Xcel Energy Colorado DR Study
In Support of 2022 Strategic Issues Filings

OVERVIEW OF DRAFT FINDINGS

PREPARED BY

Ryan Hledik
Akhilesh Ramakrishnan
Kate Peters
Ryan Nelson
Xander Bartone
Ragini Sreenath

PREPARED FOR

Colorado DSM Roundtable
May Meeting

MAY 11, 2022

Brattle

Agenda

- PSCo's Current DR Portfolio
- The Role of DR in a High Renewables System
- Draft Achievable Potential Estimate

Note: Findings are draft and subject to revision

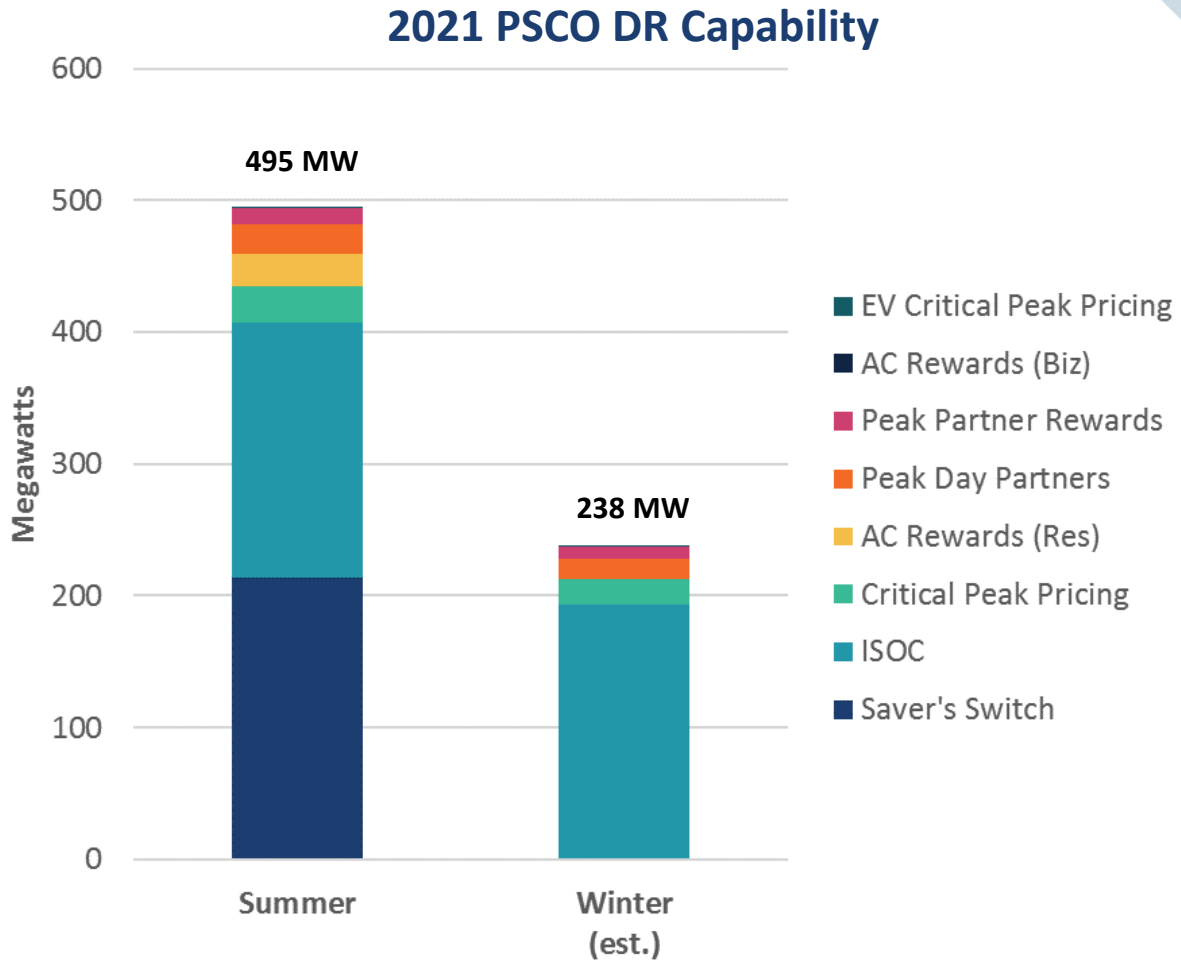
PSCo’s Current DR Portfolio

PSCo's existing DR portfolio

PSCo has a large existing DR portfolio

- 495 MW capability (7% of system peak)
- Ranks 15th out of 144 IOUs as percent of peak demand, according to EIA data
- Ranks 7th (top 5%) excluding utilities with large share of industrial load
- Capability currently concentrated in A/C control and ISOC, with significant share of large customer enrollment
- Portfolio includes several emerging programs

