

The Power Grid for the Future

Experience from California

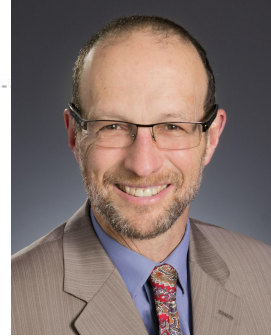
Vice-Chair Siva Gunda
November 12, 2022



California COP 27 Energy Delegation



Alice Reynolds
President
California Public Utilities Commission



Cliff Rechtschaffen
Commissioner
California Public Utilities Commission



Siva Gunda
Vice-Chair
California Energy Commission



Leuwam Tesfai
Deputy Executive Director
for Energy & Climate Policy
California Public Utilities Commission



Elizabeth Huber
Director for Siting, Transmission,
& Environmental Protection
California Energy Commission



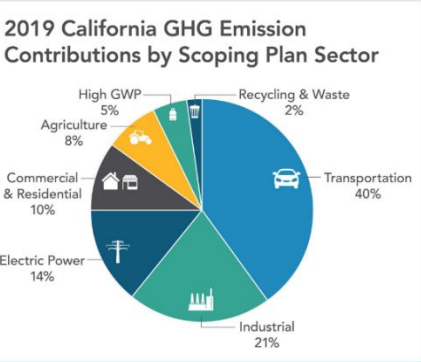
Sean Simon
Chief of Staff to Commissioner Rechtschaffen
California Public Utilities Commission

California's Climate Policy Framework



GHG Targets & Goals

Legislation & Executive Orders: Total GHGs (AB 32/SB 32) or sector targets (SB 1383/SB 100), etc.



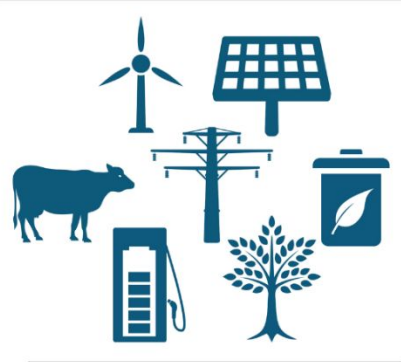
Scoping Plan

Actionable plan across all sectors



Action

Regulations & Incentives: Advanced Clean Cars, climate change investments, etc.



Projects

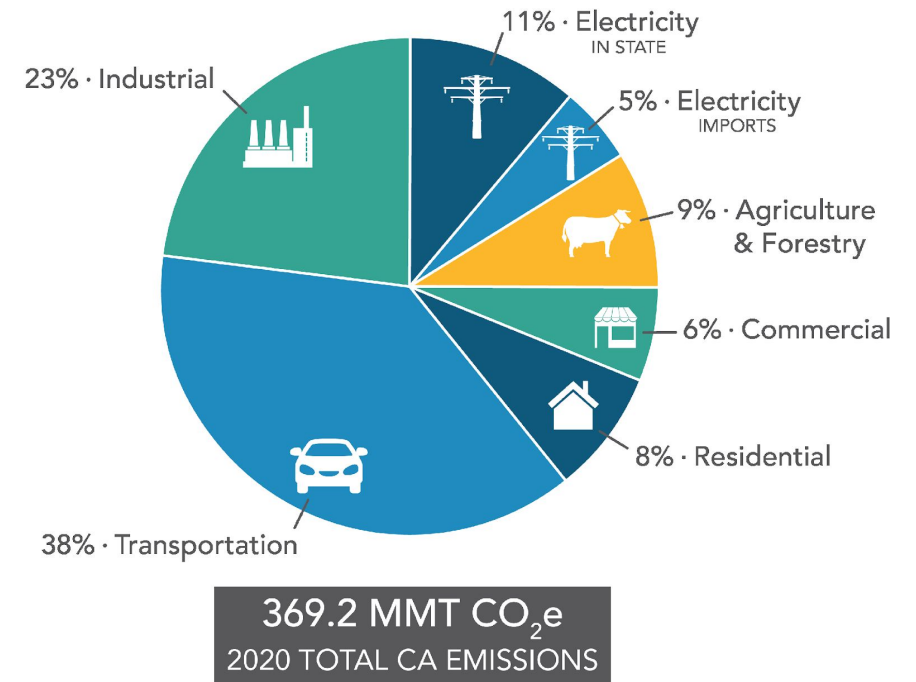
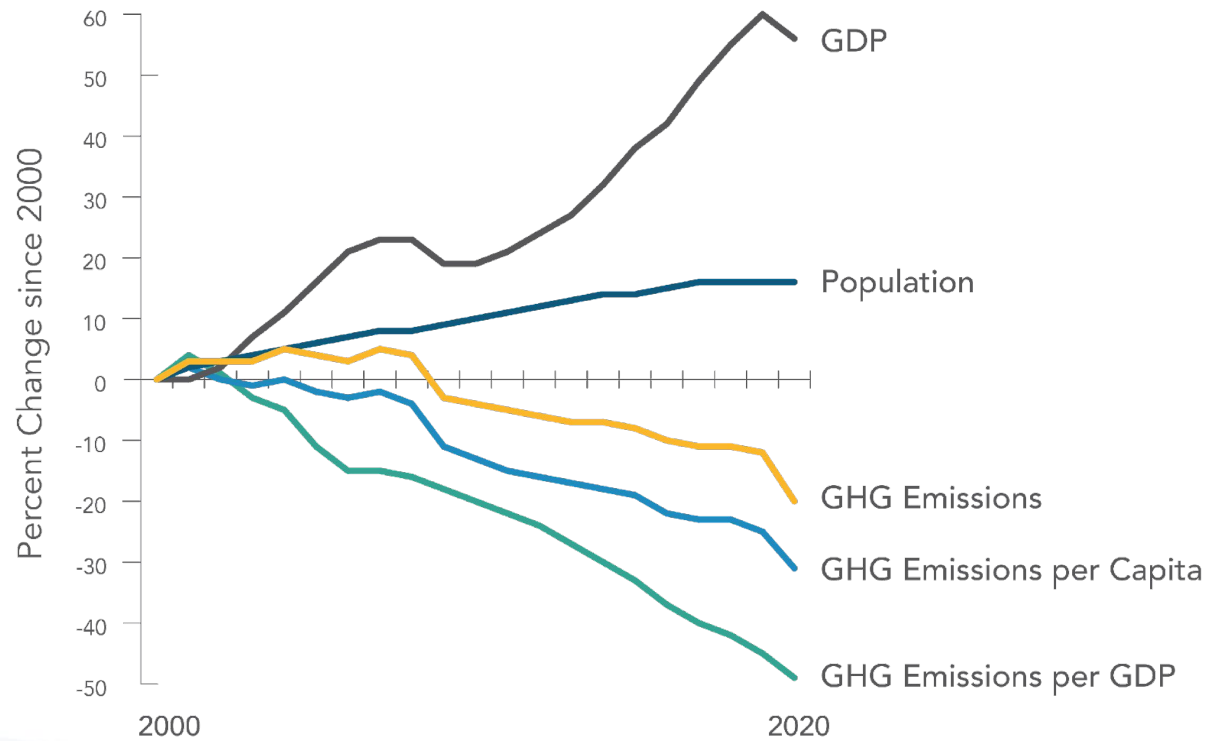
Examples: Building compost facilities, digesters, renewables, energy infrastructure, etc.

