



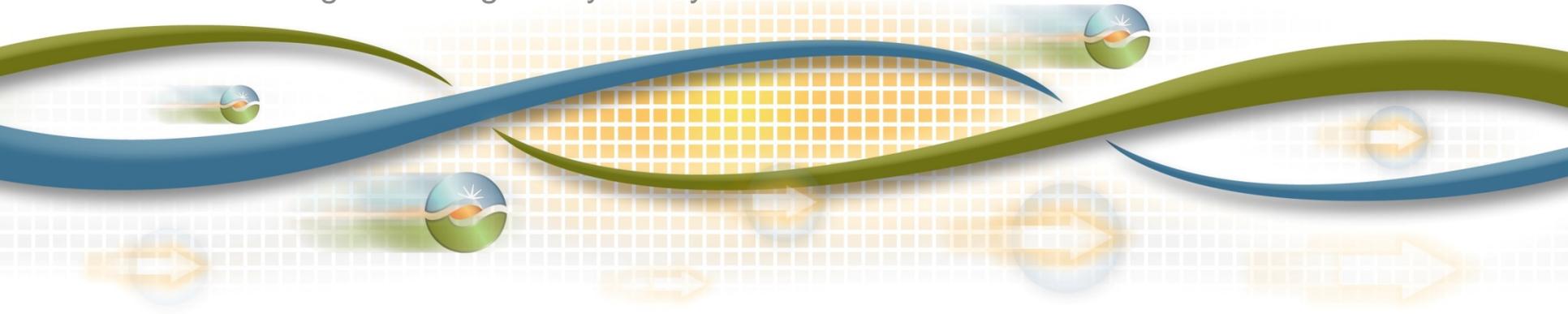
California ISO
Shaping a Renewed Future

Flexible Resource Adequacy Criteria and Must Offer Obligation – Phase 2 Straw Proposal

December 21, 2015

Karl Meeusen, Ph.D.

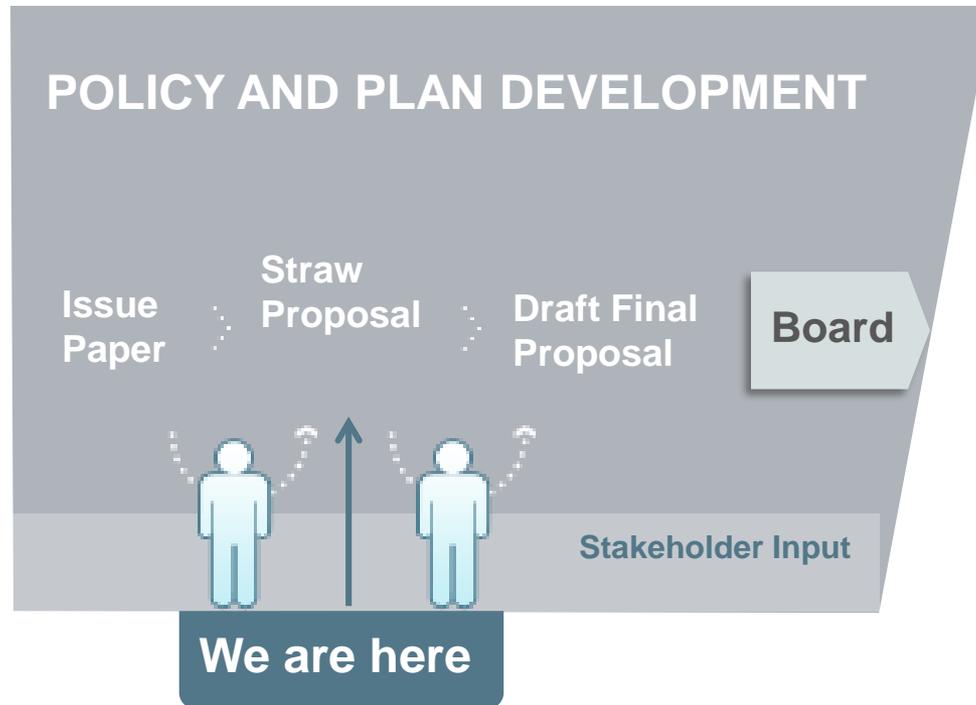
Market Design and Regulatory Policy Lead



