Demand Flexibility (D-Flex) Tool

Demand Analysis Working Group (DAWG)

February 28, 2025

Agenda

Topic	Time	Facilitator(s)
Welcome and Introductions	10:00 to 10:05	Cynthia Rogers
Demand Flexibility Tool (D-Flex Tool) • D-Flex Tool (“D-Flex Tool 1.0”): Used for developing the Load Shift Goal in 2023 • D-Flex PCM Tool (“D-Flex Tool 2.0”): Used for Demand Scenarios sensitivities developed in 2024 and considered in support of SB 100 in 2025 • Next steps	10:05 to 11:30	Ingrid Neumann, Ph.D.
Open Discussion	11:30 to 12:00	Cynthia Rogers & Ingrid Neumann, Ph.D.

Housekeeping Slide

- This is a remote workshop and is being recorded.
- Documents, presentation slides, and the recording for this workshop will be available at the DAWG webpage.
- Everyone will be muted by default.
- For participants using the Zoom computer platform, please use the "raise hand" or Q&A feature to ask questions. We will unmute you so you can ask your question or make a comment.
- For telephone participants – please press *9 to raise your hand and press *6 to mute/unmute.

Objectives of this DAWG meeting

1. To display the design of the two D-Flex Tool versions by AEAB staff and their consultant. Inputs, assumptions, and key calculations, along with scenario outputs will be presented.
2. To solicit stakeholder feedback on inputs, assumptions, and approaches to continuous updates.
   - ➢Areas of particular interest are marked!
   - ➢Please review our I&A worksheets posted on the DAWG webpage ☀
3. To present additional uses of and possible enhancements to the tool.
4. To solicit stakeholder feedback and input on proposed future work as AEAB explores expanding our analytical capabilities.

Acronyms and Initialisms

AAEE – Additional Achievable Energy Efficiency

AAFS – Additional Achievable Fuel Substitution

AATE – Additional Achievable Transportation Electrification

AEAB – Advanced Electrification Analysis Branch

AMI – Advanced Metering Infrastructure

BE – Building Electrification

BTM – Behind the meter

CAISO – California Independent System Operator

CALFUSE - California Flexible Unified Signal for Energy

CARB – California Air Resources Board

CEC – California Energy Commission

CPUC – California Public Utilities Commission

DAWG – Demand Analysis Working Group

DER – Distributed Energy Resources

DF – Demand Flexibility

DS – Demand Scenario

DS – Demand Side

EAD – Energy Assessments Division

EMS – Energy Management Systems

EV – Electric Vehicle

FZ – Forecast Zone

GH – Guidehouse

GW – Gigawatt

HHU = High Hydrogen Use

HVAC – Heating, Ventilation, and Air Conditioning

Acronyms and Initialisms (cont.)

I&A – Inputs and Assumptions

IEPR – Integrated Energy Policy Report

ILFF – Interagency Load Flex Forum

IOU – Investor-owned Utility

LBNL - Lawrence Berkeley National Lab

LSE – Load Serving Entity

LSG - Load Shift Goal

MF - Multi-Family

MW – Megawatt

MWh – Megawatt hour

Nonres – Nonresidential

PCM – Production Cost Model

PA – Planning Area

PV – Photovoltaic

RA – Resource Adequacy

Res – Residential

SB – Senate Bill

SF = Single Family

SIP – State Implementation Plan

SS – Supply Side

TE – Transportation Electrification

TOU – Time of Use

V1G – Vehicle-to-Grid

V2X – Vehicle to Everything

CEC efforts in analyzing Demand Flexibility Potential

Keeping the lights on and emissions low!

- In 2020, the CEC engaged Guidehouse to develop a tool with which to ***estimate statewide potential for demand flexibility.***
- In 2023, the first iteration of the D-Flex Tool was customized for **setting California's LSG** under **Senate Bill 846 (Dodd, Chapter 239, Statutes of 2022)**. The tool determines the potential capacity that could be shifted away from "System Net Peak hours" in a given target year.
  - CEC facilitated an interagency working group to use the D-Flex tool for the analysis of load shift potential and the development of policy recommendations (Interagency Load Flex Forum ILFF)
  - **April 2023**: **Lead Commissioner Workshop on SB 846 Preliminary Load Shift Goal**
  - **May 2023**: Neumann, Ingrid and Erik Lyon. May 2023. ***Senate Bill 846 Load-Shift Goal Report***. California Energy Commission. Publication Number: CEC-200-2023-008.

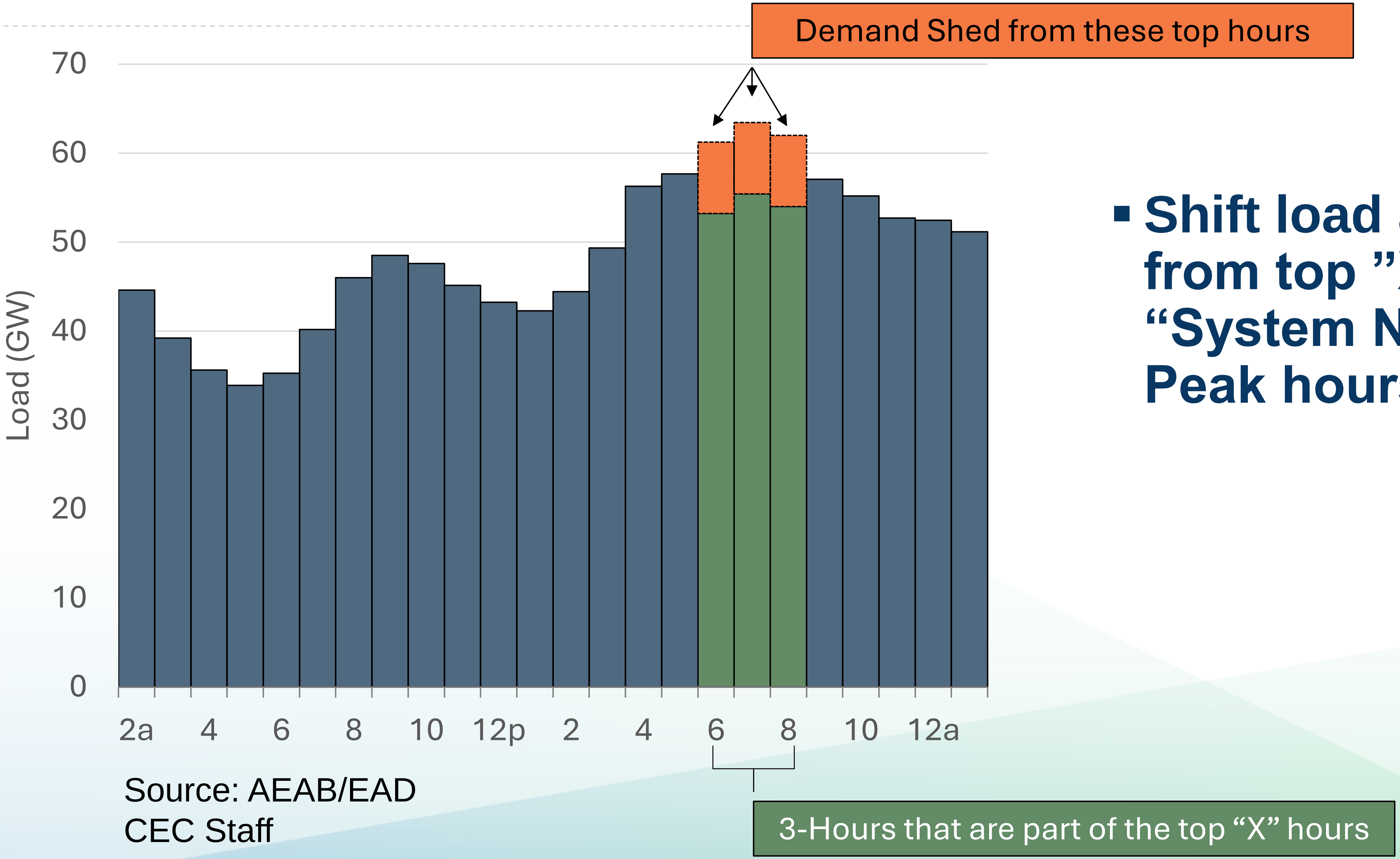
CEC efforts in analyzing Demand Flexibility Potential

Keeping the lights on and emissions low!

- D-Flex Tool PCM is an expansion of the tool, which generates potentials for each hour of a year or series of years for use in a Production Cost Model (PCM). It was used to develop **Demand Scenario sensitivities** in 2024 to support **SB 100 (De Léon, Chapter 312, Statutes of 2018)** in 2025.
- Presentation at Staff Webinar August 2024 "SB 100 Demand Scenarios: Demand Flexibility (DF) Resource Potential"

D-Flex Basic Design

D-Flex



Source: AEAB/EAD
CEC Staff

- **Shift load away from top "X" "System Net Peak hours"**

Demand Flexibility Analysis

Shift load away from top "X System Net Peak hours"

8760 Hourly Baseline Energy Consumption

Modify by Transportation and Building Electrification and Building Energy Efficiency

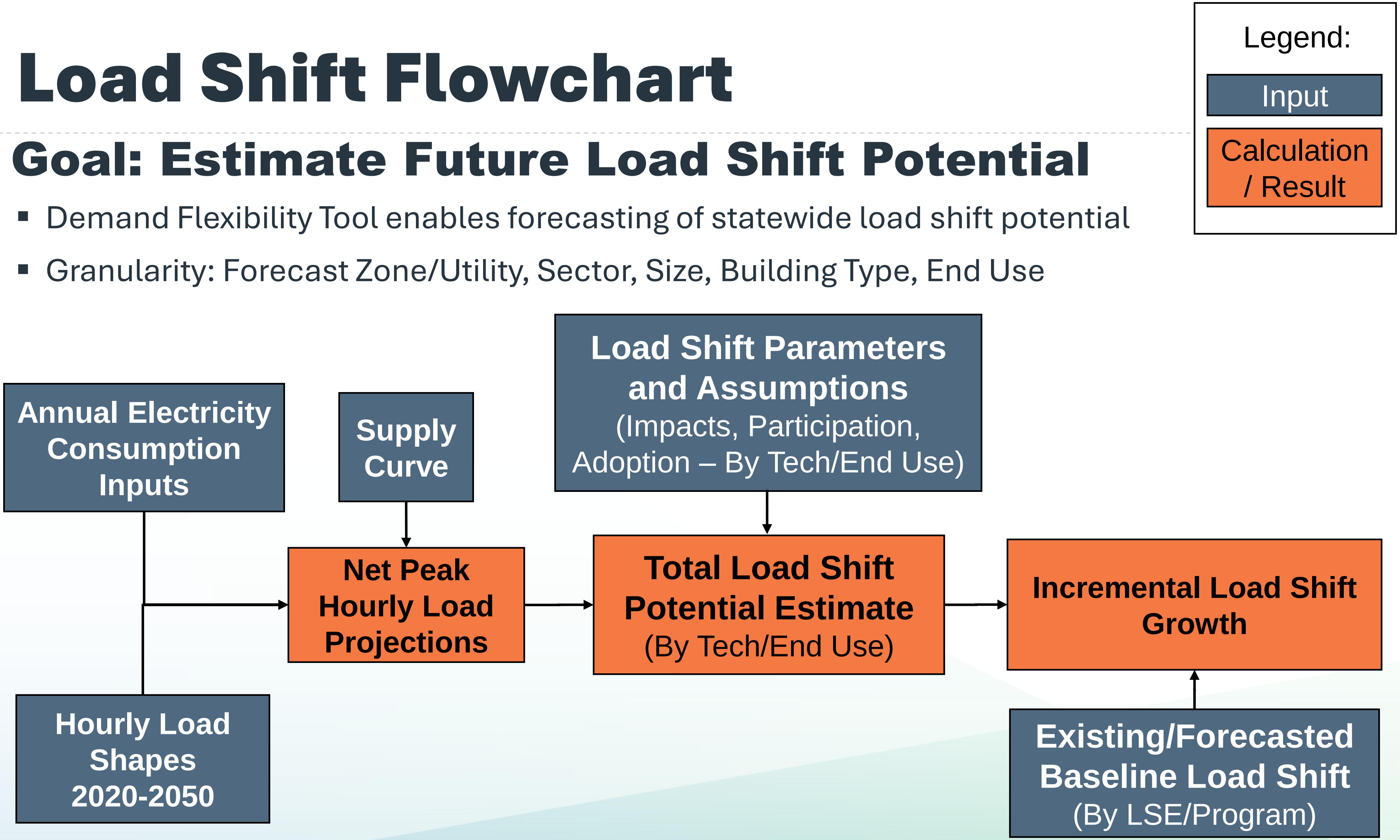
Adjust by BTM Storage and PV, as well as Utility Scale Wind and Solar Generation

"System Net Peak Hours": Top X net hours annually

Load Shift Flowchart

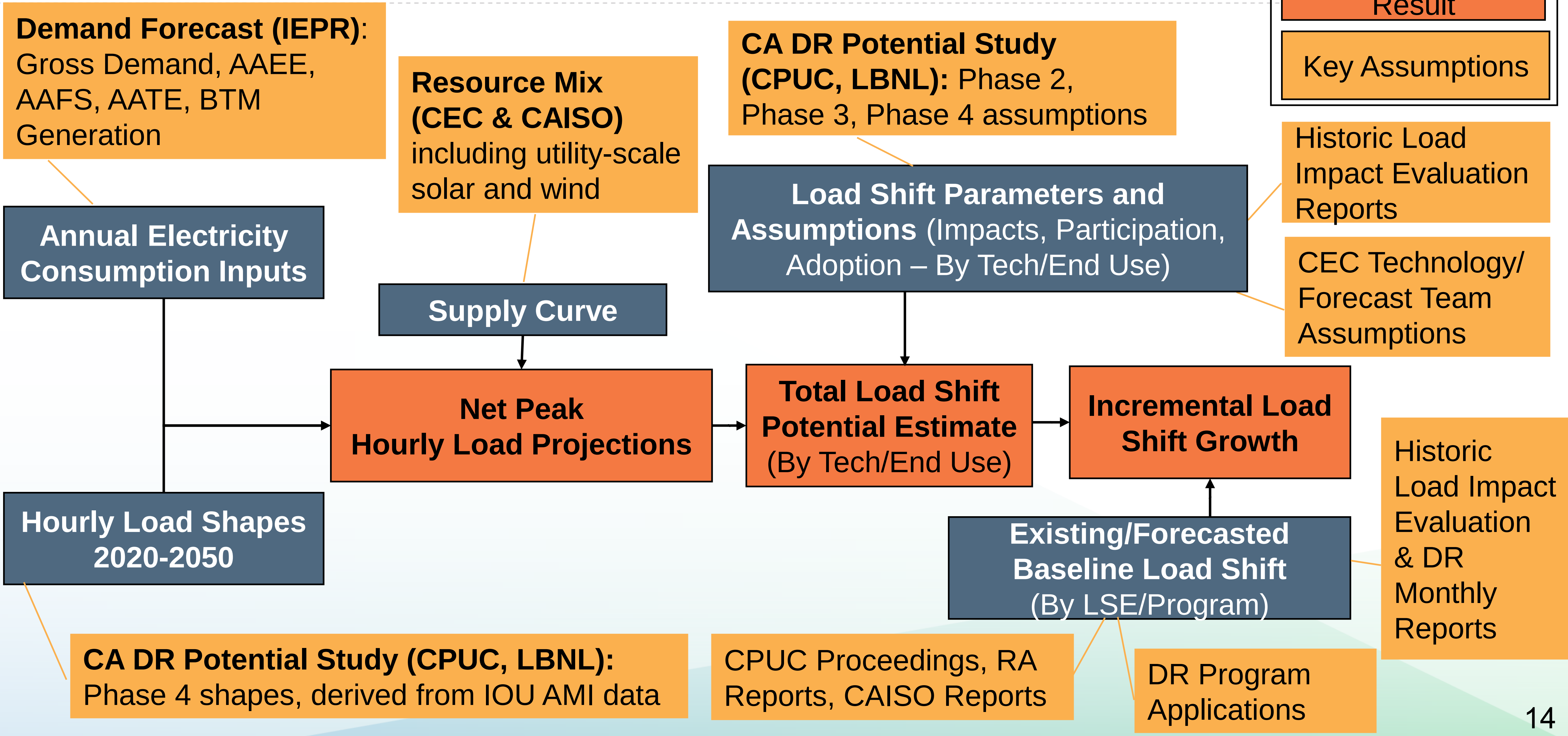
Goal: Estimate Future Load Shift Potential

- Demand Flexibility Tool enables forecasting of statewide load shift potential
- Granularity: Forecast Zone/Utility, Sector, Size, Building Type, End Use



