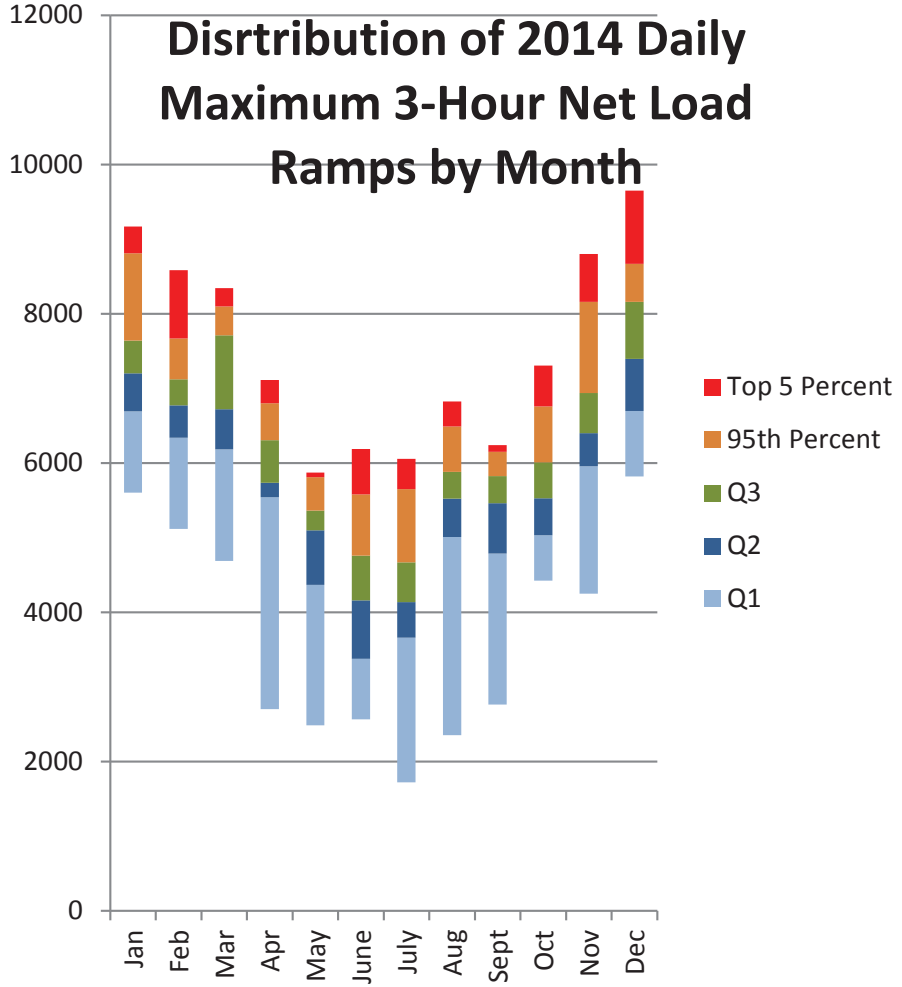
The maximum 3-hour net load ramp increases in each shoulder month by about 800-1000 MW year over year (revised to reflect 80% fixed tilt solar fleet)