Stakeholder Meeting – Agenda – 11/20/15

Time	Topic	Presenter
9:00 – 9:05	Introduction	Tom Cuccia
9:05 – 9:25	ISO proposed action plan to address oversupply	Karl Meeusen
9:25 – 9:35	Overview of Stakeholder Comments	
9:35 – 10:10	Imports and exports providing flexible capacity	
10:10 – 10:45	Flexible capacity and the pumped-hydro storage model	
10:45 – 11:10	Merchant VERs and the flexible capacity requirement	
11:10 – 11:25	Allocation of negative flexible capacity requirements	
11:25 – 11:45	RA showings for small LSEs	
11:45 – 12:00	Next Steps	Tom Cuccia

ISO Policy Initiative Stakeholder Process



Timeline

Date	Reliability Services Initiative – Phase 2
December 11, 2015	Straw proposal posted
December 21, 2015	Stakeholder call on straw proposal
January 6, 2016	Comments due on straw proposal
February 11, 2016	Revised straw proposal posted
February 25, 2016	Stakeholder call on revised straw proposal
March 10, 2016	Stakeholder comments on revised straw proposal due
April 14, 2016	Draft final proposal posted
April 28, 2016	Stakeholder call on draft final proposal
May 12, 2016	Stakeholder comments due on draft final proposal
June 28-29, 2016	Present proposal to ISO Board of Governors

The ISO proposes to continue current policy of limiting flexible product definition to upward flexible capacity

The ISO will develop enhancements to upward flexible capacity requirements through FRACMOO2 initiative

1. Provision of flexible capacity by import or export resources, including Effective Flexible Capacity calculation
2. Flexible capacity from pumped-storage hydro model (*i.e.* storage resources not using the NGR model)
3. Flexible capacity impacts of uncontracted/merchant Variable Energy Resources (VERs) (*i.e.* VERs where no LSE has procured its available capacity)
4. Allocating negative contributions to flexible capacity requirements
5. Resource adequacy showing requirements for small LSEs

The ISO proposes to address forecast oversupply conditions through:

- Providing LSEs and LRAs information on forecast operational needs, including downward flexible capacity needs, and
- Review of existing market rules to identify enhancements to provide clear economic signals to guide investment and market participant behavior to support operational needs.
 - Market design enhancements will be addressed through new initiatives planned to start next year

Market design enhancements will be addressed through new initiatives planned to start next year

- Lowering the bid floor – Stepped Constraint Parameters stakeholder initiative
- Reassessing current self-schedule priorities – Stepped Constraint Parameters stakeholder initiative
 - Would additional priorities be beneficial
 - Determine the priorities are set properly
 - Can modifications provide the ISO with additional tools to address oversupply
- Extending short-term unit (STUC) commitment horizon – Real-Time Market Enhancements stakeholder initiative

STAKEHOLDER COMMENTS

Stakeholder Comments

- Calpine, CESA, WPTF, and Wellhead support continued development of a downward flexible capacity product
- CPUC staff, PG&E, SDG&E, Six Cities, and SCE assert that the ISO has not shown sufficient evidence to demonstrate a need for downward flexible capacity
 - Encourage the ISO to rely on day-ahead and real-time market mechanisms to address downward flexibility needs.
- NGK asserts that RA needs to focus on moving GWh of generation from midday to the evening peaks and respond to fast ramps up and down, while reducing greenhouse gas (GHG) emissions.

Stakeholder Comments

- All stakeholders that commented on the issue of allowing flexible capacity from interties support expanding flexible capacity to 15 minute import resources.
- SMUD and Powerex believe the ISO should more fully explore whether exporting resources should receive reductions or waivers of ISO measured demand charges
 - SCE and Six Cities do not believe such a waiver is warranted or justified.
 - PG&E urges the ISO to focus on other means of enabling flexible capacity

Stakeholder Comments

- PG&E requests that the ISO alter its flexible capacity counting rules for storage resources that do not fit into the ISO's non-generator resources (NGR) model
- PG&E and the CPUC staff agree that the ISO should continue assessing the impact of uncontracted, or merchant VERs on the flexible capacity requirement
- CPUC staff, CDWR, and WPTF recommend that the ISO include the issue of allocating the negative flexible capacity contribution to the scope of this initiative
- The Small POU Coalition asked the ISO to further clarify RA exemptions for small LSEs

Stakeholder Comments

- The CPUC staff further recommends that the ISO expand the scope of this initiative to consider the error term adopted in FRACMOO.
 - The error term as part of the FRACMOO tariff filing
 - ISO will provide a detailed description of how and why it has made any adjustments as part of the annual flexible capacity technical study process
- The CPUC staff also requests that the ISO consider establishing EFCs for VERs
 - Existing EFC counting rules do not prohibit VERs from providing flexible capacity