Our focus in this study is on identifying incremental opportunities for expansion



The Role of DR in a High Renewables System

Evaluating DR in a high-renewables system

Background

- PSCo's system will be significantly more reliant on renewable generation by 2030
- As a result, PSCo will need to make capacity planning decisions based on net load
- This will ensure that there is sufficient capacity when load is high *and* renewable generation is low

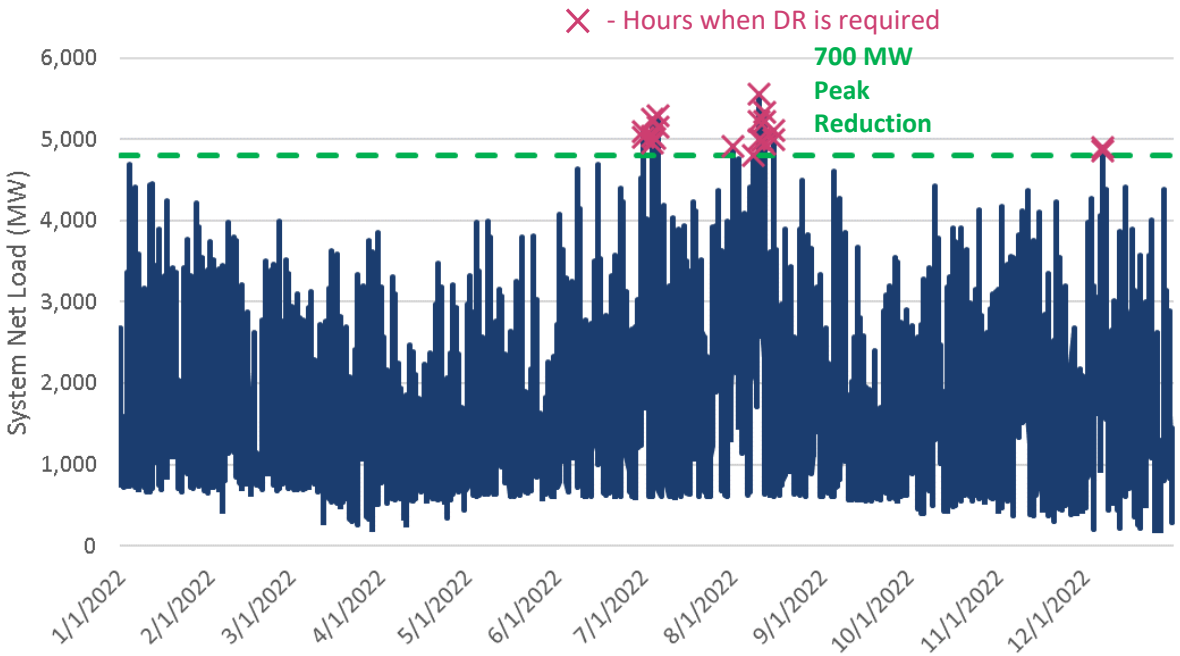
Key questions

- What are the implications for DR program operations and economics in 2030?
- What type of DR provides value, and when?

Reducing peak demand through DR: **2022**

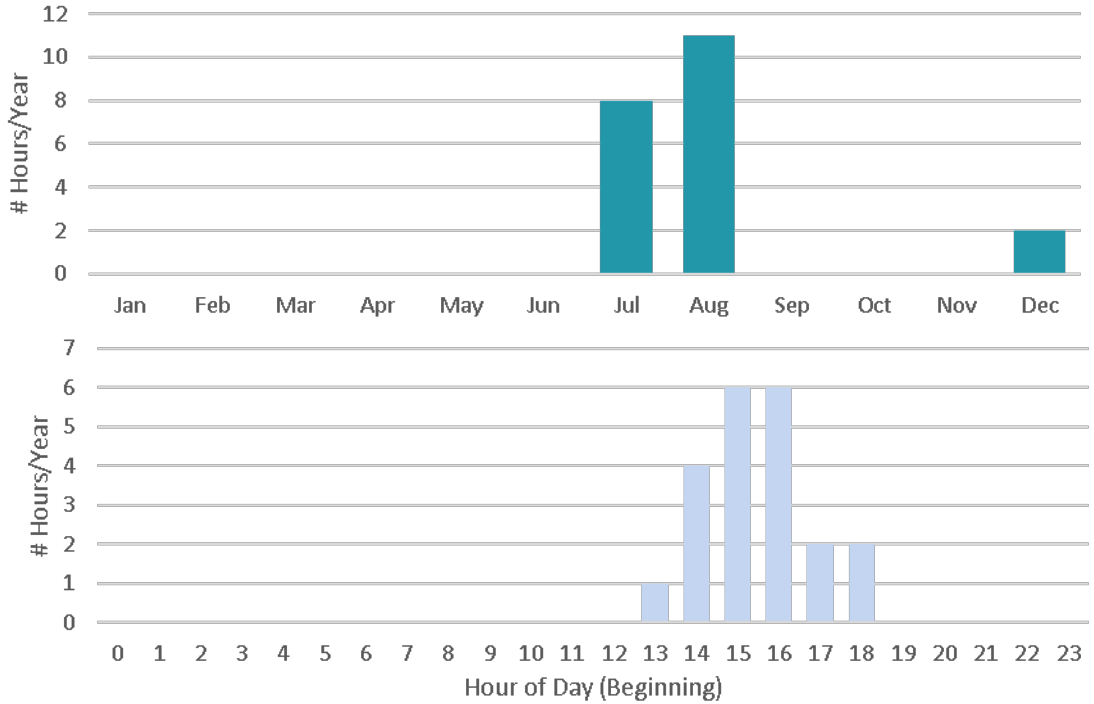
Using DR to substantially reduce system peak demand requires that load be reduced in several hours of the year. This ensures that the peak will be "clipped" and avoids creating a new peak in a different hour.