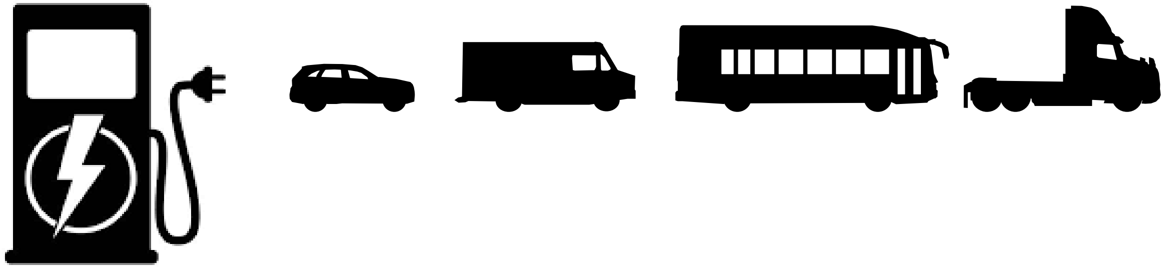
Inputs & Assumptions

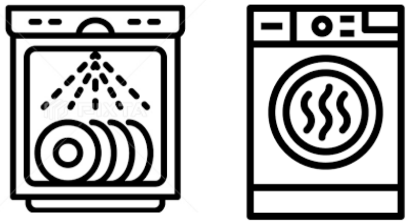
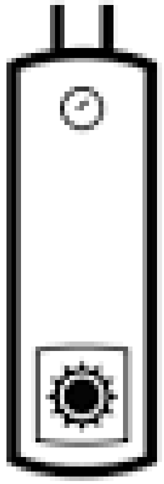
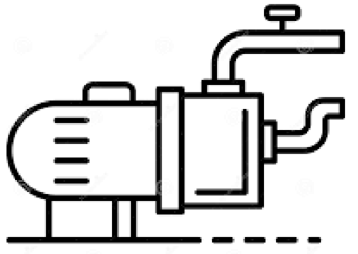
Load Shift Flowchart



End-Use and Enabling Technology Combinations for Load Flexibility

Updated with LBNL/CPUC Phase 4 DR Technology Assumptions
Electric Vehicle Managed Charging (V1G)
Electric Vehicle to Building/Home/Grid
HVAC Control (Smart Thermostats/EMS)
Water Heating Control
Appliance Load Control
Lighting Control
Agricultural Pumping Interruptions




Gerke, B, et al. The California Demand Response Potential Study, Phase 4: Report on Shed and Shift Resources Through 2050. May 2024. Lawrence Berkeley National Laboratory. Report Number LBNL-2001596. https://eta-publications.lbl.gov/publications/california-demand-response-0

Scenario Analysis Levers

- Baseline Demand Scenario Mid
- **AAEE Scenario 3**
- **AAFS Scenario 3**
- AATE Scenario 3
- BtM PV & Storage Mid Scenarios

& High Electrification sensitivity

- **Hierarchy**
  - (0) TOU (embedded in baseline)
  - **1. Dynamic Pricing**
  - **2. Event-Based DR (SS or DS)**

Sensitivity 2>1

- **Technology Adoption Scenarios**
- **Participation Scenarios**
- Unit Impacts

Reference & Ambitious versions

Annual Electricity Consumption Inputs

Supply Curve

Load Shift Parameters and Assumptions (Impacts, Participation, Adoption – By Tech/End Use)

Net Peak Hourly Load Projections

Total Load Shift Potential Estimate (By Tech/End Use)

Incremental Load Shift Growth

Hourly Load Shapes 2020-2050

- **Weather Year Scenario 1:2 & sensitivity using 1:10**

Existing/Forecasted Baseline Load Shift (By LSE/Program)

Participation (Event-based DR)

- Aligned participation inputs with LBNL Phase 4 Study
  - worked with LBNL to obtain their aggregate enrollment fractions corresponding to “achievable” participation fractions associated with procurement price at/below avoided cost

- **Reference DR case:** used LBNL aggregate enrollment fractions for 2030 achievable potential
- **Ambitious DR case:** used 20% higher enrollment fractions than Reference
  - i.e. 1.2x the enrollment fraction from LBNL Phase 4 Study

Dynamic Pricing & Enabling Technology Impacts

Brattle Group Dynamic Pricing "Arc of Price Responsiveness"

- Price response impact
  - ➢ Without enabling technology: 9% of peak reduction
  - ➢ With enabling technology: 16% of peak reduction

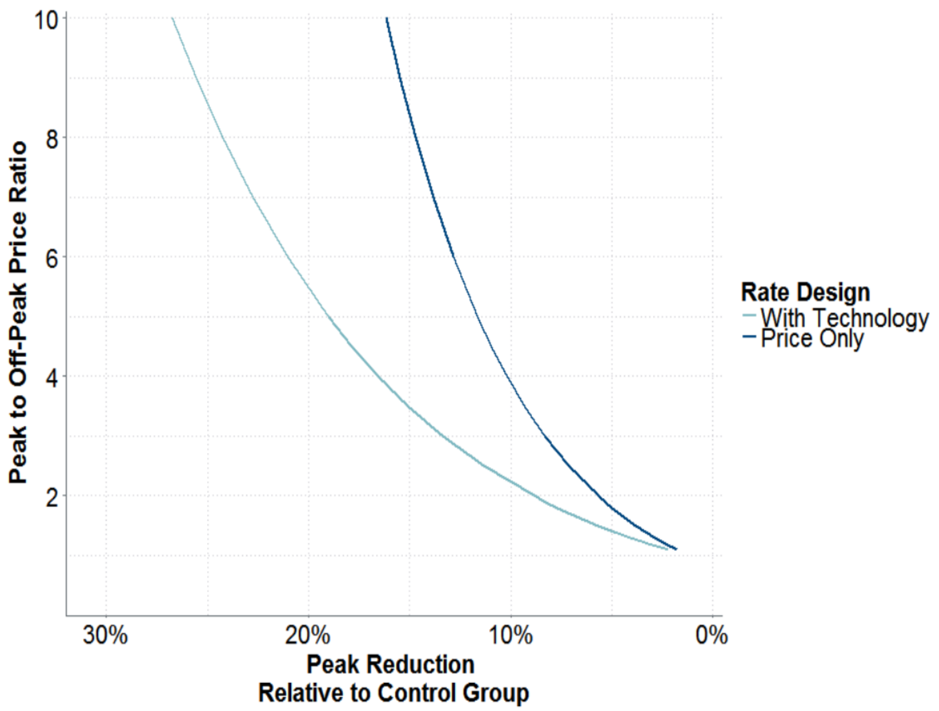
Reference DR case "early adopters":

- ➢ Propose assumption of 25% enrollment
- ➢ Propose assumption of 25% non-enabled vs. 75% tech-enabled

Ambitious DR case "everyone else":

- ➢ Propose assumption of 80% enrollment
- ➢ Propose assumption of 50% non-enabled vs. 50% tech-enabled

Figure 14: The Arc of Price Responsiveness

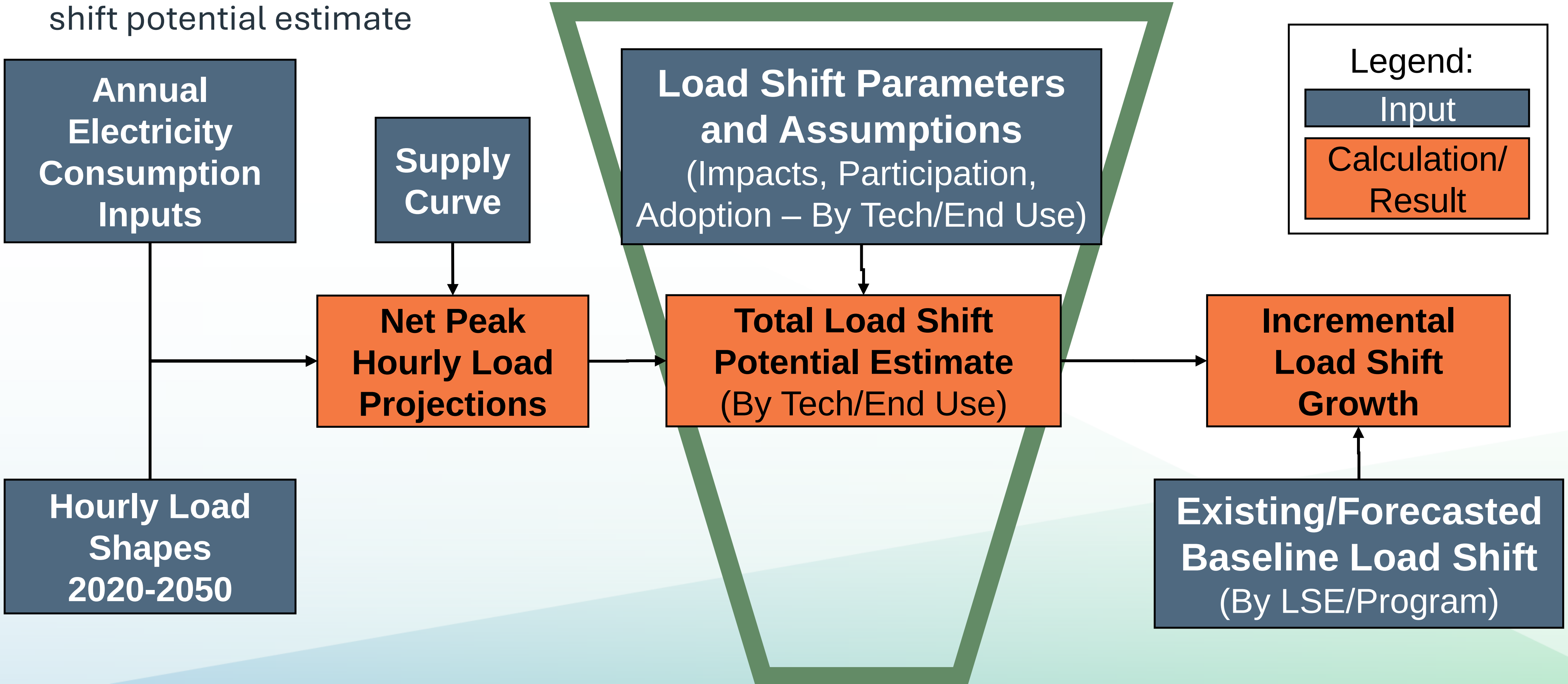


Source: Arcturus 2.0: A Meta-Analysis of Time-Varying Rates for Electricity (CPUC)

Key Calculations

Load Shift Flowchart

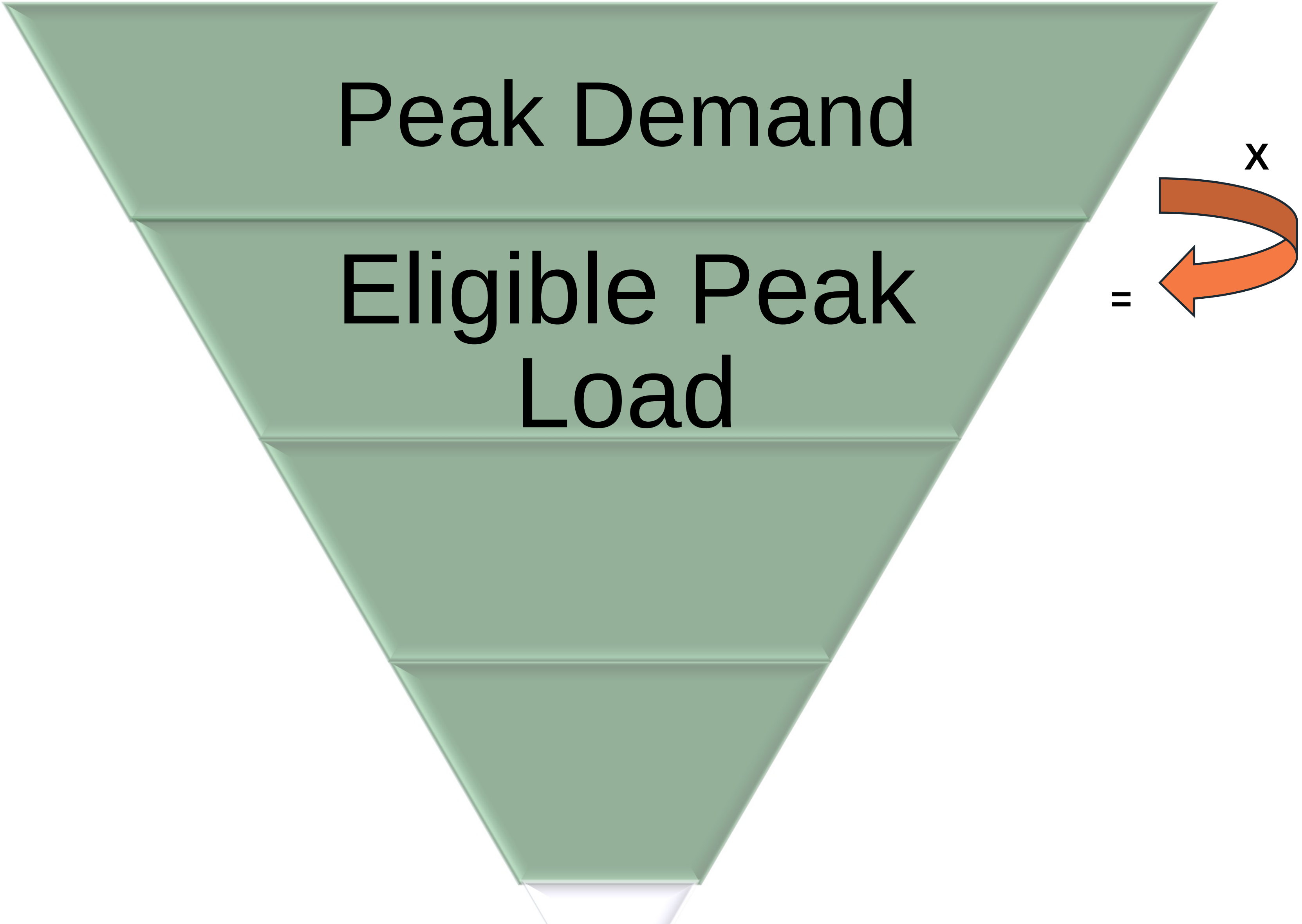
- Peak Demand is found from the net peak hourly load projections as the average net peak load (MW) over the net peak period for all DR SubOptions other than V2X
- V2X Peak Demand is calculated using EV count times charger capacity.
- Total Peak Demand is then funneled down using the Load Shift Parameters to arrive at a total load shift potential estimate



Load Shift Parameters & Assumptions

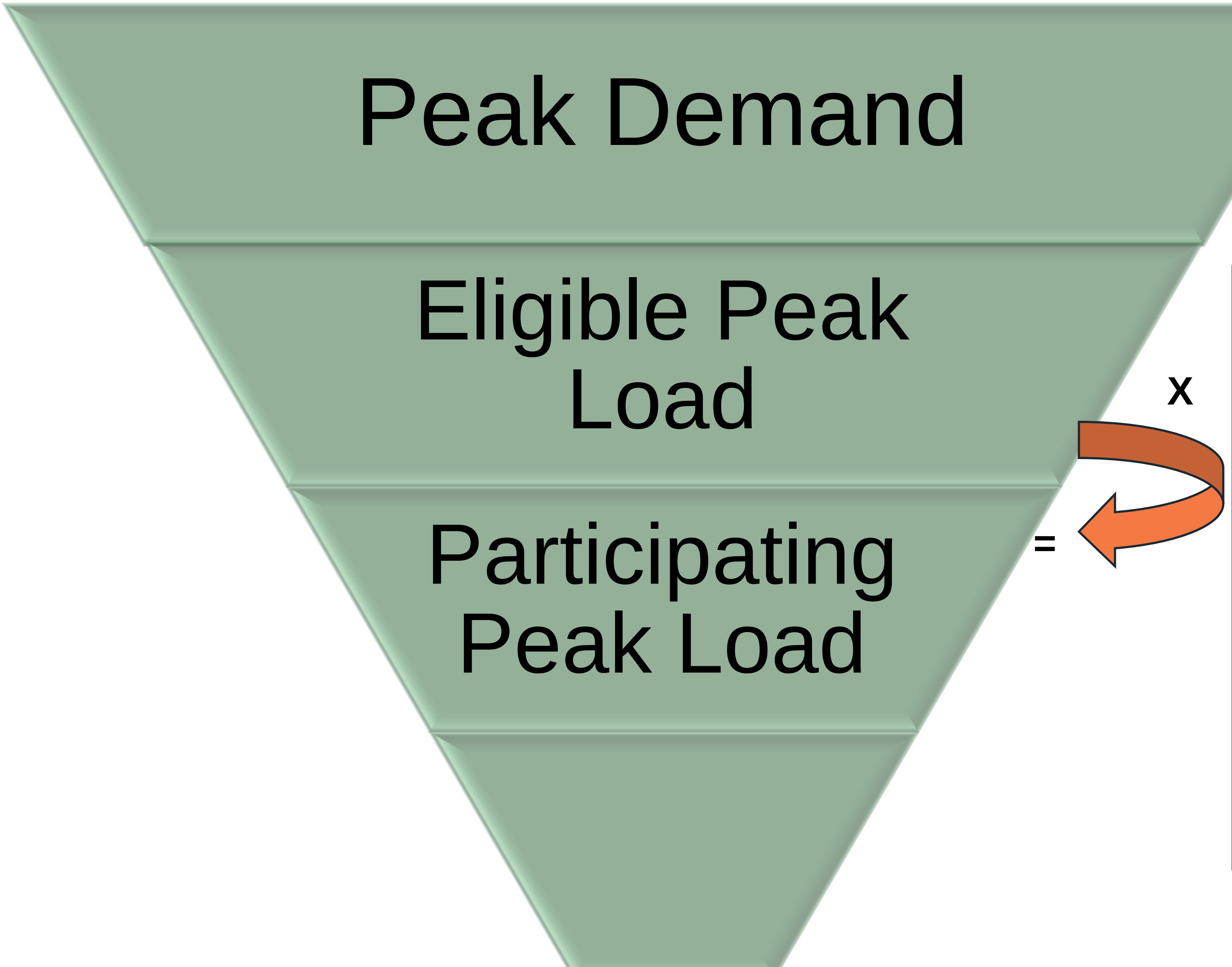
Peak Demand = **average net peak load (MW) over the net peak period by DR Option and SubOption**

