California ISO

Effective Load Carrying Capability (ELCC) Study Results for Demand Response (DR) Resources

June 24, 2021

Stakeholder Web Conference

Agenda

Time	Item	Speaker
1:00-1:10	Welcome & Introductions	ISO
1:10-1:25	Background on Variable-Output DR	ISO
1:25-2:30	ELCC Study Results for DR Resources	E3
2:30-2:55	Q&A	All
2:55-3:00	Next Steps	ISO

BACKGROUND

Background on variable-output demand response discussions

Supply Side Working Group (2018 to 2019)

- Stakeholders requested modifications to treatment of demand response resources with variable load curtailment capabilities
- CPUC presented on current ELCC approach for wind and solar
- CAISO proposed ELCC approach for variable-output DR

ESDER 4 (2019 to 2020)

- Conducted stakeholder process to explore and demonstrate ELCC as a viable qualifying capacity valuation methodology, as well as modifications to must offer obligation fulfillment
- E3 performed ELCC study on existing DR programs to inform stakeholders

Background on variable-output demand response discussions

CPUC RA Proceeding (2020)

- CAISO proposed commitment in track 2 of the adoption of ELCC by the end of track 4

CPUC RA Proceeding (2021)

- CAISO enters E3 ELCC study results into the CPUC's RA Program Track 3B.1 proceeding
- CAISO submits Proposal 2 requesting the Commission adopt an ELCC methodology to calculate QC values for variable-output demand response resources beginning in the 2022 RA year.

Milestones to meet the ELCC report filing deadline

Date	Milestone
April 29, 2021	Energy Division Staff issues DR Proposal
May 21, 2021	Energy Division Staff issues RA Proposed Decision
June 3, 2021	Commission President Batjer's Ruling in RA proceeding setting July 1 deadline for Report
June 10, 2021	Opening Comments filed on Proposed Decision
June 12, 2021	Initial study results completed
June 14, 2021	Reply Comments filed on Proposed Decision
Week of June 14, 2021	Initial study results reviewed; feedback provided to E3
June 24, 2021	Commission Business Meeting: likely vote on RA Proposed Decision
June 24, 2021	Stakeholder workshop to review results
June 28, 2021	Stakeholder comments due
July 1, 2021	ELCC report due to Commission

July 1, 2021 ELCC Report Filing Requirements for Commission submission

1. Refreshed study results based upon 2020 bid data from PG&E, SCE, as well as from San Diego Gas & Electric Company (SDG&E).

2. Thorough documentation of study methodology and assumptions, and explanation of how data from Load Impact Protocol (LIP) filings, if any, were utilized in or informed the study, as well as updated runs of the study (as needed).

3. A summary of the key differences between LIP inputs and calculations versus the proposed ELCC method.

4. A workshop report that summarizes parties' comments on the study methodology and results and attaches parties' comments.

ELCC STUDY RESULTS FOR DR RESOURCES

Energy+Environmental Economics

Demand Response ELCC

CAISO

June 24, 2021

Zach Ming, Director

Vignesh Venugopal, Consultant

Arne Olson, Sr. Partner

Overview

- **In May 2020, E3 publicly released a study quantifying the reliability contribution of demand response in the CAISO**
  - This original study is contained in slides 4 – 37 of this presentation
- **In December 2020, E3 publicly released an update of the study based on new information provided by SCE**
  - This updated study results are contained in slides 38 – 43 of this presentation
- **In June 2021, E3 publicly released an update of the study, quantifying the ELCC based on DR bids placed by PG&E, SCE and SDG&E in 2020**
  - This updated study results are contained in slides 44 - 54 of this presentation

Outline for Today’s Meeting

+ Background on ELCC and RECAP
+ Performance of PG&E, SCE and SDG&E programs in 2020
+ Questions

Overview

Background

- California has a unique approach to capacity procurement, where the CPUC administers a Resource Adequacy (RA) program to ensure sufficient resources to maintain an acceptable standard of reliability, but the CAISO retains ultimate responsibility for the reliable operation of the electricity system
- The CAISO was concerned that demand response (DR) was being overcounted in the Resource Adequacy program based on observed demand response bid data

California ISO

Project

- The CAISO retained E3 to investigate the reliability contribution of DR relative to its capacity value in the CPUC administered RA program
- To the extent that DR is overvalued, the CAISO asked E3 to suggest solutions to issue
- E3 provided technical analysis to support the CAISO in this effort

Disclaimer required by the California Public Utilities Commission

This report has been prepared by E3 for the California Independent System Operator (CAISO). This report is separate from and unrelated to any work E3 is doing for the California Public Utilities Commission. While E3 provided technical support to CAISO preparation of this presentation, E3 does not endorse any specific policy or regulatory measures as a result of this analysis. The California Public Utilities Commission did not participate in this project and does not endorse the conclusions presented in this report.

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Background on ELCC and RECAP

Effective Load Carrying Capability (ELCC)

- **Effective Load Carrying Capability (ELCC) is a measure of the amount of equivalent perfect capacity that can be provided by an intermittent or energy-limited resource**
  - **Intermittent resources:** wind, solar
  - **Energy-limited resources:** storage, demand response
- **Industry has begin to shift toward ELCC as best practice, and the CPUC has been at the leading edge of this trend**

1 → 2 → 3

1. Calibrate existing system to target LOLE standard

If necessary, add or remove "perfect capacity" to achieve target standard

2. Add desired resource to portfolio

Addition of new source of generation will decrease LOLE relative to measurement in Step 1

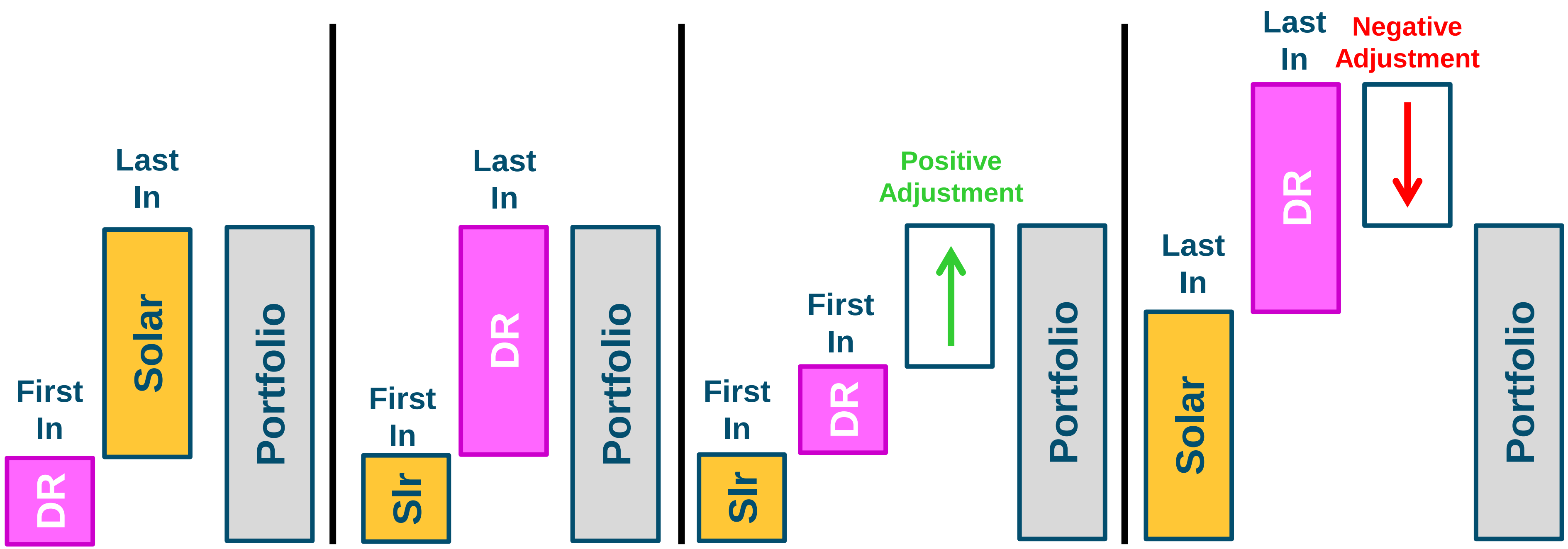
3. Remove perfect capacity until target LOLE is restored

Removal of perfect capacity results in increase in LOLE until original target is met

A resource's ELCC is equal to the amount of perfect capacity removed from the system in Step 3

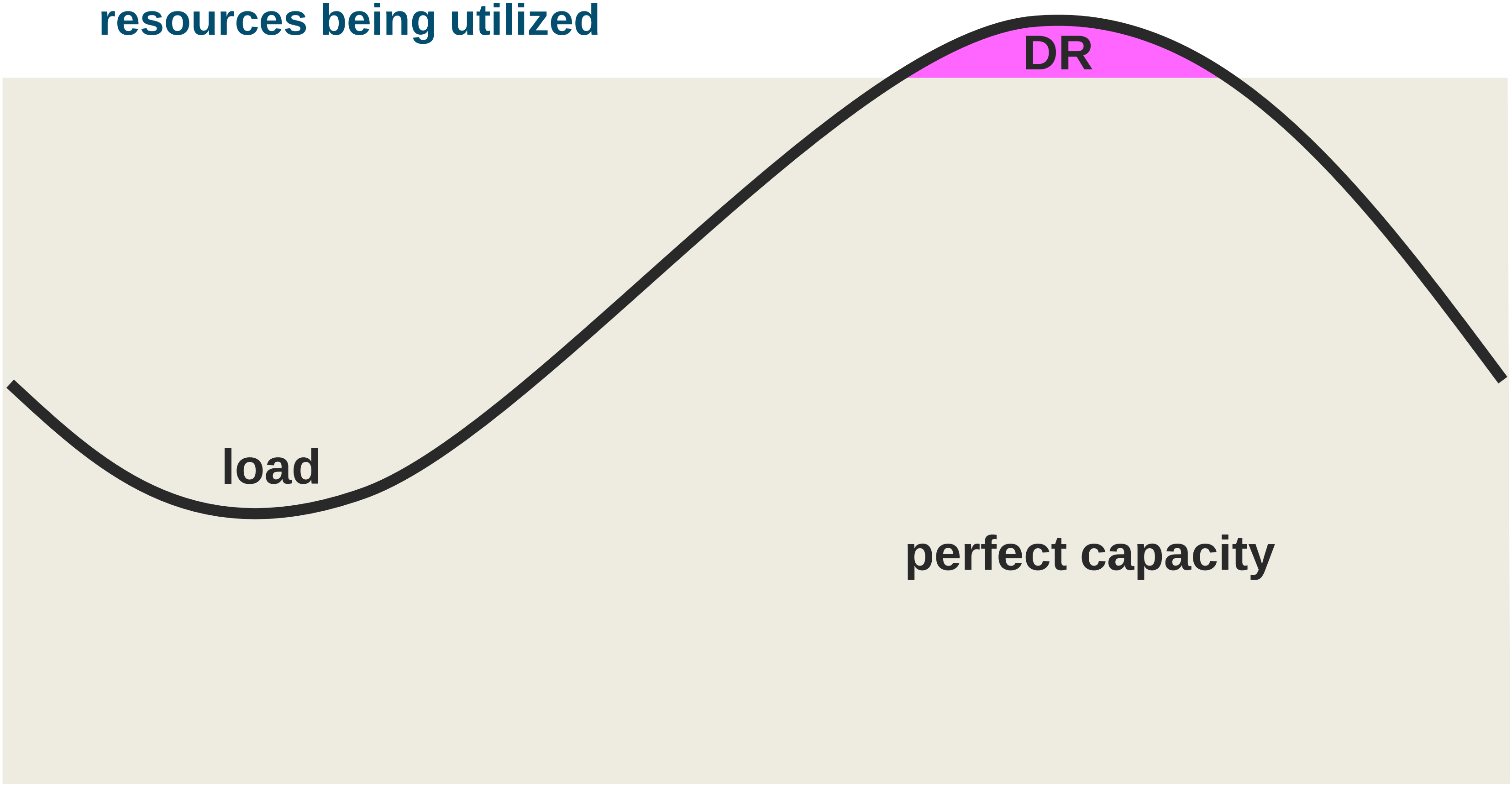
Measuring ELCC

+ **There are multiple approaches to measuring the ELCC of a resource(s)**
  - **Portfolio ELCC:** measures the combined ELCC of all intermittent and energy-limited resources on the system
  - **First-In ELCC:** measures the marginal ELCC of a resource as if it were the only intermittent or energy-limited resource on the system, thus ignoring interactive effects
  - **Last-In ELCC:** measures the marginal ELCC of a resource after all other intermittent or energy-limited resources have been added to the system, capturing all interactive effects with other resources