2022 Forecasted Hourly System Net Load



Reducing net peak demand by 700 MW in 2022 would require load reductions in 21 hours of the year

Frequency of Hours Requiring Load Reductions

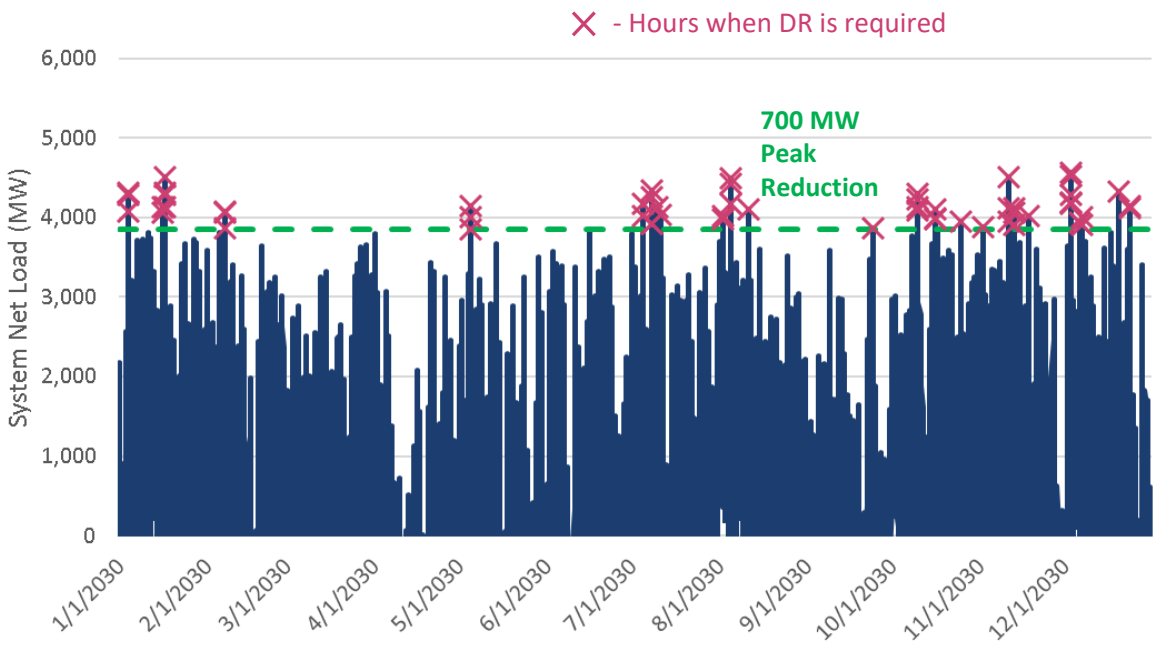


The hours requiring peak demand interruptions occur primarily during summer afternoons/evenings