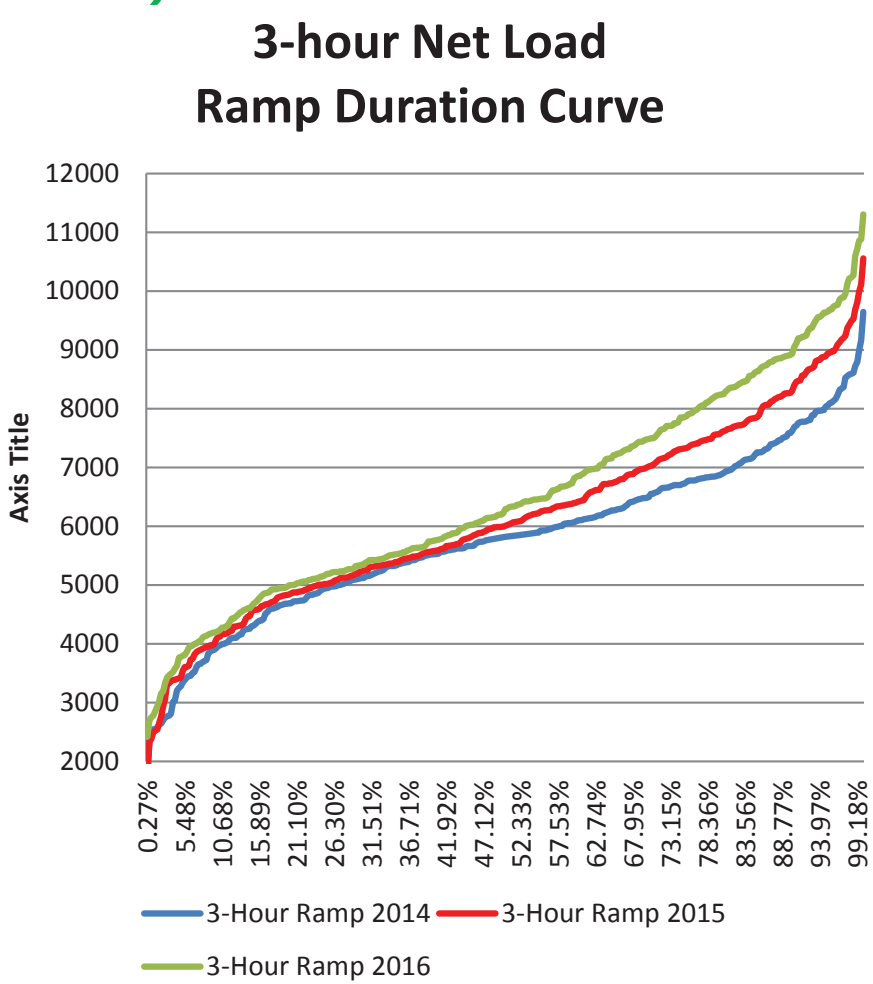


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011	7,319	6,770	5,168	5,688	5,942	6,732	7,815	7,702	7,251	6,767	6,433	7,098
2012	7,654	7,169	7,031	5,484	6,250	5,237	6,367	7,316	6,591	6,422	5,801	6,687
2014	9,167	8,584	8,341	7,113	5,873	6,189	6,054	6,824	6,239	7,304	8,799	9,648
2015	10,113	9,375	9,422	8,130	6,439	6,164	5,955	6,617	6,340	8,121	9,817	10,559
2016	10,877	10,129	10,235	8,903	7,140	6,220	6,006	6,673	6,454	8,858	10,597	11,306

* 2011 and 2012 use actual ramp data, while 2014-2016 use minute-by-minute forecasted ramp data

There are opportunities for use-limited and DR resources to address "super-ramps" (revised to reflect 80% fixed tilt solar fleet)





The proposed interim flexible capacity methodology should provide the ISO with sufficient flexible capacity

- Methodology

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

Where:

$\text{Max}[(3RR_{HRx})_{MTHy}]$ = Largest three hour contiguous ramp starting in hour x for month y

E(PL) = Expected peak load

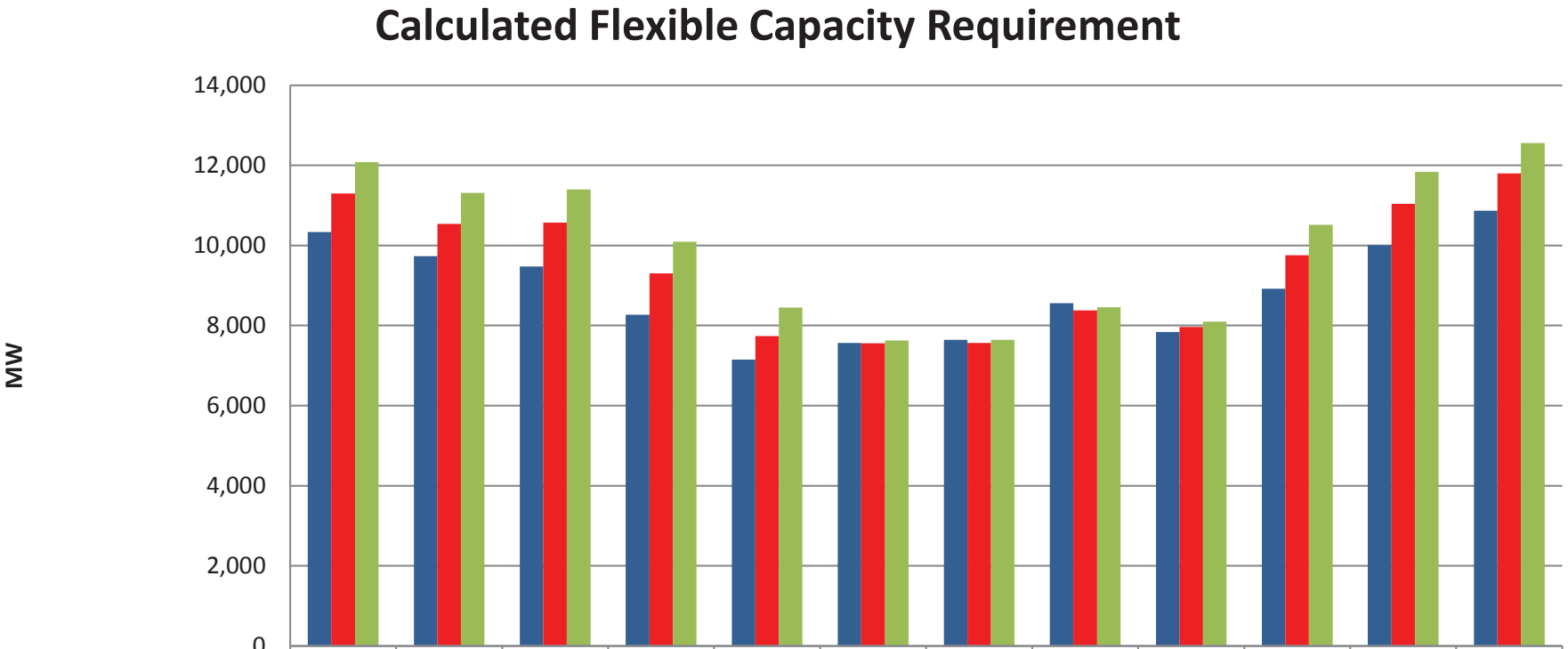
MTHy = Month y

MSSC = Most Severe Single Contingency

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

- Methodology for 2017 and beyond needs to be developed

The forecasted peak ramping needs are greatest in the shoulder months and growing over time (revised to reflect 80% fixed tilt solar fleet)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Total_Flex_Need_2014	10,335	9,732	9,474	8,272	7,151	7,563	7,646	8,563	7,841	8,916	10,007	10,869
Total_Flex_Need_2015	11,296	10,539	10,570	9,305	7,734	7,556	7,568	8,380	7,964	9,754	11,042	11,796
Total_Flex_Need_2016	12,077	11,310	11,400	10,095	8,454	7,631	7,643	8,460	8,100	10,515	11,839	12,560

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

Note: In the 2014-2016 assessments, the MSSC is never larger than the $3.5\%*E(PL_{MTHy})$

