RA Track 2: Demand Response Valuation: *Load Impact Protocol Profile Informed Effective Load Carrying Capability*

Anja Gilbert, CAISO
Vignesh Venugopal, E3

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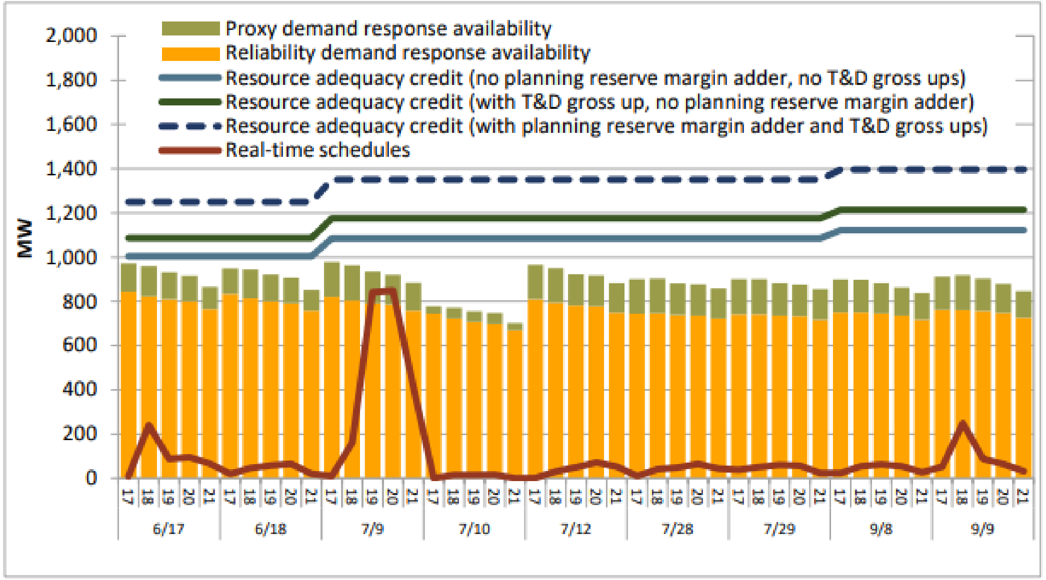
Agenda

- Background
- Proposal
- Implementation: LIP Profile Informed ELCC Guide (E3)

Background: Problem Statement

- Demand response resources used to meet resource adequacy requirements are over counted compared to the availability of these resources, particularly in peak net load hours.
- Utility demand response capacity is credited and therefore not subject to CAISO resource adequacy must-offer-obligations, substitute capacity obligations, or the CAISO’s resource adequacy availability incentive mechanism (RAAIM).
- In August 2021, 80 percent of demand response counted towards system resource adequacy requirements was associated with utility demand response programs. On high load days in summer 2021, this capacity availability fell short of resource adequacy credits by an average of 450 MW, or 34 percent, of total resource adequacy credits (including the 15 percent planning reserve margin adder).

Figure 2.1 CPUC-jurisdictional utility demand response availability and resource adequacy credits



Source: DMM, 2021 Demand Response Issues and Performance Report. January 12, 2022.

Background: The CAISO's RA Principles for Demand Response

The CAISO recommends any new qualifying capacity for demand response must:

- Represent accepted industry leading practices recognizing demand response resources' limited and variable output nature;
- Assess demand response resources' contribution to reliability across the year or seasons; and;
- Assess demand response resources' interactive effects with other resources as incremental amounts of energy and use-limited resources begin to add less and less incremental capacity value to the system.