Reducing peak demand through DR: **2030**

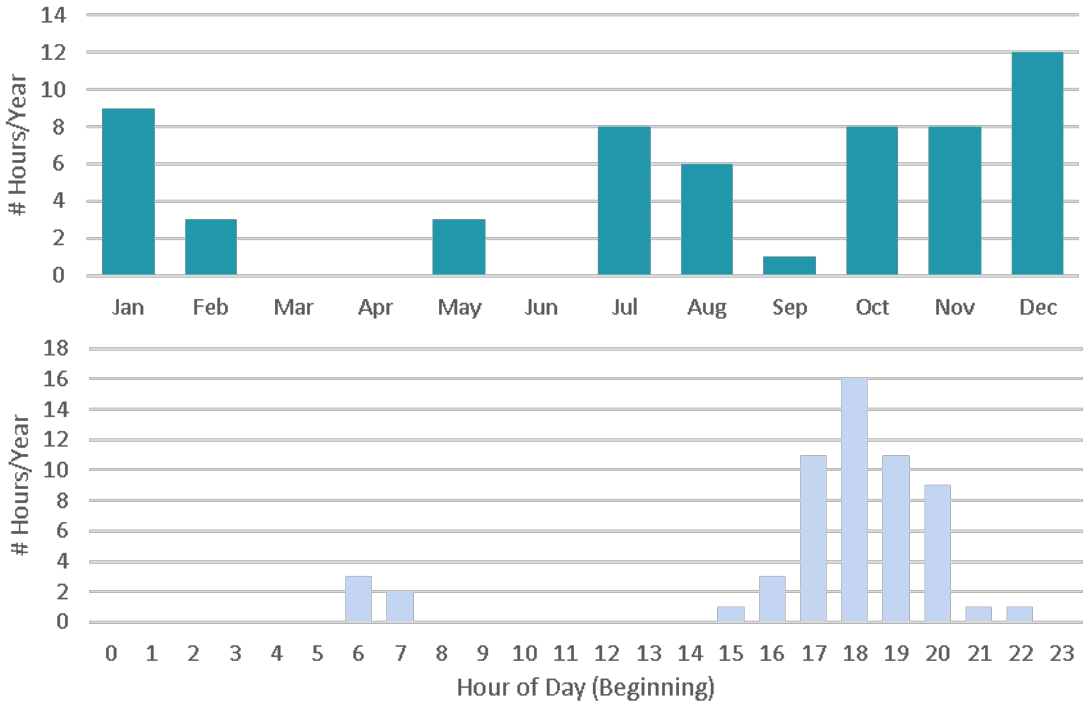
PSCo's net load shape will change significantly by 2030 due to a large increase in renewable generation. The frequency and timing of required DR events will change dramatically.

2030 Forecasted Hourly System Net Load



The number of hours of DR events required to achieve a 700 MW reduction increases from 21 in 2022 to 58 in 2030

Frequency of Hours Requiring Load Reductions

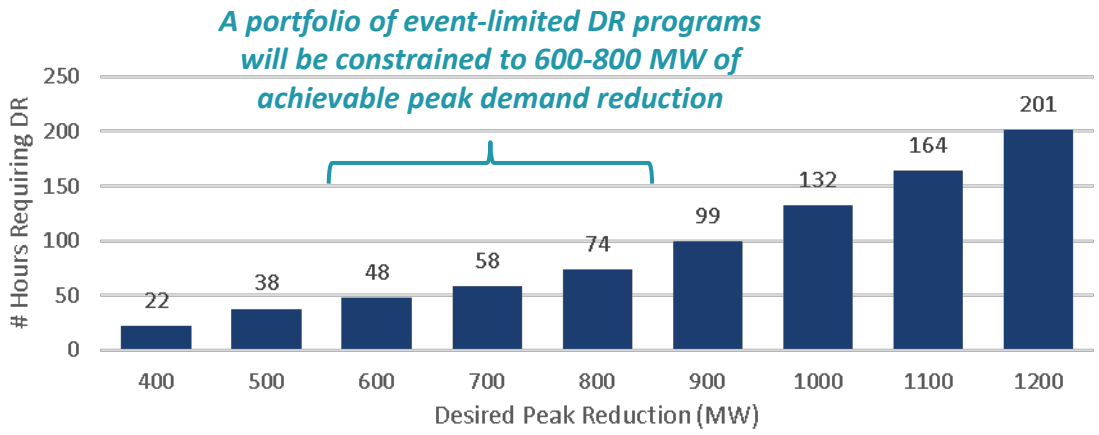


The hours with DR events in 2030 are spread throughout the year and span more hours of the day