Load Shift Parameters & Assumptions



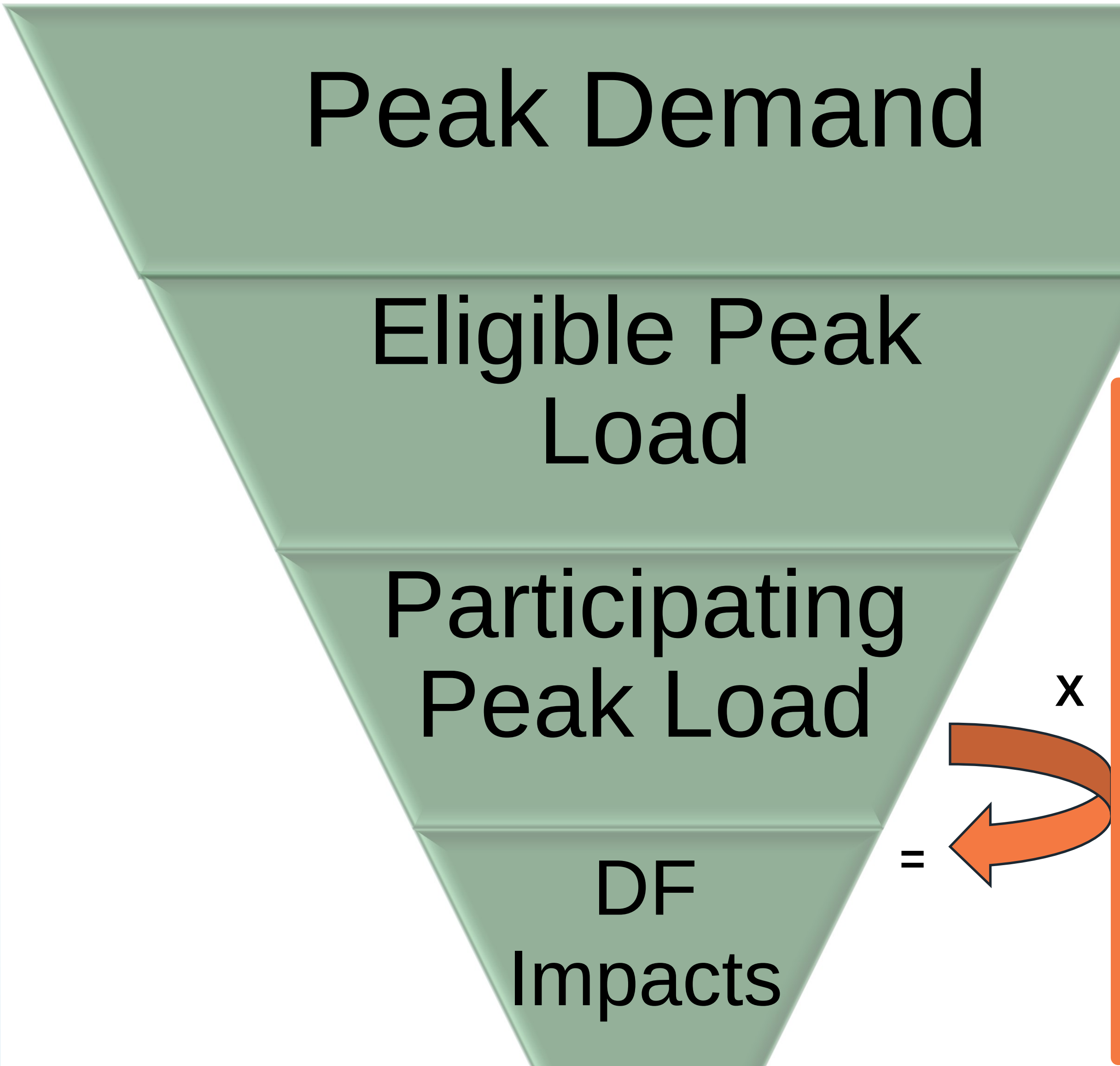
Control Strategy: factors that represent the percent of customers within a particular SubSector that have the necessary technology or controls to participate in a given DR SubOption based on the End Use Group.

Load Shift Parameters & Assumptions



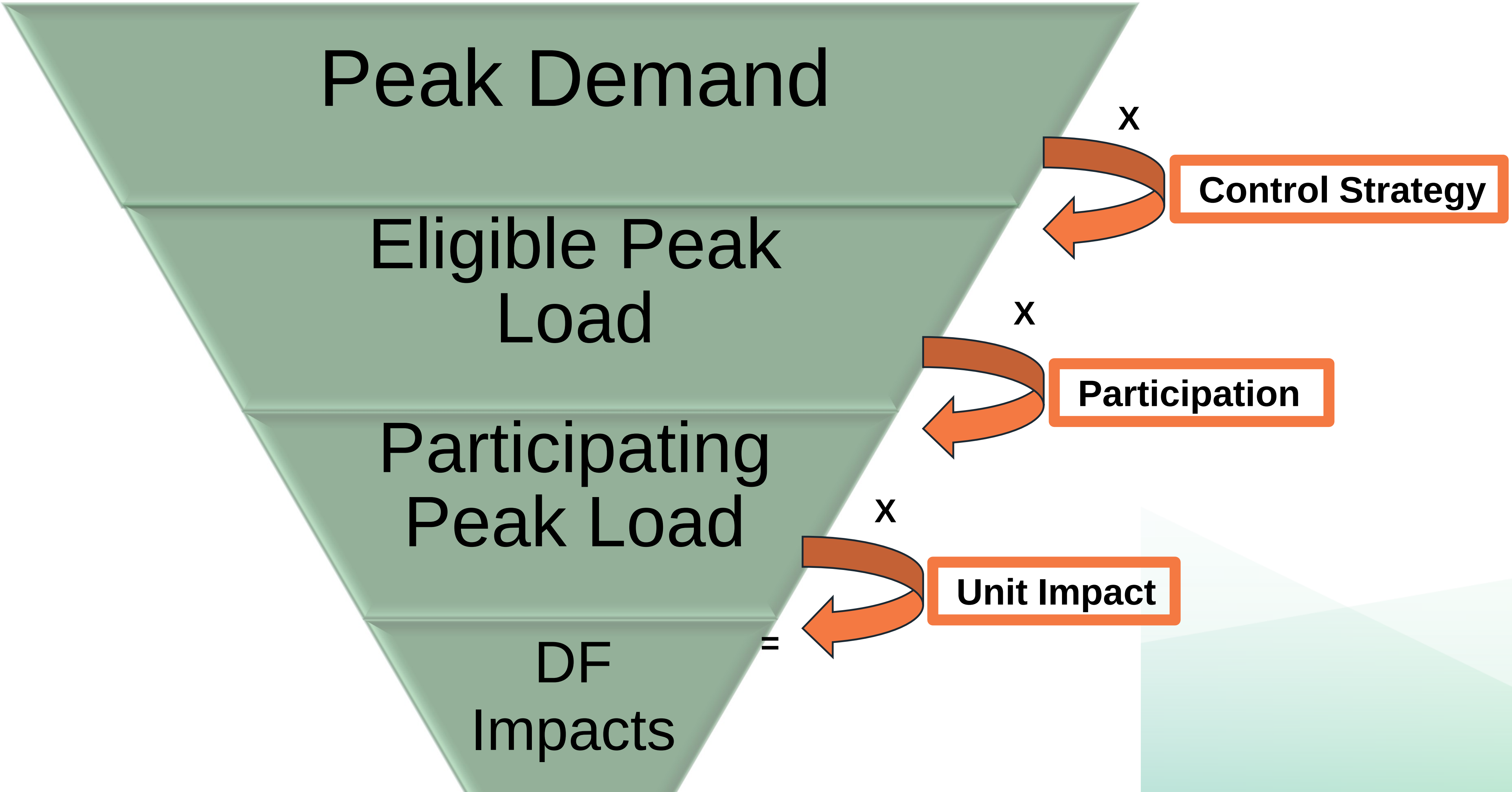
Participation:
the proportion of eligible end-use peak load in each year that is assumed to participate in each DR SubOption. These factors utilize cost-optimized participation fractions from the LBNL Phase 4 Study which reflect cost-effectiveness screening in the Phase 4 Study in order to estimate achievable potential.

Load Shift Parameters & Assumptions



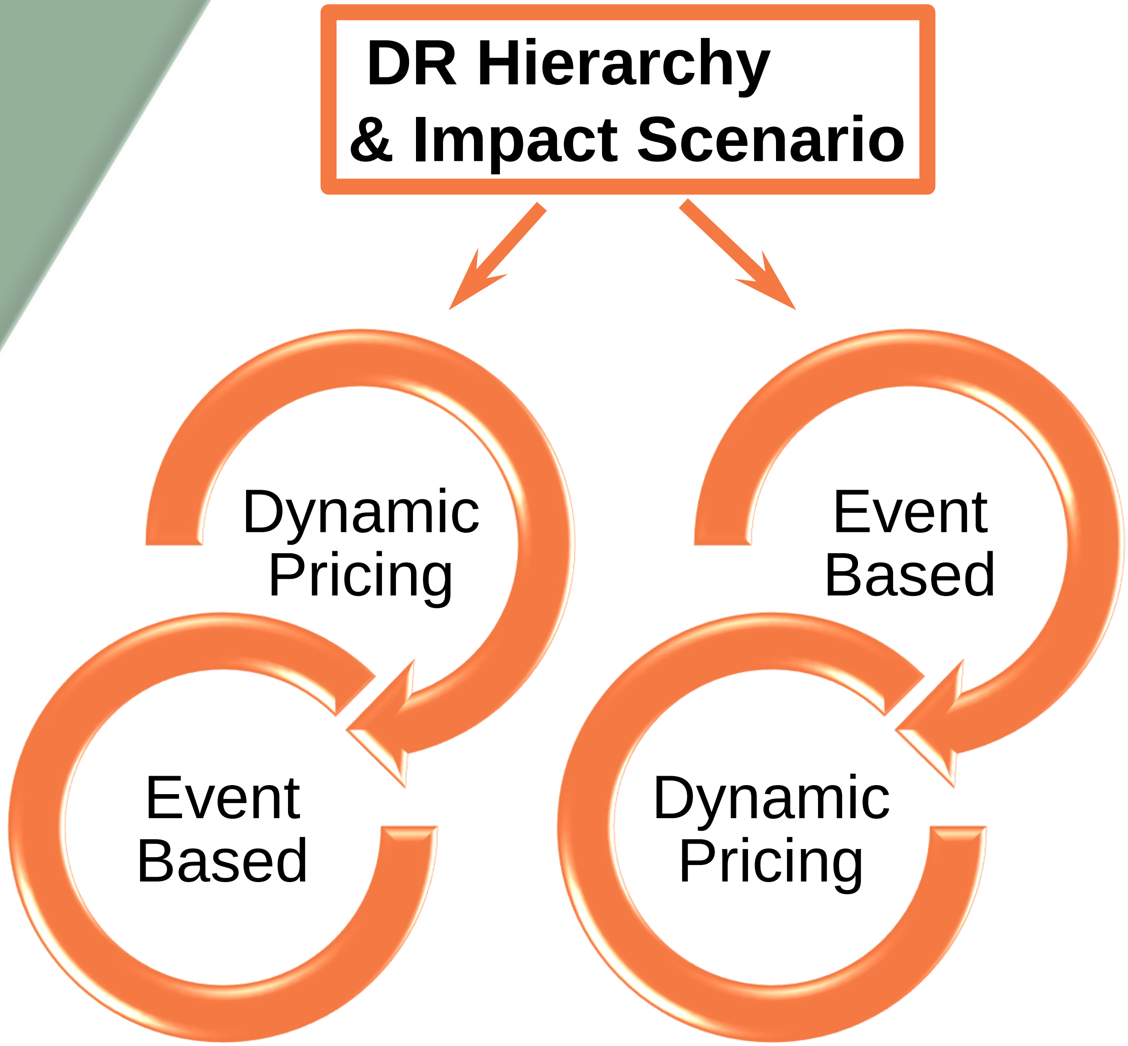
Unit Impact:
assumptions represent the load reductions achieved by eligible and participating customers, as a percentage of those customers' average peak load. For Event-Based Options, the unit impact assumptions were sourced from the LBNL Potential Study. For Dynamic Pricing, unit impact estimates were based on the Arcturus 2.0 analysis conducted by authors from The Brattle Group and discussions with CPUC staff.

Load Shift Parameters & Assumptions



Load Shift Parameters & Assumptions

Total Load Shift Potential



Load Shift Parameters & Assumptions

Peak Demand

Eligible Peak Load

Participating Peak Load

DF Impacts

Control Strategy

- Dynamic Rates 100%
- Event Based 4-100% by sub option

Participation

- Dynamic Rates: 25% or 80%
- Event Based 0-66% by sub option

Unit Impact

- Dynamic Rates: 15%
- Event Based 25-100% by sub option

Please review our assumptions for each of these parameters posted to the DAWG webpage.

Scenario Outputs from LSG Development in 2023

Six Scenarios Analyzed

Reference	Reference Demand & High DR	High Electrification	High Electrification & High DR	Reference LBNL Hierarchy	Reference 1:10 weather year

Total Achievable Potential ~5000 to over 8000 MW

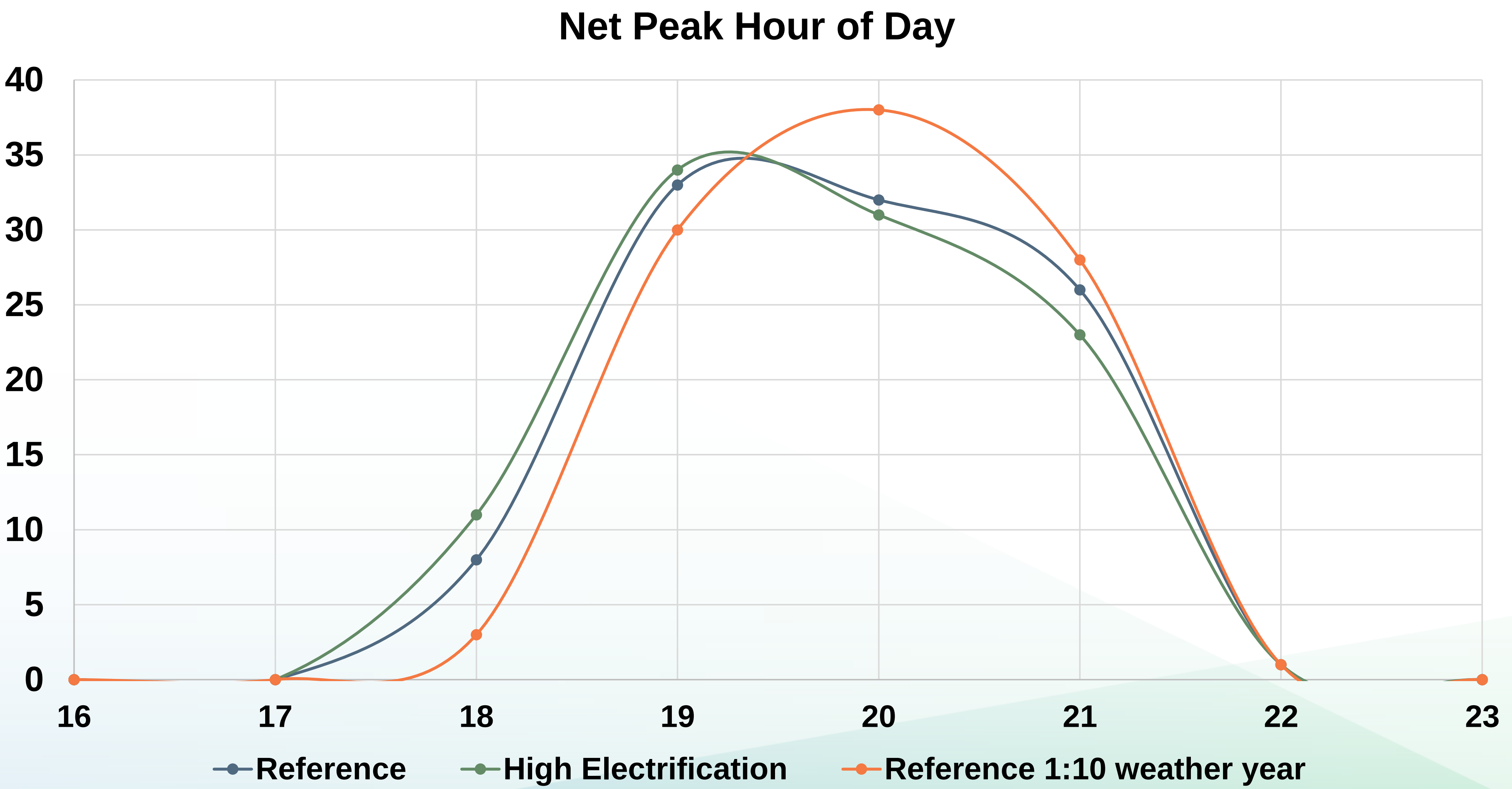
- Dynamic Pricing: ranges from 1300 to 4100 MW
- Event Based DR: ranges from 3800 to 4300 MW

