



2 Hour Resource Adequacy Product

2/7/2017

Proposal

- Allow resources with a 2 hour energy duration to qualify for resource adequacy
 - Limit quantity to 1% of monthly RA requirement to limit reliance of resources for reliability
 - Resources must meet all category 1 qualifications except their production must be for two consecutive hours instead of four
- Due to renewable penetration in market this is an opportune time to test integration of shorter duration products
 - Net load peaks are shorter in nature
 - Net load peaks occur in a tighter distribution allowing for a reliable dispatch of 2 hour RA resources
- Resource limits can be changed as product effectiveness is tested through market operations

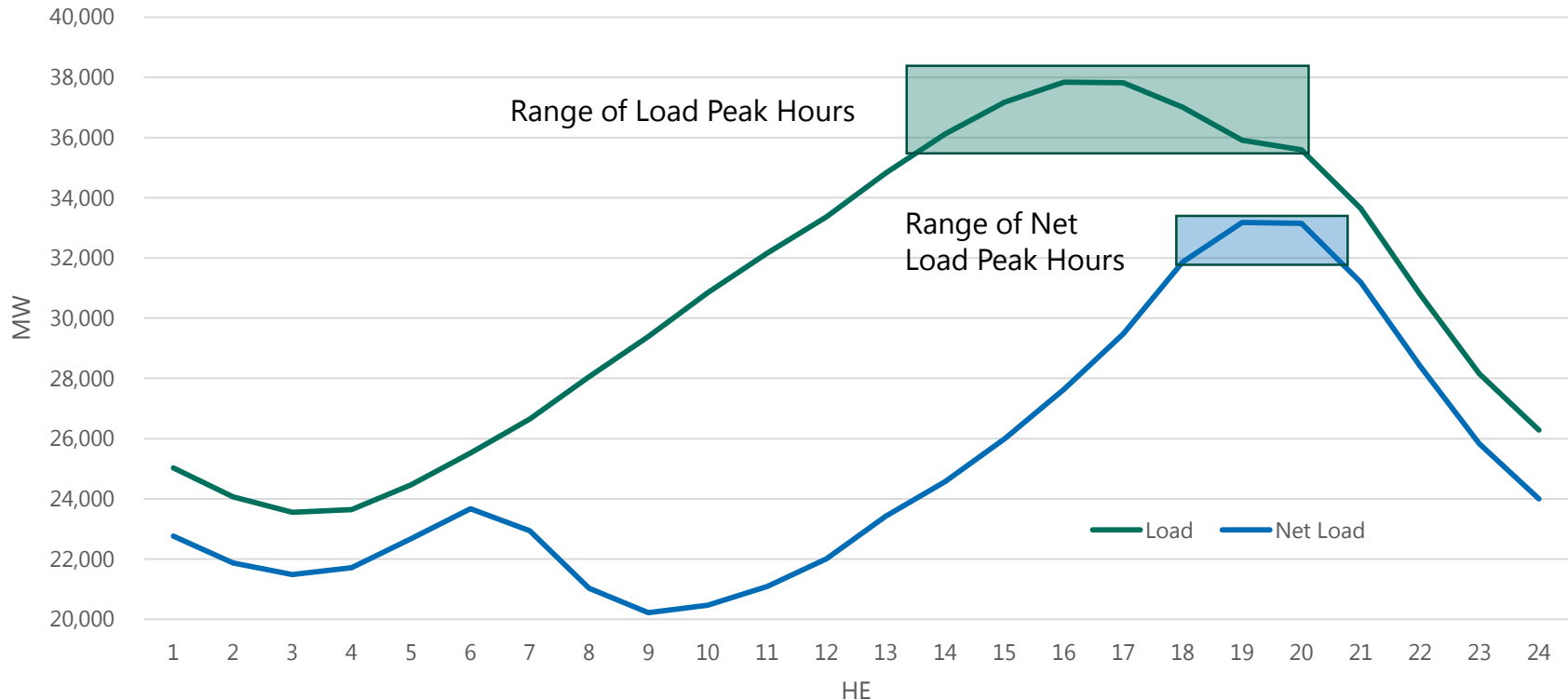
2 Hour RA Study Results - 2017

Month	2 Hour Resource Category Maximum (MW)	Peak Load (MW)	2 Hour Category as % of RA Requirement	1% Limitation (MW)
1	274	32,383	0.73%	274
2	1,304	31,596	3.59%	363
3	1,955	30,730	5.53%	353
4	1,721	33,147	4.51%	381
5	1,164	37,235	2.72%	428
6	1,739	41,953	3.60%	482
7	610	45,444	1.17%	523
8	856	45,985	1.62%	529
9	1,115	45,814	2.12%	527
10	1,113	37,552	2.58%	432
11	559	32,459	1.50%	373
12	453	33,851	1.16%	389

- Methodology- To limit risk while testing product found the minimum between:
 - Net load peak minus daily largest 3rd highest net load peak
 - Net load peak minus 6th largest monthly net load peak
 - Capped at 1% of monthly RA requirement
 - Performed using 2017 CAISO Flexible Capacity Needs Assessment net load data
- Does not consider operational constrains
 - Recommend using Net Load to determine optimal dispatch hours

Utilizing Net Load

Average Load vs Net Load - August 2017 Forecast



- Net load reduces the duration of a dispatch event
 - These are the hours a 2 hour RA product will be most useful

Utilizing Net Load Continued

		1st and 2nd Peak Load Hours																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Month	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	31	21	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	28	27	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	30	29	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-	-	1	-	2	3	-	-	-	23	28	3	-	-	-	-
	5	-	-	-	-	-	-	-	2	-	-	1	-	1	2	4	3	5	27	17	-	-	-	-	-
	6	-	-	-	-	-	-	-	-	-	-	1	2	3	19	20	6	-	7	2	-	-	-	-	-
	7	-	-	-	-	-	-	-	-	-	-	1	1	2	22	28	6	-	2	-	-	-	-	-	-
	8	-	-	-	-	-	-	-	-	-	-	-	-	2	27	29	4	-	-	-	-	-	-	-	-
	9	-	-	-	-	-	-	-	-	-	-	-	-	2	8	25	19	1	4	1	-	-	-	-	-
	10	-	-	-	-	-	-	-	-	-	-	-	-	-	5	13	6	15	20	3	-	-	-	-	-
	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	29	29	2	-	-	-	-	-
	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20	31	11	-	-	-	-	-

		1st and 2nd Peak Net Load Hours																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Month	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	31	20	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28	28	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31	31	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21	30	9	-	-	-	-
	5	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	5	31	25	-	-	-	-
	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	30	12	-	-	-	-
	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	26	30	5	-	-	-	-
	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	31	29	-	-	-	-	-
	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	30	13	-	-	-	-	-
	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24	31	7	-	-	-	-	-
	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22	29	8	1	-	-	-	-
	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19	30	11	1	1	-	-	-

- The net load shape results in more consistent peak hours for a 2 hour RA product to dispatch towards
 - The current 4 hour RA product resources will cover the variable hours