Summary of Findings

- Flexibility Capacity Need is largest in off-peak months
  - Flexible capacity will need to make up a greater percentage of the RA fleet in off-peak months
- The flexible capacity needs increase by about 800-1000 MW year over year in non-peak months
  - Increase almost exclusively caused by 3-hour ramp, not increase in peak load
- The most extreme ramps grow over time, showing increased ramping needs
- Daily maximum 3-hour ramps have significant monthly variance
  - Presents opportunity for Use-Limited resources, Demand Response, and Storage to meet “super ramps”

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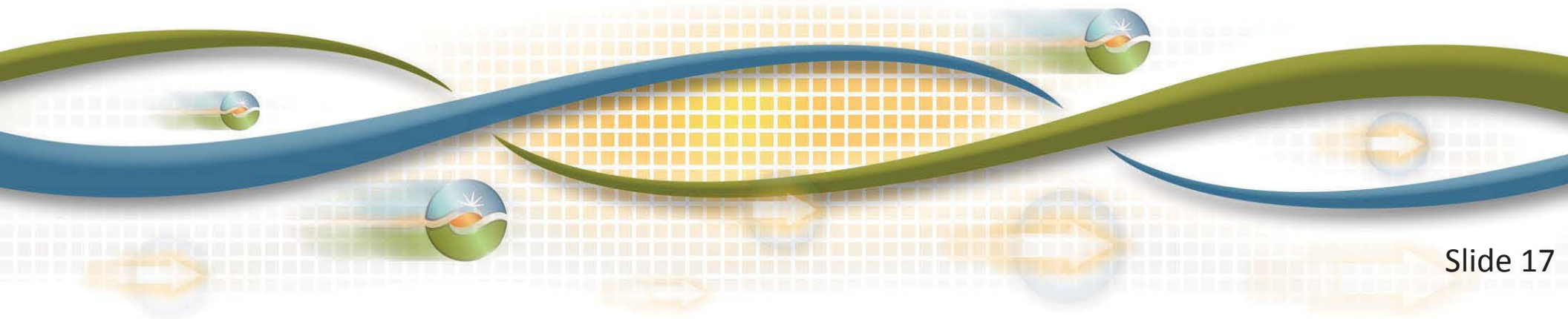
Calculating and Assessing Effective Flexible Capacity of the Fleet



Joint Parties proposal allows parties to determine a resource's effective flexible capacity

Start-up time greater than 90 minutes

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

Start-up time less than 90 minutes

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

Where:

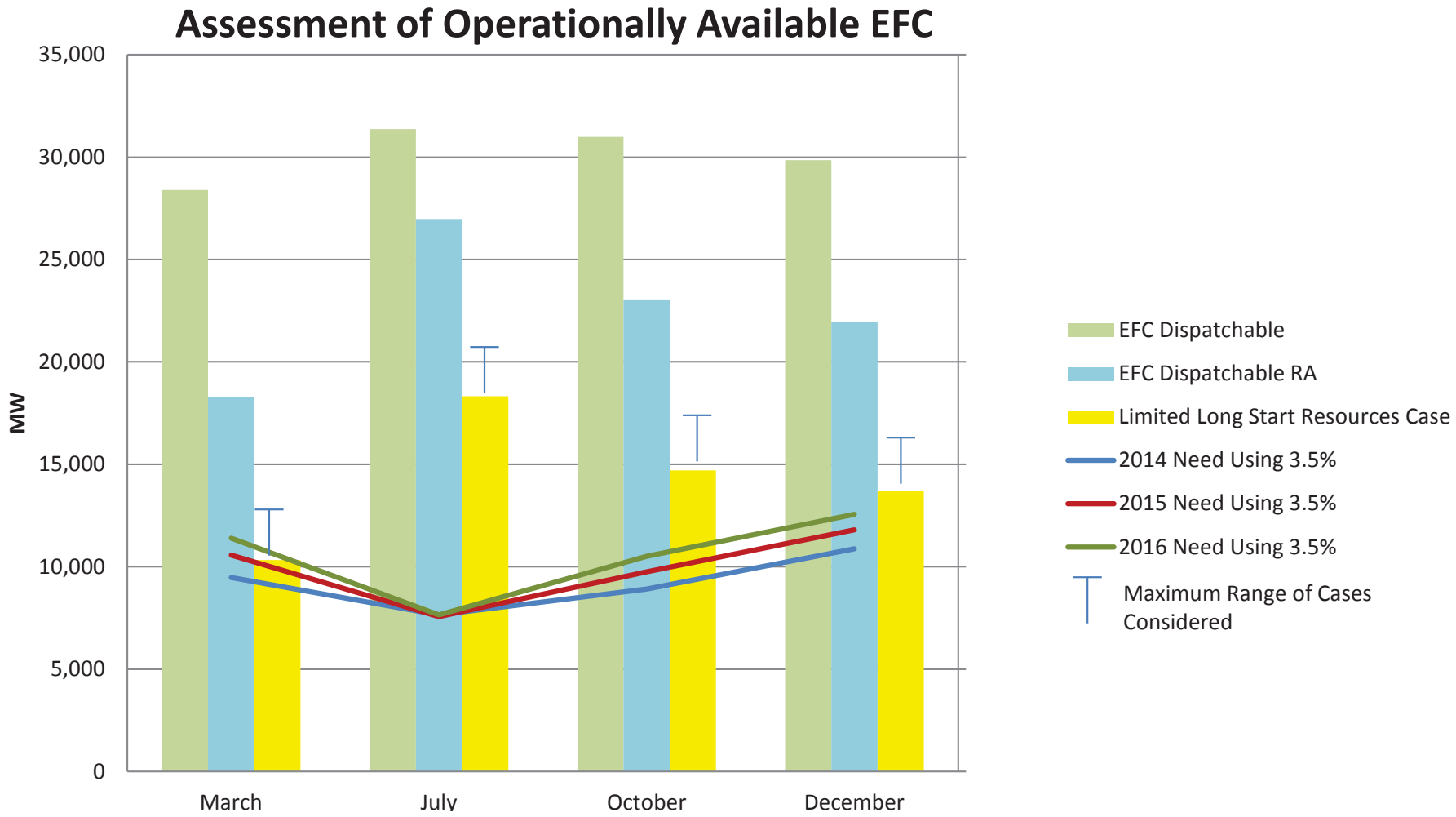
EFC: Effective Flexible Capacity

NQC: Net Qualifying Capacity

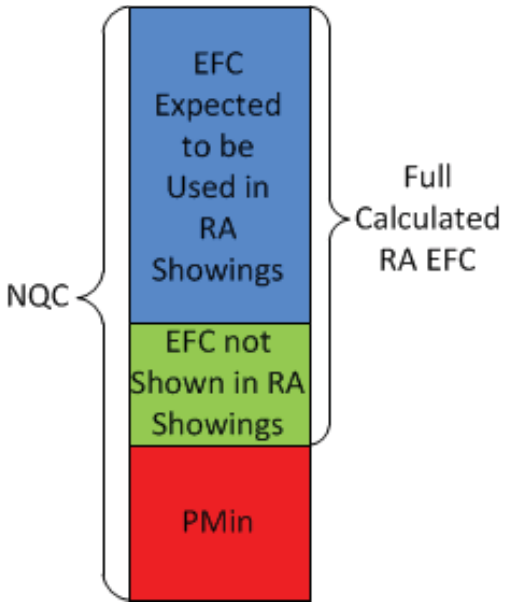
SUT: Start up Time

RRavg: Average Ramp Rate

Need a procurement rule to ensure sufficient flexibility in the procured RA resources (revised to reflect 80% fixed tilt solar fleet)



Need procurement rule that accounts for and ensures flexible capability is available for operational use



- Just because a resource has a calculated EFC, does not mean it will be listed as flexible in an RA showing and available for operational use.
- Simple case assessments* reflect potential of reduction of EFC for actual operation use due to:
  - Hydro conditions/run of river
  - Self-scheduling
  - Outages
  - Elections by resources to be inflexible

* Assumed reductions and additional cases are detailed in the Appendix

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Flexible RA Capacity Procurement Requirement Process Timeline

2014 Flexible RA Capacity Procurement Requirement Process Timeline

Flexible Capacity Requirement Setting (Activities occurring in the year prior to RA compliance year)	
• FCR methodology and assumptions paper and EFC amounts by eligible resource presented at CPUC workshop	Mar 20, 2013
• Parties submit comments on workshop and ISO proposed 2014 flexibility requirements	Set by CPUC
• Publish draft final LCR study and EFC list of eligible flexible capacity resources	Mar 28, 2013
- ISO stakeholder meeting to discuss LCR / FCR results	Apr 4, 2013
- Stakeholders submit comments	Apr 18, 2013
• Final 2014 LCR & FCR study	May 1, 2013
• CPUC proposed and final annual RA decision incorporating LCR and FCR obligations	May / June 2013
CPUC Procurement Obligation Allocation (System, local and flexible obligations for the following RA compliance year)	
• LSEs receive Year-Ahead obligations	Jul 31, 2013
• Revised load forecasts for following RA compliance year	Aug 17, 2013
• LSEs receive revised RA obligations	Sep 17, 2013
Showings (Activities occurring during the RA compliance year)	
• Year-ahead showing of system, local, and flexible capacity (show 100% local and 90% system and flexible)	Oct 31, 2013
• Month-ahead showings, including local and flexible true-ups	2014 Operating Month (T) – 45 days
• ISO notifies LSEs and suppliers of any deficiencies of system, local, and or flexible capacity	T-25 days
• LSEs demonstrate to the ISO that identified deficiencies have been cured	T-11 days

Illustrative 2015 & Beyond FCR Process Timeline

Flexible Capacity Requirement Setting (Activities occurring in the year prior to RA compliance year)	
Receive CEC load forecast used for TPP expansion plan	By Jan
Receive updated RPS build-out data from the IOUs	By Jan
Publish annual FCR assumptions paper	By Jan
– ISO stakeholder meeting to discuss assumptions	Feb
– Stakeholders submit comments	Feb
– Posting of comments with ISO response	Feb
Draft LCR and FCR study completed (including EFC list of eligible flexible capacity resources)	Mar 4
– Local & flexible capacity needs stakeholder meeting	Mar 7
Publish draft final LCR & FCR needs study	Mar 28
– ISO stakeholder meeting to discuss LCR / FCR results	Apr 4
– Stakeholders submit comments	Apr 18
Final 2014 LCR & FCR study	May 1
CPUC proposed and final annual RA decision incorporating LCR and FCR procurement obligations	May / June
CPUC Procurement Obligation Allocation (System, local and flexible obligations for the following RA compliance year)	
LSEs receive Year-Ahead obligations	Jul 31
Revised load forecasts for following RA compliance year	Aug 17
LSEs receive revised RA obligations	Sep 17
Showings (Activities occurring during the RA compliance year)	
Year-ahead showing of system, local, and flexible capacity (show 100% local and 90% system and flexible)	Oct 31
Month-ahead showings, including local and flexible true-ups	T -45 days
ISO notifies LSEs and suppliers of any deficiencies of system, local, and or flexible capacity	T-25 days
Final opportunity for LSEs to demonstrate to the ISO that any identified deficiencies have been cured	T-11 days