Proposal: Load Impact Protocol Profile Informed Effective Load Carrying Capability

- Method:
  - Energy Division would assess DR's contribution to reliability using a Loss of Load Expectation to calculate the Effective Load Carrying Capability (ELCC) of demand response using SERVM.
  - ELCC is highly dependent on the availability of the resource. To approximate demand response availability under a variety of conditions, the CAISO and PG&E have proposed using Load Impact Protocol Profiles.
- Scope: Resource Adequacy Year 2023 and 2024 to learn from the process and refine the method, prior to a permanent method in RAY 2025.
  - 2023: IOU supply side DR
  - 2024: IOU supply side DR and third party DR (to refine implementation)
- Qualifies for RAAIM Exemption under CAISO's Variable Output Demand Response Policy

Key Timeline Milestones: Calendar Year 2022 for RA Year 2023

LIP Process

April 1: LIP Reports Due

ELCC Process

Jan- March '22: Refined data assumptions and inputs based on SERVM

May 2: LIP profiles submitted

May – June (6-8 weeks): ELCC run by CPUC

June: CPUC RA Decision

June – July: Comment Period

RA Process

July 1 – Initial RA Allocations

September: Final RA requirements assigned to LSEs

October: LSEs Submit YA RA Compliance Filing

LIP PROFILE INFORMED ELCC GUIDE (E3)

Overview of entire process

IOUs develop LIP-informed profiles for each program and LCA that currently gets a unique QC. Also help define call constraints

→

Program-level profiles are aggregated

→

DR Programs are fed into SERVM and ELCCs calculated using delta-method

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Program-level ELCCs are allocated such that each program sub-type and LCA gets a unique QC, as they do today

The proposal covers IOU-run event-based DR programs

IOU	PG&E																							
Program	BIP								SAC								CBP							
LCA	Bay Area	Greater Fresno	North Coast	Humboldt	Kern	Outside LCA	Sierra	Stockton	Bay Area	Greater Fresno	North Coast	Humboldt	Kern	Outside LCA	Sierra	Stockton	Bay Area	Greater Fresno	North Coast	Humboldt	Kern	Outside LCA	Sierra	Stockton
Res, Non-Res Distinction																	Res, Non-Res	Res, Non-Res	Res, Non-Res	Res, Non-Res	Res, Non-Res	Res, Non-Res	Res, Non-Res	Res, Non-Res
Notification Time Distinction																								

IOU	SCE															
Program	BIP			API			CBP			SDP			SEP			LCR
LCA	LA Basin	Big Creek	Outside LCA	LA Basin	Big Creek	Outside LCA	LA Basin	Big Creek	Outside LCA	LA Basin	Big Creek	Outside LCA	LA Basin	Big Creek	Outside LCA	LA Basin
Res, Non-Res Distinction										Res, Non-Res	Res, Non-Res	Res, Non-Res				
Notification Time Distinction	15-min, 30-min	15-min, 30-min	15-min, 30-min				DA, DO	DA, DO	DA, DO							

IOU	SDG&E		
Program	CBP	BIP	AC
LCA	SDGE	SDGE	SDGE
Res, Non-Res Distinction			Res, Non-Res
Notification Time Distinction	DA, DO		DA, DO

ELCCs to be calculated for each program and then allocated to each LCA and sub-type

IOU	PG&E			SCE						SDG&E		
Program	BIP	SAC	CBP	BIP	API	CBP	SDP	SEP	LCR	CBP	BIP	AC

- Keeps the process computationally tractable
- Program-ELCC can be distributed across LCAs and program sub-types in proportion to their LIP-informed availability in critical hours

California ISO

Developing hourly availability profiles using the Load Impact Protocols (LIPs)

- Today IOUs calculate the load impact of demand response under 1-in-2 conditions, which informs DR's NQC
- IOUs build models that estimate load impact as a function of time, weather, DR participant characteristics, etc.
- We propose using the models to estimate load impacts across all weather conditions from 1998-2017*, and NOT just the 1-in-2 conditions
- This load impact time-series will be used to define the hourly availability for the DR program, like we do with solar and wind in SERVM
- We are leveraging the model calculating load impacts and NOT the NQC

*Represents weather years modeled in SERVM

Defining call constraints

- IOUs will be requested to provide this information based on their most recent tariffs
- Will include –
  - Limit on # of calls and/or # of total hours of calls
  - Limit on duration of each call
  - Hours required ahead of dispatch to commit