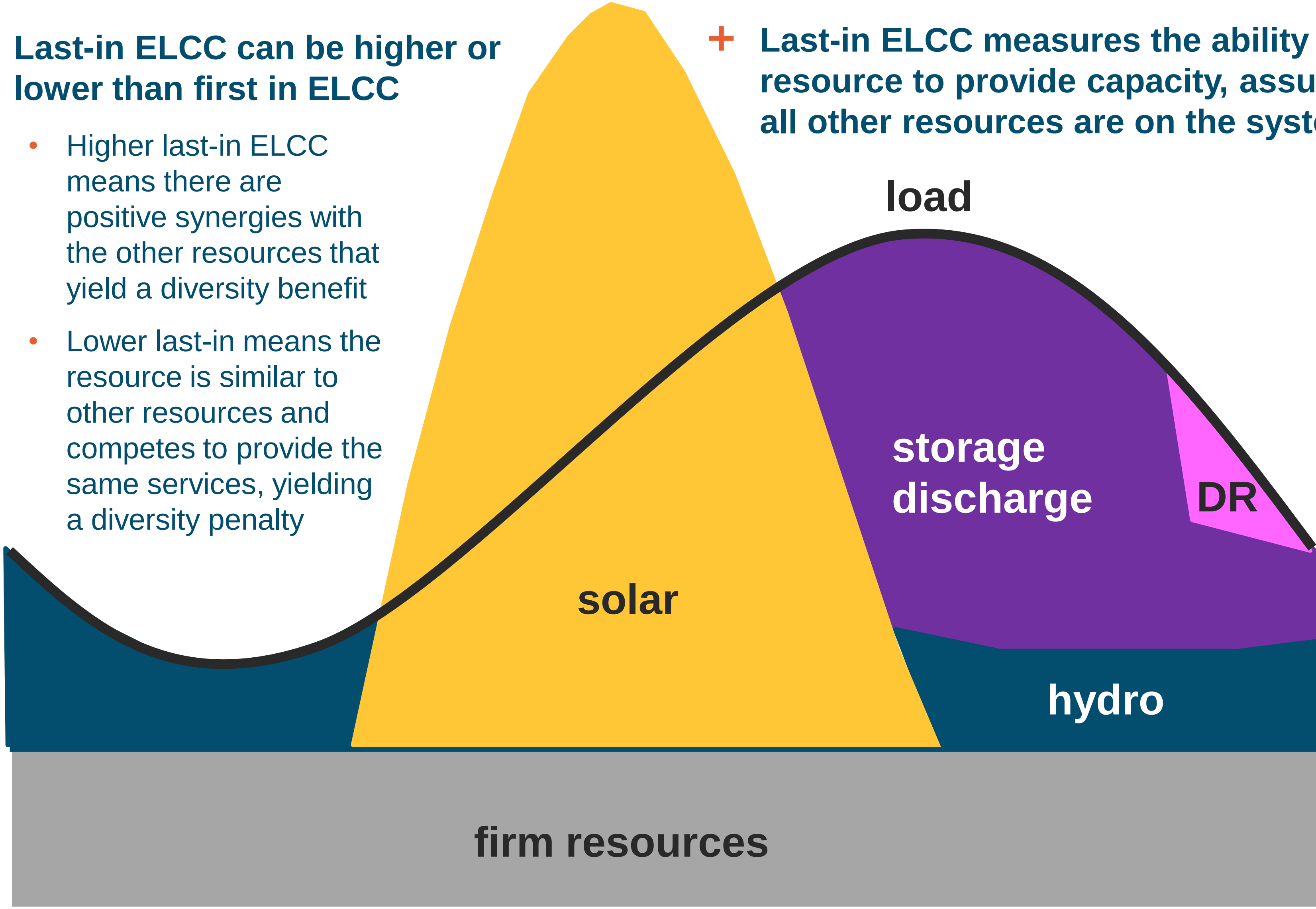
"First-In" ELCC

- First-in ELCC measures the ability of a resource to provide capacity, absent any other resource on the system
- This measures the ability of a resource to "clip the peak" and is often analogous to how many industry participants imagine capacity resources being utilized



“Last-In” ELCC

- **Last-in ELCC can be higher or lower than first in ELCC**
  - Higher last-in ELCC means there are positive synergies with the other resources that yield a diversity benefit
  - Lower last-in means the resource is similar to other resources and competes to provide the same services, yielding a diversity penalty
- **Last-in ELCC measures the ability of a resource to provide capacity, assuming all other resources are on the system**



RECAP: Renewable Energy Capacity Planning Model

+ **RECAP evaluates adequacy through time-sequential simulations over many years**

Inputs

Load
- *Hourly load for many weather years*

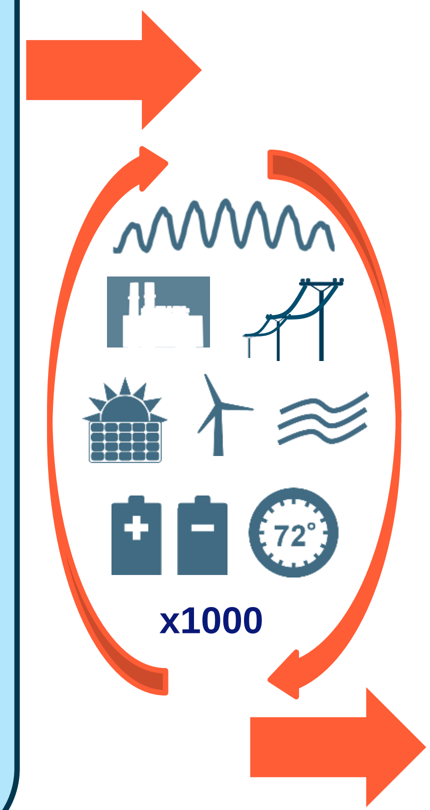
Dispatchable Generation
- *Capacity*
- *FOR*
- *Maintenance*

Renewables
- *Capacity*
- *Hourly generation profiles for many weather years*

Hydro
- *Hydro availability for many hydro years*
- *Max/min constraints*

Storage
- *Capacity*
- *Duration*
- *Roundtrip efficiency*
- *FOR*

Demand Response
- *Capacity/ Hourly Availability*
- *Max # of calls*
- *Duration of each call*



Outputs

LOLE
- *Loss of load expectation*
- *days/yr of total expected lost load*

ALOLP
- *Annual loss of load probability*
- *% probability of having a single loss of load in any given year*

EUE
- *Expected unserved energy*
- *MWh/yr of energy that cannot be served*

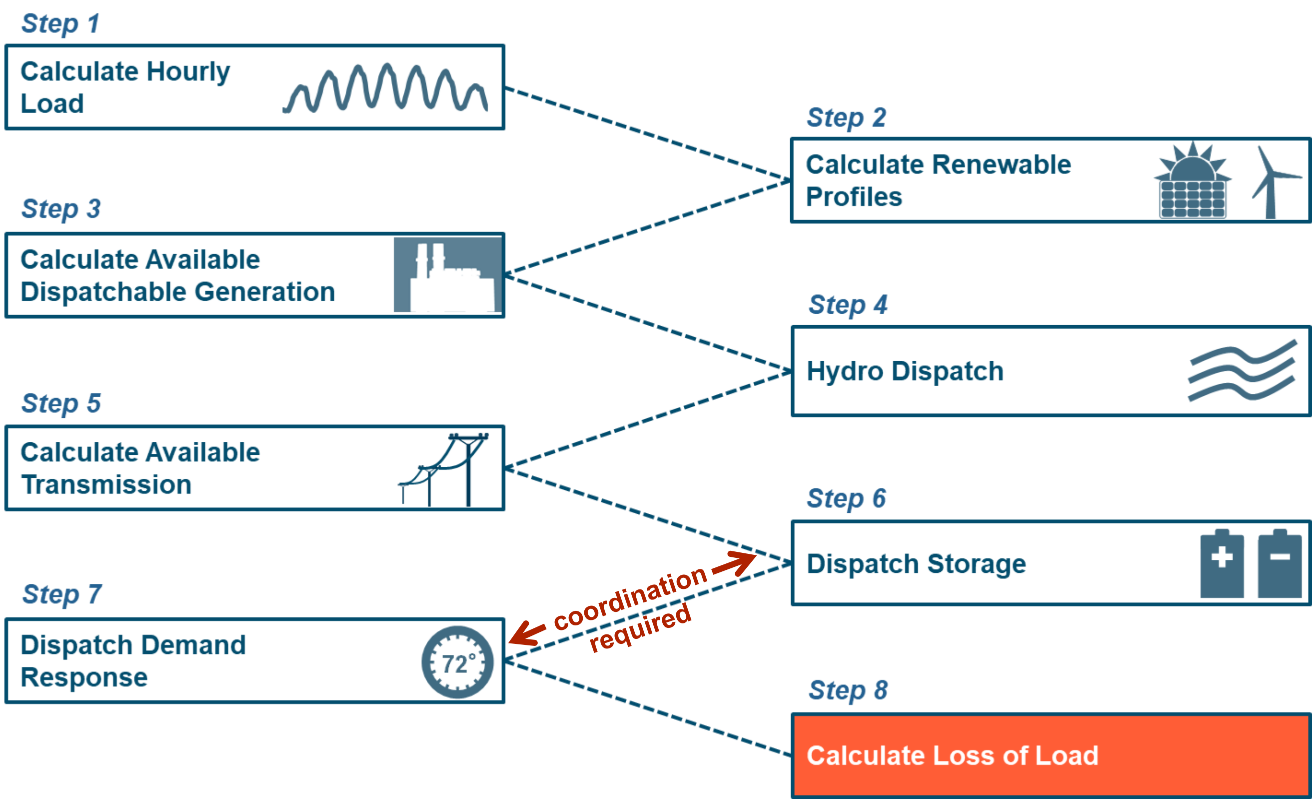
ELCC
- *Effective load carrying capability*
- *Equivalent quantity of 'perfect capacity' for a variable or energy-limited resource*

TPRM
- *Target planning reserve margin*
- *PRM required to achieve a specified reliability threshold (i.e. LOLE, ALOLP, or EUE)*

DR Interaction with Storage

- Historically, DR is dispatched as a resource of "last resort" which is how RECAP dispatched DR
- A system with high penetrations of storage require much more coordination in the dispatch of DR and storage in order to achieve maximum reliability

E3 RECAP Model Methodology



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Assessment of 2020 DR Bids

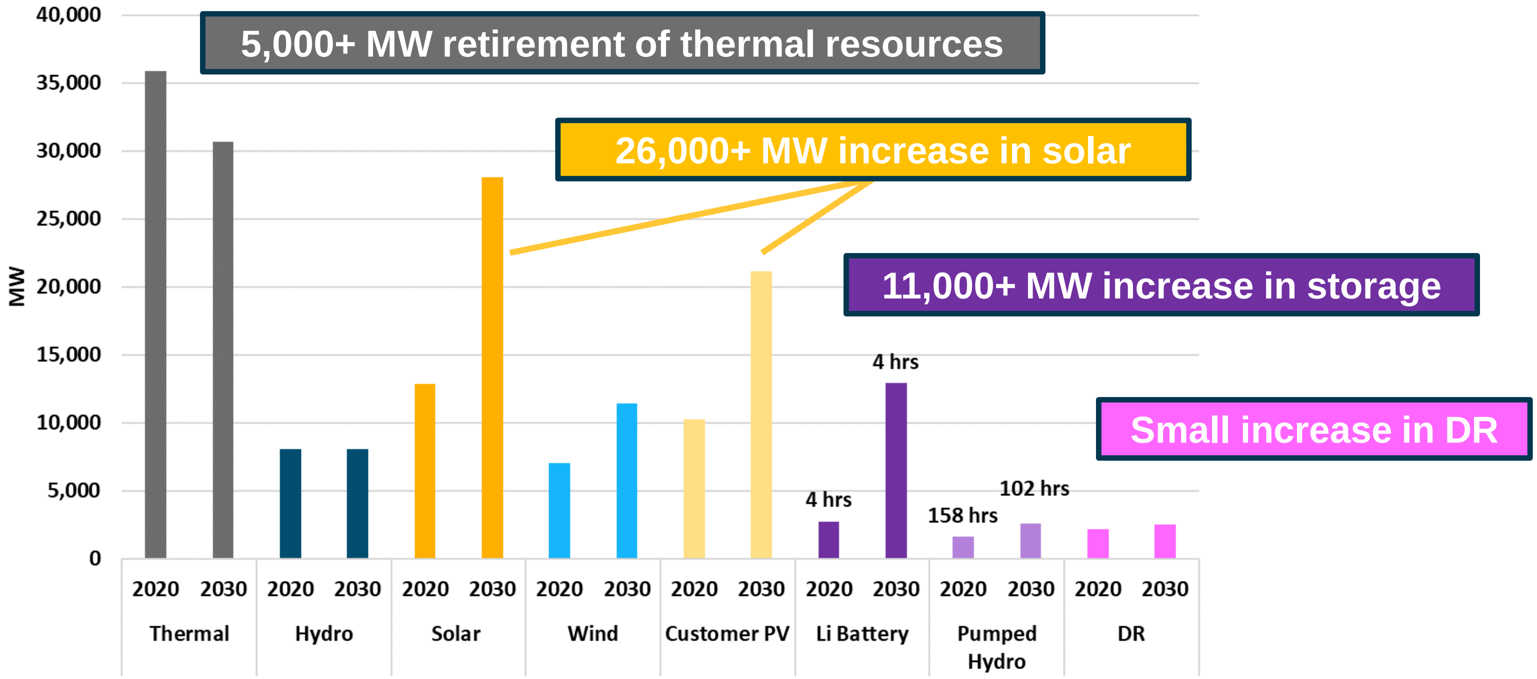
CAISO
June 2021

Zach Ming, Director
Vignesh Venugopal, Consultant

CAISO System Modelled in 2020 and 2030

+ E3 analyzed the value of DR to the CAISO system in 2020 and 2030 based on the IRP portfolio for the 2021-2022 Transmission Planning Process[1]