Legislature

Air Resources Board

Public Utilities Commission and Energy Commission
Create Policies and Programs

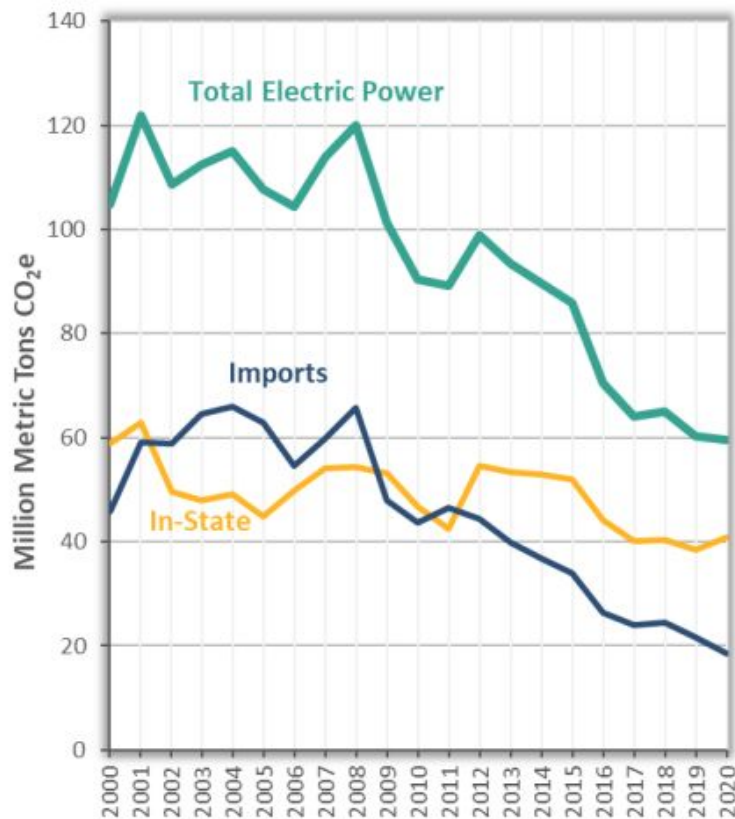
California's GHG Trends



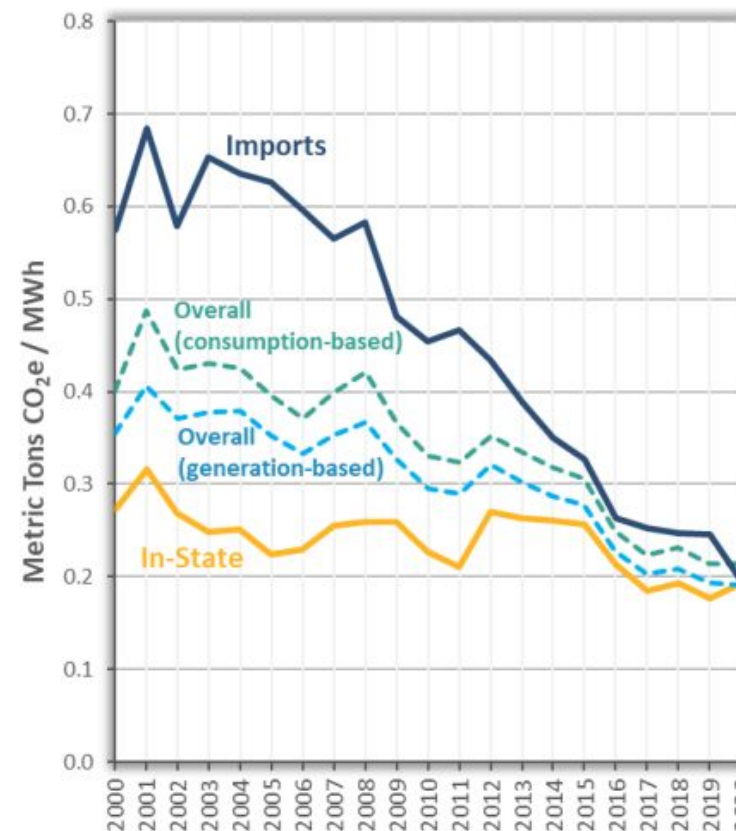
Source: 2022 Edition, California Greenhouse Gas Emission Inventory: 2000-2020