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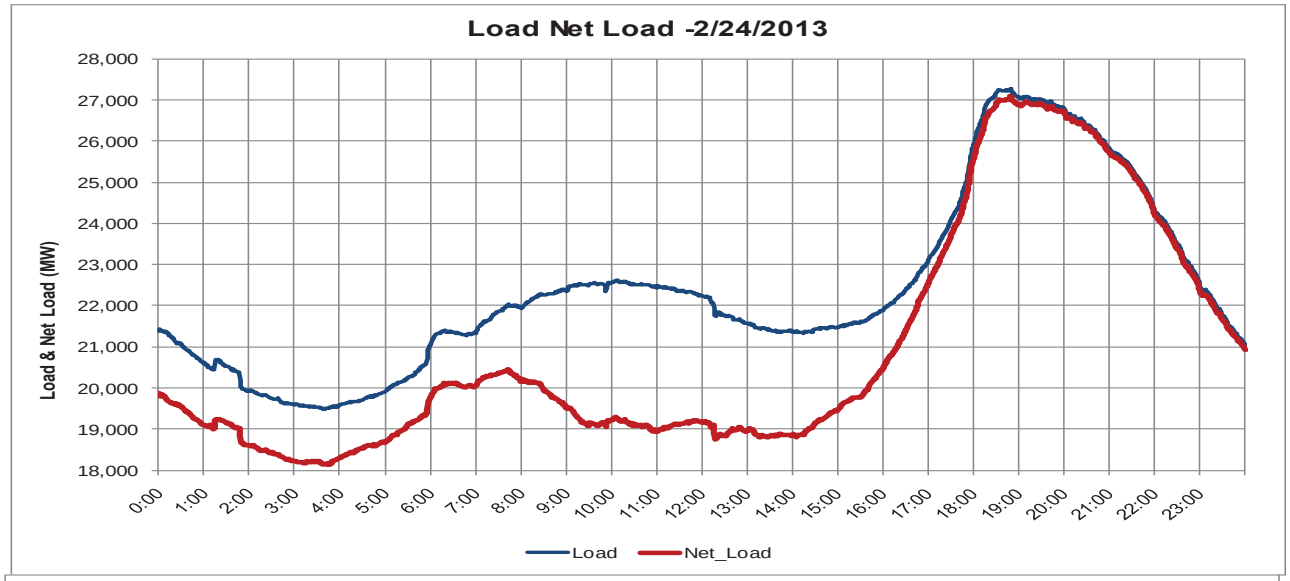
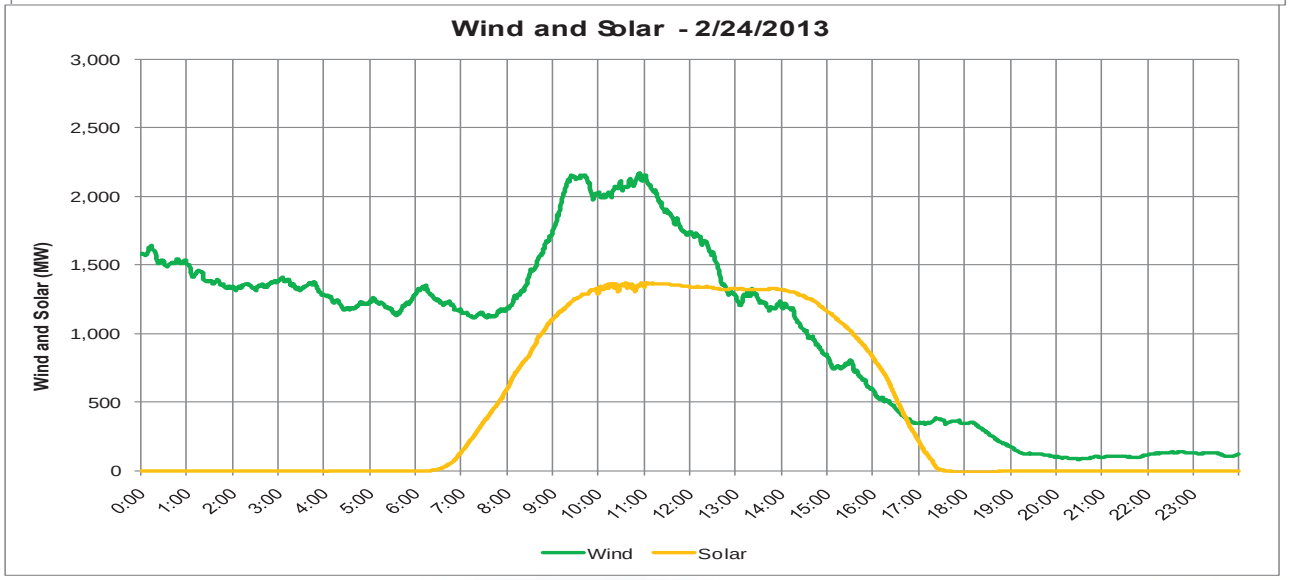
Appendix

Wind and solar output drop simultaneously, resulting in a 7,100 MW Net load ramp: Actual Data from 2/24/2013

- 1,300 MW of solar & 800 MW of wind dropped off in 21/2 hours as load increased
- Wind & solar contribution at peak was about 300 MW
- Maximum ramp approx. 8,000 MW in 5-hours
- Maximum 3-Hour ramp 7,171 MW
- Steep evening ramps are real and expected to increase with more renewable resources