2020 and 2030 CAISO Resource Portfolio

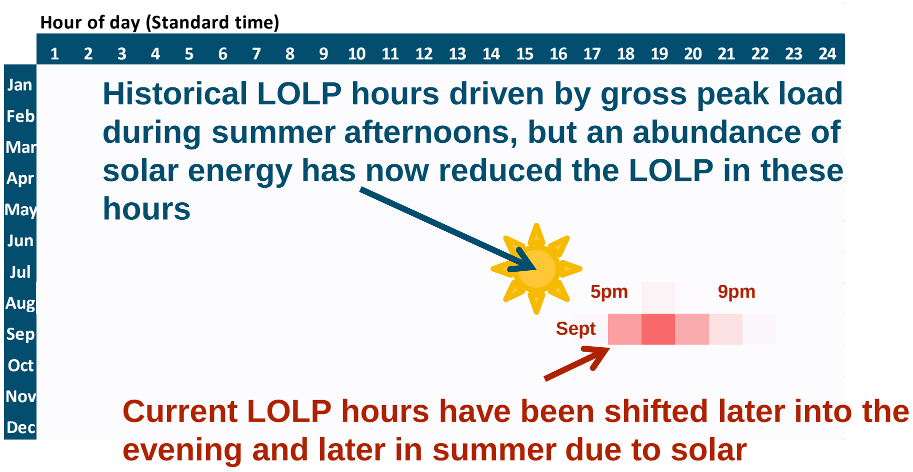


[1] IRP Inputs to 2021-22 TPP

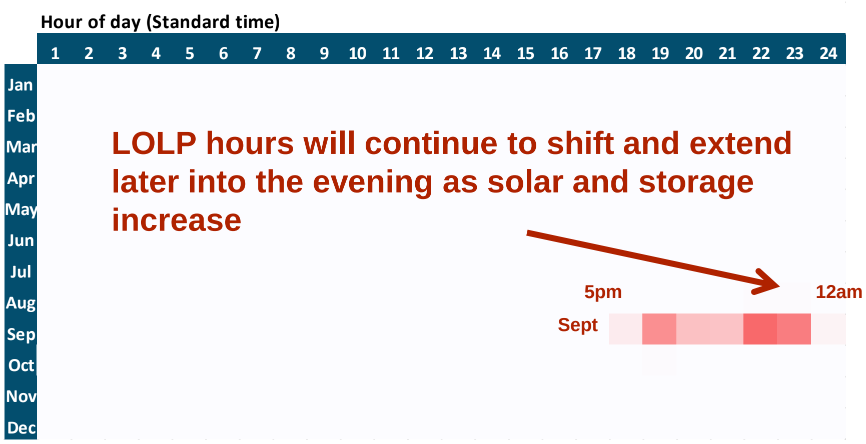
Time Window Availability Needs for DR in 2020 & 2030

- Month/hour (12x24) loss of load probability heat maps provide a quick overview of "high risk" hours
- Key findings from this project are showing elongation of the peak period by 2030

LOLP in 2020

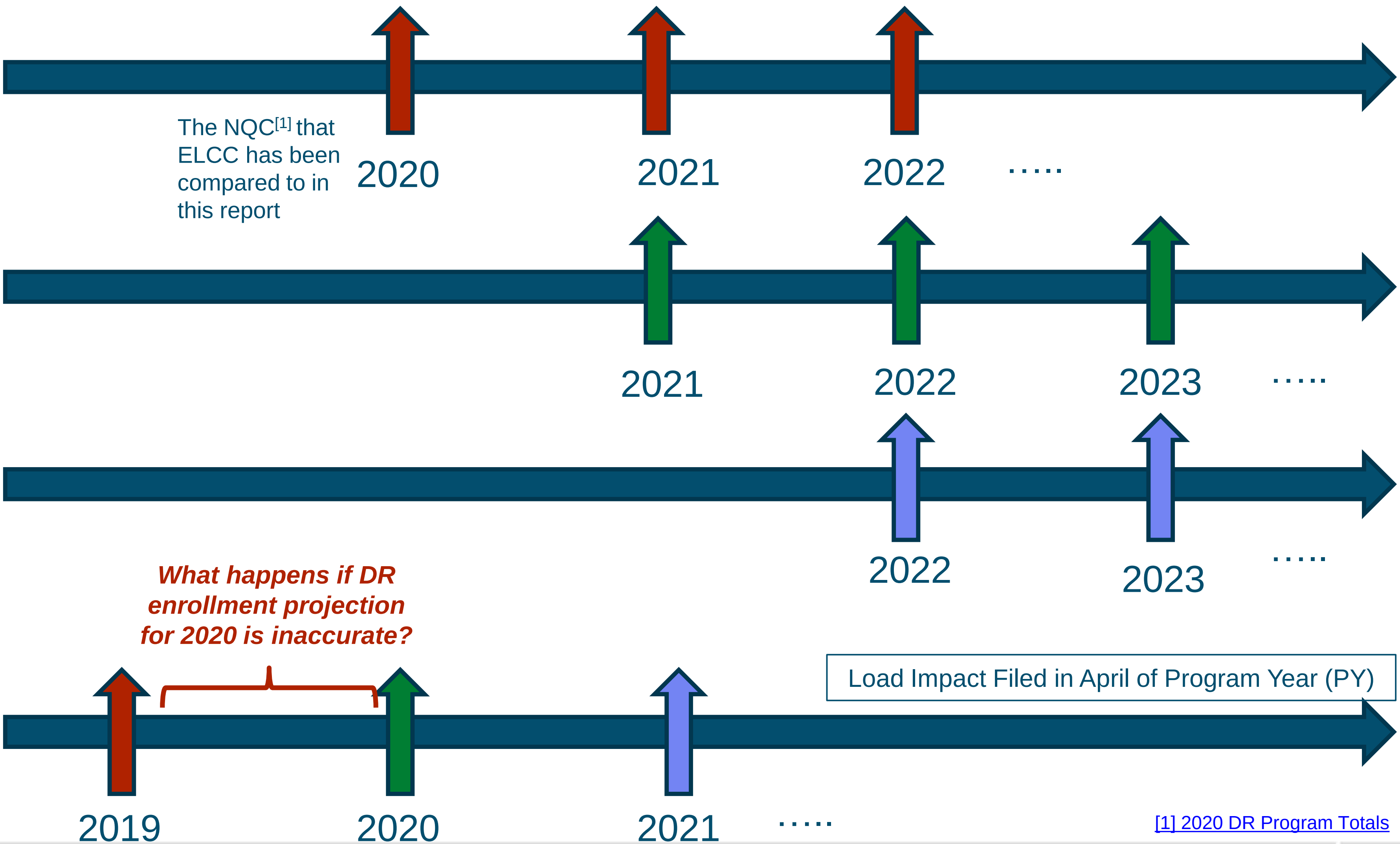


LOLP in 2030



LIP Filing and NQC Calculation Timeline

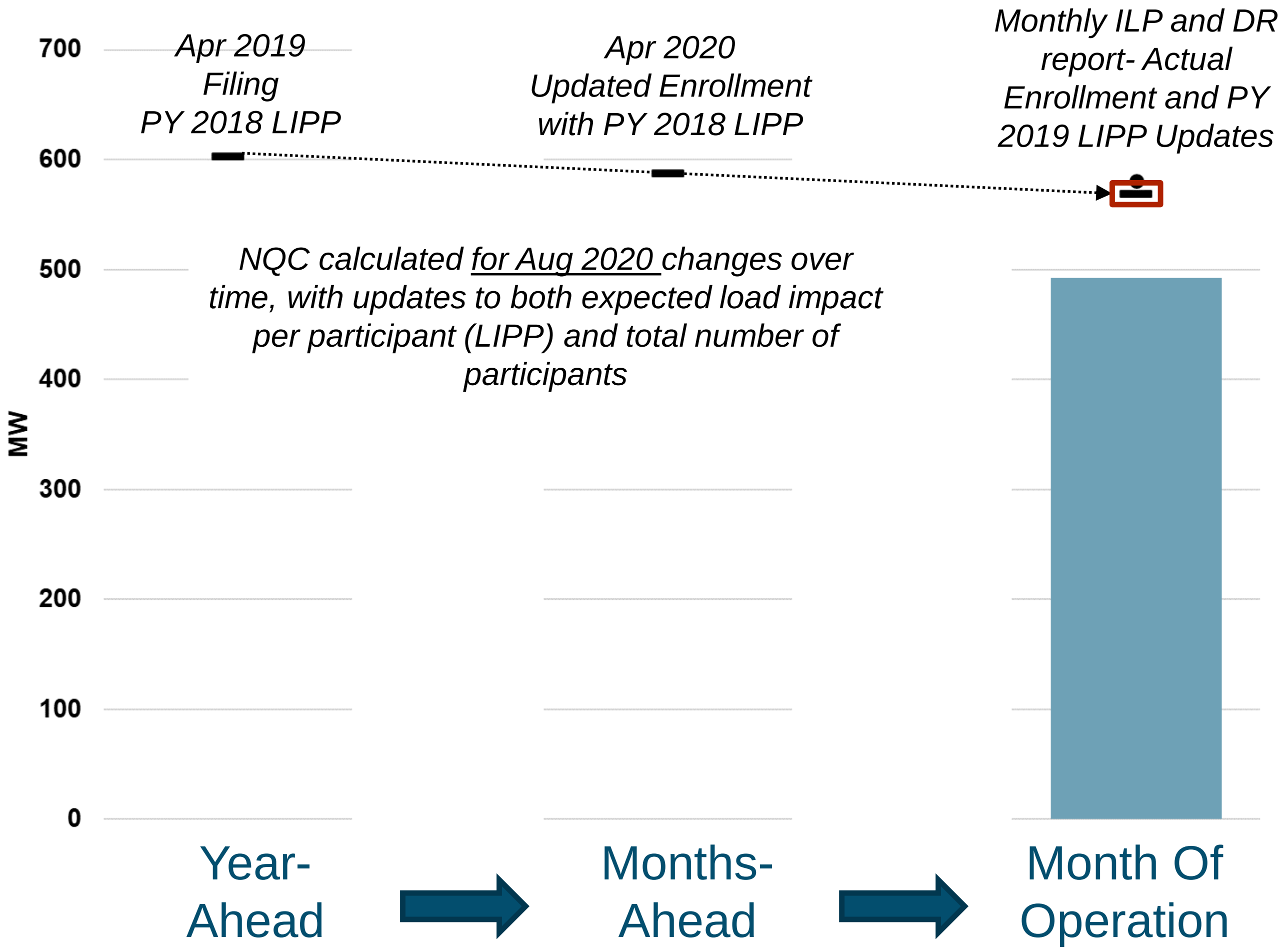
NQC Calculated For Future Years. Based on- (1) DR Performance in Year Prior to PY and (2) DR Enrollment Projections



[1] 2020 DR Program Totals

Change in NQC Leading Up to Real-Time
SCE BIP In August For Example

While bids are most in line with this NQC, updates to NQC do NOT feed into the RA process



