



California's Clean Energy Goals & the Gas Transition

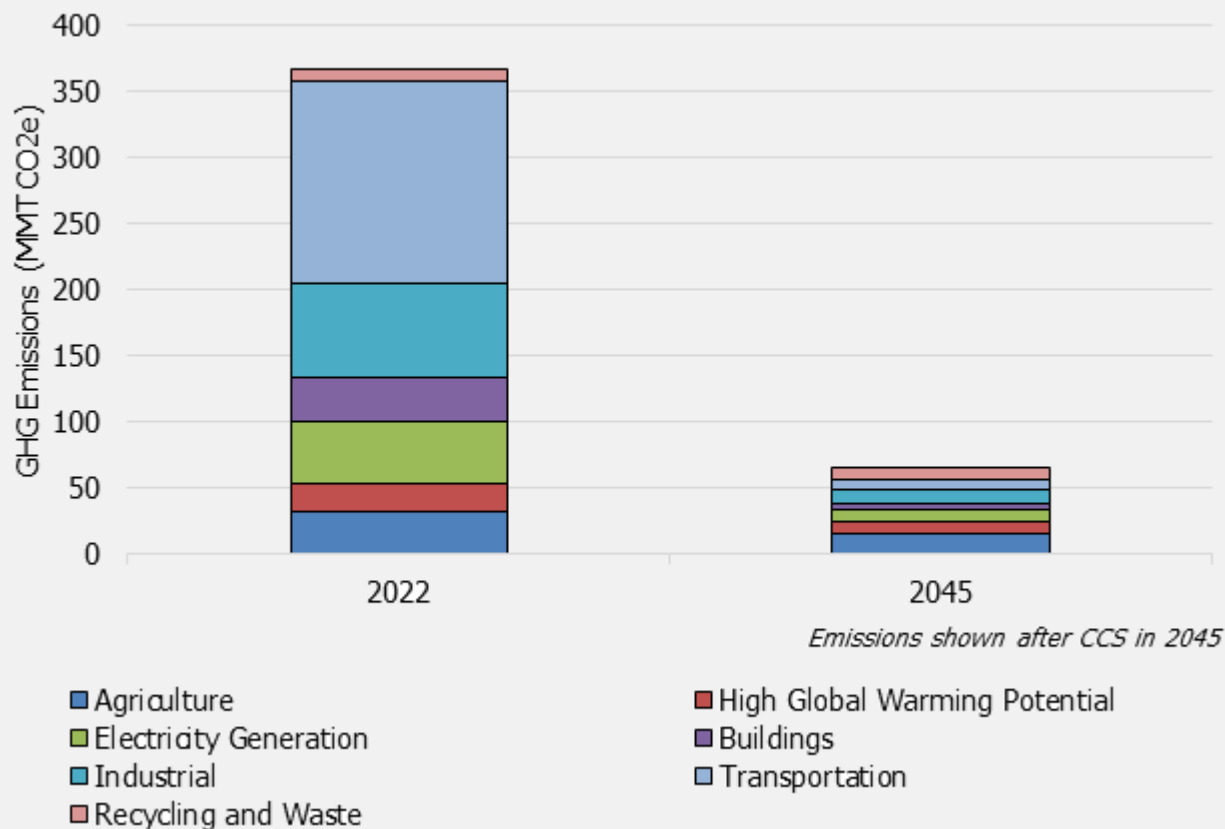
Liz Gill, PhD

*Electricity Resources Analysis Branch Manager
California Energy Commission*

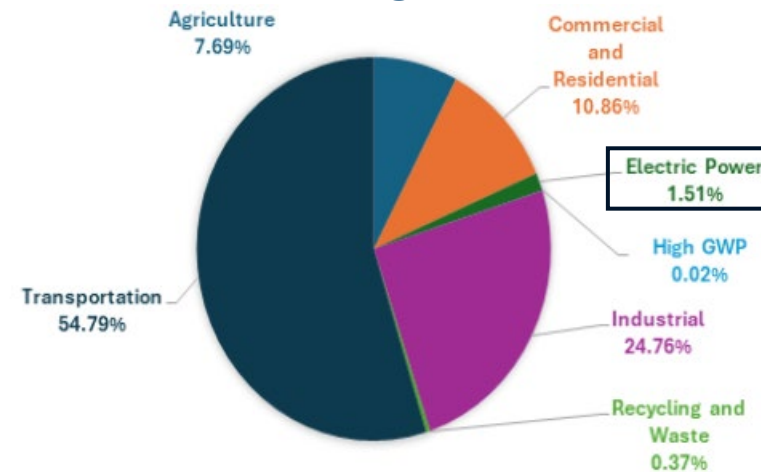


Economy-Wide Climate Goals Hinge on an Affordable, Reliable and Safe Power Sector

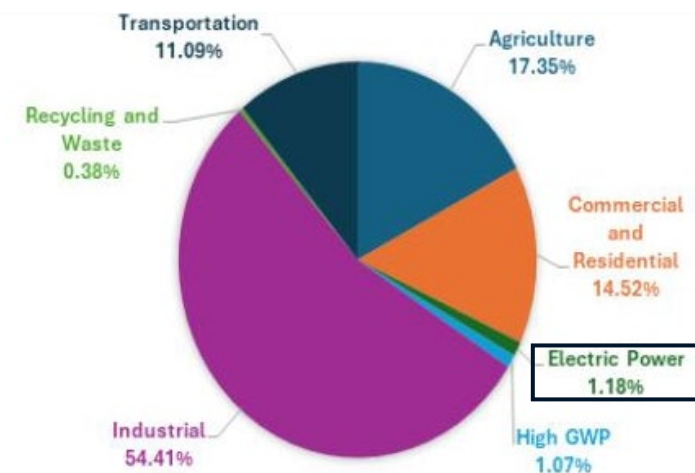
CARB Scoping Plan Modeled Annual Emissions