RPS Data Collection – By IOU

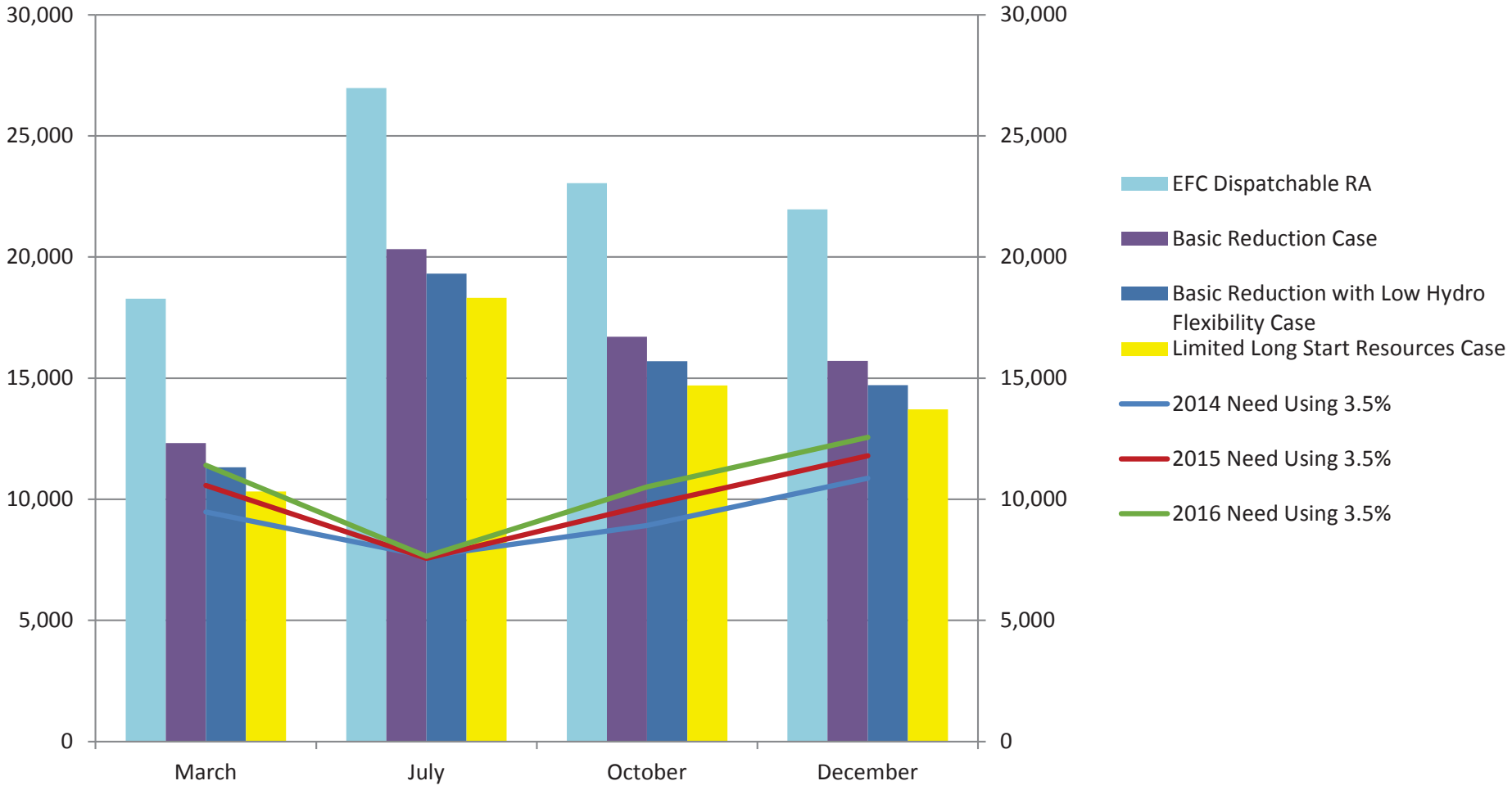
		2013	2014	2015	2016	2017
Load (Replicating Base Case Scenario from R.12-03-014)		48870	49577	50240	50951	51625
Total by IOU, Technology, and Year		2013	2014	2015	2016	2017
PG&E	Solar PV	1,026	1,646	1,929	2,131	2,202
PG&E	Solar Thermal	373	748	968	1,718	1,918
PG&E	Wind	29	29	42	52	52
SubTotal of PG&E 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

Reductions to EFC used in ISO case assessments, using 2012 Month-ahead RA showings

	Run-of-River Hydro Reductions	Reduction in Hydro based on Hydro conditions**	Reductions for continued Self Scheduling	EFC OTC retirement in 2015	Reductions based on election of inflexibility elections	Assumed outage rate of all remaining resources
Basic Reduction Case	1000	1000	2000	500	0	8%
Basic Reduction with Low Hydro Case	1000	2000	2000	500	0	8%
Limited Long Start Resources	1000	1000	2000	500	2000	8%