DR bids are placed in the DAM or RTM. Thus, based on most recent NQC

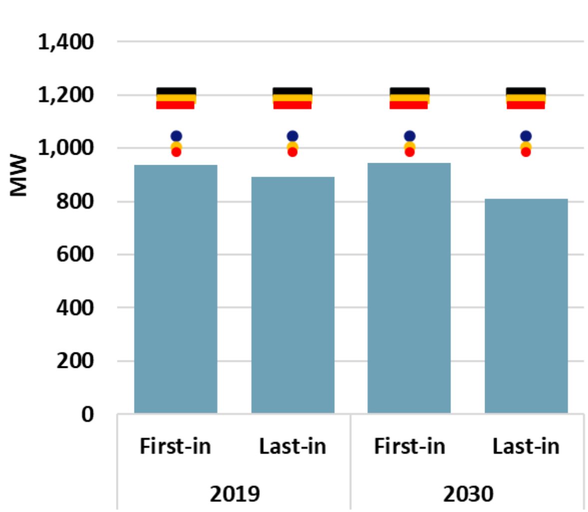
DR availability is represented using DR bids. ELCC in MW does not change based on NQC it is being compared to

Legend
- RECAP ELCC
- NQC Net of PRM and T&D
- Max DR Bid

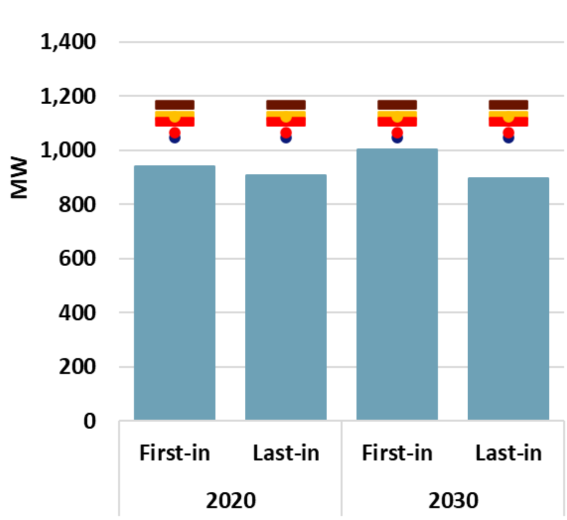
Aggregate ELCC Results

While we remove PRM and T&D gross-up from the NQC to ensure a fair comparison with DR bids submitted, the NQC attributed to DR in the Resource Adequacy process is grossed up for both

2019-PG&E and SCE



2020-PG&E and SCE



2020-With Additional SCE Programs and SDG&E

Legend

- RECAP ELCC
- NQC Net of PRM and T&D (Aug)
- NQC Net of PRM and T&D (Jul)
- NQC Net of PRM and T&D (Sep)
- Max DR Bid (Aug)
- Max DR Bid (Jul)
- Max DR Bid (Sep)

- *DR bids in the summer increased by ~60 MW on avg*
- *ELCCs increase by 4-90 MW*
- *NQCs reduced by ~50 MW*

- *Inclusion of SCE's SEP and LCR and SDG&E's CBP, BIP and AC programs*
- *First-in ELCC increases by ~90 MW, Last-in by ~45 MW*

Difference In NQC and Bids from 2019 to 2020

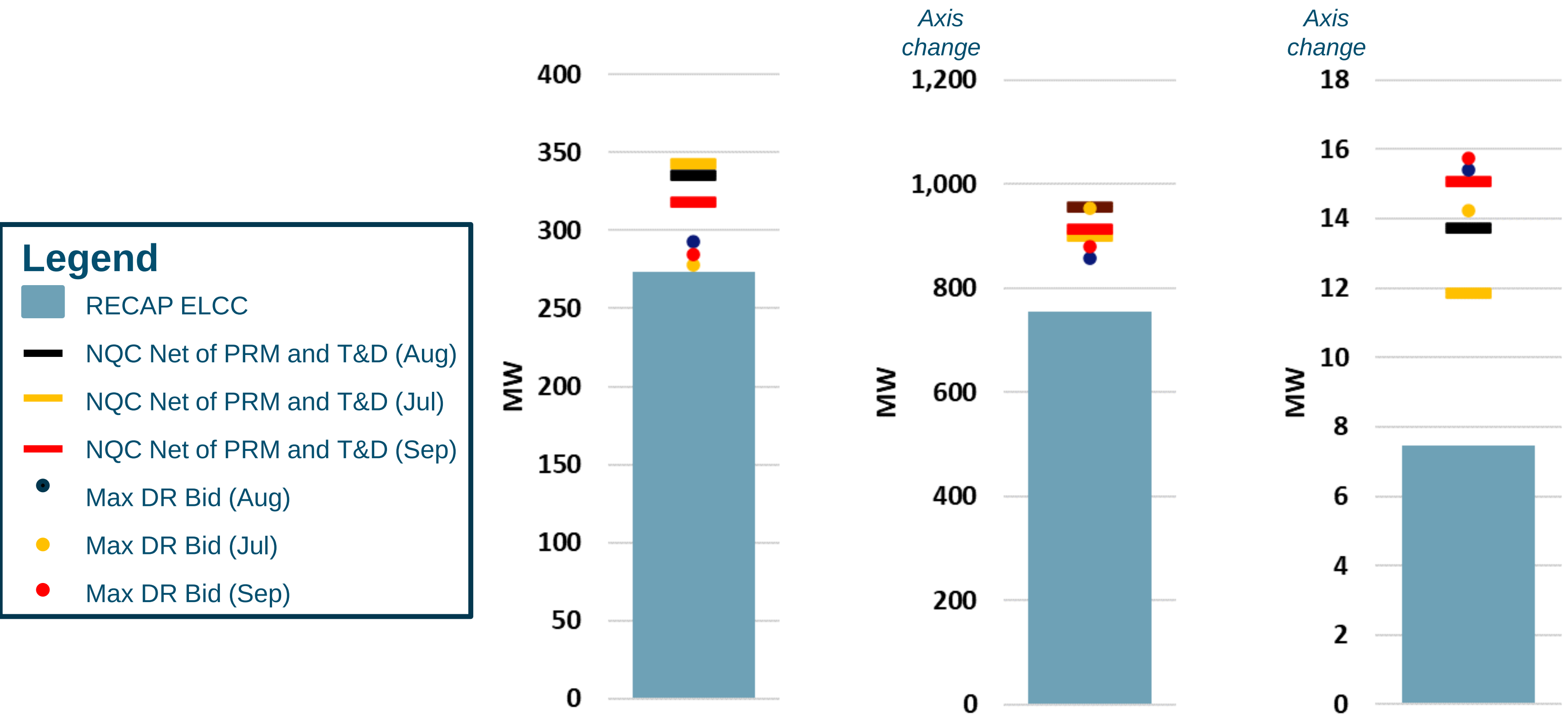
IoU	Program	LCA	NQC before T&D and PRM			Max Bid		
			Jul	Aug	Sep	Jul	Aug	Sep
PG&E	BIP	All LCAs						
	CBP	Bay Area						
	CBP	CAISO System						
	CBP	Greater Fresno						
	CBP	Humboldt						
	CBP	Kern						
	CBP	North Coast						
	CBP	Sierra						
	CBP	Stockton						
	SAC	Bay Area						
	SAC	CAISO System						
	SAC	Greater Fresno						
	SAC	Kern						
	SAC	North Coast						
	SAC	Sierra						
	SAC	Stockton						
SCE	API	Big Creek						
	API	CAISO System						
	API	LA Basin						
	BIP	Big Creek						
	BIP	CAISO System						
	BIP	LA Basin						
	CBP	Big Creek						
	CBP	CAISO System						
	CBP	LA Basin						
	SDP	Big Creek						
	SDP	CAISO System						
	SDP	LA Basin						