2023 Annual Average NOx Emissions

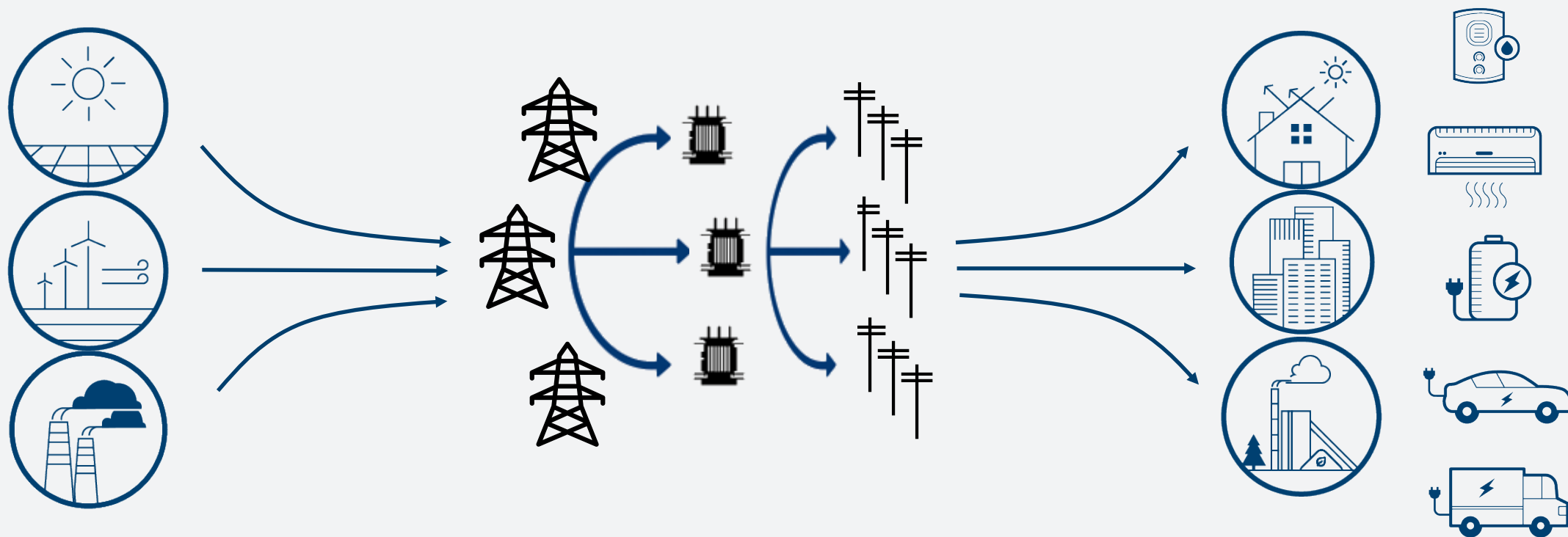


2023 Annual Average PM2.5 Emissions