Electricity Sector Improvements 2000-2020

**GHG Emissions from the
CA Electricity Sector**

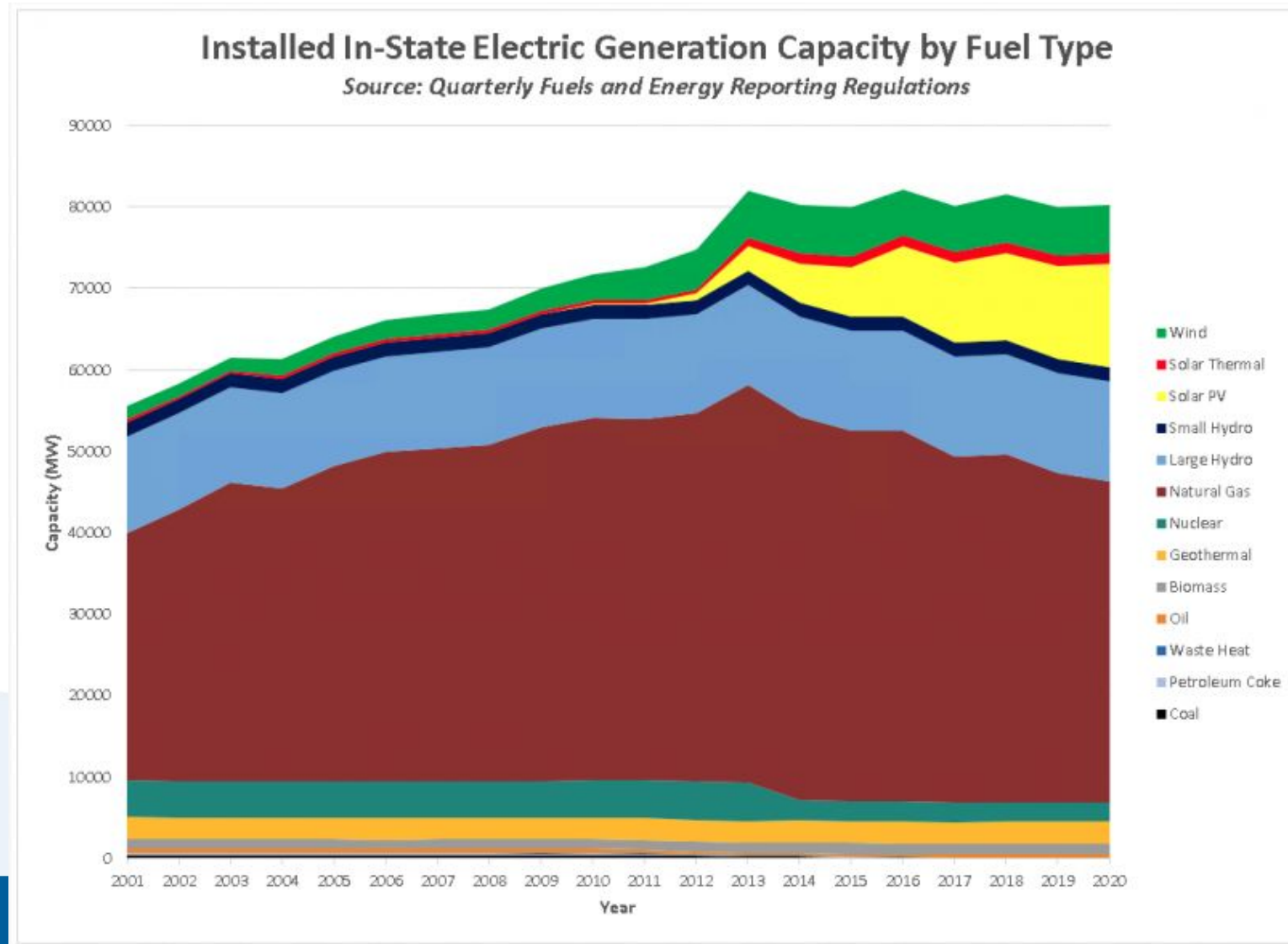


**GHG Intensity of
California Electricity**

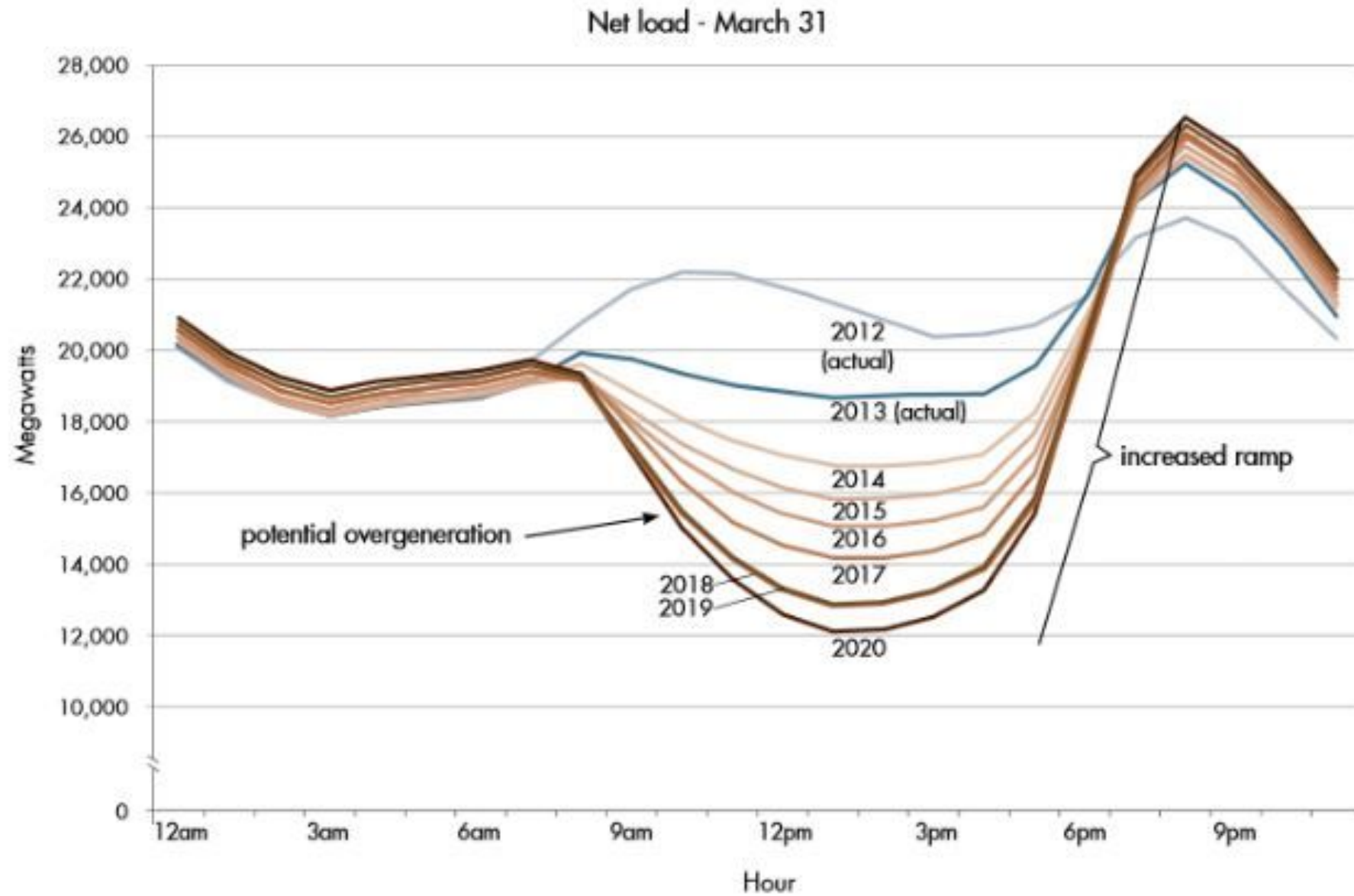


Source: 2022 Edition, California
Greenhouse Gas Emission
Inventory: 2000-2020

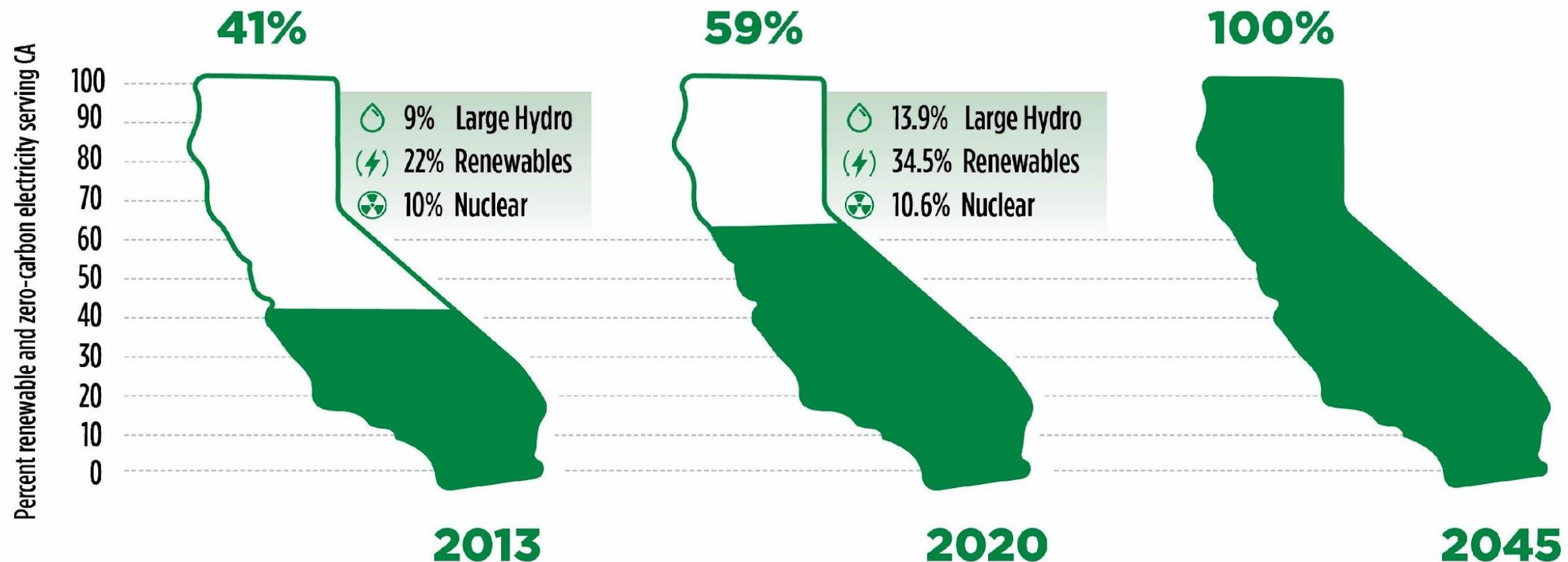
Electrification is a Critical Component of CA's Climate Policy



THE DUCK CURVE (Net load chart)



Progress to 100% Clean Electricity



Foundations of Grid Transition

Clean

Reliable

Affordable

Equitable

California

Clean Electricity Resources

**Projected to increase annual costs
6% above a 60% RPS baseline**













* Includes in-state

** Includes in-state and out of state capacity

† New hydro and nuclear resources were not candidate technologies for this round of modeling and could not be selected



Achieving 100% Clean Electricity in California

		Existing Resources	Projected New Resources	
		2019*	2030**	2045**
	Solar (Utility-Scale)	12.5 GW	16.9 GW	69.4 GW
	Solar (Customer)	8.0 GW	12.5 GW	28.2 GW
	Storage (Battery)	0.2 GW	9.5 GW	48.8 GW
	Storage (Long Duration)	3.7 GW	0.9 GW	4.0 GW
	Wind (Onshore)	6.0 GW	8.2 GW	12.6 GW
	Wind (Offshore)	0 GW	0 GW	10.0 GW
	Geothermal	2.7 GW	0 GW	0.1 GW
	Biomass	1.3 GW	0 GW	0 GW
	Hydrogen Fuel Cells	0 GW	0 GW	0 GW
	Hydro (Large)	12.3 GW	N/A†	N/A†
	Hydro (Small)	1.8 GW	N/A†	N/A†
	Nuclear	2.4 GW	N/A†	N/A†