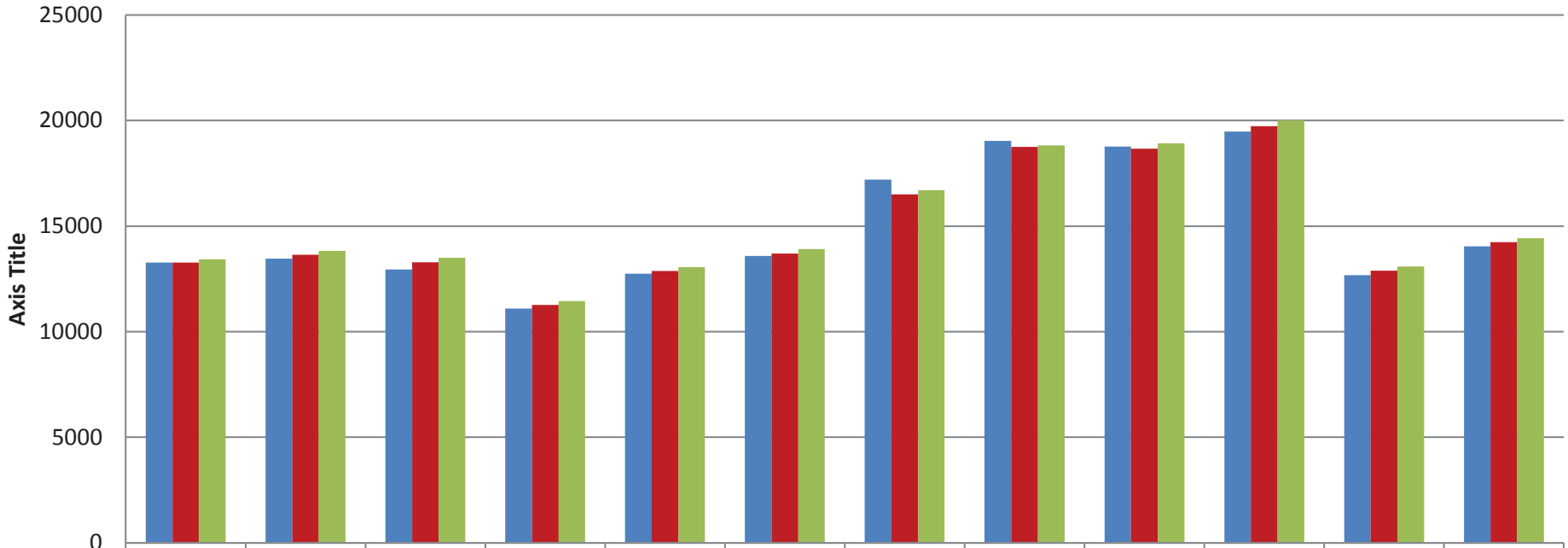
* Full RA EFC calculated based on 2012 actual month-ahead RA showings
** Assumes all non-run-of river qualify as flexible capacity.

Need a procurement rule to ensure sufficient flexibility is procured from the RA Fleet (revised to reflect 80% fixed tilt solar fleet)



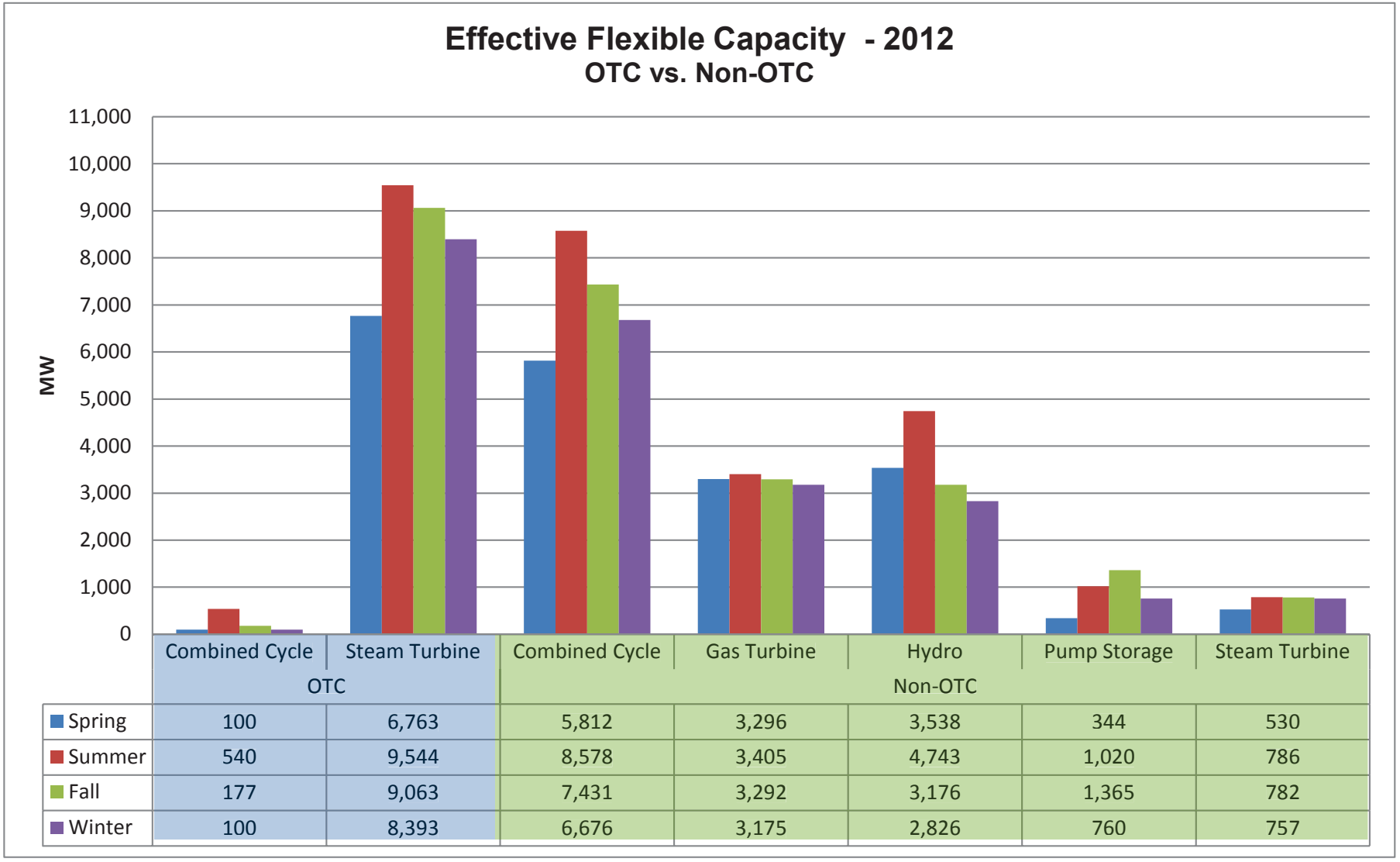
The ISO will still have to address net-load variations that last longer than the 3-Hour Ramp (revised to reflect 80% fixed tilt solar fleet)