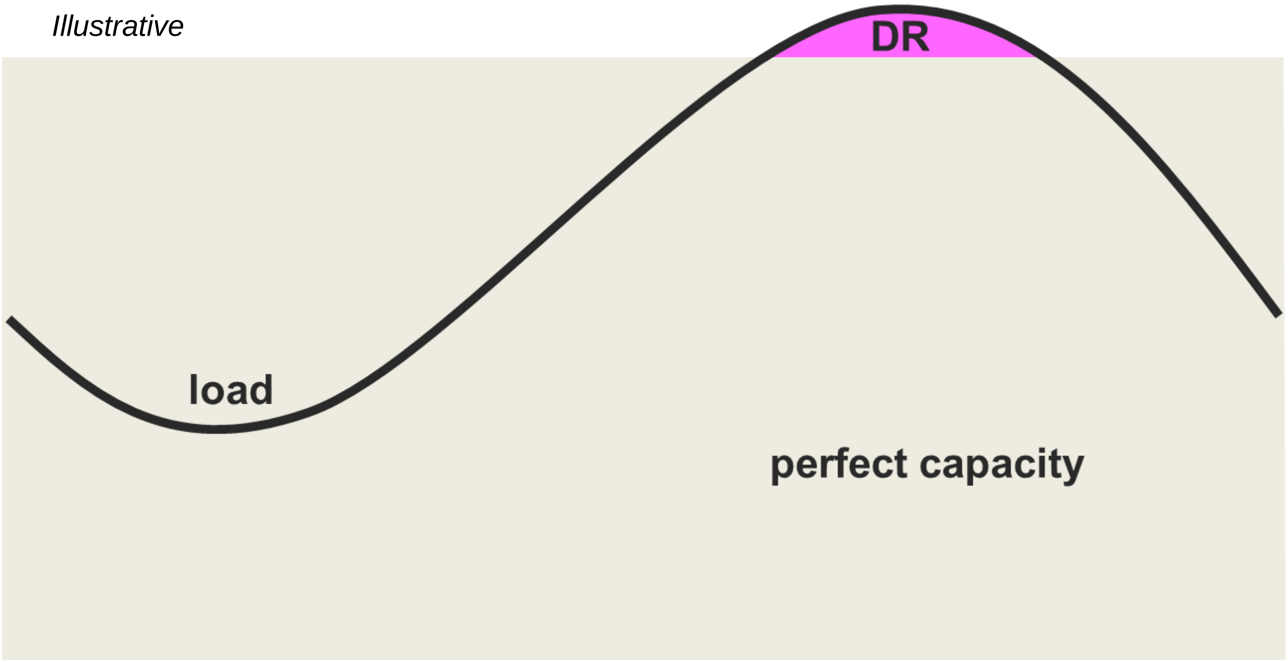
ELCCs and capturing resource interactions

- Effective Load Carrying Capability (ELCC) is a measure of the amount of equivalent perfect capacity that can be provided by an intermittent and/or energy-limited resource
- ELCCs can be calculated to either ignore or account for *all* interactions between one resource and *all* others
- But interactive effects need to be reasonably allocated among all resources contributing to the effect
- This proposal includes an allocation method applicable for both interactions between resource classes – solar, wind, storage, DR and for resources within the same class – DR programs CBP, BIP, AC, etc.

Calculating the "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 gross peak" but does not capture interactive impacts between resources