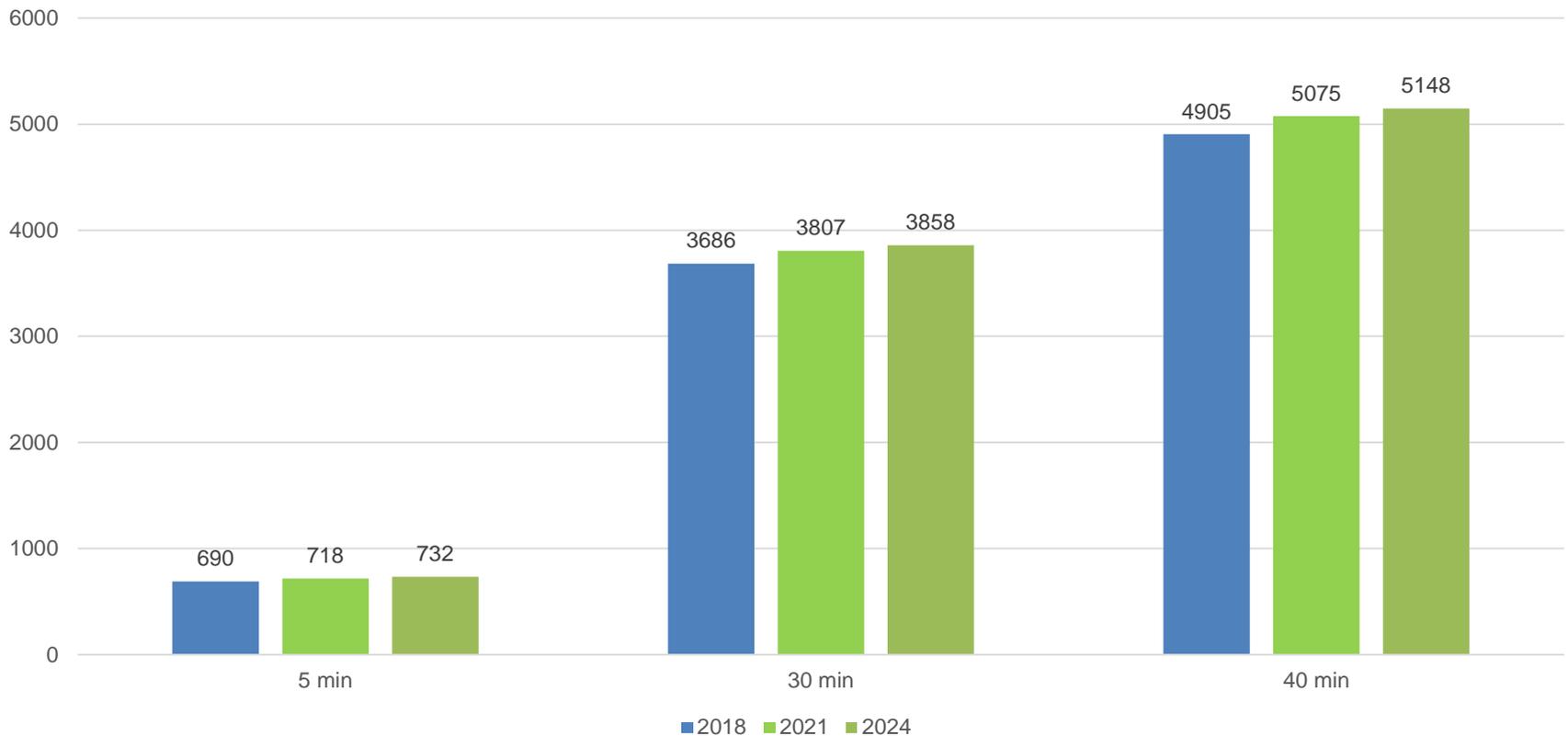
FLEXIBLE CAPACITY BY IMPORT OR EXPORT RESOURCES

The ISO proposes to allow qualified 15-minute inertia resources to provide flexible capacity

- 15-minute inertia resources can provide reliability benefits,
- Still significant variability after dispatch instructions for 15-minute inertia resources
 - Benefits are not comparable to 5-minute dispatchable capacity
 - A measured approach is warranted
- ISO proposes to cap flexible capacity from qualified inertia flexible capacity resources to no more than 50 percent of the total flexible capacity showing
 - ISO can reassess benefits of raising this limit at a later time