Peak-to-Trough: Largest Differences in Net load in a Single Day (Independent of Continuity and Duration)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	13271.54	13461.743	12943.627	11087.585	12747.24	13578.29	17194.048	19040.102	18770.391	19477.244	12680.985	14034.5
2015	13273.241	13636.134	13284.429	11264.17	12866.275	13696.968	16497.829	18745.225	18665.008	19727.107	12890.602	14239.379
2016	13,425	13,821	13,503	11,446	13,054	13,914	16,700	18,828	18,919	20,021	13,084	14,420

Available EFC will reduce significantly as OTC resources retire



	OTC		Non-OTC				
	Combined Cycle	Steam Turbine	Combined Cycle	Gas Turbine	Hydro	Pump Storage	Steam Turbine
Spring	100	6,763	5,812	3,296	3,538	344	530
Summer	540	9,544	8,578	3,405	4,743	1,020	786
Fall	177	9,063	7,431	3,292	3,176	1,365	782
Winter	100	8,393	6,676	3,175	2,826	760	757

ATTACHMENT B

CALIFORNIA INDEPENDENT SYSTEM OPERATOR
PROPOSED
FINDINGS OF FACT, CONCLUSIONS OF LAW AND ORDERING
PARAGRAPHS TO ADOPT ITS RECOMMENDATIONS IN THIS PROCEEDING

FINDINGS OF FACTS:

1. There is a reasonable likelihood of operational flexible capacity deficiency starting as early as 2014.

2. Flexible capacity is needed to ensure that the ISO has sufficient flexible capacity available in 2014 to manage current and incremental operation needs as more intermittent resources come on-line.

3. The adoption of a flexible capacity requirement as part of the resource adequacy program will help ensure that flexible capacity is operationally available to the ISO to maintain grid reliability.

4. Establishing a flexible capacity requirement for 2014 will allow load serving entities and resources to gain experience with the requirement effectively before flexible capacity is absolutely critical to maintaining reliability in the balancing area in the following years.

5. The Joint Parties' Proposal provides the needed framework to implement flexible capacity procurement obligations for CPUC jurisdictional load serving entities for 2014.

6. Energy Division's revised proposal is highly aligned with the Joint Parties' Proposal and adds important implementation details.

7. The proposal of PG&E for the counting and treatment of hydro resources allows operators of flexible hydro resources to balance the operational needs for ramping during a day with hydrological and environmental constraints.

8. The ISO's flexibility capacity requirement assessment is based on the most current RPS build-out data, a methodology developed in the CPUC LTPP proceeding, and use of conservative estimates for load and tracking solar.

CONCLUSIONS OF LAW:

1. The resource adequacy program should be amended to implement a flexible capacity requirement for the 2014 resource adequacy compliance year.

2. Flexible capacity procurement obligations should be established for all CPUC jurisdictional load serving entities for 2014.

3. The flexible capacity procurement obligations should be determined based on the Joint Parties' Proposal and the revised Energy Division proposal, with the clarifications proposed by the ISO.

4. The methodology and calculations that should be used to determine the flexible following:

    - The methodology the ISO used to determine the monthly flexible capacity requirement, and to identify the monthly obligation to CPUC jurisdictional load serving entities based on their contribution to peak load ratio share,

    - The flexible capacity requirement for 2014 as calculated and proposed by the ISO in this proceeding,

    - The differentiated capacity proposed by the Joint Parties and Energy Division,

    - The “bundling” principle linking flexible and generic capacity,

    - The formulas and criteria for counting the effective flexible capacity of resources (except hydro) toward meeting flexible capacity procurement obligations as set forth in the Joint Parties Proposal,

    - The PG&E proposal for qualifying and counting hydro resources’ effective flexible capacity toward meeting flexible capacity procurement obligations, and

    - The methodology the ISO used to identify the monthly obligation of CPUC jurisdictional load serving entities based on their contribution to peak load ratio share,

4. The effective flexible capacity of a resource should not exceed its net qualifying capacity.

5. Each CPUC jurisdictional load serving entity should be required to make a 90% year-ahead and 100% month-ahead showing of flexible capacity for each month of the compliance year.

6. The following issues should be addressed in the resource adequacy proceeding for compliance year 2015:

    - Establishing counting rules, criteria, and qualifications for use-limited resources, including those with start-up or environmental restrictions, demand response, and storage devices, and

    - Develop penalties and enforcement provisions applicable to jurisdictional load serving entities that are deficient in the flexible capacity procurement obligations.

ORDERING PARAGRAPHS:

1. The resource adequacy program is hereby amended to implement a flexible capacity requirement for the 2014 resource adequacy compliance year.

2. Each CPUC jurisdictional load serving entity shall meet the flexible capacity procurement obligation for 2014 set forth in this order, as calculated by the ISO based on the on the Joint Parties' Proposal and the revised Energy Division proposal, with the clarifications proposed by the ISO.

3. The effective flexible capacity of a resource shall not exceed its net qualifying capacity.

5. Each CPUC jurisdictional load serving entity shall be required to make a 90% year-ahead and 100% month-ahead showing of flexible capacity for each month of the compliance year.

6. The following issues shall be considered in the resource adequacy proceeding for compliance year 2015:

    - Establishing counting rules, criteria, and qualifications for use-limited resources, including those with start-up or environmental restrictions, demand response, and storage devices, and

    - Develop penalties and enforcement provisions applicable to jurisdictional load serving entities that are deficient in the flexible capacity procurement obligations.