Scenario Definitions

Source: AEAB/EAD CEC Staff

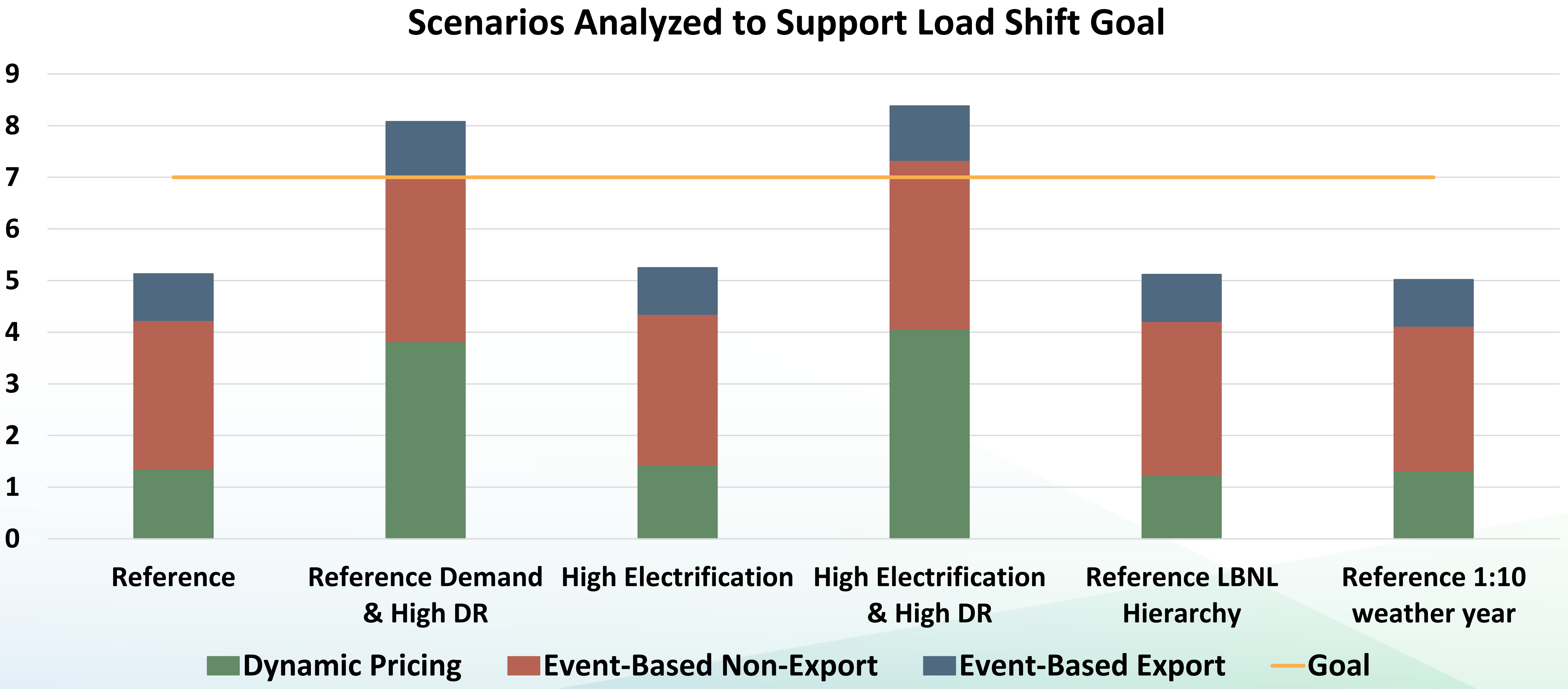
Scenario Variations	Reference	Reference Demand & High DR	High Electrification	High Electrification & High DR	Reference LBNL Hierarchy	Reference 1:10 Weather Year
Energy Efficiency	AAEE 3	AAEE 3	AAEE 2	AAEE 2	AAEE 3	AAEE 3
Fuel Substitution/ BE	AAFS 3	AAFS 3	AAFS 4 plus SIP	AAFS 4 plus SIP	AAFS 3	AAFS 3
Transportation Electrification	AATE 3	AATE 3	AATE 3	AATE 3	AATE 3	AATE 3
Weather	1 in 2	1 in 2	1 in 2	1 in 2	1 in 2	1 in 10
DR Hierarchy	1>2	1>2	1>2	1>2	2>1	1>2
DR Potential	LBNL Phase 4 assumptions	ambitious	LBNL Phase 4 assumptions	ambitious	LBNL Phase 4 assumptions	LBNL Phase 4 assumptions

Results of Scenario Runs Net Peak Hour of Day



Source: AEAB/EAD CEC Staff

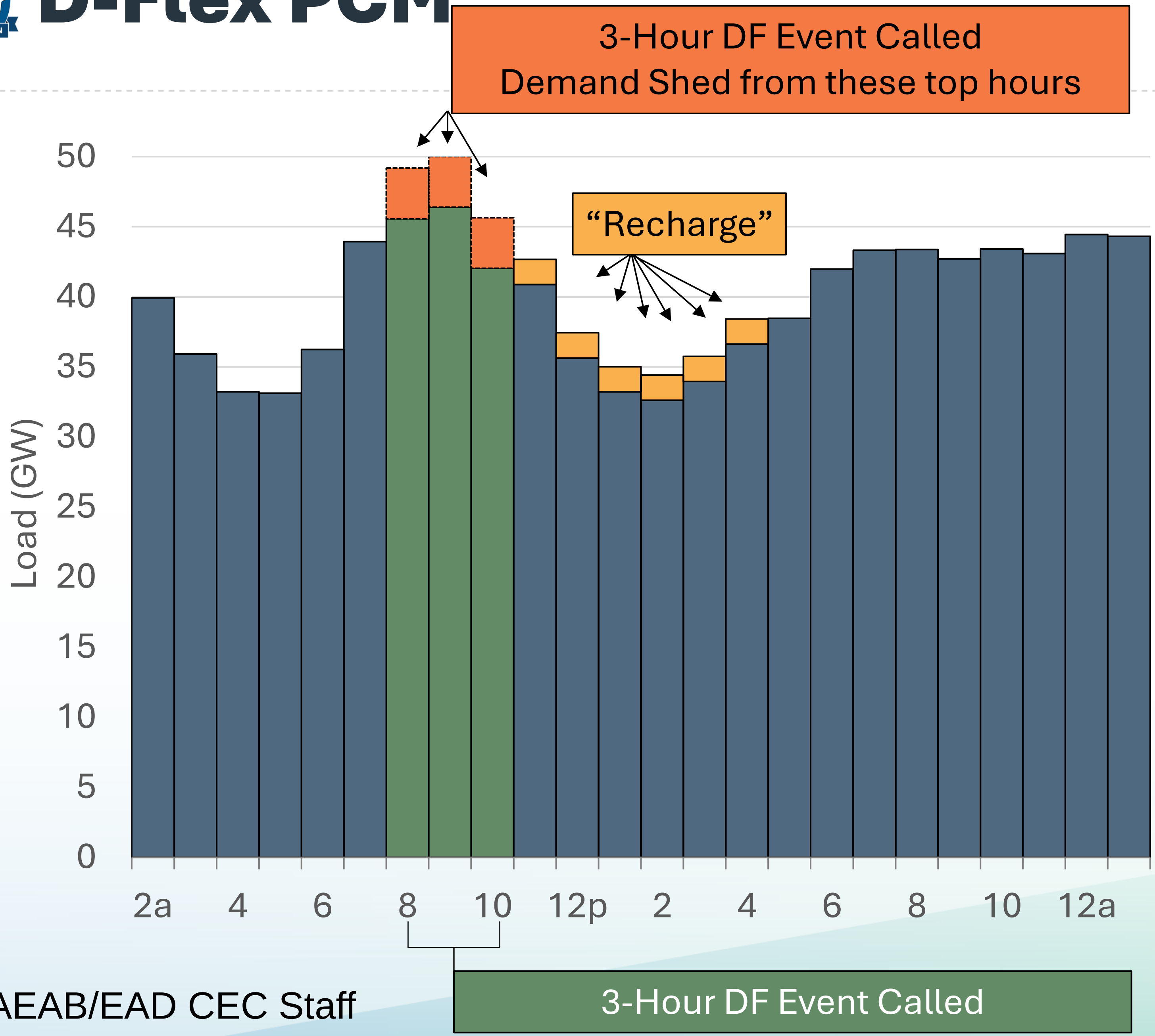
Results of Scenario Runs



Source: AEAB/EAD CEC Staff

D-Flex PCM Basic Design

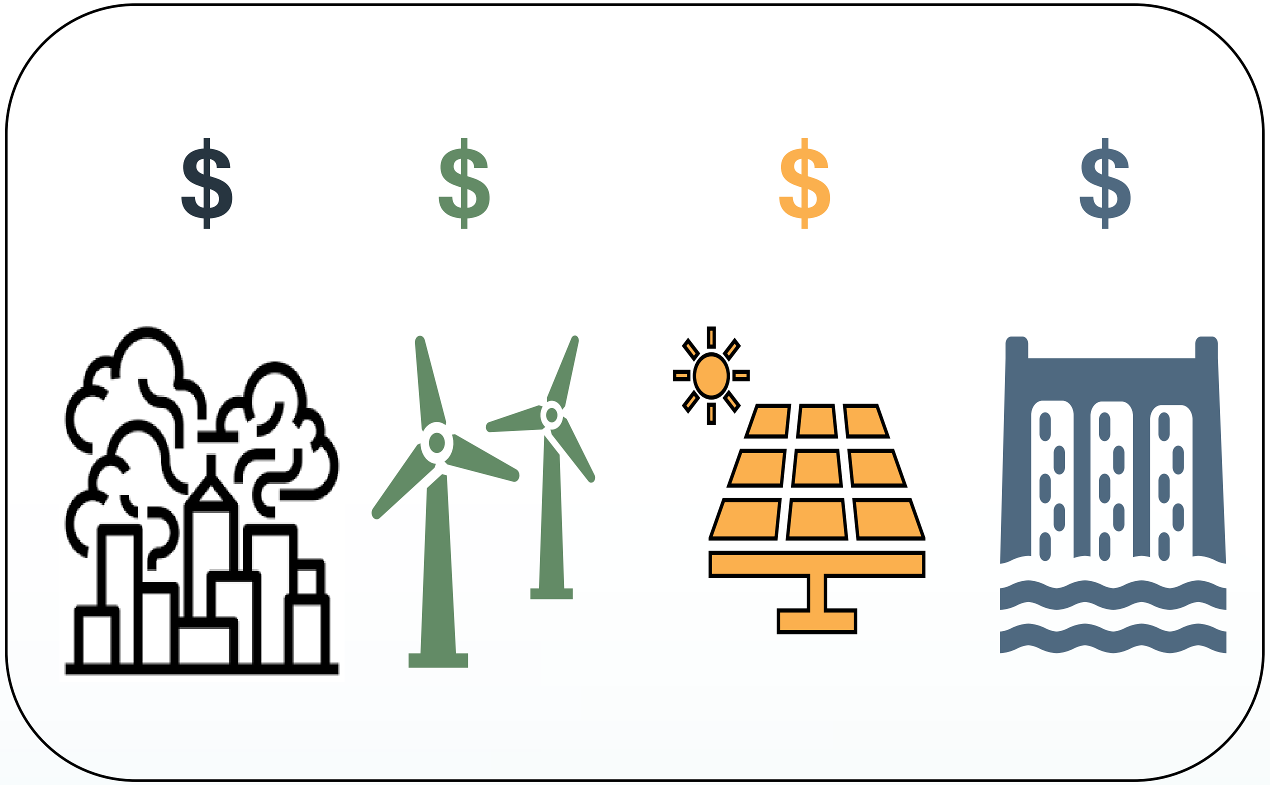
D-Flex PCM

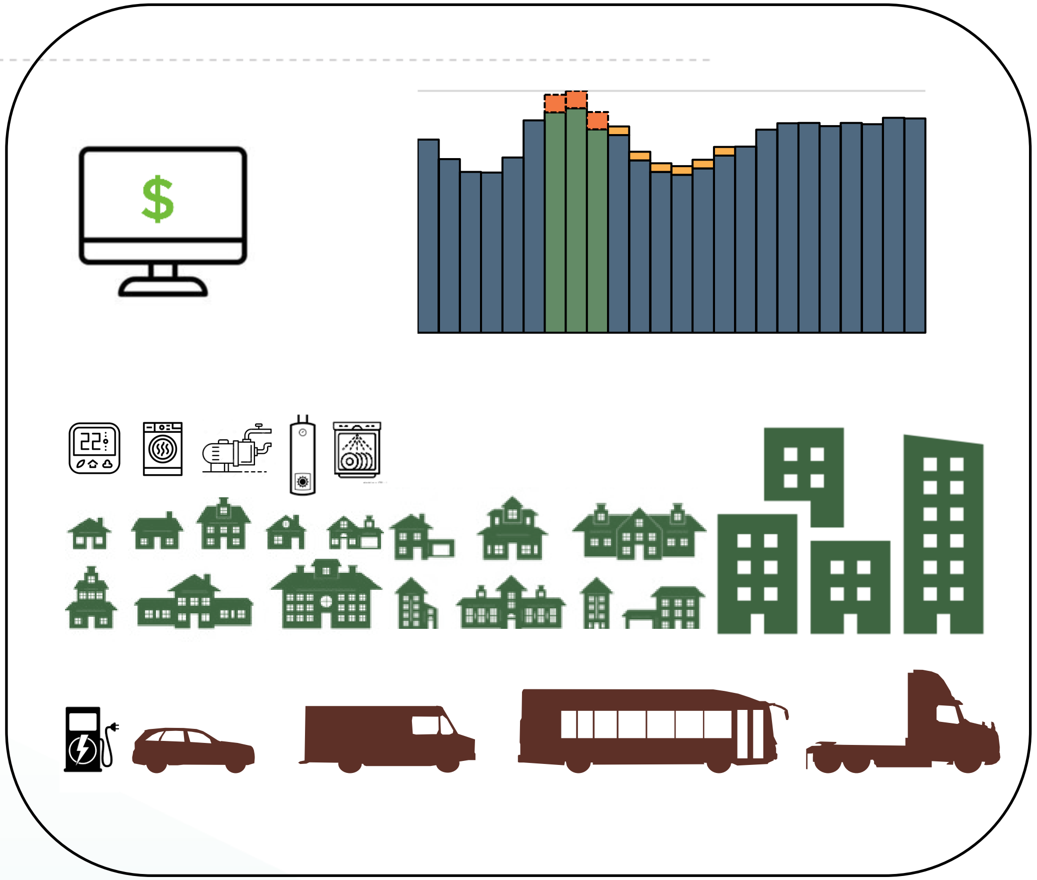


- **Generate potentials for each hour of the year for use in the PCM**
- Establish operation parameters (e.g., limited flex events in a day) **"Dispatch Constraints"**
- **Cost estimates** for D-Flex options
- Not directly comparable to a load modifier
- **ONLY modifies load IF selected by PCM**

Source: AEAB/EAD CEC Staff

D-Flex 2.0 – Additional Resource Options





Traditional Supply Side Resource **vs.** **Demand Flexibility**

Source: AEAB/EAD CEC Staff

DF Potential Development

Note potential estimates are only for event-based, economically-dispatched programmatic interventions, not dynamic rates/CalFUSE

DF Tool Functionality Overview

1. Hourly Gross Load and Capacity Estimates

Estimate magnitude of resource that can be leveraged for DF:

- **Gross building load** by end use, including EV charging
- **Available capacity** from BTM battery and EV V2X resources

2. Apply DF Parameters and Assumptions

Calculate **hourly load reduction potential** for 38 DF options using:

- **Eligibility/Capability Percentage**
- **Participation Percentage**
- **Unit Impacts Load Dispatch**

3. Group and Simplify Results for use in PCM

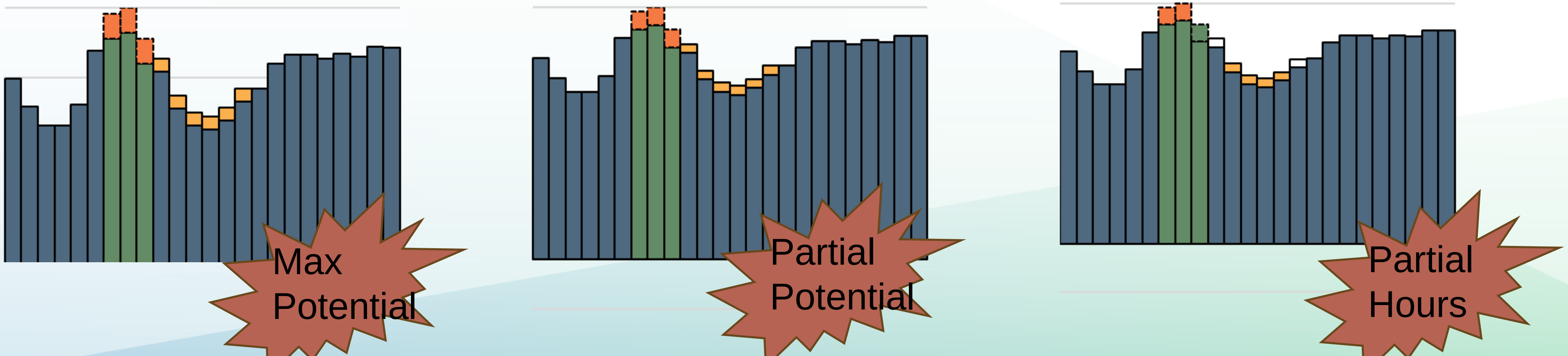
Simplify DF tool outputs for use in the PCM:

- **Group 38 DF options into 7 resources**
- **Group resources into PAs**
- **Develop average 24-hour profiles by month**

Mostly the same as for D-Flex

Caveats on the D-Flex PCM Tool

- DF potentials represent availability estimates of load reduction or load shifting that could be realized in future programmatic constructs.
  - By itself, it does not contain any predictions about when or to what extent DF resources are dispatched or utilized.
- DF resources are one component of the resource mix in the PCM for the SB 100 modeling.
- The final SB 100 analysis will likely contain only a portion of the potential load shed/shift resources as selected by the PCM.

