Demand Response Counting Method Using LIP Informed by LOLE

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Who is CLECA

- An organization of large high load factor customers located in CA who all participate in the Base Interruptible Program (BIP)
- BIP was used to maintain grid reliability seven times in 2020 and once in 2021
- In 2020, BIP was 845 MW (Sep) which represented 75% of event-based demand response
- CLECA members represent a significant portion of the statewide BIP participation and have responded when necessary to reduce load by shutting down their manufacturing processes
- Supports accurate measurement of load reduction and removal of non-performing customers from BIP to maintain a gold standard reputation

LIP informed by LOLE (LIP + LOLE)

- Loss of load expectation (LOLE) results can be applied to the load impact protocol hourly results to align with the time periods when additional resources would improve reliability
  - i.e., load reduction from 6-7pm (HE19) has more value than at 3-4pm (HE16)
- LOLE results incorporate various weather scenarios, resource availability, and interactive and saturation effects of the mix of resources on the system
- LIP informed by LOLE would avoid the need to perform hourly reliability modeling for every DR program, which is costly and time-consuming
- For Jun-Sep, the qualifying capacity of DR is calculated by using the hourly relative LOLE to weight the hourly load impact for each DR program in the LIP worksheets; for other months the existing LIP results can be used

We used the CAISO/E3 LOLE results
From July 2021 DR ELCC study

- CAISO LOLE Study
  - Provided 24 hours for each month
  - No differences for weekday or weekend

Month	HE13	HE14	HE15	HE16	HE17	HE18	HE19	HE20	HE21	HE22	HE23	Grand Total
1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
6	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
7	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
8	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.6%	0.7%	0.0%	0.0%	0.0%	3.3%
9	0.0%	0.0%	0.0%	0.0%	1.4%	25.2%	39.5%	21.8%	7.5%	1.4%	0.0%	96.7%
10	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
11	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
12	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Grand Total	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**1.4%**	**25.2%**	**42.1%**	**22.5%**	**7.5%**	**1.4%**	**0.0%**	**100.0%**

- Process: Use the hourly relative LOLE as weights for the hourly load impacts; here HE17-21
- Since annual peaks can occur from Jun-Sep, apply the same total hourly (grand total line) LOLE weights to the monthly LIP results for Jun-Sep

Comparison of LIP vs LIP+LOLE

- Each hour's DR load reduction is weighed by its relative LOLE value
- A/C cycling (SDP) load impact drops over time, but the higher value at the beginning of the event results combined with low LOLE results in a lower value than simple average

		SCE-BIP			SCE-SDP-Commerical	
		Load Impact			Load Impact	
HE	LOLE	MW			MW	
16	0.0%	0			0	
17	1.4%	494			28.95	
18	25.2%	498			23.72	
19	42.1%	494			18.78	
20	22.5%	495			14.90	
21	7.5%	497			12.61	
22	1.4%	506			-2.81	
23	0.0%	164			-1.21	
	100.0%					
		LIP Avg of HE17-21	LIP weighted by LOLE HE17-22		LIP-Avg HE17-21	LIP weighted by LOLE HE17-21
		496	496		19.79	18.58
	SCE ExAnte LIP for PY2020 with 2021					
	Impacts for September call, 1 in 2 weather year					
	BIP HE22 adjusted to show full load reduction for 6 hour event					
	NOTE:If SDP can be called for 6 hours, then profile needs revision.					

Key Assumptions and Pro/Cons

- LOLE occurs during the hottest week of the month, which aligns with the LIP of a 1 in 2 monthly peak
  - If LOLE occurs in cooler weeks, then need to align it with hourly DR impacts associated with cooler weeks; affects only weather-sensitive DR programs
    - CAUTION: If DR's capacity value is significantly reduced, it can lead to over procurement for the peak
- Pros:
  - Measures value of a DR program's contribution during a LOLE event across hours
  - Reduces modeling complexity and reduces cost
    - ✓ Eliminates developing load impact profiles for every weather scenario
    - ✓ Eliminates running computationally-intensive effective load carrying capacity (ELCC) for every DR program
- Cons
  - Is not as precise as estimating a DR program's ability to avoid loss of load based upon every weather year scenario modeled
  - Based upon CAISO opposition to ELCC heatmap, unlikely to qualify for RAAIM exemption

Single monthly QC values are incompatible with Slice of Day framework

- 24-hour slice needs an hourly profile
- Single monthly value (LIP or ELCC) results in under-counting at the peak and over-counting at the net peak
- The hourly load impacts properly count DR's response for each slice

	Hypothethcial Load Impact		
HE	LOLE	MW	
16	0.0%	0	
17	1.4%	250	
18	25.2%	250	Peak
19	42.1%	100	
20	22.5%	20	Net Peak
21	7.5%	20	
22	1.4%	0	
23	0.0%	0	
	100.0%		
	Avg of HE17-21	128	
	ELCC	115	
(weighted by LOLE HE17-22)			

LOLE from CAISO July 2021 DR ELCC Study

Background on Effective Load Carrying Capability

- ELCC requires first estimating a system's LOLE
  - The LOLE will identify those hours with the greatest need for incremental capacity
- ELCC is a measure of the ability to change the reference LOLE compared to a reference resource (E3 and CPUC uses a perfect resource)
  - Solar can provide 100 MW to serve load at noon but contributes much less during the evening when the LOLE hours occur
- ELCC has traditionally been an annual value
  - Monthly ELCC requires LOLE to occur in every month, which has been achieved by artificially removing resources from the system or artificially increasing load; distorts the purpose to identify periods of highest reliability need
- Average vs Incremental ELCC controversy in Resource Adequacy
  - Current system cannot serve load without existing solar (average), yet additional solar does not improve reliability because LOLE is in the late afternoon/evening

How does LIP+LOLE differ from ELCC Heat Map?

- The ELCC heat map uses a table of duration and call frequency to determine a derate factor

ELCC (% of nameplate)		Max annual calls						
		1	2	4	5	10	15	20
Max call duration (hrs)	1	41%	43%	43%	43%	43%	43%	43%
	2	60%	65%	65%	65%	65%	65%	65%
	4	72%	91%	95%	95%	95%	95%	95%
	6	73%	92%	98%	98%	98%	98%	98%
	8	73%	92%	98%	98%	98%	98%	98%

- The problem is the value in terms of improved reliability of a 2-hour DR program from 4-6 pm is different than from 6-8 pm; ELCC heat map approach does not take this into account
- The LIP+ELCC solves this problem as hourly impacts are weighted by hourly LOLE values
- CAISO's July 2021 ELCC study showed only 2 events per year, so frequency limits do not appear to be a problem