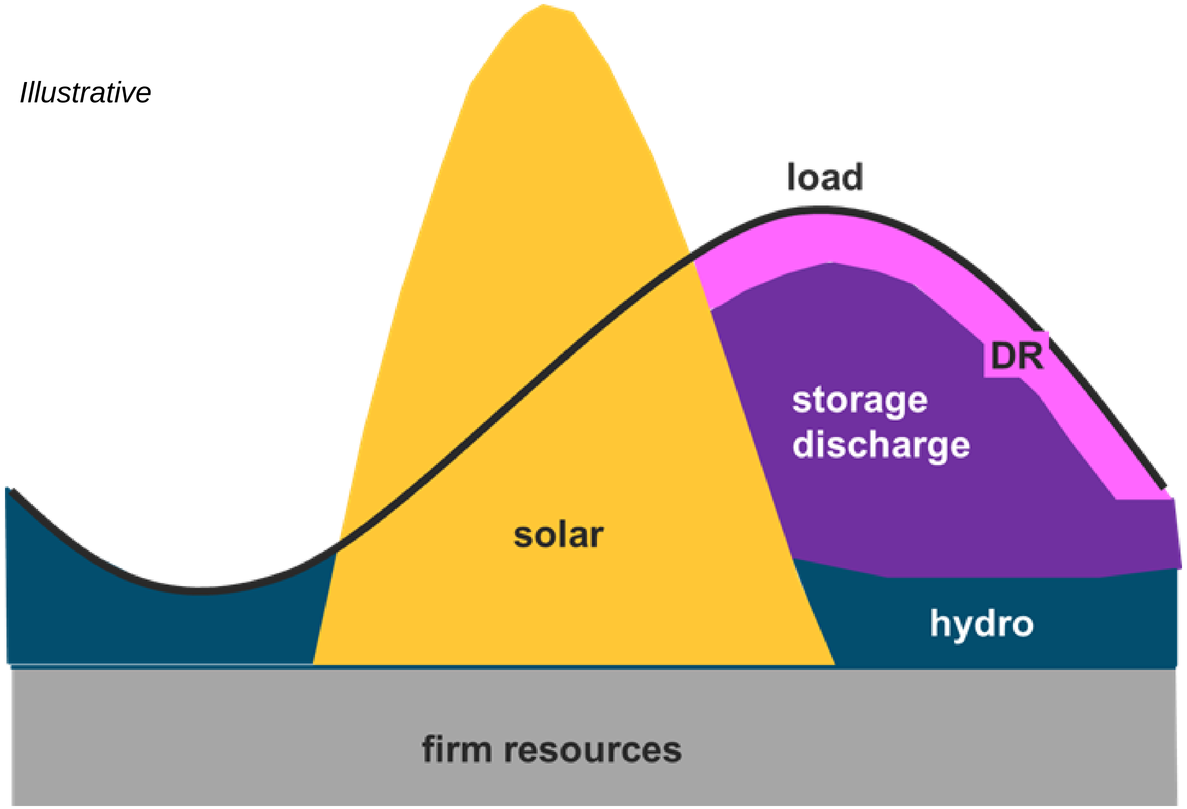
Illustrative



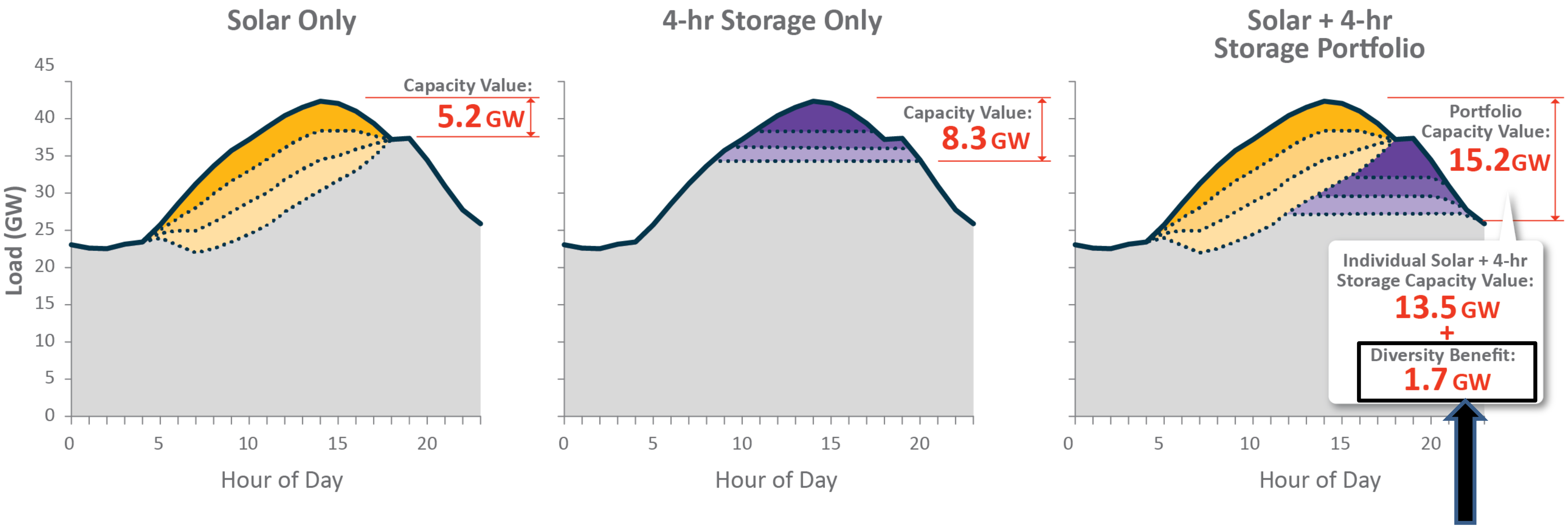
Calculating the “Last-in” ELCC

- Last-in ELCC measures the ability of a resource to provide capacity, assuming all other resources are on the system
- Captures *all* diversity benefit/penalty between the last-in resource and the remaining resources
- But this benefit/penalty needs to be distributed among all interacting resources

Illustrative



Illustrative example of interactive benefit from having solar *and* storage



How to fairly distribute this 1.7 GW of added benefit between solar and storage

Consequences of allocating interactive impact in proportion to the **first**-in ELCCs

Resource	First-in ELCC (GW)	Nameplate (GW)	Interactive Benefit (GW)	Total ELCC (% of Nameplate)
Solar	5.2	15	1.7 x 5.2/(5.2 + 8.3) = 0.65	(5.2 + 0.65) / 15 = 39%
Storage	8.3	9	1.7 x 8.3/(5.2 + 8.3) = 1.04	(8.3 + 1.04) / 9 = 104%

Interactive Benefit = 1.7 GW

ELCCs may exceed 100%

Resource	First-in ELCC (GW)	Nameplate (GW)	Interactive Benefit (GW)	Total ELCC (% of Nameplate)
Solar	5.2	15	1.7 x 5.2/(5.2 + 8.3 + 25) = 0.23	(5.2 + 0.23) / 15 = 36%
Storage	8.3	9	1.7 x 8.3/(5.2 + 8.3 + 25) = 0.37	(8.3 + 0.37) / 9 = 96%
Non-Interacting Firm Resource	25	25	1.7 x 25/(5.2 + 8.3 + 25) = 1.1	(25 + 1.1) / 25 = 104%