Increase

No Change

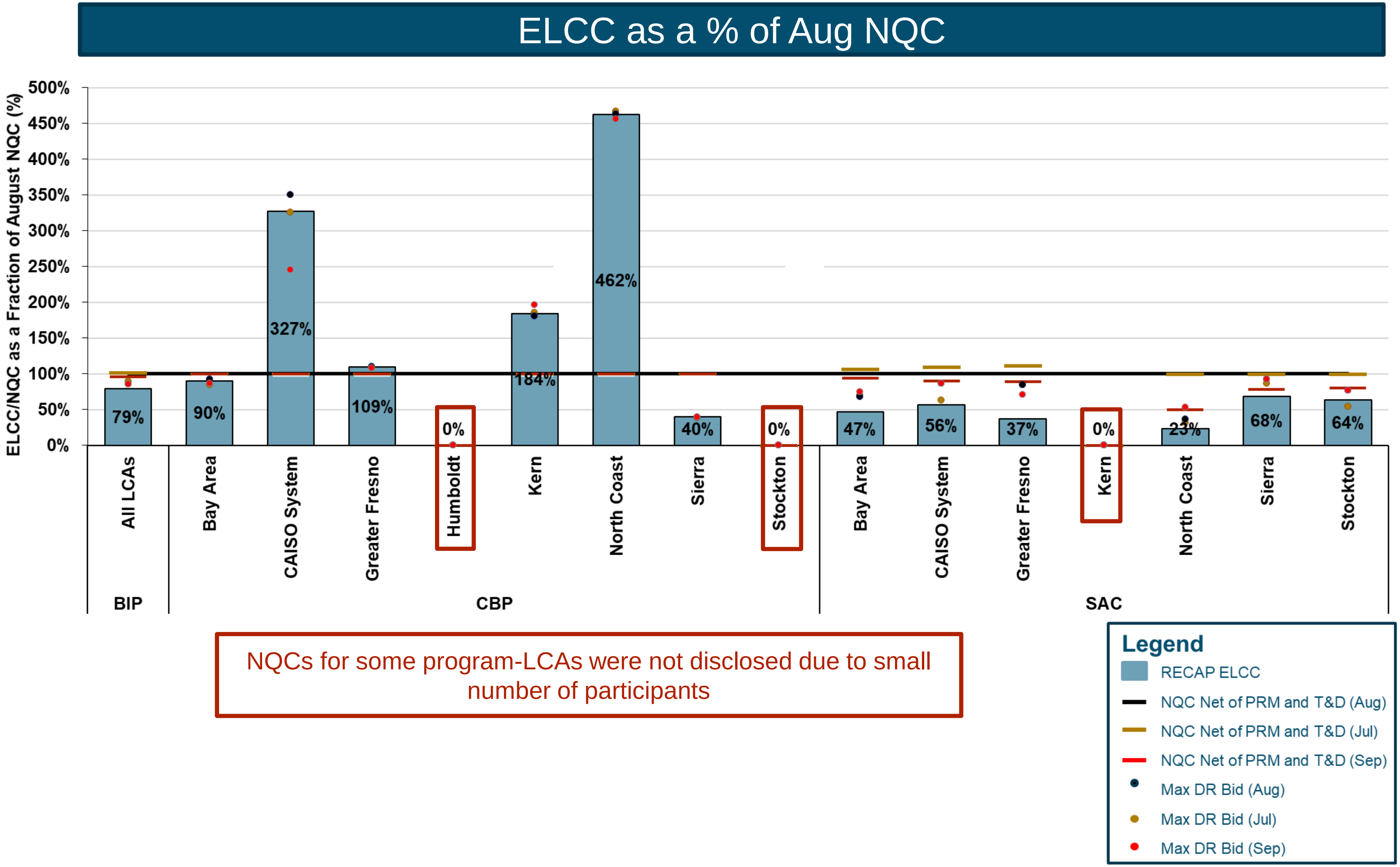
Decrease

First-in ELCC Based on 2020 DR Bids

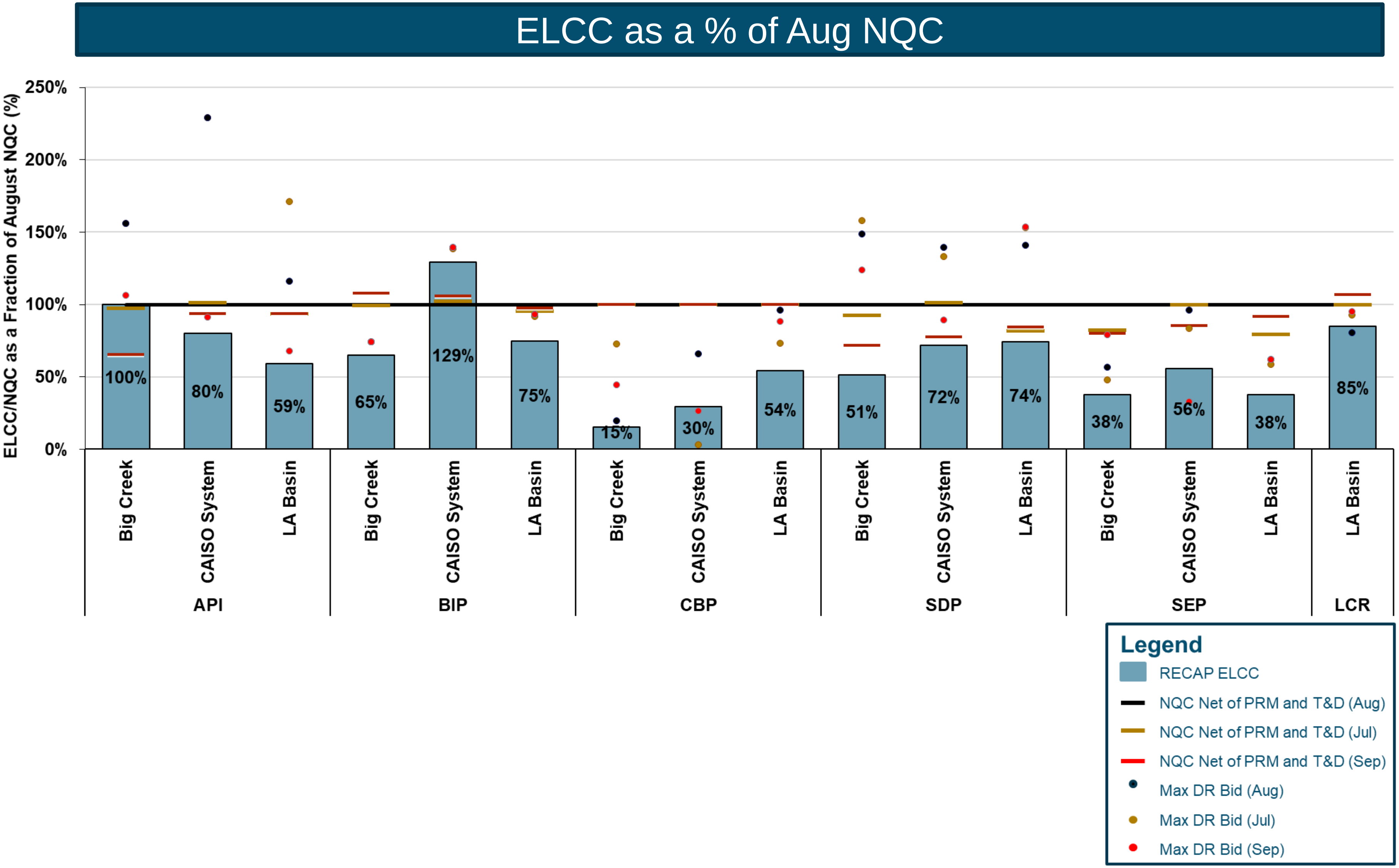


ELCC as a % of NQC Net of PRM and T&D	PG&E	SCE	SDG&E
July	80%	84%	63%
Aug	82%	79%	54%
Sep	86%	83%	49%

First-in ELCC Based on 2020 DR Bids PG&E Programs

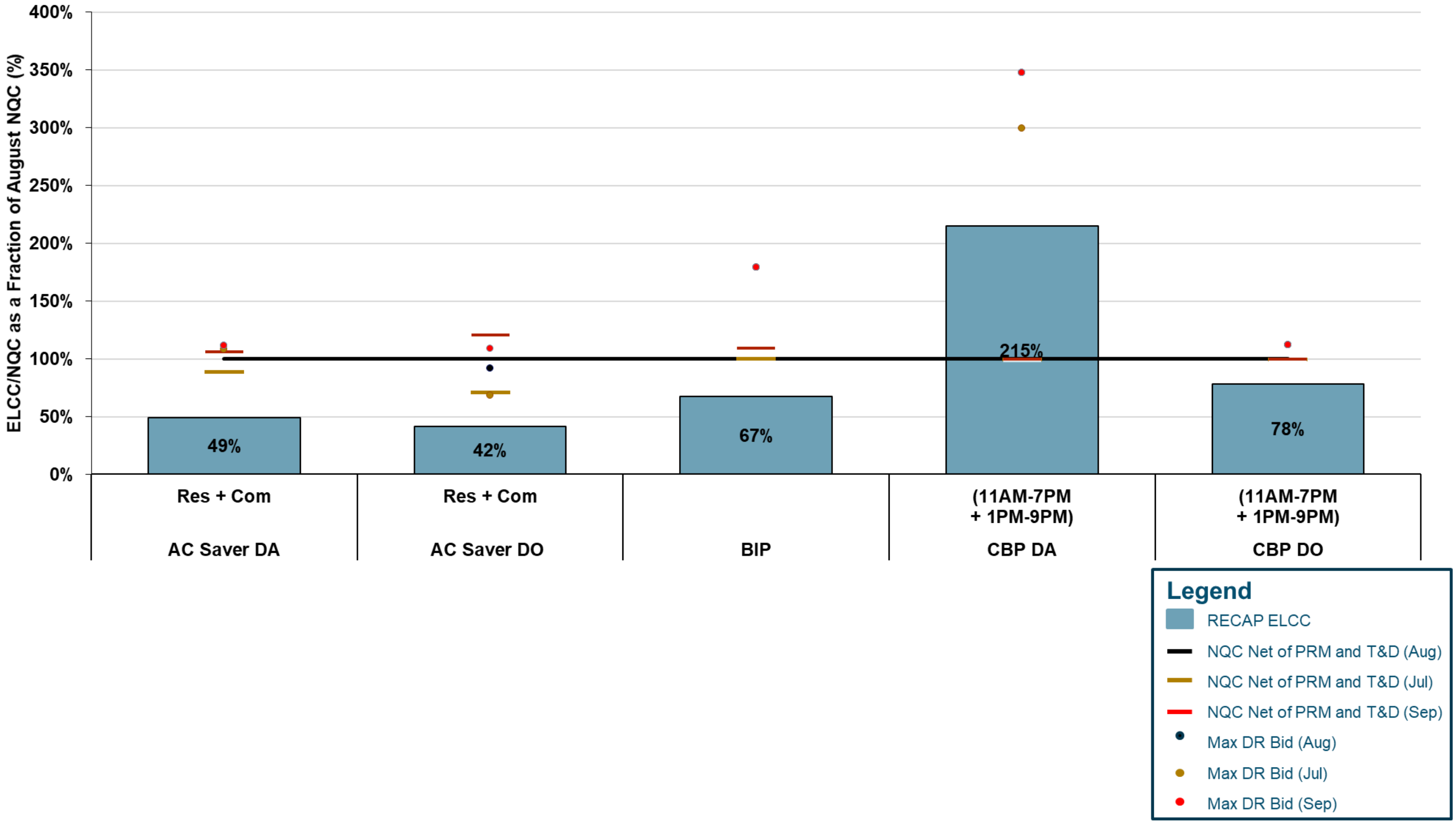


First-in ELCC Based on 2020 DR Bids SCE Programs



First-in ELCC Based on 2020 DR Bids SDG&E Programs

ELCC as a % of Aug NQC



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Appendix

NQCs as a Basis for Comparison with ELCCs

- NQCs are calculated using load impacts (LI) , i.e. load reductions expected during peak conditions, calculated in line with the Load Impact Protocols.
- Load impacts are grossed up for transmission and distribution losses, as also the 15% PRM, owing to demand response being a demand reduction measure.

$$NQC = LI * 1.15\,(PRM) * T\&D\ loss\ factor$$ [1]

- Load impacts for the year 2019 are referenced from the CPUC's RA Compliance documents[2]
- Load impacts were defined on an LCA level from 1 pm to 6 pm, Apr to Oct, and from 4 pm to 9 pm in the rest of the year, both with and without line losses
- The timing has since been revised to 4 pm to 9 pm year-round[3]

[1] CPUC 2019 RA Guide
[2] CPUC 2019 IoU DR Program Totals
[3] CPUC 2020 IOU LIP Workshop

Key Question: What Call and Duration Characteristics are Needed to Maximize DR ELCC?

+ **E3 tested how two primary constraints impact the ELCC of demand response resources**
  - Max # of calls per year
    - How many times can a system operator dispatch a demand response resource?
  - Max duration of each call
    - How long does the demand response resource respond when called by the system operator?
+ **Key Assumptions:**
  - DR portfolio is divided into 100 MW units, each of which can be dispatched independently of the other
    - In other words, 2-hour-100 MW units can be dispatched in sequence to avoid an unserved energy event 100 MW deep and 4 hours long
  - Each 100 MW unit is available 24/7, at full capacity of 100 MW, subject to call constraints defined above to establish a clear baseline for ELCC %'s
  - Pure Shed DR; No shifting of load; No snap-backs

Average ELCC as a function of DR Capacity on the System

First-in ELCC

2019

ELCC (% of DR capacity) — Call constraints

DR capacity (MW)	1 hour/call 1 call/year	1 hour/call 4 calls/year	4 hours/call 1 call/year	4 hours/call 4 calls/year	4 hours/call 20 calls/year	6 hours/call 10 calls/year	8 hours/call 4 calls/year	8 hours/call 20 calls/year
2,195	46%	51%	70%	94%	95%	95%	94%	95%
3,000	40%	47%	61%	92%	94%	96%	93%	96%
4,000	36%	42%	52%	78%	80%	86%	80%	86%
5,000	32%	39%	46%	73%	75%	83%	74%	84%
10,000	21%	30%	31%	51%	60%	65%	53%	70%
20,000	14%	21%	20%	33%	46%	44%	35%	52%

2030

ELCC (% of DR capacity) — Call constraints

DR capacity (MW)	1 hour/call 1 call/year	1 hour/call 4 calls/year	4 hours/call 1 call/year	4 hours/call 4 calls/year	4 hours/call 20 calls/year	6 hours/call 10 calls/year	8 hours/call 4 calls/year	8 hours/call 20 calls/year
2,195	41%	43%	72%	95%	95%	98%	98%	98%
3,000	38%	40%	66%	92%	93%	98%	97%	98%
4,000	35%	37%	56%	83%	88%	91%	85%	91%
5,000	32%	35%	50%	74%	80%	86%	77%	88%
10,000	23%	30%	33%	52%	62%	67%	55%	71%
20,000	15%	22%	22%	35%	47%	46%	37%	53%

Last-in ELCC

2019

ELCC (% of DR capacity) — Call constraints

DR capacity (MW)	1 hour/call 1 call/year	1 hour/call 4 calls/year	4 hours/call 1 call/year	4 hours/call 4 calls/year	4 hours/call 20 calls/year	6 hours/call 10 calls/year	8 hours/call 4 calls/year	8 hours/call 20 calls/year
2,195	59%	73%	77%	100%	100%	100%	100%	100%
3,000	52%	65%	67%	99%	100%	100%	99%	100%
4,000	44%	57%	63%	93%	98%	98%	93%	98%
5,000	39%	52%	59%	87%	94%	94%	88%	94%
10,000	27%	39%	38%	61%	75%	75%	61%	80%
20,000	19%	28%	25%	39%	53%	50%	40%	57%

2030

ELCC (% of DR capacity) — Call constraints

DR capacity (MW)	1 hour/call 1 call/year	1 hour/call 4 calls/year	4 hours/call 1 call/year	4 hours/call 4 calls/year	4 hours/call 20 calls/year	6 hours/call 10 calls/year	8 hours/call 4 calls/year	8 hours/call 20 calls/year
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3,000	30%	33%	48%	65%	65%	72%	90%	90%
4,000	25%	28%	43%	61%	61%	65%	88%	88%
5,000	22%	25%	41%	57%	57%	60%	80%	82%
10,000	14%	19%	30%	43%	43%	47%	54%	56%
20,000	11%	15%	22%	29%	30%	31%	32%	32%

Incremental ELCC as a function of DR Capacity on the System

2019

First-in ELCC

Call constraints

ELCC (% of DR capacity) / DR capacity (MW)	1 hour/call 1 call/year	1 hour/call 4 calls/year	4 hours/call 1 call/year	4 hours/call 4 calls/year	4 hours/call 20 calls/year	6 hours/call 10 calls/year	8 hours/call 4 calls/year	8 hours/call 20 calls/year
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3,000	25%	36%	37%	86%	93%	99%	90%	99%
4,000	22%	29%	26%	34%	39%	57%	40%	58%
5,000	15%	23%	22%	52%	56%	69%	51%	73%
10,000	11%	22%	16%	30%	45%	47%	32%	57%
20,000	7%	11%	10%	16%	31%	23%	17%	33%

Last-in ELCC

Call constraints

ELCC (% of DR capacity) / DR capacity (MW)	1 hour/call 1 call/year	1 hour/call 4 calls/year	4 hours/call 1 call/year	4 hours/call 4 calls/year	4 hours/call 20 calls/year	6 hours/call 10 calls/year	8 hours/call 4 calls/year	8 hours/call 20 calls/year
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10,000	14%	26%	18%	35%	56%	56%	34%	66%
20,000	11%	18%	12%	18%	30%	25%	18%	34%