The ISO's preliminary assessment of flexible ramping needs between five minute dispatch and 15-minute dispatch timing

Interhour Ramps



15-minute intertie resources must meet basic criteria to provide flexible resource adequacy capacity

- Must economically bid into day-ahead and real-time markets
- Must be resource specific
- LSE must have sufficient Maximum Import Capability (MIC) allocation for the resource
- Firm energy schedule

The ISO seeks stakeholder input on these criteria and any other criteria that should be considered for 15-minute imports

Intertie resources must be resource specific

Two primary shortcomings from not requiring resource specific resources

- If non-resource specific imports can provide flexible capacity, it is possible resources could count towards meeting the flexible capacity requirement of two BAs
 - Is the resource specific criteria is necessary for non-EIM capacity?
- Determining the quality of the flexible capacity and the amount of capacity the resource can provide
 - As the resources backing a non-resource specific flexible capacity resource change, the “operational attributes” of the import might also change day-to-day or even hour-to-hour

LSE must have sufficient Maximum Import Capability (MIC) allocation for the resource

- The MIC is how LSEs demonstrate that an RA resource's output, and therefore flexibility, is deliverable to the ISO.
 - The ISO is not proposing changes to the MIC allocation process
- Having sufficient MIC is a requirement for any import resources to provide RA capacity
 - It is equally important that flexible capacity be deliverable into the ISO

The flexible capacity resource must commit to providing firm energy to the ISO

- The ISO is relying on the output of the resource to meet flexibility needs
- Allowing other BAAs or even the SC for the resource to adjust the output from the resource for external reasons may compromise the ISO's ability to meet a ramping need

Because import resources must be resource specific, EFCs will be calculated the same way as for internal resources

- If start-up time of a resource is greater than 90 minutes:
 - 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)**
- If start-up time of a resource is less than or equal to 90 minutes:
 - 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

The ISO will apply RAIM to all import flexible capacity resources

- The ISO will hold an import flexible capacity resource to the must offer obligation of the highest quality of flexible capacity for which it is shown
- Intertie flexible capacity resources on outage must provide substitute capacity from either an internal flexible capacity resource or another qualified flexible import resource
 - Able to provide the same level of flexible capacity for the duration of the outage

The ISO should be able to verify that imports have actually provided flexible capacity

- Imports must provide flexible capacity
 - i.e., not simply providing a wheeling schedule
- How can the ISO ensure that the flexible capacity sold by 15-minute intertie resource is actually made available for use by the ISO?
- Are there other special considerations that are needed to properly apply RAIM to import resources?
- Are there other concerns regarding the RAIM, or any other aspect of allowing flexible capacity from intertie resources?

The ISO is currently exploring the potential for exports to provide flexible capacity

- The potential benefits of pursuing such a product (i.e. Would this product be procured and/or needed)
- Qualifying criteria for providing the product
- Should exports providing flexible Resource Adequacy capacity be exempted from or receive reduced measured demand charges?
 - Adjustments to measured demand charges may be warranted
 - Needed to help facilitate exports ability to provide flexible capacity and
 - May not be applicable since the export is providing a grid service

FLEXIBLE CAPACITY FROM PUMPED-STORAGE HYDRO MODEL

The ISO committed to reassess pumped-storage hydro unit model for EFC as part of the current initiative

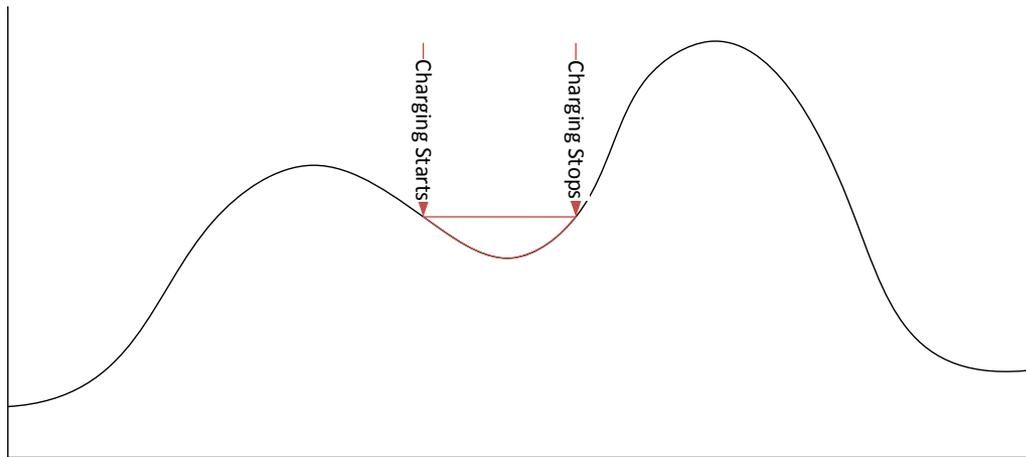
- The ISO's assessment focused on two attributes of pumped-hydro storage resource:
 - Transition time and
 - Discrete, or blocky, dispatch volumes both on and off.
- The ISO will assess both of these attributes in determining whether
 - It is reasonable to allow pumped-storage hydro resources to count pumping load as flexible capacity
 - If it is appropriate to determine the EFC for the resource, how the quantity is determined