To Achieve Clean Energy

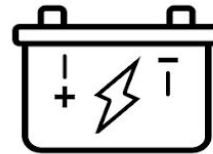
Development Needs
To Rapidly Accelerate



Solar & Wind

3X

Solar and wind build rates need to nearly triple*



Battery

8X

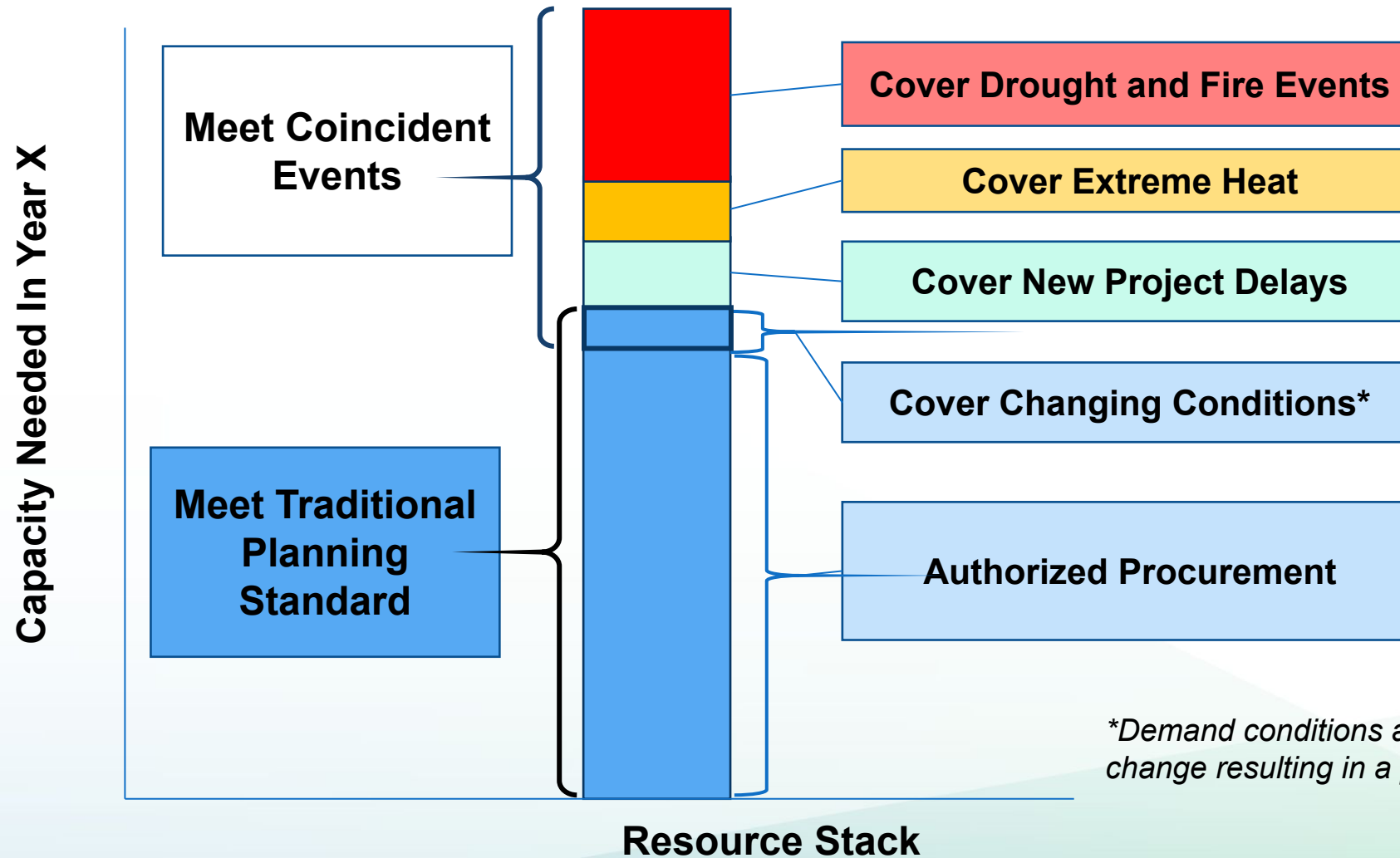
Battery storage build rates need to increase by nearly eightfold**