2030

First-in ELCC

Call constraints

ELCC (% of DR capacity) / DR capacity (MW)	1 hour/call 1 call/year	1 hour/call 4 calls/year	4 hours/call 1 call/year	4 hours/call 4 calls/year	4 hours/call 20 calls/year	6 hours/call 10 calls/year	8 hours/call 4 calls/year	8 hours/call 20 calls/year
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4,000	25%	28%	25%	53%	71%	72%	48%	72%
5,000	19%	25%	24%	39%	48%	65%	45%	76%
10,000	15%	26%	17%	31%	45%	49%	33%	53%
20,000	8%	13%	11%	17%	32%	25%	19%	36%

Last-in ELCC

Call constraints

ELCC (% of DR capacity) / DR capacity (MW)	1 hour/call 1 call/year	1 hour/call 4 calls/year	4 hours/call 1 call/year	4 hours/call 4 calls/year	4 hours/call 20 calls/year	6 hours/call 10 calls/year	8 hours/call 4 calls/year	8 hours/call 20 calls/year
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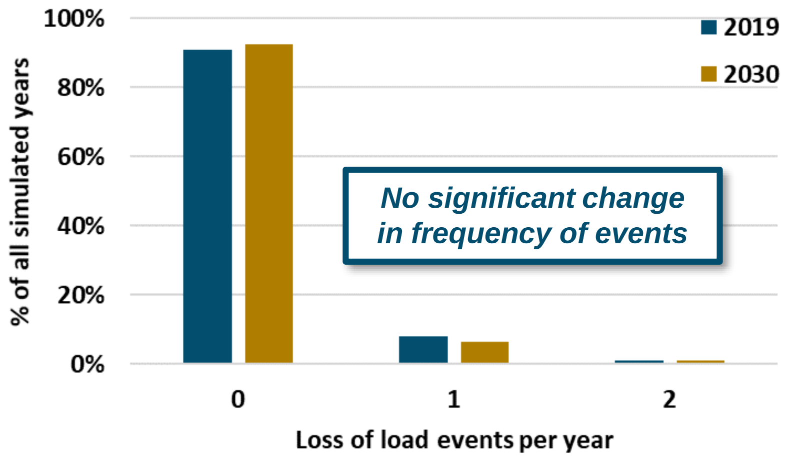
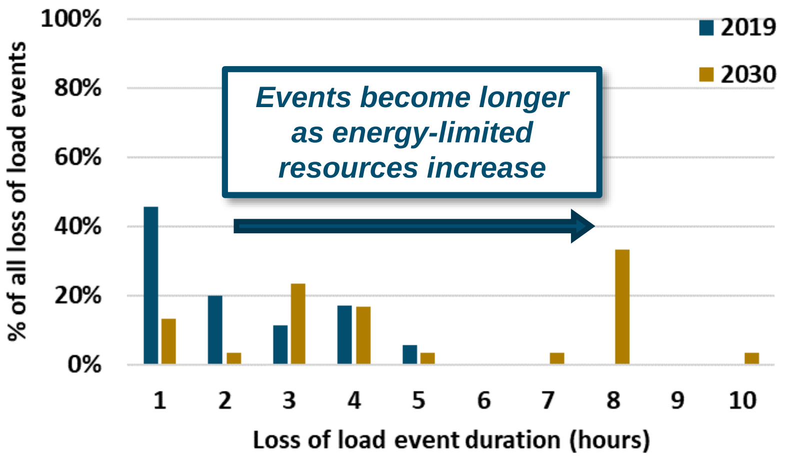
3,000	9%	16%	29%	50%	50%	51%	78%	78%
4,000	10%	12%	29%	48%	48%	47%	82%	82%
5,000	11%	13%	34%	42%	42%	38%	46%	55%
10,000	6%	13%	20%	28%	28%	33%	29%	30%
20,000	9%	11%	13%	15%	18%	16%	9%	8%

2019 vs 2030 Loss of Load Events

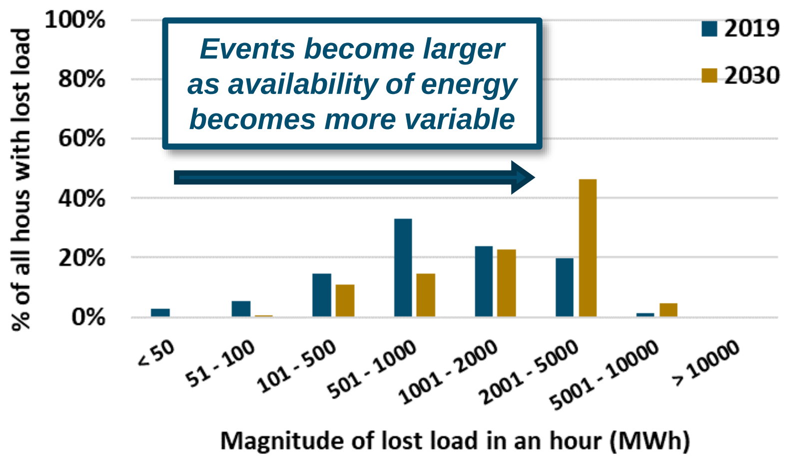
Frequency of Event Occurrence



Distribution of Event Duration



Distribution of Event Magnitude



Overview of Data

- **The 2019 PG&E and SCE DR ELCC results focus on "event-based" DR programs, as opposed to passive measures like dynamic pricing applicable throughout a season/year**
  - Does not consider SDG&E or Demand Response Auction Mechanism (DRAM) resources which are a significant portion of the data DR portfolio, due to data limitations
- **Data sources for RECAP ELCC calculations**
  1. Hourly PG&E DR bid data for 2019
     - BIP, CBP, and SAC
     - PSPS outage logs were provided by PG&E and used by E3 to identify and then fill gaps in DR bid data
  2. Hourly SCE DR bid data for 2019
     - API, BIP, CBP, and SDP

Data Benchmarking

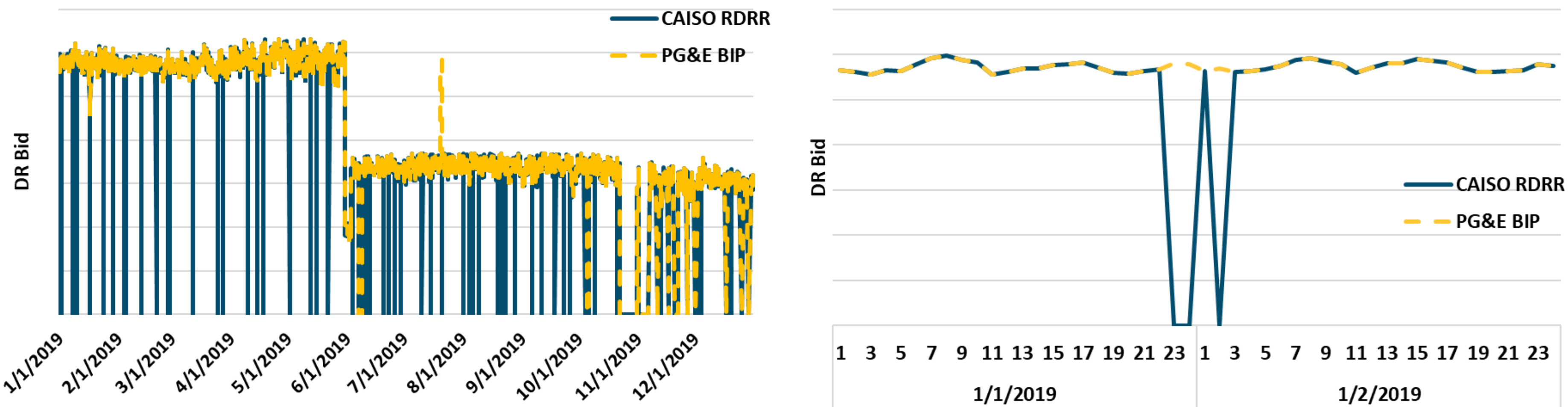
- **E3 used utility data directly from PG&E and SCE for two reasons**
  - CAISO does not have data by utility program
  - Wanted to ensure results were not predicated on CAISO data
- **E3 benchmarked utility data to CAISO data to ensure the veracity of the data**
  - Data generally benchmarked well
  - A few inconsistencies were spotted in the RDRR data:
    - In ~1.3% of hours in the year, DR bids present in PG&E's data are missing in CAISO's data. Technical glitches in transmitting/recording systems may explain this.
    - DR bids in SCE data were slightly lower than bids recorded in CAISO data across significant portions of the year.

      Underlying reason is currently not known.

Benchmarking of 2019 Bid Data from PG&E and CAISO

+ **PDR data from the two sources are identical**
+ **There are a few hours (114 out of 8760) where RDRR data is inconsistent:**
  - Several instances across each of the 24 hours of the day
  - These are hours where data is missing in the CAISO dataset
  - Unclear if a bid was not placed, or if it was placed but not recorded due to technical glitches

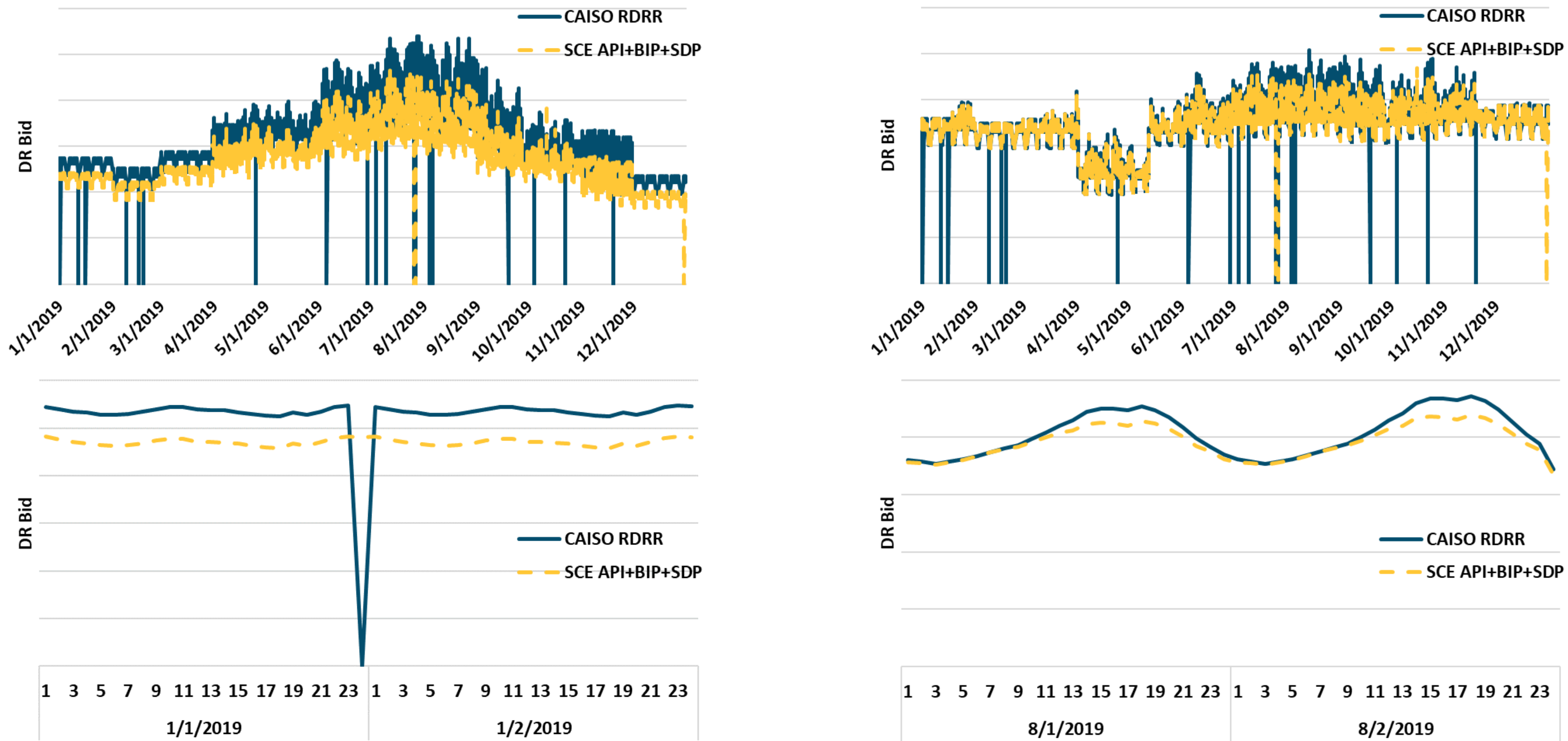
Example comparison for one of the subLAPs over the entire year and a couple of days in specific