Implications

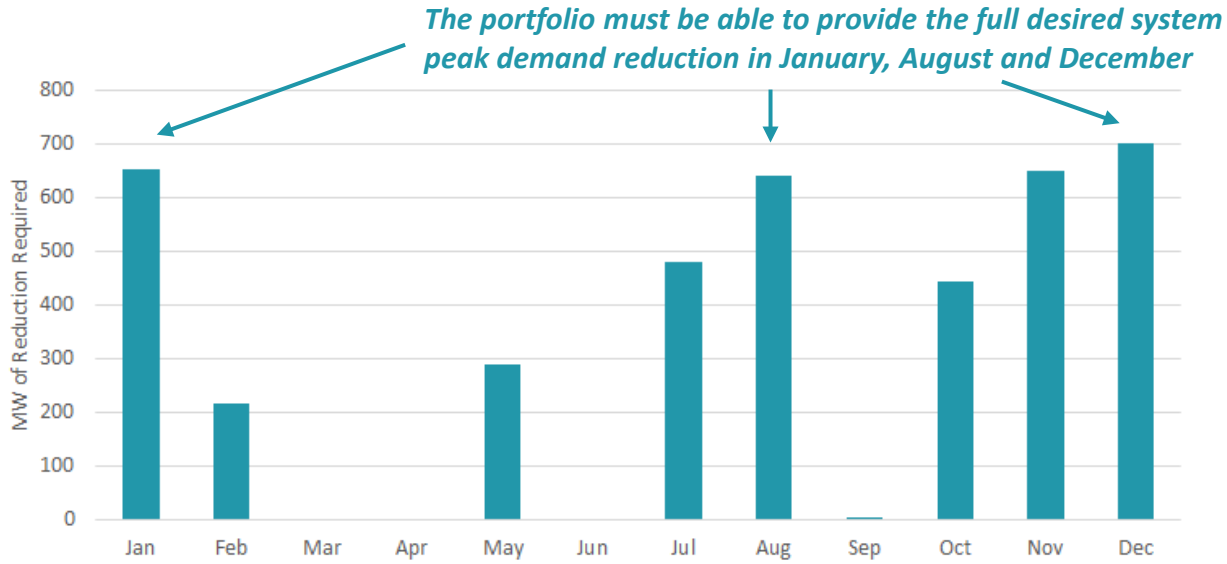
The 2030 system net load shape will effectively serve as a limit on the peak demand reduction that can be achieved through conventional "peak clipping" programs, because those programs have strict limits on the number, timing, and (in some cases) season of DR events.

of Hours Required to Achieve Target Net Peak Demand Reduction (2030)



DR events can be staggered across participants to increase the number of hours of load reduction, but only to a degree.

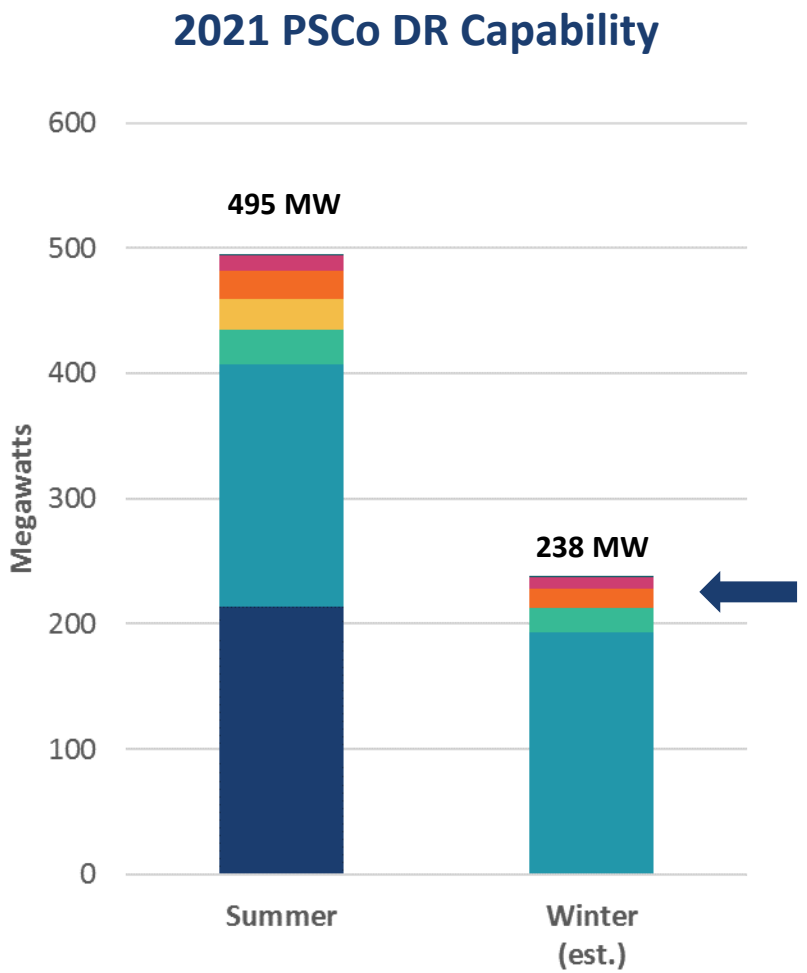
MW of Reduction Required in Each Month to Achieve 700 MW System Demand Reduction (2030)



A 700 MW peak demand reduction requires up to 700 MW of reduction in both winter (Jan, Dec) and summer (Aug) months