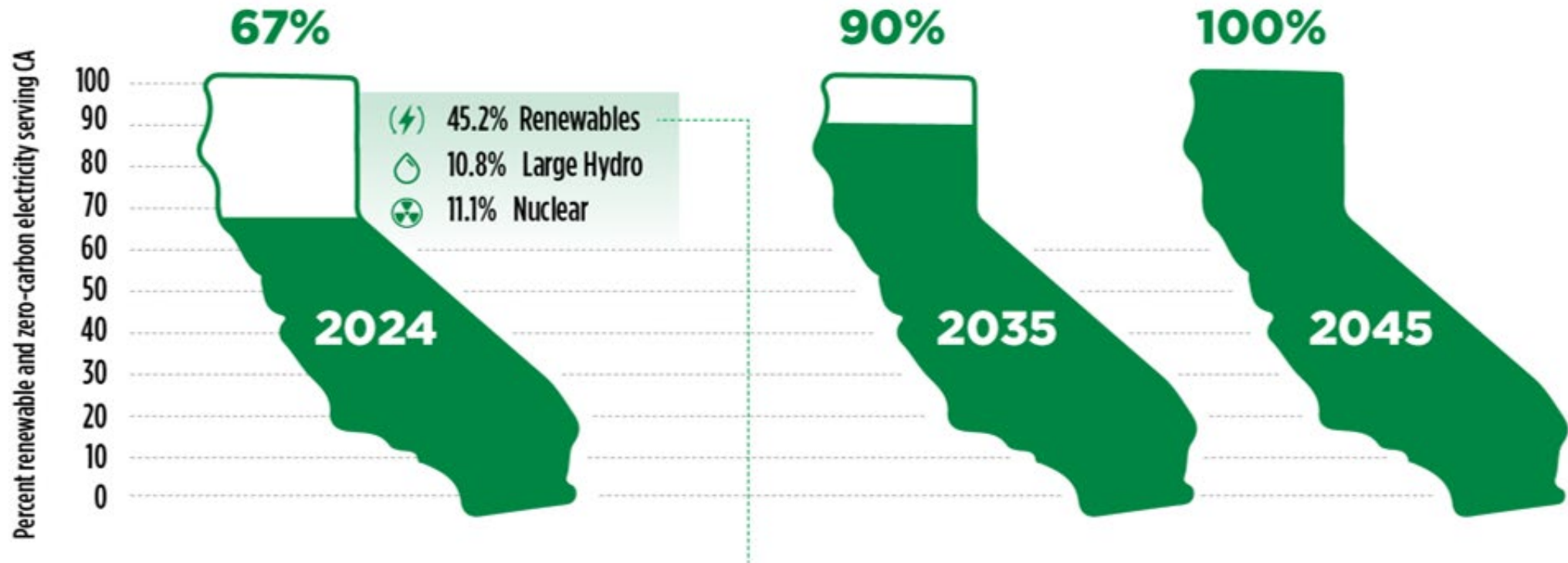
Electrification Hinges on an Affordable, Reliable and Safe Power Sector