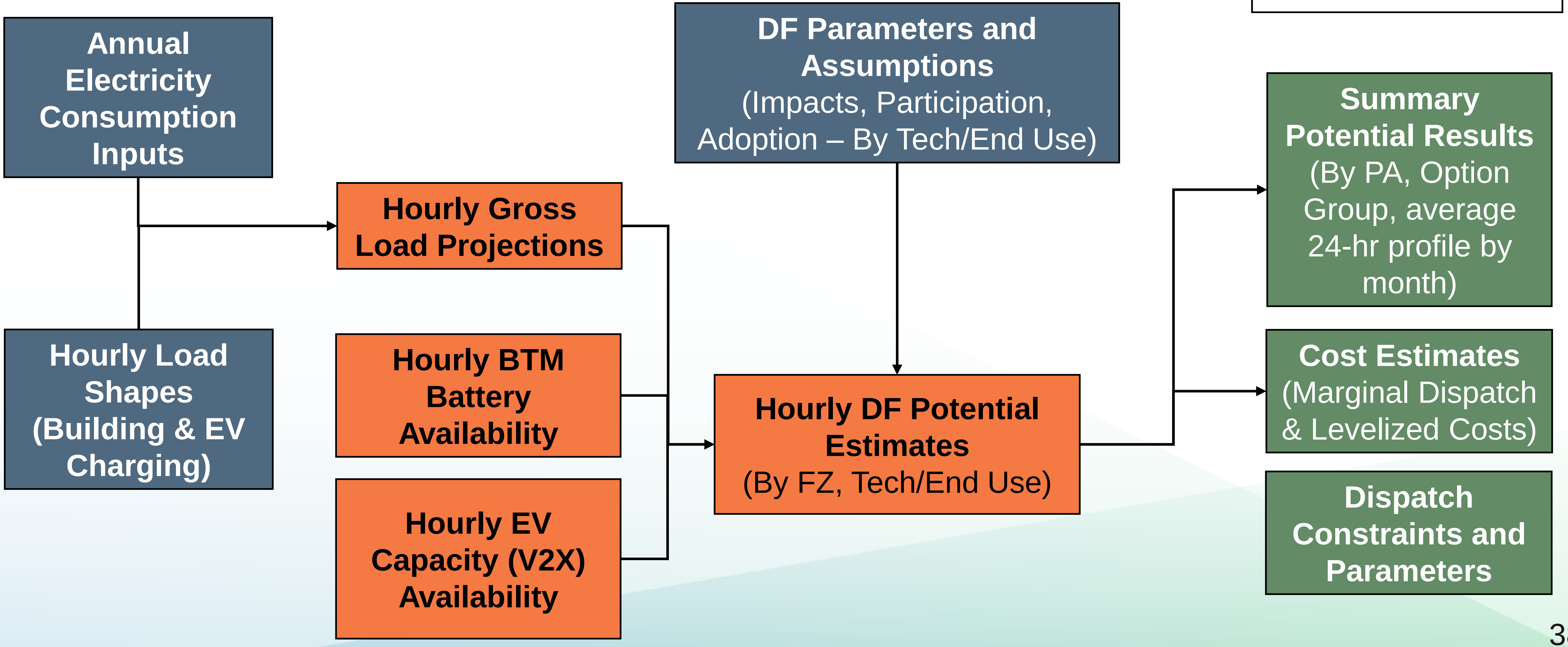


DF Potential Flowchart

Legend
- Input
- Calculation
- Result for PCM

Goal: Forecast Hourly DF Potential Resource "Availability"

Granularity: Forecast Zone (FZ), Sector, Size, Building Type, End Use



Inputs & Assumptions

DF Potential Data Sources [1]

Goal: Forecast Hourly DF Potential Resource "Availability"

Granularity: Forecast Zone (FZ), Sector, Size, Building Type, End Use

Legend
- Input
- Calculation
- Result for PCM

Annual Electricity Consumption Inputs

Demand Forecast Inputs (IEPR)
- Baseline consumption forecast
- AAEE and AAFS load modifiers
- TE forecasts
- BTM storage forecasts

Hourly Gross Load Projections

Summary Potential Results (By PA, Option Group, average 24-hr profile by month)

Hourly Load Shapes (Building & EV Charging)

LBNL DR Potential Study (Phase 4)
- Building load shapes, derived from IOU AMI data

CEC TE Forecast
- EV charging load shapes

Cost Estimates (Marginal Dispatch & Levelized Costs)

Hourly EV Capacity (V2X) Availability

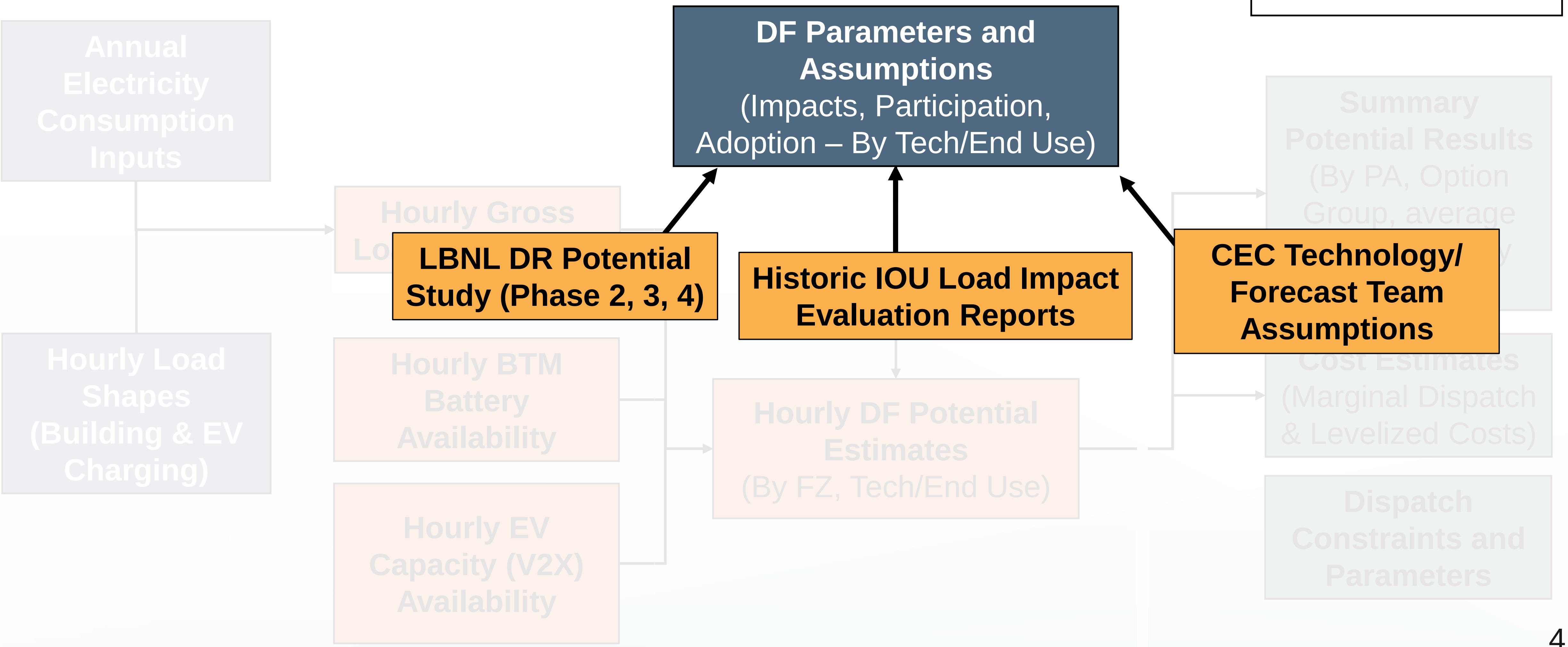
Dispatch Constraints and Parameters

DF Potential Data Sources [2]

Goal: Forecast Hourly DF Potential Resource "Availability"

Granularity: Forecast Zone (FZ), Sector, Size, Building Type, End Use

Legend
- Input
- Calculation
- Result for PCM

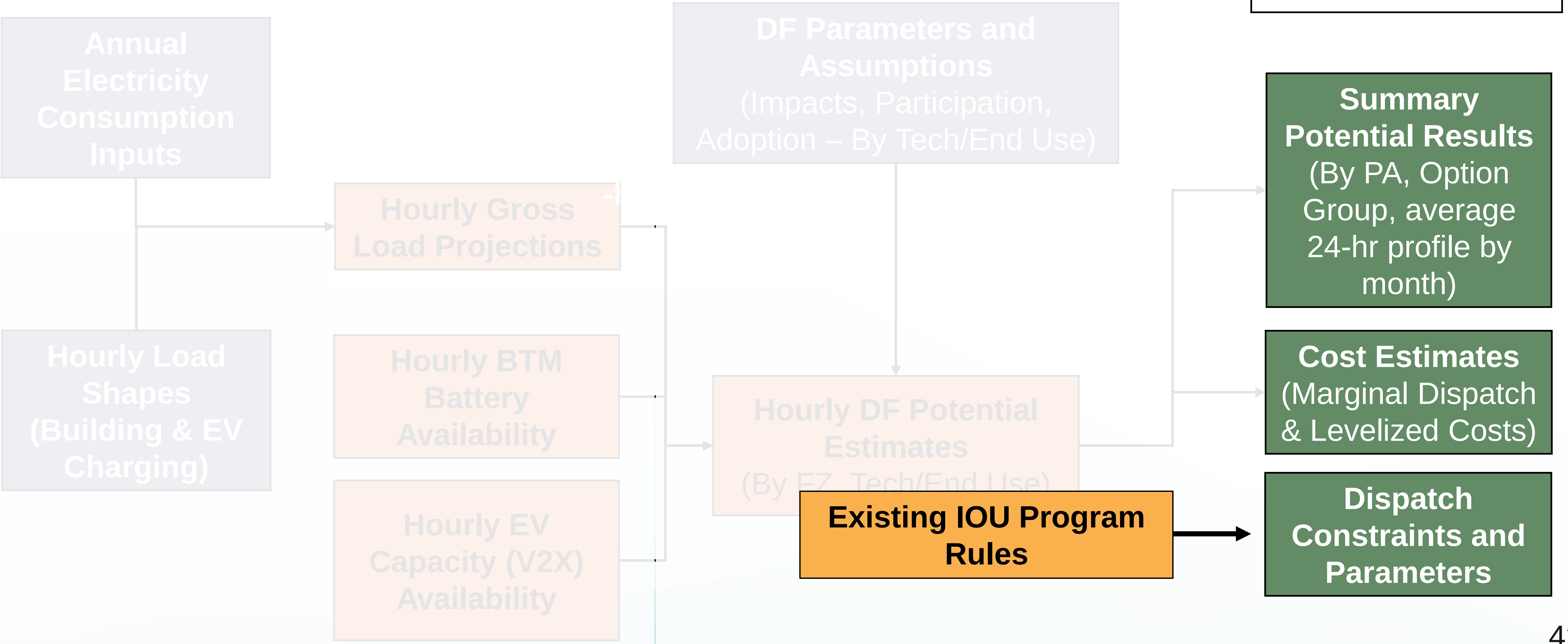


DF Potential Data Sources [3]

Goal: Forecast Hourly DF Potential Resource "Availability"

Granularity: Forecast Zone (FZ), Sector, Size, Building Type, End Use

Legend
- Input
- Calculation
- Result for PCM



LBNL Phase 4 Potential Study

End Use	DR Measure
HVAC	Programmable communicating thermostat
HVAC	HVAC Direct Load Control Switch
HVAC	Manual thermostat adjustment
Dishwasher	Internal connection for remote control
Dishwasher	Manual delay cycle
Washer	Internet connection for remote control
Washer	Manual delay cycle

- List of end use and enabling technology DF options & eligibility assumptions
- Shed fractions (unit impacts)
- Participation rates
- Cost assumptions

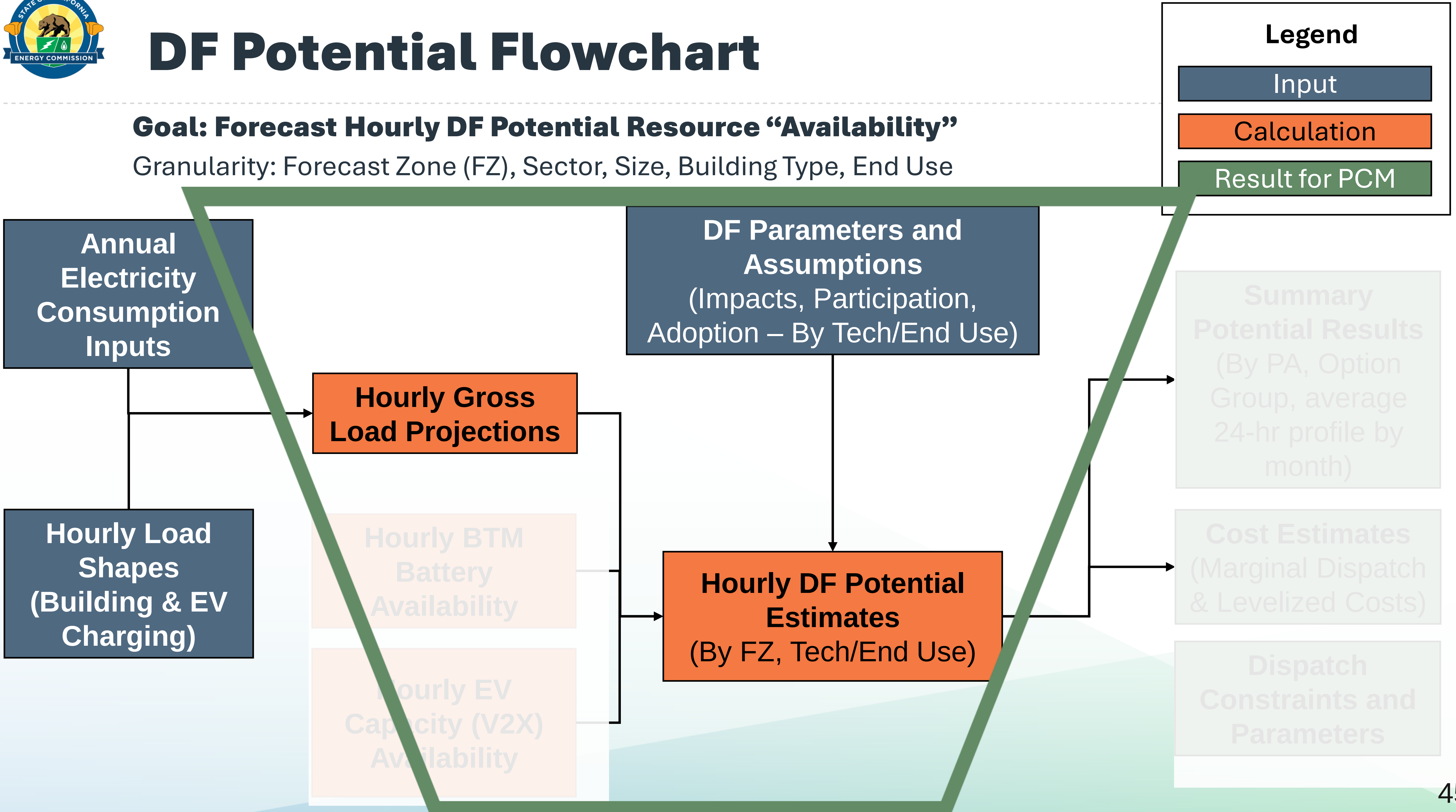
**Gerke, B, et al. The California Demand Response Potential Study, Phase 4: Report on Shed and Shift Resources Through 2050. May 2024. Lawrence Berkeley National Laboratory. Report Number LBNL-2001596. https://eta-publications.lbl.gov/publications/california-demand-response-0.*