*Based on 10-year average | **Based on 2020

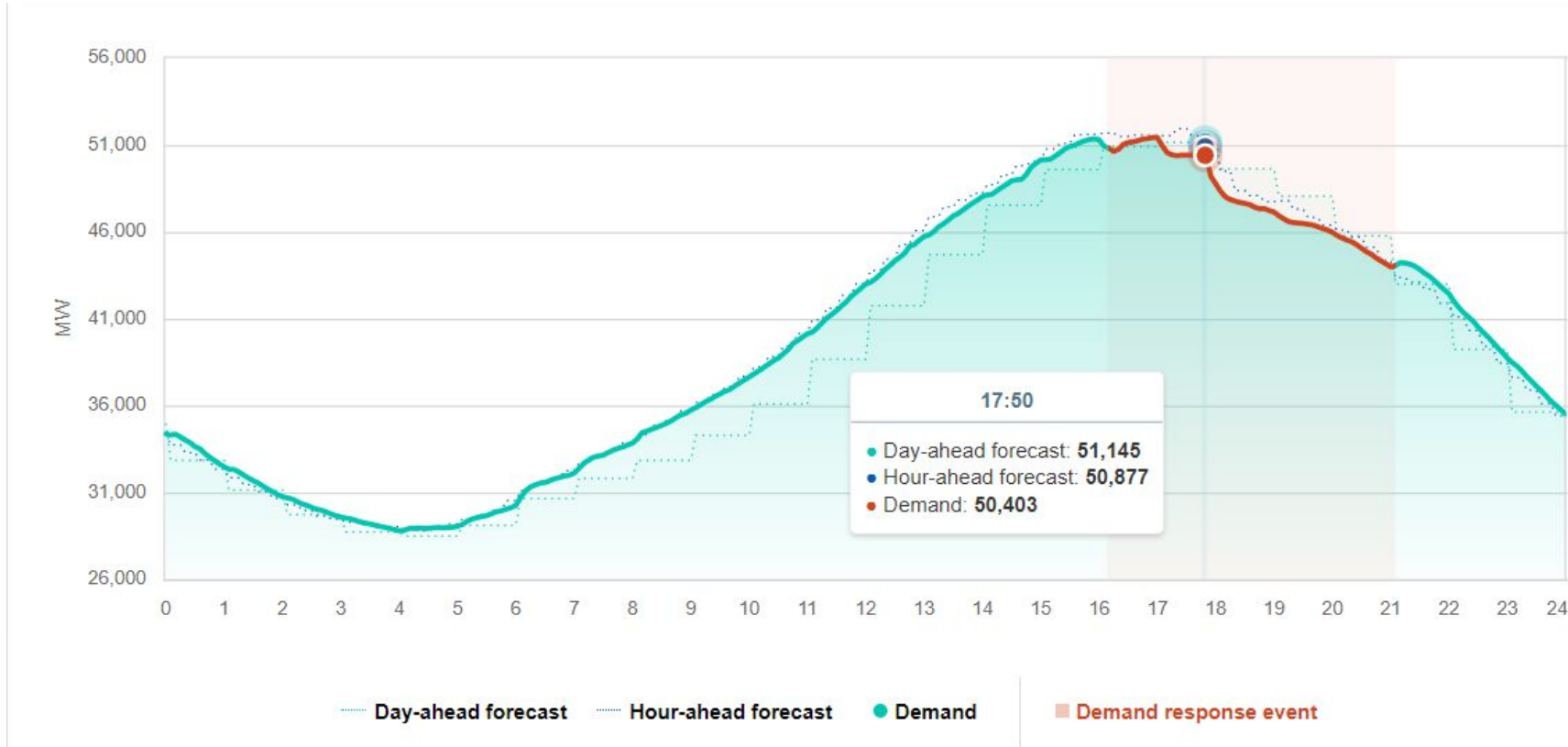


Reliability Challenges



**Demand conditions and assumptions may change resulting in a procurement lag*

CA Experienced a Historic Heat Wave in Sept '22



Demand Volatility is becoming more and more common

Average Demand for Sept 2022 was forecasted to be ~44,600 MW

We were on track for a peak of ~53,000 before demand side load reductions were called on

Critical Elements Along CA's progress

Floating Offshore Wind



Kincardine Offshore Wind Project
Aberdeen, Scotland

Source: <https://www.offshorewindca.org/photo-gallery>

Long Duration Storage