Benchmarking of 2019 Bid Data from SCE and CAISO data

- PDR data from the two sources are identical
- Inconsistencies exist in RDRR data – unclear if the difference is systematic and attributable to a single factor, like treatment of line-losses

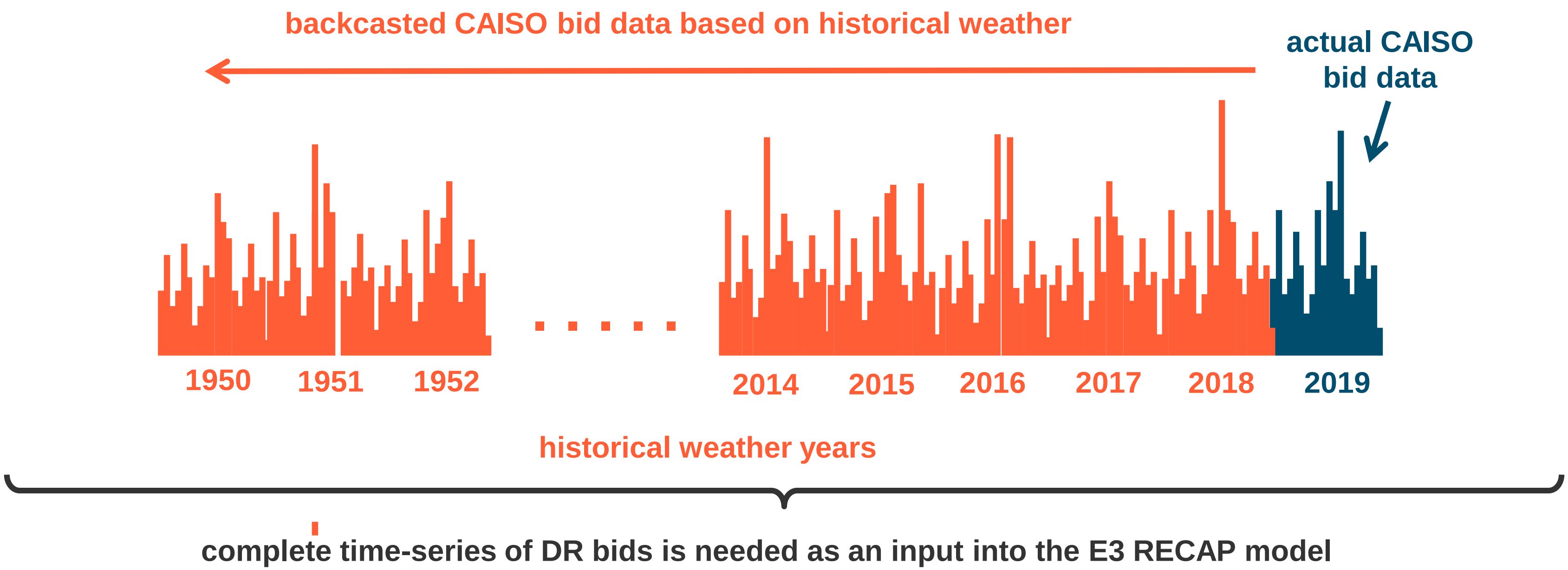
Example comparisons for 2 subLAPs- across the entire year and across a couple of days in specific



Extrapolation of DR Bid Data

+ In order to calculate the ELCC of a DR program or portfolio, RECAP must predict how these programs will perform over many different conditions and weather years

+ Therefore, E3 must extend actual 2019 data over the entire historical temperature record as a data requirement for the E3 RECAP model



+ In response to stakeholder feedback from the May 3 CAISO ESDER meeting, E3 modified the backcasting approach to include temperature for temperature-dependent air conditioner DR programs

  - More details on this process and methodology can be found in the appendix

Process of Extrapolating Actual DR Bid Data to Entire Weather Record

Get daily max, min and average temperature data (1950-2019) from NOAA for every climate zone that DR program bids come from

⇩

Use weather-informed day-matching to match every day from Jan 1, 1950 - Dec 31, 2018 to the "most similar" day from Jan 1, 2019 – Dec 31, 2019

⇩

Use day-matching results to extrapolate hourly DR bids from just 2019 to 1950-2019

⇩

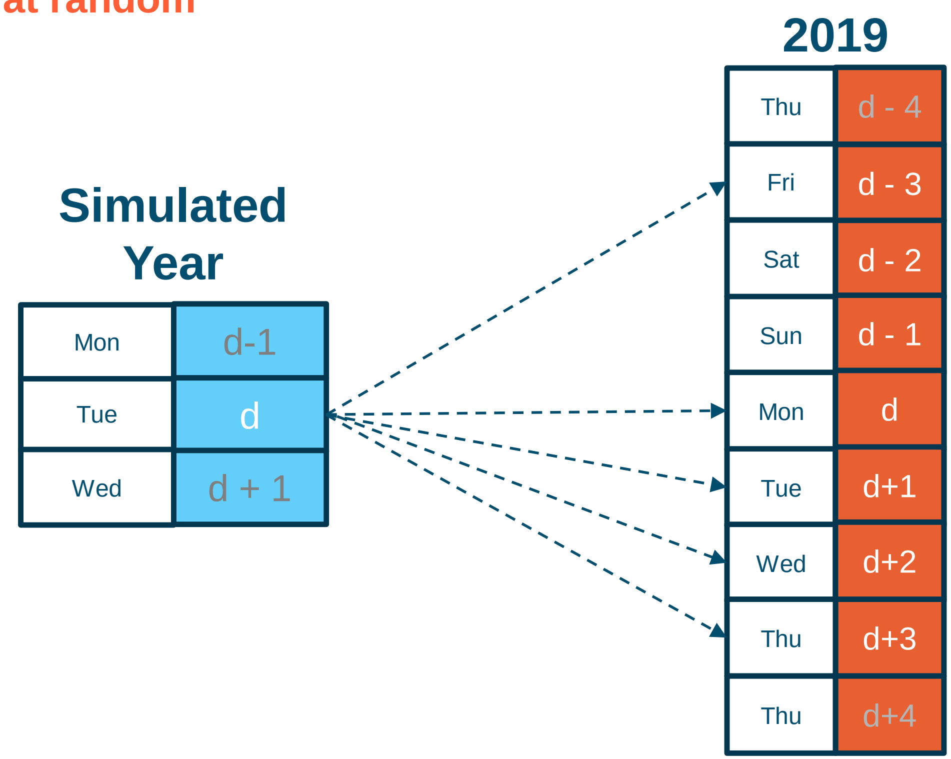
Aggregate extrapolated DR bids by program-LCA to allow for comparison with respective NQCs

⇩

Each aggregated shape dictates the hourly availability of the corresponding DR program-LCA combination in RECAP

Simple Day-Matching Algorithm for CBP, BIP and API DR Programs

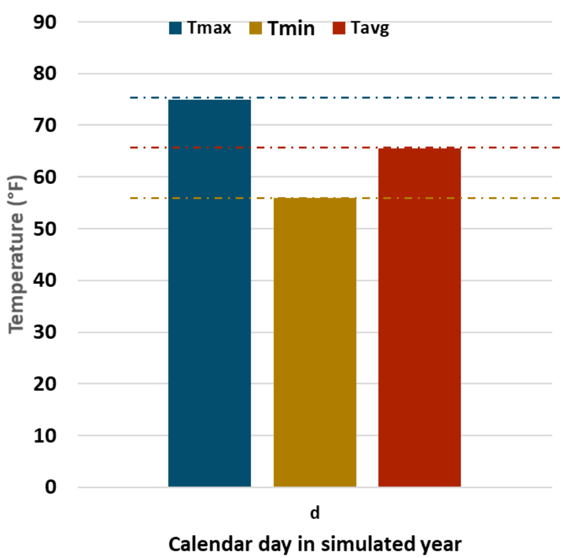
- As in the previous phase of this project, E3 used a simple day-matching approach for CBP, BIP and API programs
- DR bid forecasts for these programs were not as strong a function of the temperature as Smart AC
- For an individual DR program and a particular day, ‘d’ in a simulated year, pick one day out of +/- 3 calendar days, ‘d+3’ to ‘d-3’ of the same type (workday/holiday) from the actual 2019 data at random



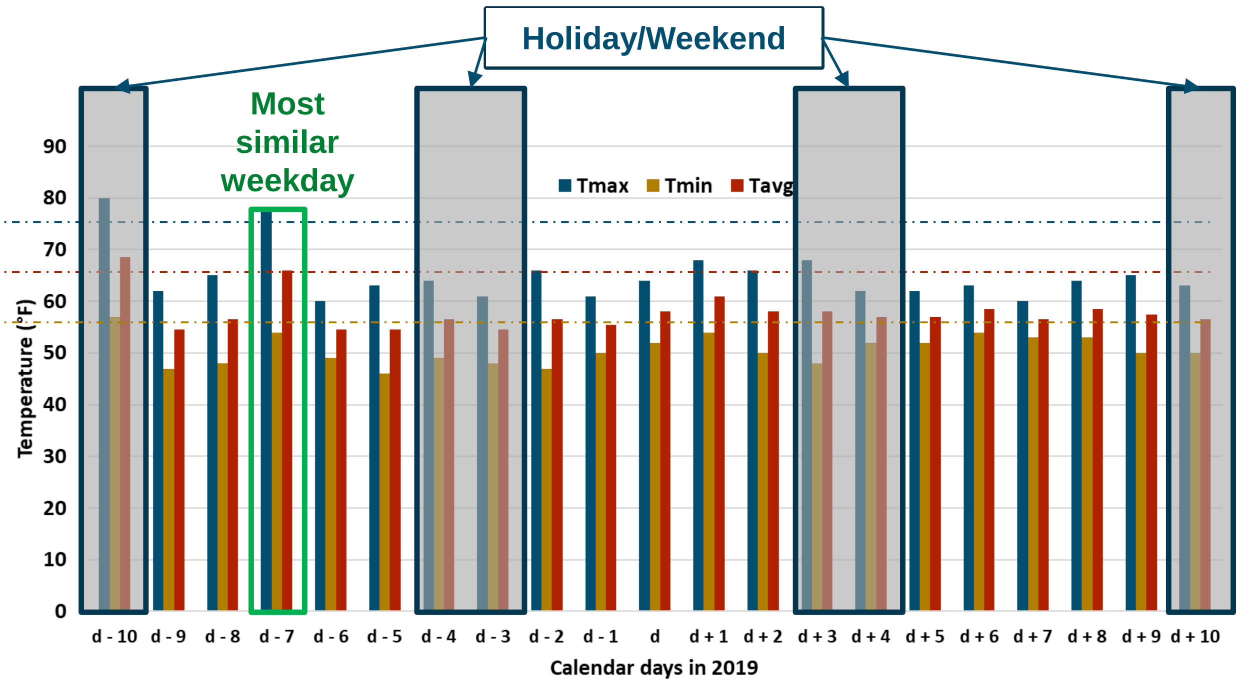
Weather-informed Day-Matching Algorithm for AC cycling DR Programs

- Inclusion of weather for air conditioner DR is in direct feedback to stakeholder comments from the May 3, 2020 CAISO ESDER meeting
- For an individual DR program and a particular day in a simulated year, pick one day out of +/- 10 calendar days of the same type (workday/holiday) from actual 2019 data **with the closest T_{max}, T_{min} and T_{avg}**
- Applied to PG&E’s Smart AC program and SCE’s Summer Discount Plan program data to account for influence of temperature on DR availability