Key Calculations

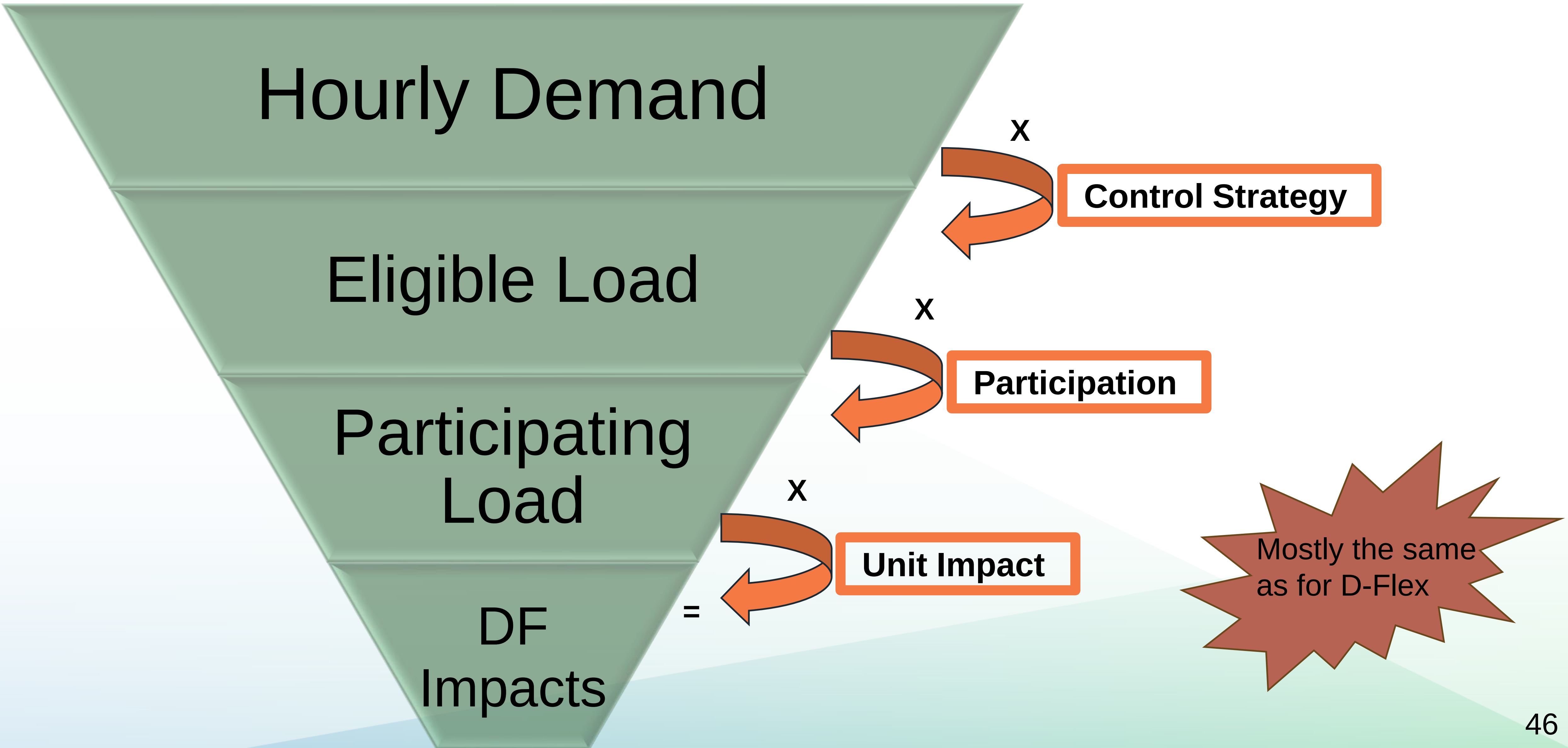
DF Potential Flowchart

Goal: Forecast Hourly DF Potential Resource "Availability"

Granularity: Forecast Zone (FZ), Sector, Size, Building Type, End Use



Load Shift Parameters & Assumptions



Comparison of Load Shift Parameters & Assumptions

	D-Flex	D-Flex PCM
DR SubOptions	42 Event Options plus Dynamic Pricing	38 Event Options, no Dynamic Pricing, removed BTM Battery Load Shift, kept BTM Dispatch
Control Strategy	percent of customers in SubSector that have the necessary technology or controls to participate in a given DR SubOption LBNL Phase 4 study	same as for reference in original with some additional levels of disaggregation
Participation	reference = raw 2030 participation fractions from LBNL Phase 4 study aggregated to DR Sub Option	similar to reference in original but did adjust and calibrate values so could ramp from current state in 2023 to ~LBNL values in 2030 via linear ramp; no need for V2X derating factors since using actual charging loadshapes and driving profiles
Unit Impacts	4-hr shed fractions from LBNL Phase 4 study by DR Sub Option	same as in original

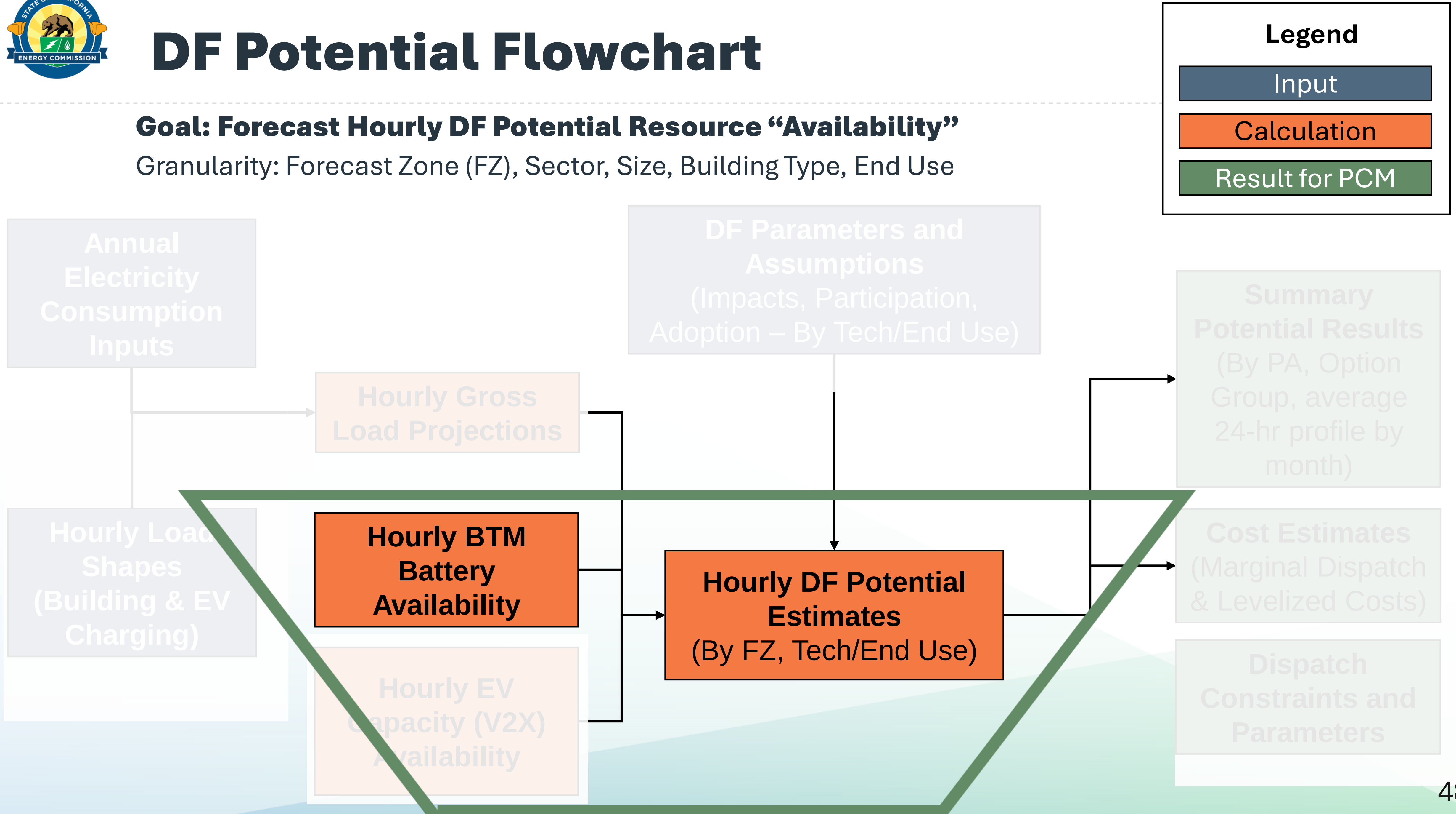
Source: AEAB/EAD CEC Staff

Please review our assumptions for each of these parameters in the workbooks posted on the DAWG webpage.

DF Potential Flowchart

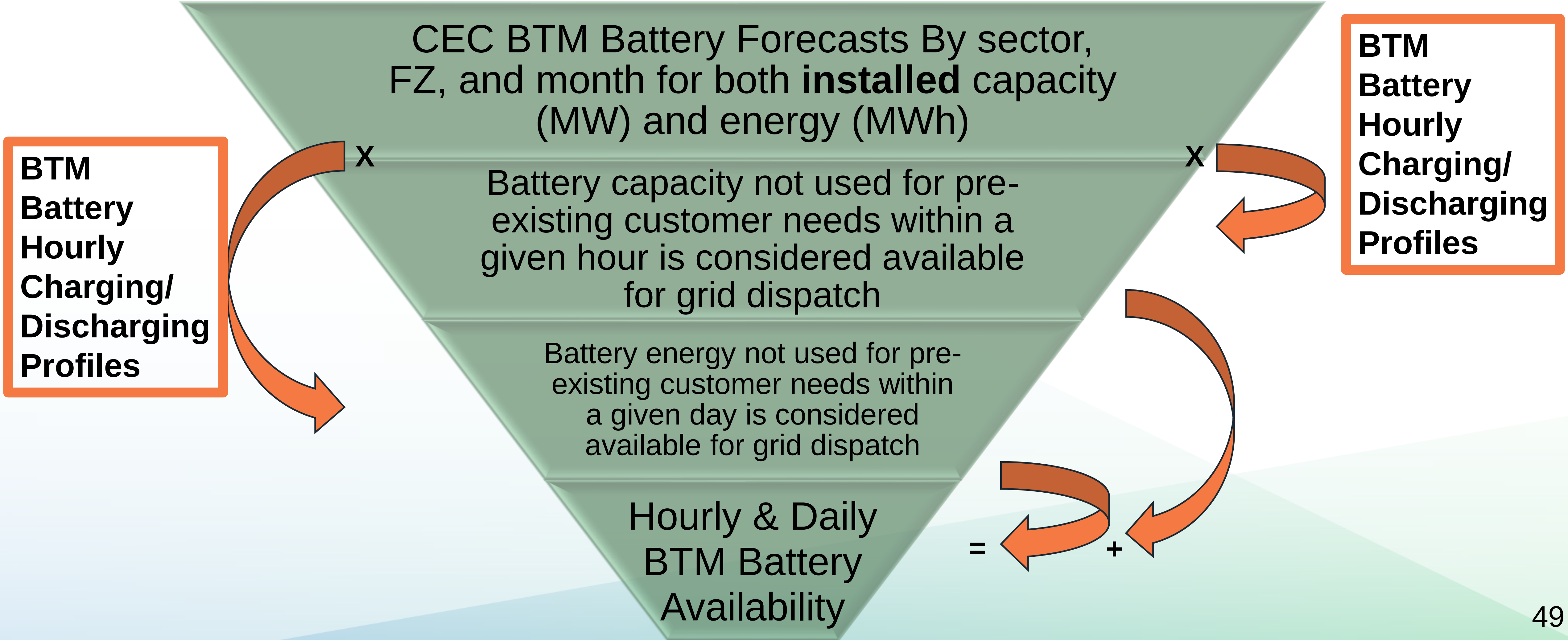
Goal: Forecast Hourly DF Potential Resource "Availability"

Granularity: Forecast Zone (FZ), Sector, Size, Building Type, End Use



BTM Existing Battery Availability

- The DF potential analysis considers potential only from **existing** BTM battery resources that are expected to be installed for **customer needs**, such as **daily TOU arbitrage**, **back-up**, or **resiliency**.



DF Potential Flowchart

Legend

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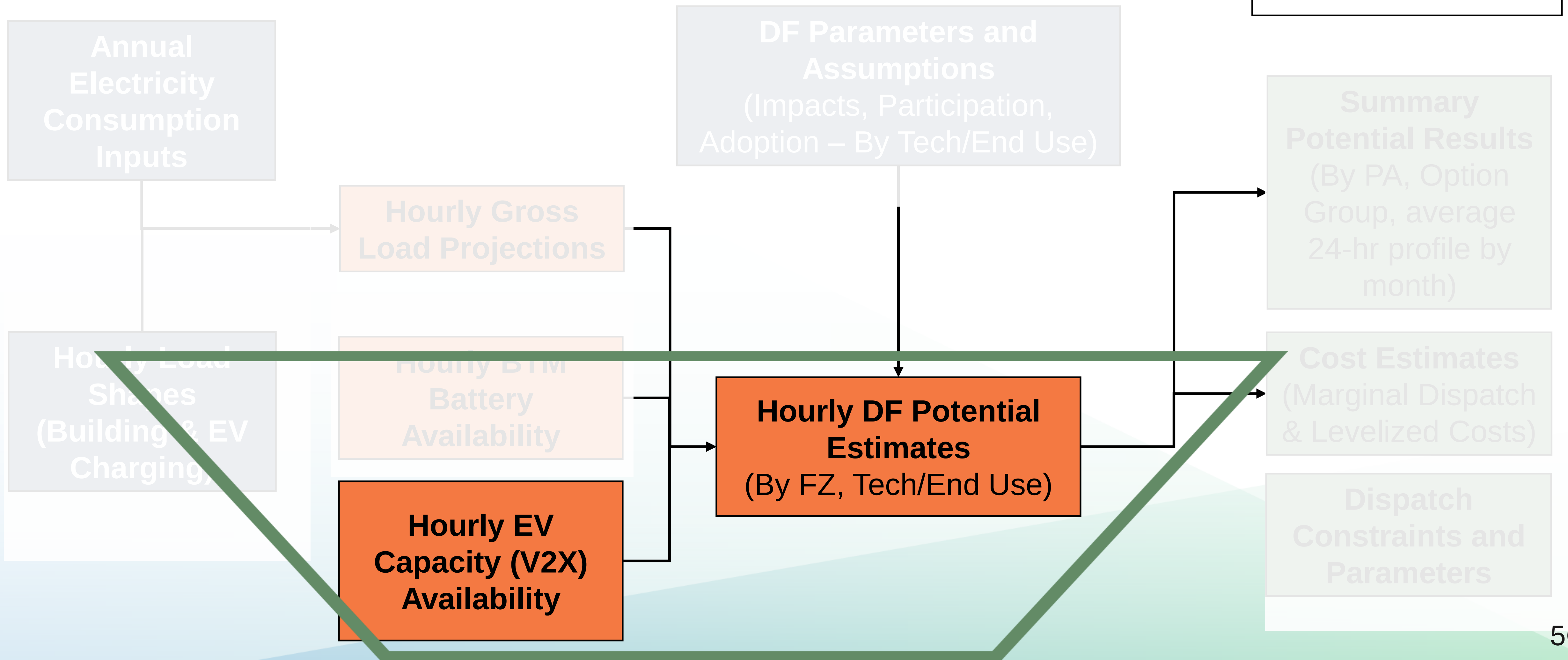


EV Capacity (V2X) Availability

Theoretical Discharge Power at Hour

= EVs x Charger Power - EV Charging Load at Hour

% EVs/Sites with Technical Capabilities

X

% EVs at Suitable V2G Site at Hour

X

% EV Drivers Participating in V2G Program

X

% EVs Plugged In

X

= Hourly EV DF Potential

Results of Potentials Are Summarized and Grouped for PCM Use

Option Groups

DF Tool Output

Ag-Auto-DR-Pumping Control
Ag-DLC Switch-Pumping Control
Water Supply/WW pumping control
Ag-Battery Dispatch
Com-Battery Dispatch
Ind-Battery Dispatch
Res-Battery Dispatch
EV-Electric Buses-Charging Control
EV-HDV-Charging Control
EV-LDV-Charging Control
EV-MDV-Charging Control
EV-Electric Buses-V2X
EV-HDV-V2X
EV-LDV-V2X
EV-MDV-V2X
Com-DLC-HVAC-Switch
Com-HVAC-EMS
Com-HVAC-TES
Com-HVAC-Thermostat

Ind-HVAC Control
Res-DLC-HVAC-Switch
Res-HVAC-Thermostat
Com-Lighting control
Com-Other End Uses Control
Com-Refrigeration control
Com-Refrigeration TES
Ind-Lighting control
Ind-Process Control
Ind-Refrigeration control
Res-Appliances Control
Res-Lighting Control
Res-Other end uses control
Com-DLC-Water Heating-Switch
Com-Water Heating-Add-on CTA 2045 control
Com-Water Heating-Smart Water Heater
Res-DLC-Water Heating-Switch
Res-Water Heating-Add-on CTA 2045 control
Res-Water Heating-Smart Water Heater

38 Individual DF Options

7 Option Groupings

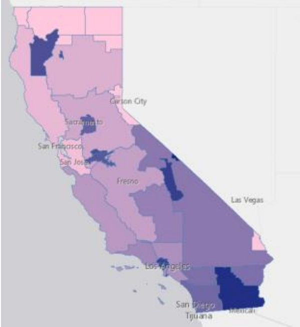
- Ag Pumping
- Battery – Non-Res
- EV Charging
- HVAC
- Battery – Res
- EV V2X
- Other

Grouped based on similarities in end use, magnitude of potential, and common programmatic constructs

PCM Input

Geographic Granularity

DF Tool Output



20 FZs

7 PAs

PCM Input

Hourly Averaging

DF Tool Output

Full 8760 hourly results per year

- Option Group (7)
- Planning Area (7)
- Year (2023-2050)

Average 24-hour potential by month (288 values per year)

- Option Group (7)
- Planning Area (7)
- Year (2023-2050)

PCM Input

Cost Estimates for PCM

First, the DF Tool calculates **levelized costs ($/kW)** to represent all costs for DF resource availability.