Takeaways

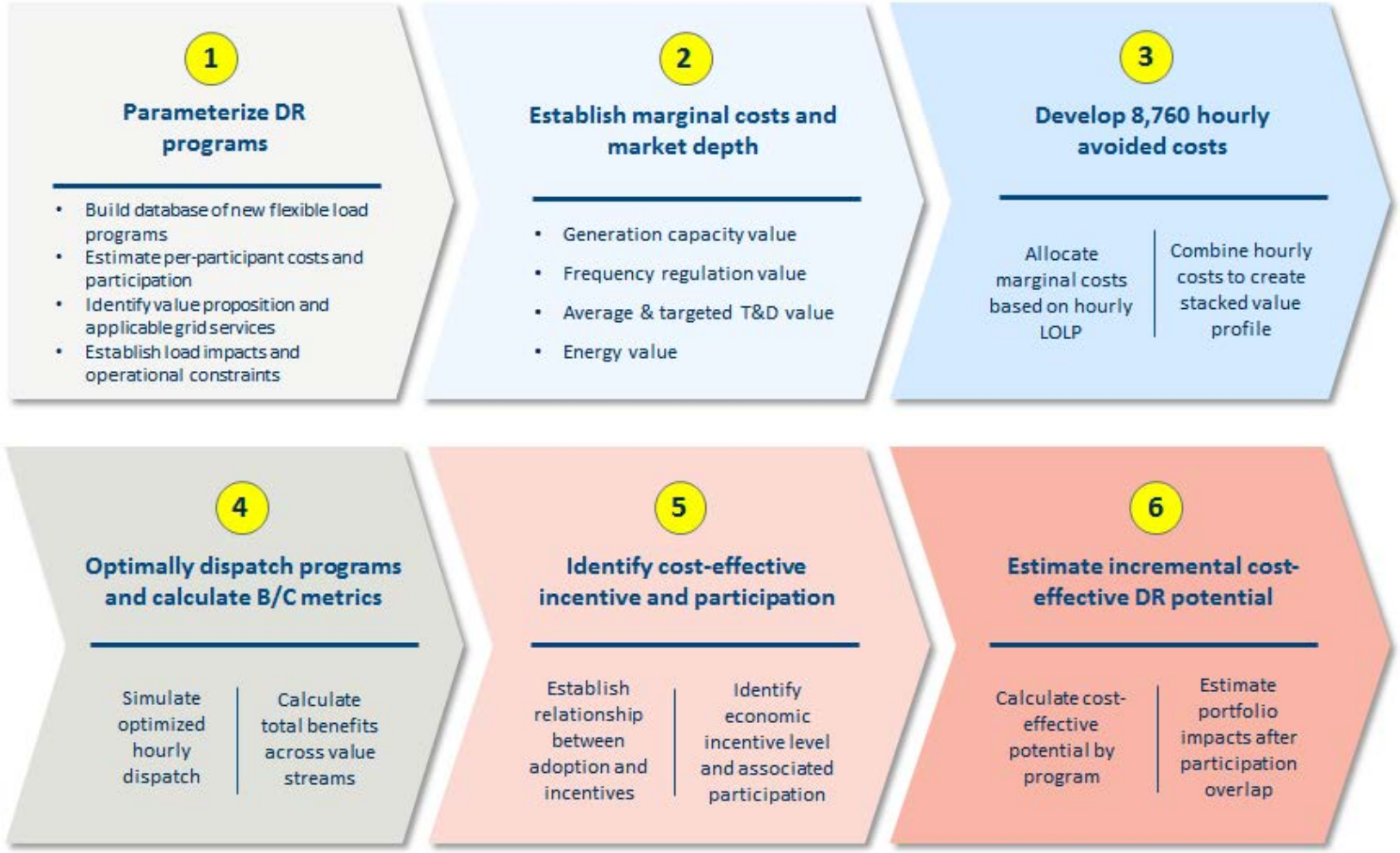
- By 2030, PSCO's DR programs will need to be utilized significantly more frequently than in the past
- **The DR portfolio will need to provide peak demand reductions of comparable magnitude in both summer and winter**
- Significant DR portfolio expansion will require new programs that have the ability to reduce peak demand year round, and with higher frequency (>75 DR event hrs/yr)



In 2030, the existing portfolio will be limited to providing ~240 MW of system net peak demand reduction capability

Draft achievable potential estimate

Methodology overview – the LoadFlex model



Modeled DR programs

Low frequency programs
(<75 DR event hrs/yr)

- Savers Switch
- Smart thermostat (Res & Small C&I)
- Peak time rebate (Res & Small C&I)
- Behavioral DR (Res)
- BTM storage (Res)
- Interruptible (Large)
- Critical peak pricing (Large)
- Peak Day Partners (Large)
- EV workplace managed charging

High frequency programs
(>75 DR event hrs/yr)

- Default TOU (Res & Small)
- Grid-interactive water heating (Res)
- EV TOU (Res)
- Default TOU (Large)