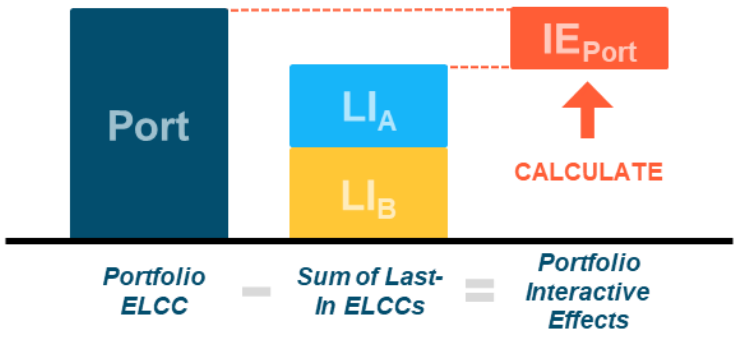
Interactive Benefit = 1.7 GW

Benefit may accrue to resources that did NOT contribute to it

E3's Delta Method to allocate portfolio ELCC to Resource Classes

STEP 1 Calculate Portfolio Interactive Effects

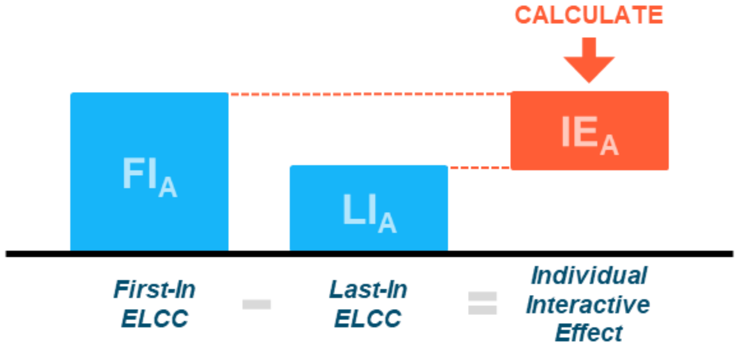
Calculated as the difference between the **Portfolio ELCC** and the sum of the **Last-In ELCCs** for all individual resources



STEP 2 Calculate Individual Interactive Effects

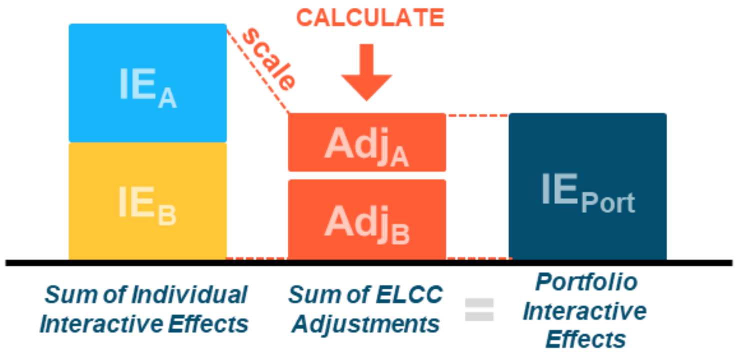
for each resource

Calculated as the difference between the **First-in ELCC** and **Last-In ELCC** for each individual resource



STEP 3 Calculate Individual ELCC Adjustments

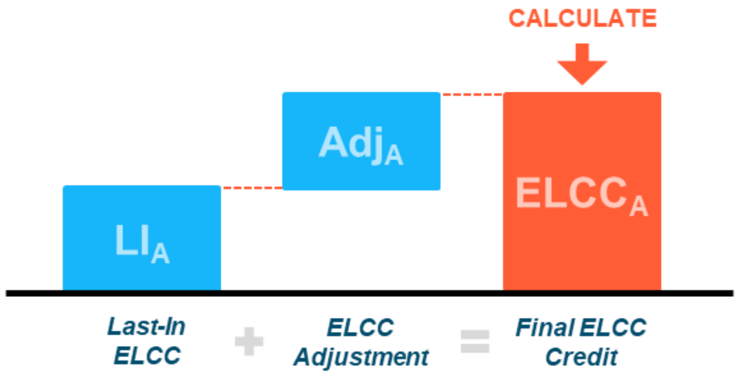
Calculated by scaling all *Individual Interactive Effects* to match the *Portfolio Interactive Effects*