The ISO proposes to allow pumped-storage hydro resources with transition times to be eligible to receive an EFC

- Transition times do not create a reliability basis for disqualifying pumped-storage hydro resources from providing flexible capacity from their pumping load
- Transition times are not unique to the pumped-storage hydro model.
 - Multi-stage generating (MSG) resources also have transition times and allowed to provide flexible capacity
- STUC outlook looks out over four and half hours
 - can determine when the pumping load is not needed and account for transition time

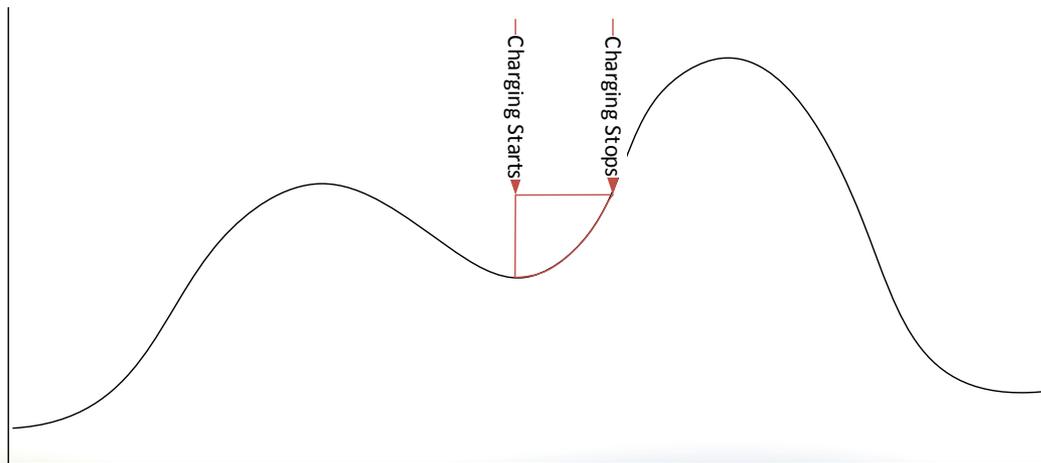
EFC based on a resource's ability to address the ISO's three hour net load ramp, *not simply lifting the net load*

- NGRs transition smoothly from charge to discharge.
 - Smooth transition from the charging to a zero output state allows NGRs to reduce the net load ramp



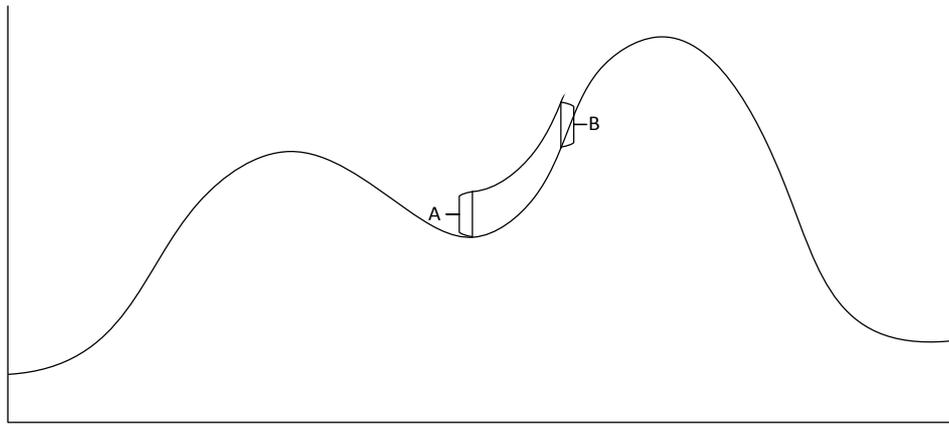
EFC based on a resource's ability to address the ISO's three hour net load ramp, *not simply lifting the net load*