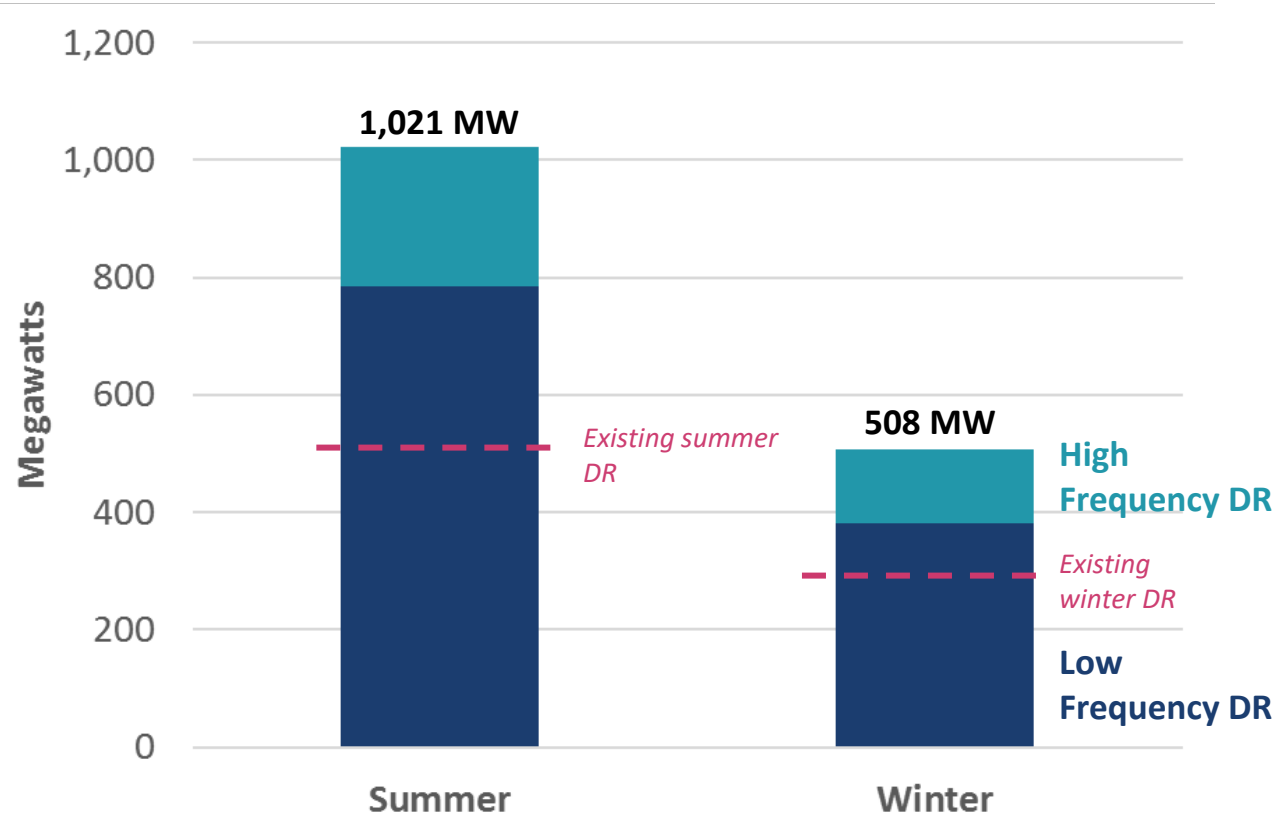
Not yet modeled
(Likely small impacts)

- Auto-DR (Large)
- Heat pump water heating DR (Res)

Seasonal achievable potential

- **Total system-wide DR potential is limited to 508 MW in 2030, as that is the maximum potential DR capability in the winter.**
- Summer DR has significantly higher potential due to flexibility in air-conditioning load. However, peak demand reductions beyond 508 MW in the summer effectively will provide no capacity value, because net peak demand will remain in the winter.
- Low Frequency DR does not exceed the upper-bound threshold of 600 to 800 MW for event-limited DR described in the previous section of this presentation, so that is not a constraint on the portfolio.