California Energy Commission
recently awarded \$31 Million
grant to Viejas tribe

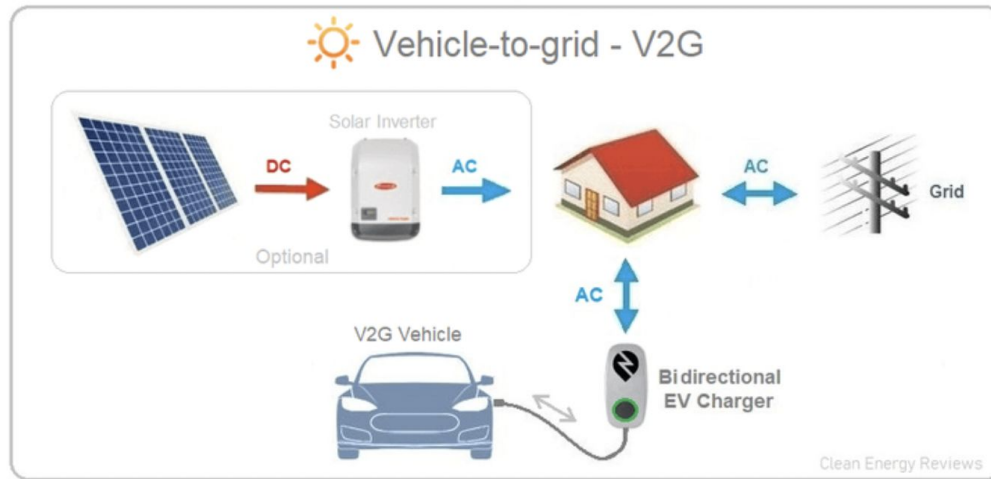
Distributed Energy Resources



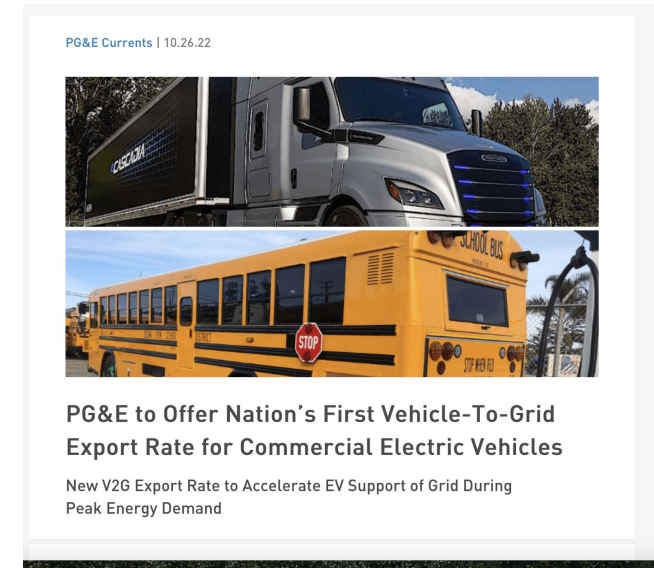
Source: <https://www.contextlabs.com/>

Seeking Ways to Leverage CA Leadership on Electric Vehicles for Reliability

- All new passenger vehicle sales in CA will be electric by 2035
- Expecting 7-8 Million EVs by 2030
- Investing \$4B in Zero Emission Infrastructure including V2G
- Just 5 million bidirectional EVs store enough energy to power every home in California for a day



Vehicle to Grid (V2G) energy flow diagram using a DC bidirectional charger.