- The important feature is the smooth transition off, not on.
 - Storage resource turns on discretely, but is able to decrease its charge continuously,
 - Reduces the net load ramp for all of its charging portion



EFC based on a resource's ability to address the ISO's three hour net load ramp, *not simply lifting the net load*

- When the resource then stops pumping, load drop means that new net load *drops* immediately back to the old net load curve.
 - In short, the actual ramp, in terms of MW, between A and B is the same on both curves.



ISO proposes not to provide an EFC for pumping load that is subject to discrete dispatches to reduce pumping load

- The ISO remains open to considering alternative options and demonstrations as to how such a resource can provide flexible capacity benefits
 - Seeking additional stakeholder input on this matter

The ISO has identified a need to further explore the assumption that a resource can provide ramping capabilities to the system without congestion concerns

- The flexible capacity requirement is currently a system capacity requirement.
- The ISO has explored whether the charging portion of storage resources can lift the net load without turning on additional generation internal to the load pocket
- The ISO has determined that additional studies are needed
 - off-peak study of transfer capability into load pocket
 - Based on these study results, the ISO will determine maximum allowable charging EFC that can be provided in a given local area.

FLEXIBLE CAPACITY IMPACTS OF UNCONTRACTED/MERCHANT VARIABLE ENERGY RESOURCES (VERS)

The ISO has conducted an assessment of the impact of merchant VERs on flexible capacity requirements

Month	Three hour net load ramp	Average of Wind contribution 2016	Estimated MW of total wind contribution	Percent of wind resources that are merchant VERs	Flexible RA contribution
January	9,974	-1%	99.74	4.48%	4.47
February	9,421	-2%	188.42	4.48%	8.44
March	9,284	-2%	185.68	4.48%	8.32
April	8,850	2%	-177	4.48%	-7.93
May	6,498	-8%	519.84	4.48%	23.30
June	5,876	7%	-411.32	4.48%	-18.44
July	6,392	6%	-383.52	4.48%	-17.19
August	6,412	6%	-384.72	4.48%	-17.24
September	7,784	1%	-77.84	4.48%	-3.49
October	9,066	-2%	181.32	4.48%	8.13
November	10,858	-1%	108.58	4.48%	4.87
December	11,662	-2%	233.24	4.48%	10.45

ISO does not believe there is sufficient evidence to change the existing RA construct

- The ISO will not pursue an additional requirements for merchant VERs at this time
 - Contribution caused by merchant VERs is *de minimis*
- Merchant VERs may increase over time as existing contracts expire
 - Increased state RPS targets may reduce the likelihood that resources under expiring contracts remain merchant VERs
 - The ISO will continue monitor these changes to determine if future action is warranted
- The ISO will file an informational report at FERC by the end of the year

ALLOCATING NEGATIVE CONTRIBUTIONS TO FLEXIBLE CAPACITY REQUIREMENTS

The ISO proposes to provide each LRA with its actual contribution to the three hour net load ramp, even if it is negative

- An LRA's contribution is currently limited to a minimum of zero.
 - Possible that an LRA may actually have a beneficial impact on the three hour net load ramp
- The ISO will provide LRA's with actual contribution to the three hour net load ramp
 - If the contribution is negative, the LRA could allocate that contribution to its jurisdictional LSEs, who could, in turn, sell those negative contributions
- Results in a more equitable treatment for LRAs that can help reduce the net load ramps

RESOURCE ADEQUACY SHOWING REQUIREMENTS FOR SMALL LSES

The ISO will clarify RA showing requirements for small LSEs

- ISO tariff exempts LSEs from RA showings if previous year's peak measured demand is less than one MW
 - Tariff is less clear about the showing requirements during those months.
 - No discussion about local and flexible capacity requirements of less than one MW.
- LSEs with RA requirements of less than one MW in a given month may show zero MW on RA showings
 - System
 - Local (by TAC)
 - Flexible
- LSE must still submit the RA showing for the month

NEXT STEPS

Tom Cuccia

Timeline

- Stakeholder comments on the straw proposal are due January 6, 2016; submit to initiativecomments@caiso.com
- Revised straw proposal will be posted on February 11, 2016
- A stakeholder call will be held on February 25, 2016