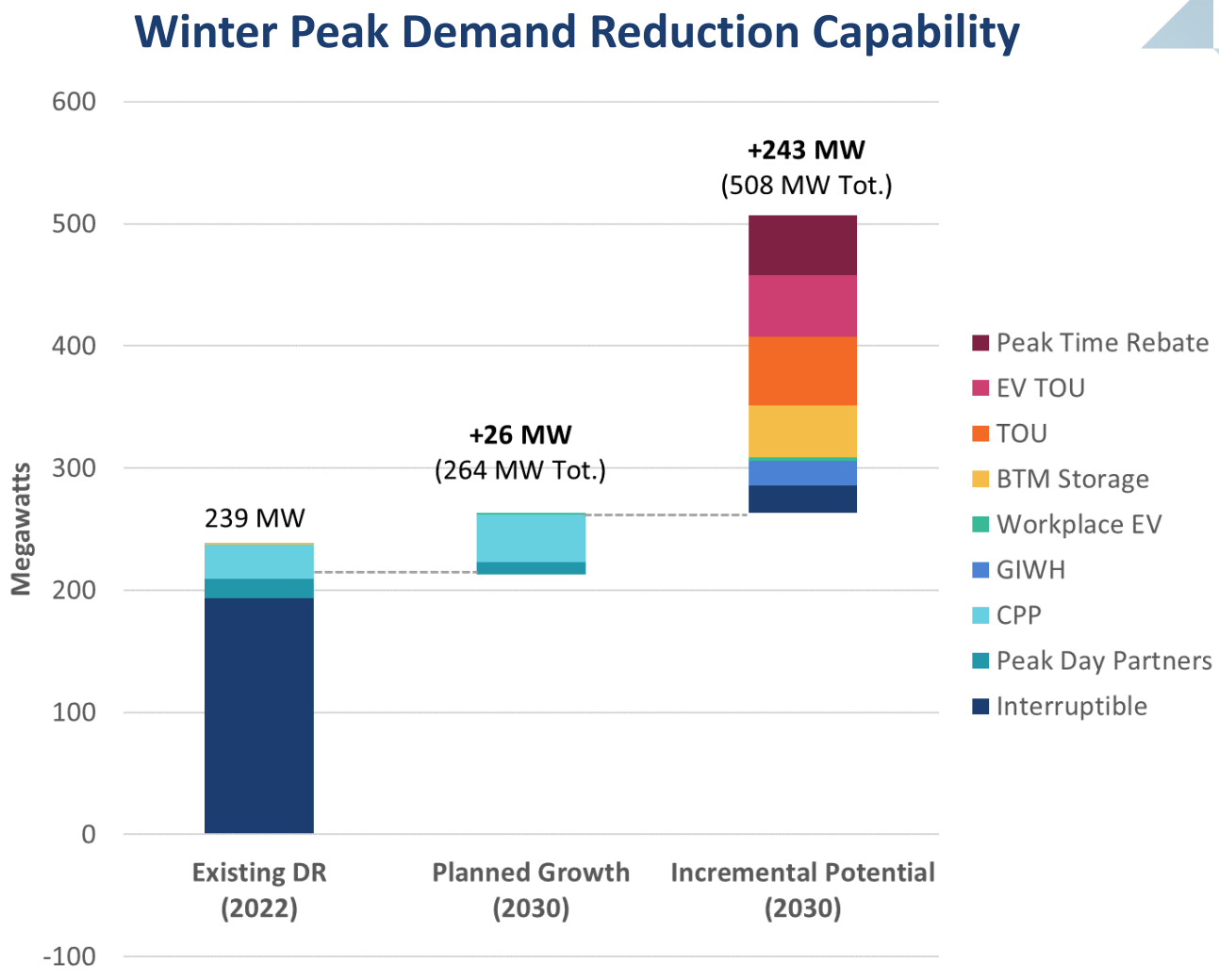
2030 Achievable DR Potential, by Season



Note: Potential estimates shown are inclusive of existing and planned DR capability.

Winter DR potential by program type

- Developing a DR portfolio with 500 MW of system peak demand reduction capability in 2030 will require roughly doubling PSCO's existing/planned winter DR capability.
- Primary drivers of achievable incremental potential are default TOU rates for all customer classes, EV managed charging (TOU in our analysis), a targeted peak time rebate to provide event-based behavioral DR beyond TOU impacts, and growth in the BTM battery program.
- To reach a matching peak reduction of 508 MW in the summer, PSCo's currently planned level of growth through 2030 is sufficient



Note: "Planned Growth" starts below the top of the "existing DR" bar because ISOC capability is forecasted to decline under business-as-usual conditions by 2030 (-25 MW).

Initial conclusions and next steps

Initial conclusions

- PSCo's transition to decarbonized power supply will significantly change how DR is used by 2030
- Summer DR will continue to provide value, but the DR portfolio will need to provide year-round performance
- Winter DR capability will need to increase significantly for the portfolio to keep up with changing system conditions
- While we estimate that the system peak reduction capability of the portfolio has the potential to increase only by 10-20 MW by 2030 (from 495 to 508 MW), winter peak demand reduction capability will need to double for this to happen

Next steps

- Finalize modeling of remaining programs (impact likely in the tens of megawatts)
  - Auto-DR, residential water heating, dynamic pricing for commercial customers
- Continue auditing model results
- Conduct sensitivity analysis
- Summarize methodology and findings in final report (June)