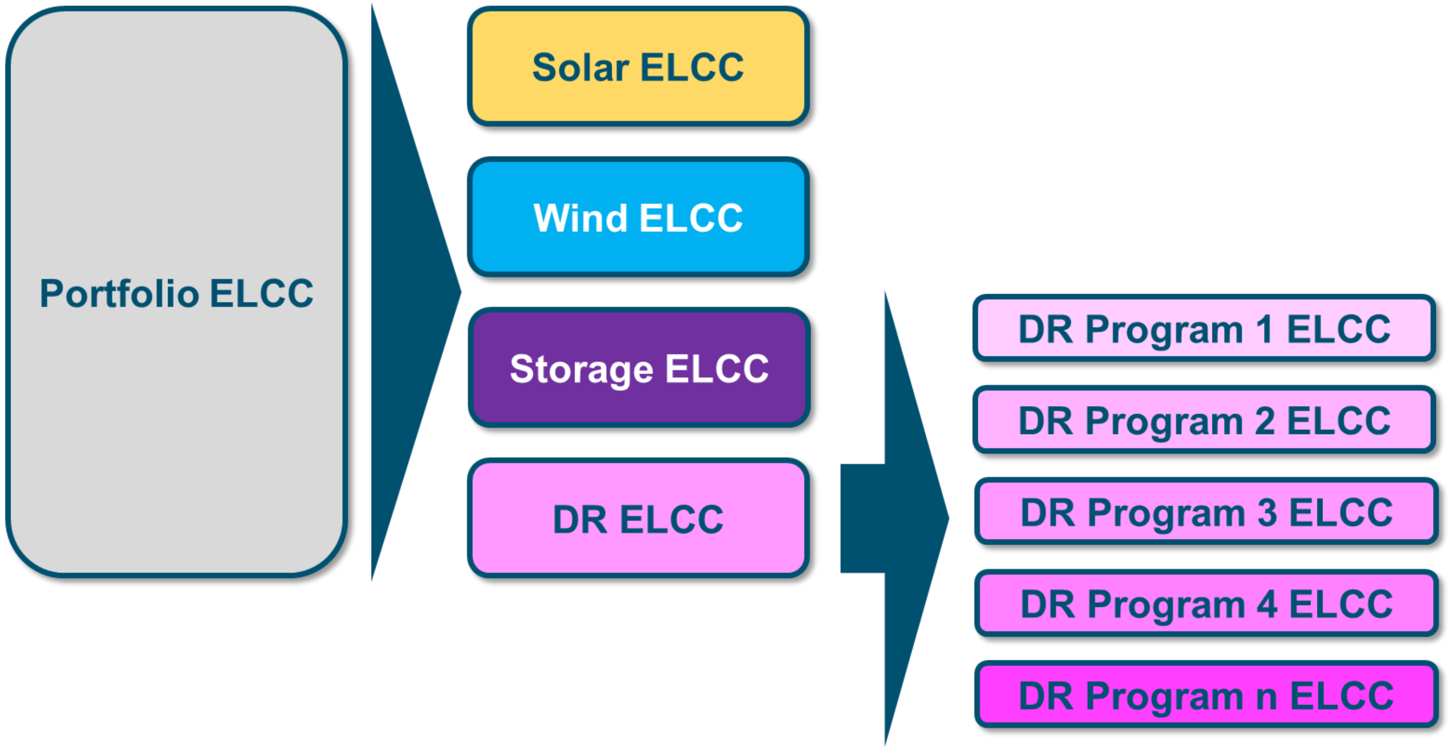
STEP 4 Calculate ELCC Accreditation

for each resource

Add *Individual Resource ELCC Adjustment* to **Last-In ELCC** for each individual resource



The Delta Method can be used to both calculate a DR class ELCC, and an ELCC for each DR program



Program-level to LCA-level ELCC calculations can be done for each month based on critical hours observed in SERVM

- *Final* results from the study will be an ELCC for-
  - Each month
  - Each program and LCA defined on slide 7
- Illustrative example -
  - DR was required in 4 hours in a specific month
  - Say a DR program "P" exists in two LCAs - LCA "A" and LCA "B"
  - If P in A could provide 800 MWh in these 4 hours and P in B could provide 800 MWh as well, they each get 50% of P's total ELCC for that month
  - If P in A could provide 800 MWh and P in B could provide 400 MWh, P in A gets 66.7% and P in B gets 33.3% of P's total ELCC for that month respectively
- This system-level ELCCs may also be used towards meeting Local Capacity Requirements (LCRs)
  - Consistent with how system-wide solar and wind ELCCs and DR NQCs count towards LCRs as well today

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Resources

- The LIP-Informed DR ELCC guide
  - https://efiling.energy.ca.gov/GetDocument.aspx?tn=241246&DocumentContentId=75092
- E3's white paper on the Delta Method with an illustrative example
  - https://www.ethree.com/wp-content/uploads/2020/08/E3-Practical-Application-of-ELCC.pdf
- Additional DR-specific illustrative example
  - https://efiling.energy.ca.gov/GetDocument.aspx?tn=240948&DocumentContentId=74799

Q&A