Includes **upfront enablement**, **recurring non-incentive** costs, and **recurring incentive** cost components.

Sourced from the LBNL Phase 4 Study.

The Tool calculates **marginal dispatch costs ($/MWh)** to represent the “bid” cost for a resource. Calculated by spreading the levelized cost over an **assumed number of dispatch hours** in each year.

Marginal dispatch costs ($/MWh) are utilized by the PCM.

Upfront Enablement Costs
+
Recurring Non-Incentive Costs
+
Recurring Incentive Costs

Levelized Costs
/
Annual Dispatch Hours

Marginal Dispatch Cost for PCM

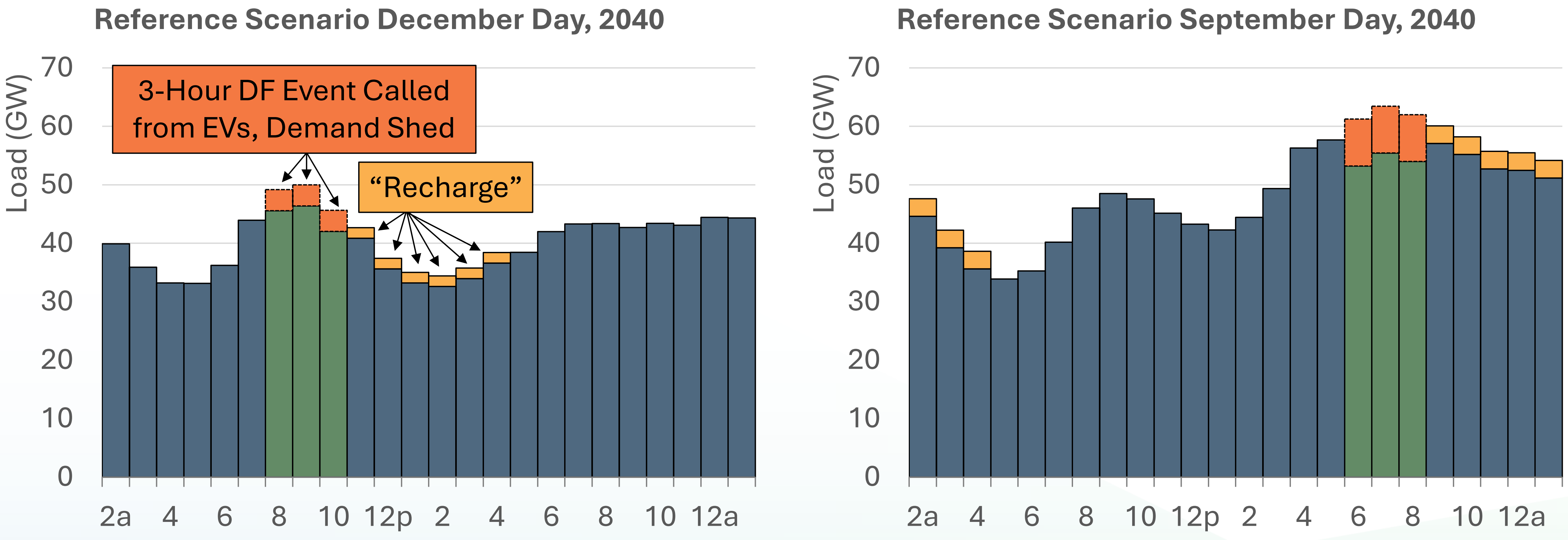
Dispatch and Load Shift Parameters

- Limited customer willingness to curtail/shift
- Dispatch constraints based on physical characteristics of technologies

Option	Max Hours per Dispatch	Max Dispatches per Day	Max Dispatches per Month or Year	Load Shift Timing
Ag Pumping	6	1	10/month, 30/year	Up to 8 hours before dispatch
BTM Battery (Res)	4	2	50/season, 100/year	Up to 6 hours after dispatch
BTM Battery (Nonres)	4	2	50/season, 100/year	Up to 6 hours after dispatch
EV Charging	4	2	50/season, 100/year	Up to 6 hours after dispatch
EV V2X	4	1	50/season, 100/year	Up to 6 hours after dispatch
HVAC	4	1 (Summer) 2 (Winter)	25/season, 50/year	2-hour pre-cool, 6-hour snapback
Other	6	1	72/year	Up to 4 hours before and after dispatch

Source: AEAB/EAD CEC & GH Staff

Example Demand Flex and "Recharge" Event



In earlier hours of the day, there is less EV potential, leading to less EV flexibility during winter peaks

Source: AEAB/EAD CEC Staff

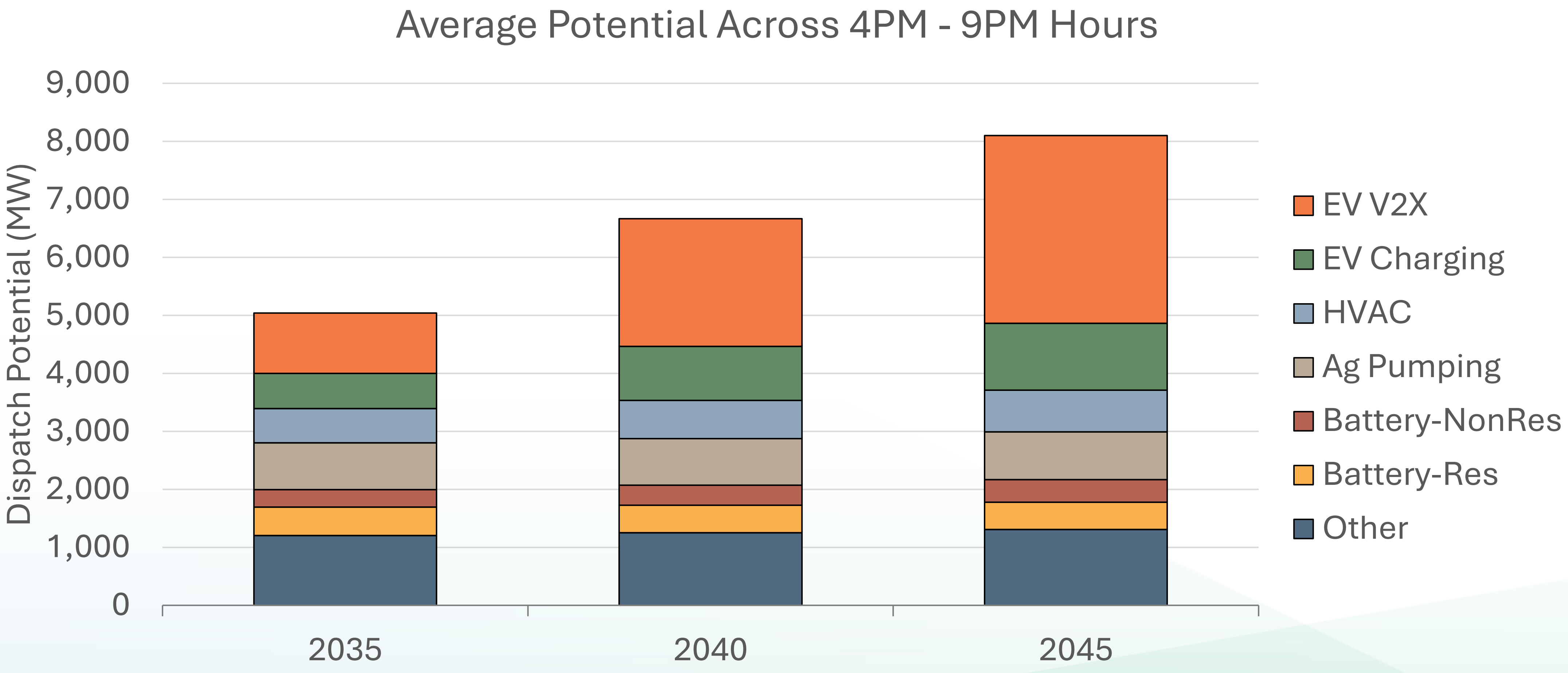
Demand Scenario Sensitivity Outputs developed in 2024; used to support SB 100 in 2025

DF Scenarios

	Input	Policy Scenario (Moderate DF)	Policy Scenario (High DER & High DF)	Policy Scenario (HHU & Moderate DF)
Demand Scenario Inputs	AAEE 3 Adjustment	AAEE 3	AAEE 4 (res/com) AAEE 3 (all other)	AAEE 3
	AAFS Adjustment	AAFS 4	AAFS 4	AAFS 4
	TE Adjustment	Policy Scenario TE	Policy Scenario TE	Policy Scenario with HFS
	BTM Battery Forecast	2023 IEPR	Augmented Forecast	2023 IEPR
Demand Flexibility Inputs	EV V2X LD Applicability	SF Only	SF + MF + Commercial Fleet	SF Only
	EV V2X Plugged-In Factor	50%	65%	50%

Source: AEAB/EAD CEC Staff

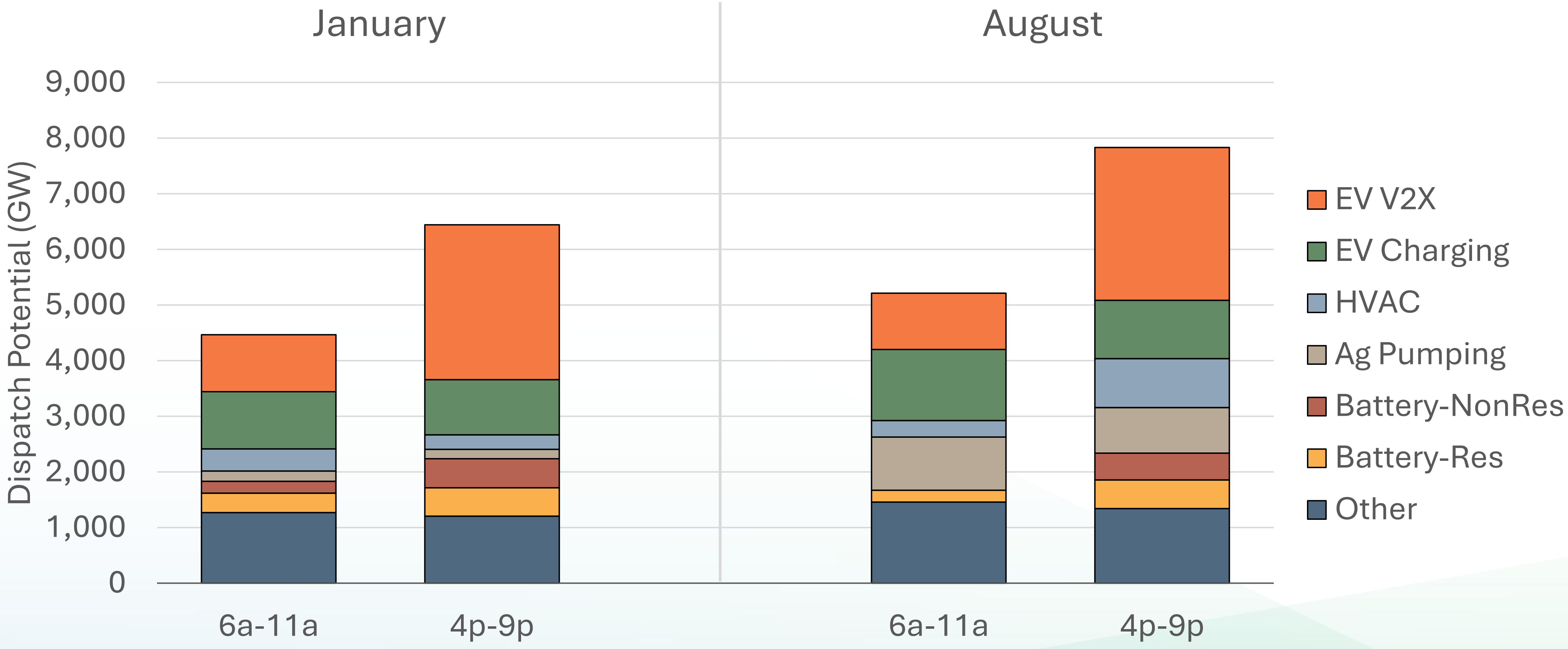
DF Potential Results (Policy Scenario with Moderate DF)



Long-Term potential growth dominated by EVs

Source: AEAB/EAD CEC Staff

Seasonal Variation at Key Times During the Day (2045)