California's Climate Commitment | 2021-2022 Budget Agreements



\$13.8 Billion

Transportation



\$10 Billion

Zero-Emission Vehicles



\$9.1 Billion

Clean Energy & Reliability



\$8.7 Billion

Drought & Water Resilience



\$5.7 Billion

Climate Resilience



\$2.3 Billion

Wildfire & Forest Resilience



\$1.1 Billion

Agriculture



\$975 Million

Climate Homes



\$723 Million

Climate Schools & Research



\$525 Million

Climate Innovation



\$460 Million

Circular Economy



\$346 Million

Climate Health



\$315 Million

Climate Jobs



**\$54.1
BILLION
TOTAL**

September 2022



Strategic Electricity Reliability Reserve (AB 205)



\$2.4 Billion

**Strategic Reliability
Infrastructure Assets**



\$700 Million

**Distributed Electricity
Backup Assets**



\$295 Million

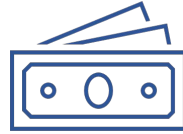
**Demand Side
Grid Support**



\$3.4 BILLION TOTAL

*As of September 2022

Clean Energy Alternatives for Reliability (SB846)



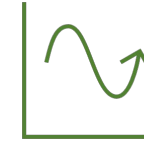
\$1 Billion Clean Energy Reliability Investment Plan

Electric supply and demand needs for near- and mid-term reliability

100 percent zero-carbon and renewable energy by 2045

Greenhouse gas emissions reduction target for electricity

Preferred resources, such as demand response and energy efficiency



Load Shift Goal

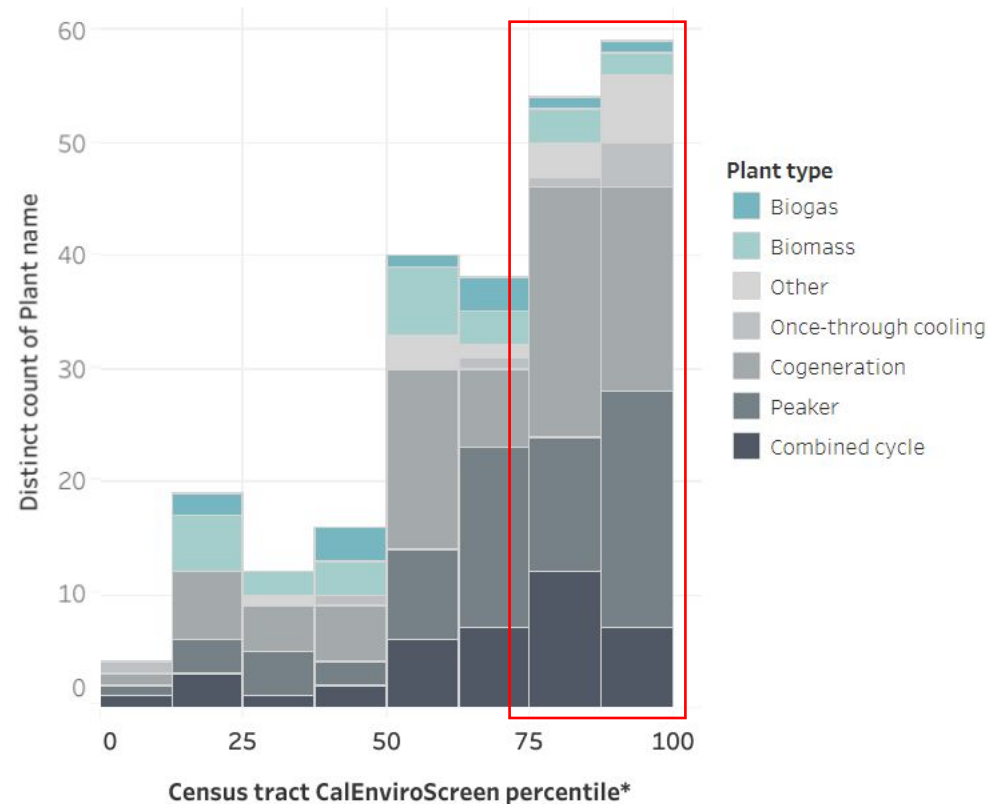
Adopt a goal for load shifting to reduce net peak electrical demand

Increase demand response and load shifting

Do not increase GHG emissions or electric rates

Power Plants are Disproportionately Located in Disadvantaged Communities

Distribution of plants by CalEnviroScreen percentile



Source: PSE Healthy Energy California Power Map

Equity and Justice Has to Be Foundational

- 1) **Words matter.** It is *our* energy system, not *the* energy system.
- 2) **Timing matters.** We must engage early, often, and meaningfully with tribes, communities, and local leaders.
- 3) **People matter.** We must be thoughtful about inviting people, who represent and work closely with the residents to make sure we are getting a comprehensive set of voices at the table.
- 4) **Build trust.** We must build true relationships with partners and communities to carry out our work equitably. We will achieve more and do better when we work and act together.
- 5) **Consistency and communication matters.** Equity relies critically on consistent commitment of resources and communication to build those relationships and break down silos.
- 6) **Conflict is necessary.** To achieve equity, change is required and when change happens, conflict arises. Rather than run away from this conflict we need to lean into it to learn from it and make progress.

The Great Implementation Will Require Finding Common Ground

1. Start with what we agree on
2. Align on where we are going
3. Recognize there will be tradeoffs along the way

...and lean into conflict!

Thank You