Example weekday in simulated year



Candidate (2019) days for matching

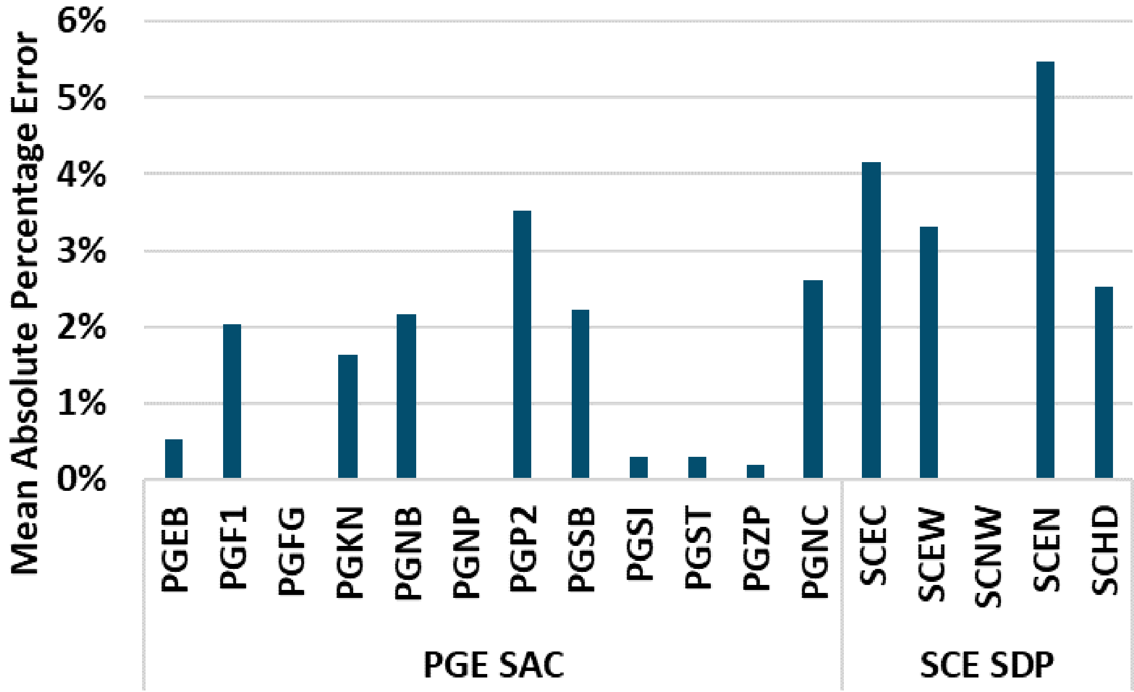


Comparison of day matched and real values

- The Mean Absolute Percentage Error (MAPE) is defined as:

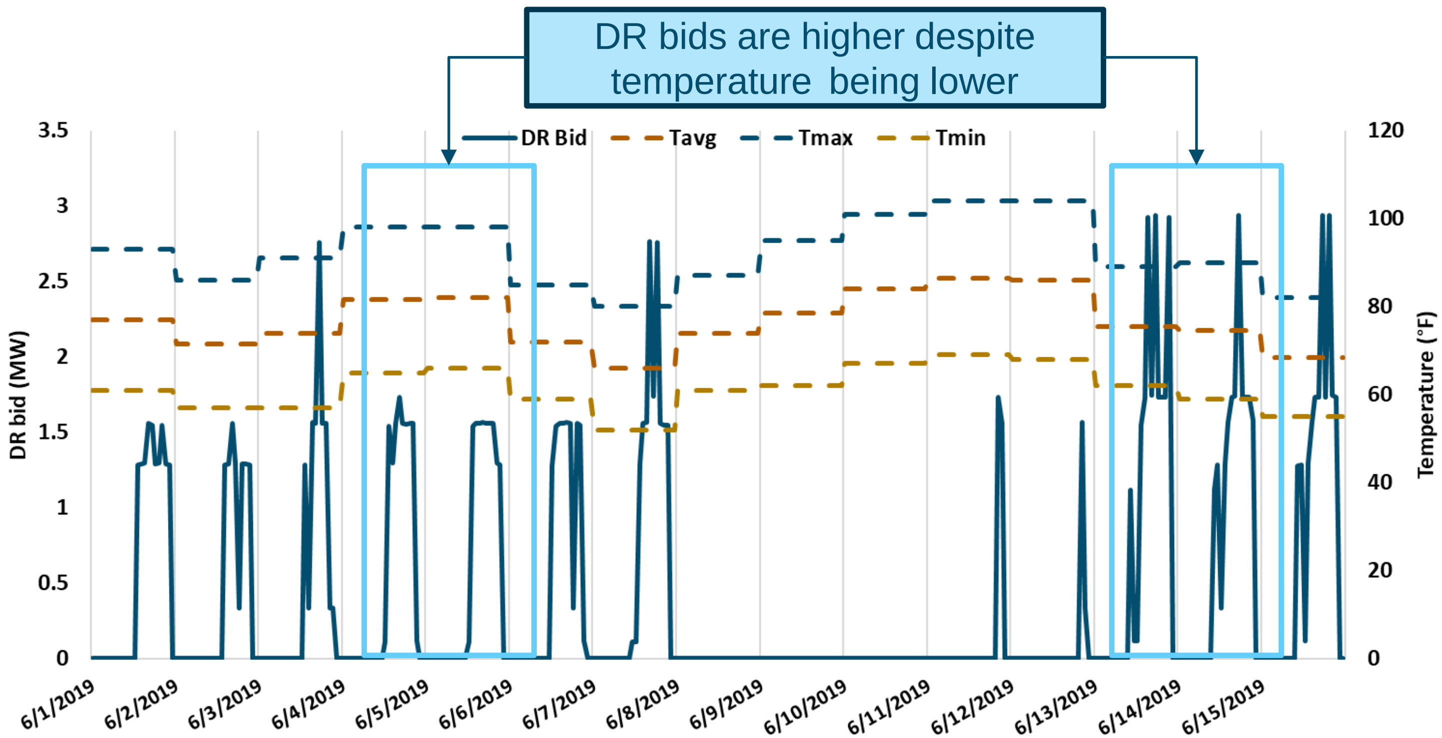
$$\frac{\text{Abs(Day–matched value – Actual Value) x 100}}{\text{Actual Value}}$$

- MAPE is calculated and shown below for July-September, 4 pm to 10 pm



Why Day Matching and not Regression?

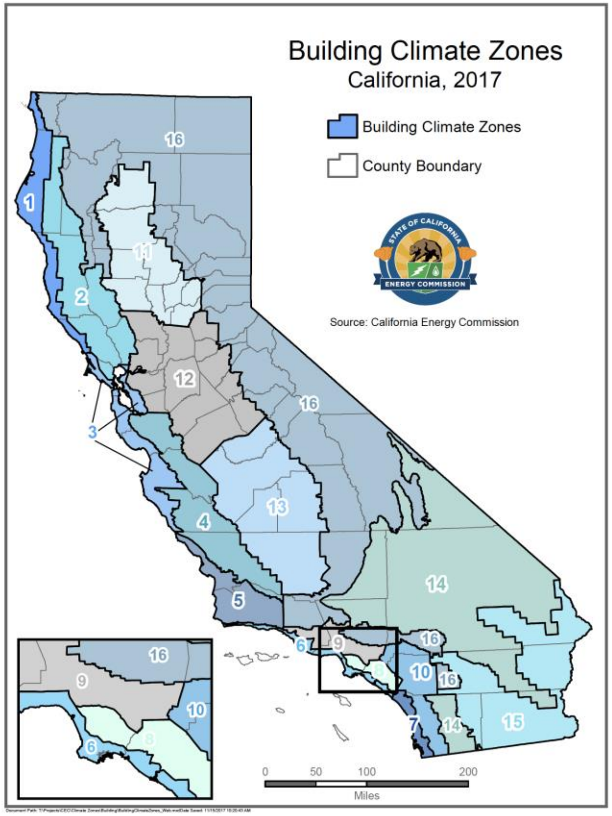
+ **Regression based on temperature, month and day-type couldn't explain movement in DR bids. Potential reasons could be:**
  - Mismatch in temperature data used by E3 and IoUs.
  - Not accounting for other explanatory variables that IoUs use in their forecasts.
+ **Absence of reliable hourly temperature records going back to 1950 meant only regression for daily DR bids was doable.**

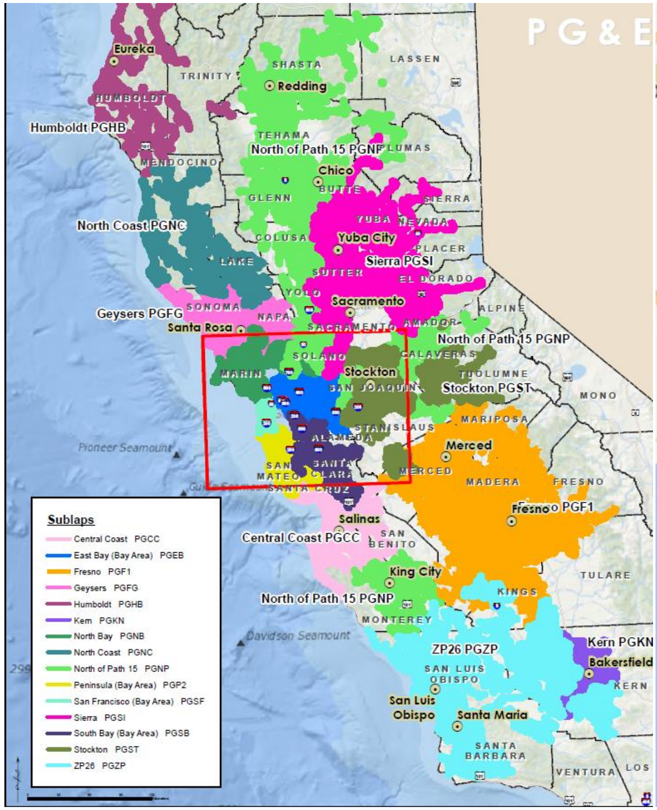


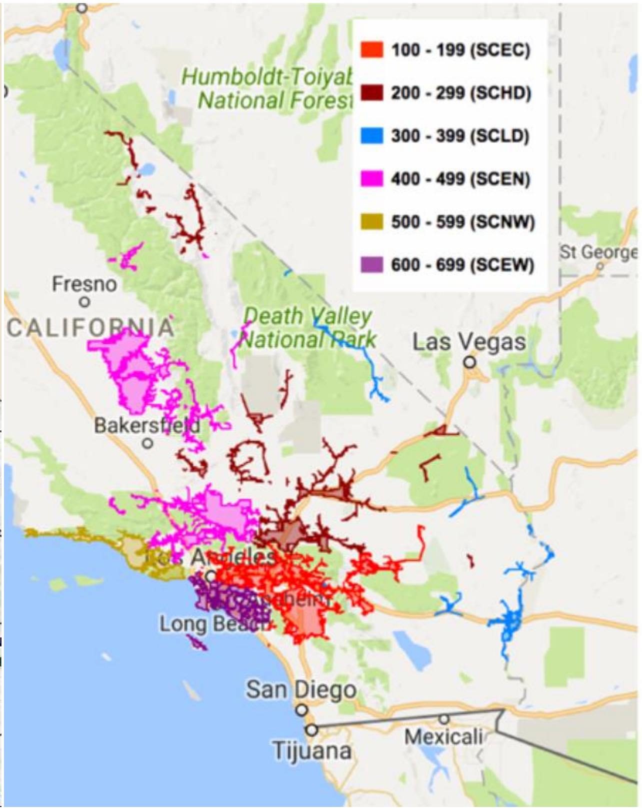
Assumptions on DR Program Characteristics

Utility	DR Program	Event Duration (hours/call)	Max. Events per Month	Max. Events per Year
PG&E	BIP	6	10	
	CBP	6	5	
	SAC	6		17
SCE	API	6		25
	BIP	6	10	
	CBP	6	5	
	SDP	6		30
	SEP	4		45
	LCR	4	20	
SDG&E	AC Saver	4		25
	CBP	4	6	
	BIP	4	10	

Climate zones and sub-LAPs for reference







Sub-LAPs vs. Local Capacity Areas

Sub-LAP	Sub-LAP (long form)	Local Capacity Area
PGCC	PG&E Central Coast	Bay Area
PGEB	PG&E East Bay	Bay Area
PGF1	PG&E Fresno	Greater Fresno
PGFG	PG&E Fulton-Geysers	North Coast/North Bay
PGHB	PG&E Humboldt	Humboldt
PGKN	PG&E Kern	Kern
PGNB	PG&E North Bay	North Coast/North Bay
PGNC	PG&E North Coast	North Coast/North Bay
PGNP	PG&E North of Path 15 - non local	CAISO System
PGP2	PG&E Peninsula	Bay Area
PGSB	PG&E South Bay	Bay Area
PGSF	PG&E San Francisco	Bay Area
PGSI	PG&E Sierra	Sierra
PGST	PG&E Stockton	Stockton
PGZP	PG&E ZP26 (between Path 15 and 26) -non local	CAISO System
SCEC	SCE Central	LA Basin
SCEN	SCE North (Big Creek)	Big Creek/Ventura
SCEW	SCE West	LA Basin
SCHD	SCE High Desert	CAISO System
SCLD	SCE Low Desert	CAISO System
SCNW	SCE North-West (Ventura)	Big Creek/Ventura
SDG1	SDG&E	San Diego/Imperial Valley
VEA	VEA	CAISO System

Q&A

NEXT STEPS

Next Steps

- The updated ELCC study results, as well as all related meeting material, are available at: http://www.caiso.com/informed/Pages/MeetingsEvents/MiscellaneousStakeholderMeetings/Default.aspx

- Please submit stakeholder written comments on today's discussion and updated ELCC study results, by June 28, 2021, to initiativecomments@caiso.com, using the comments template provided (posted on the miscellaneous meetings webpage linked above)