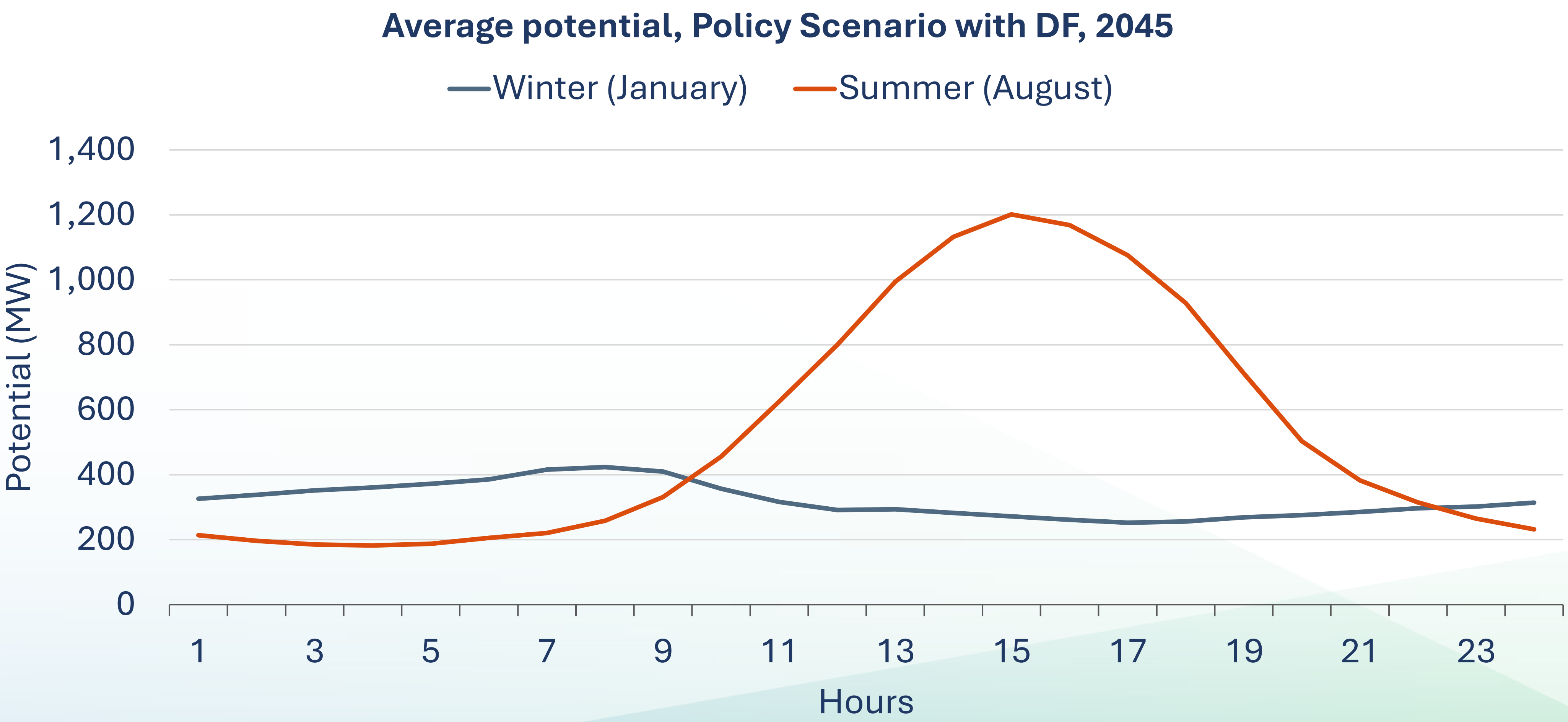


Winter and Early Hours Have Less Potential than Summer Later Hours

Source: AEAB/EAD CEC Staff

HVAC Seasonal and Hourly Variation

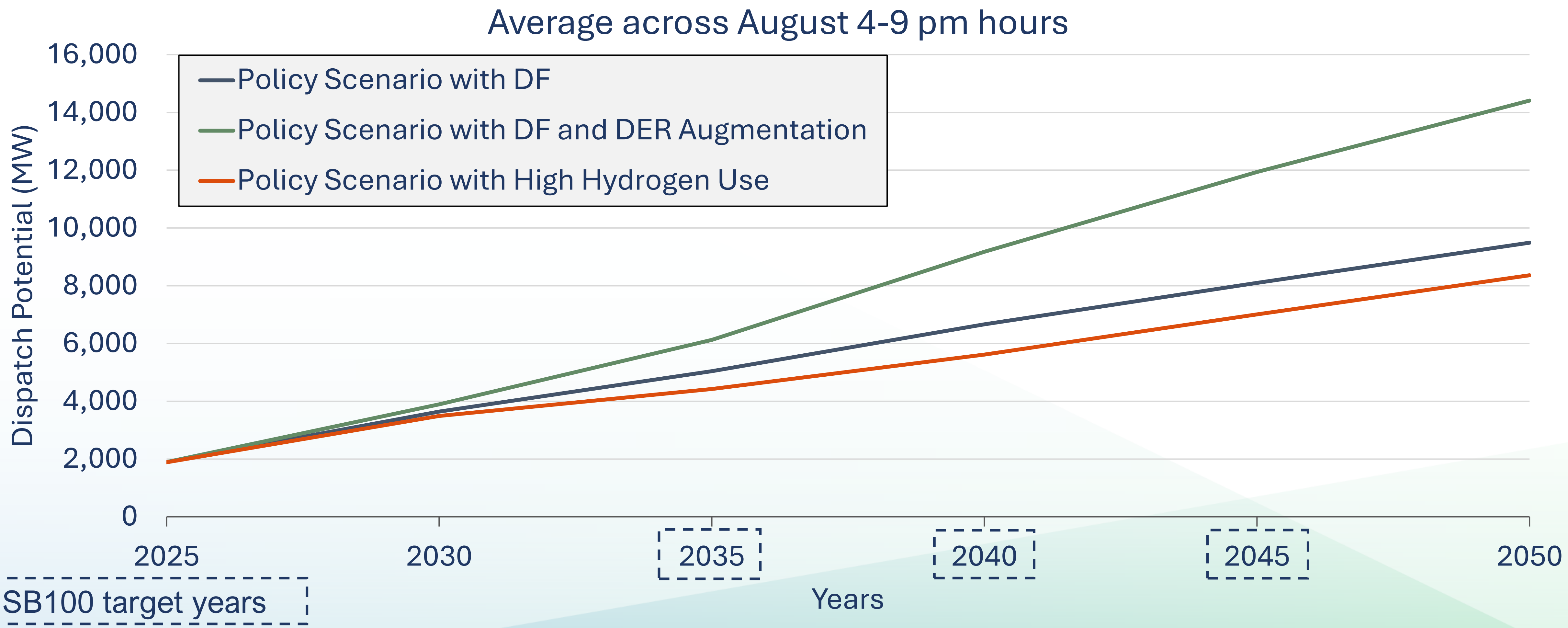
Large hourly dispatch shape change between summer and winter for HVAC.



Source: AEAB/EAD CEC Staff

Potential by Scenario

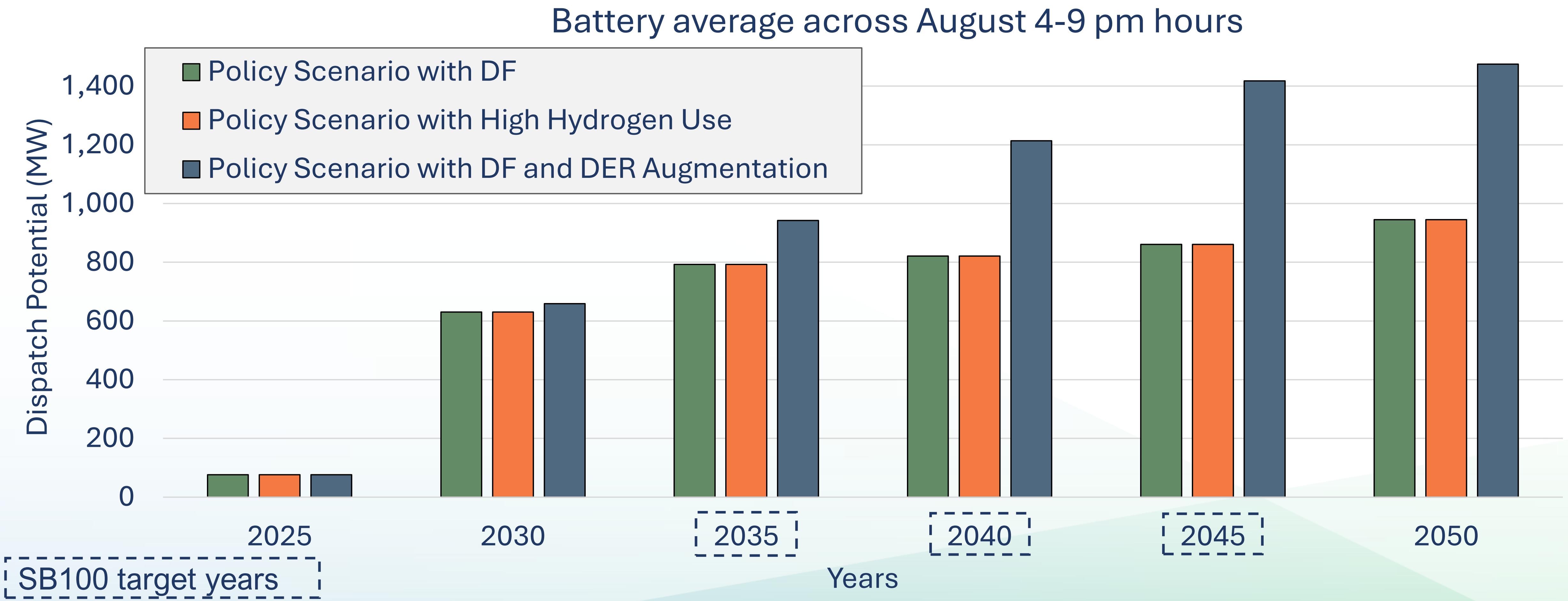
The primary driver of differences between scenarios are in the **BTM Battery** and **Electric Vehicle (Managed Charging and V2X)** Options



Source: AEAB/EAD CEC Staff

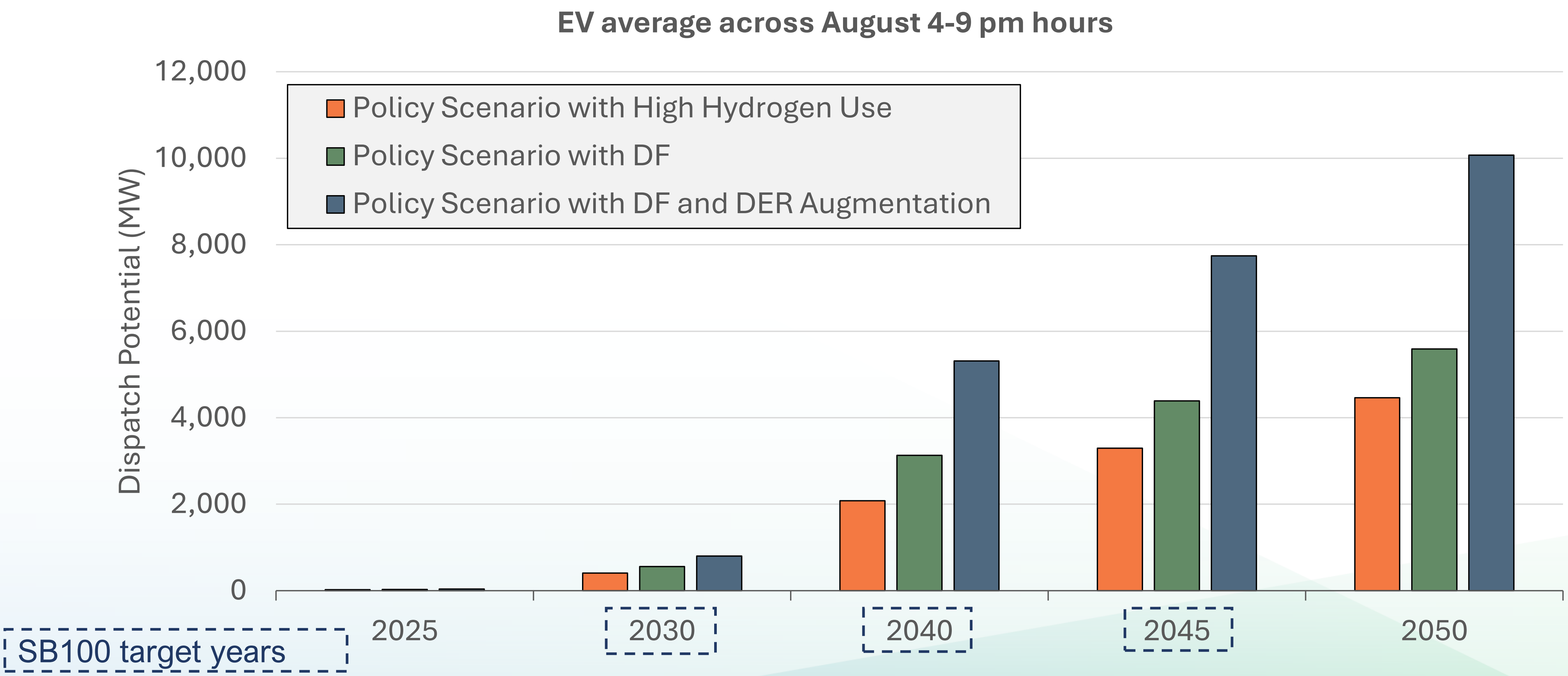
BTM Battery Scenario Comparison

Scenarios with **DER Augmentation** include a higher forecast of installed BTM batteries, primarily from the residential sector.



Source: AEAB/EAD CEC Staff

EV Scenario Comparison



Source: AEAB/EAD CEC Staff

Key Takeaways

- The expanded D-Flex tool allows for full 8760 load flex potentials for a given demand scenario
- D-Flex tool outputs are <u>potentials</u>, not actual load or load modifiers
- The “realization” of potentials depends on PCM selections and resource mixes.
- The largest contributor to potential is the EV category
- Seasonal factors play a role
  - ➢ Summer hours 12-19 have high HVAC potential
  - ➢ Winter hours 6-10 have lower total potential, critical hours of expected heating loads in the demand scenarios

D-Flex Next Steps…

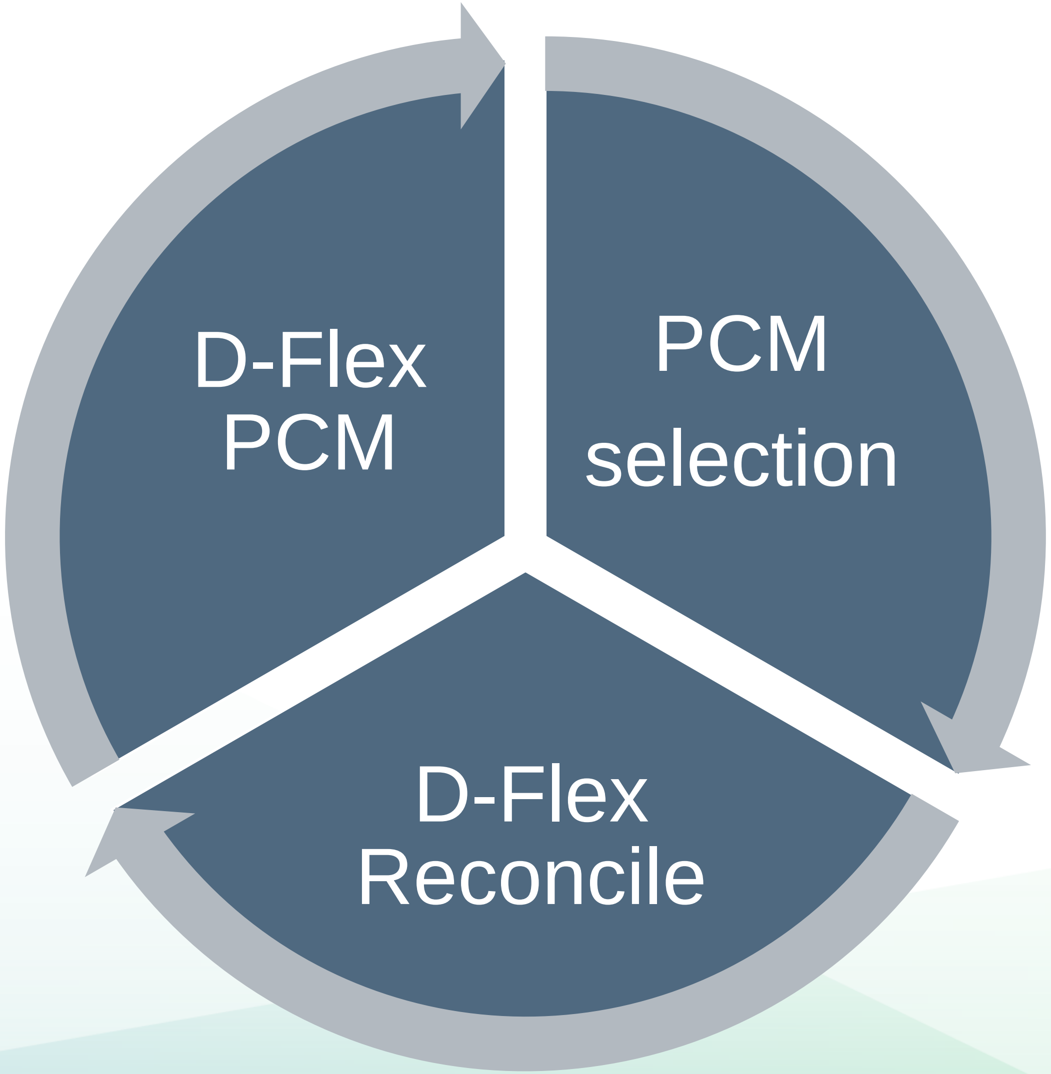
Run D-Flex for 2025 IEPR using updated 2024 IEPR inputs to assess change in potential towards 2030 LSG

- Update the baseline and load modifier forecasts
  - Update supply curves?
- May reflect scenarios with additional electrification

- D-Flex is self contained & ready to run
  - directly comparable to analysis performed to set the 7000 MW LSG for 2030
- Works in conjunction with an update to the tracking of current DR/Flex efforts
  - **Allows for direct insight into subsectors/technologies where new program development or program expansion has the largest potential**

Creation of Load Modification based on PCM results…

- Project for 2025-2026
- Will follow from SB 100 PCM work



How to account for extreme weather events?

- ?1:20, 1:50, 1:100 extreme weather profiles
- ? Other method
- May be helpful to support RA work in 2027

How to account for Dynamic Pricing?

- Dynamic pricing was not represented in D-Flex PCM
  - ➢ due to uncertainty with how future dynamic pricing rates will be structured and implemented, and
  - ➢ due to fundamental challenges in representing the availability of dynamic pricing in the DF Tool without knowing a priori the results of PCM, the supply mix, and future electricity prices.
- Is there a way to make long term projections with reasonable error bounds?

Desire for stakeholder engagement and next steps.

- Areas of particular interest are marked!
  - Please review our I&A worksheets posted on the DAWG webpage
- Always desirous of continuous improvement both in sourced data and modeling methods
- Thank you for your time & Please reach out anytime!

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