On track to achieve 100% clean electricity

67% of the state's electricity already comes from renewable & zero-carbon resources



Renewables Breakdown

22.8% - Solar | 13.8% - Wind | 5.0% - Geothermal | 1.9% - Biomass | 1.7% - Small Hydro

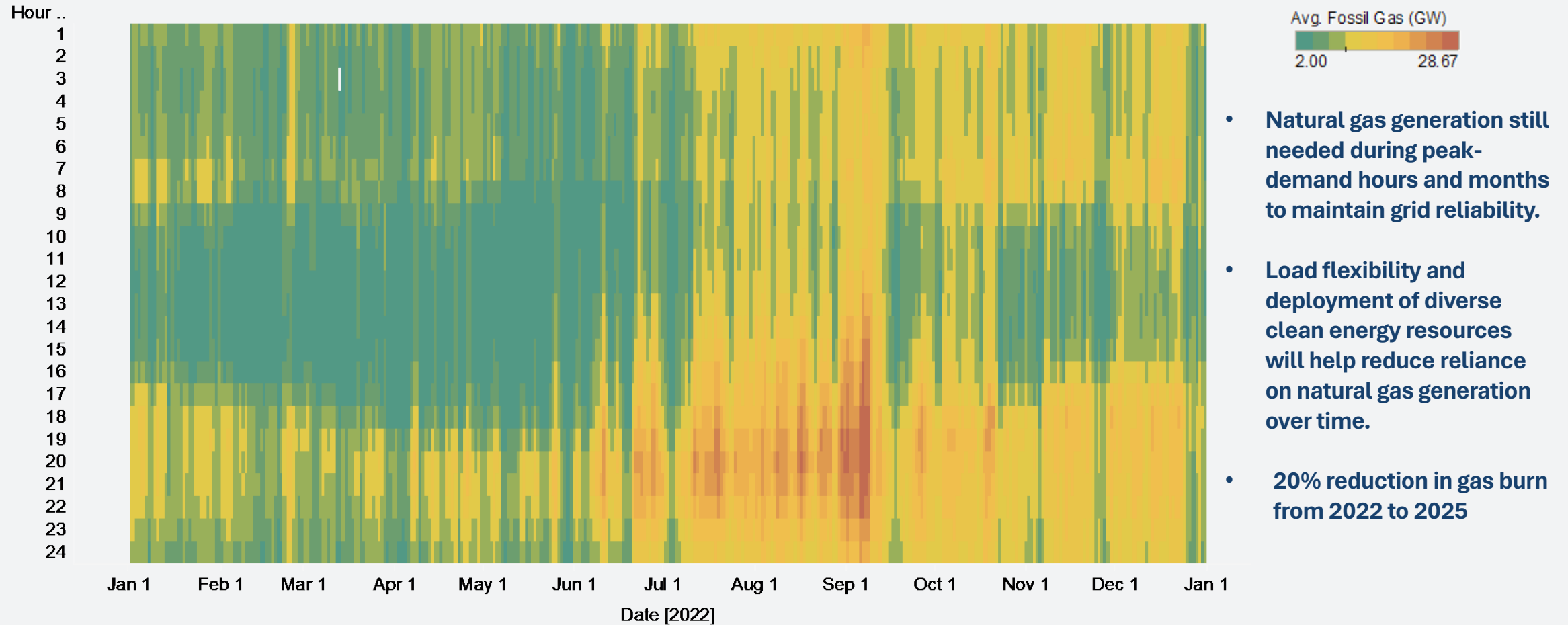
September 8, 2026

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Board Strategic Development Committee and
Special SMUD Board of Directors Meeting



Heat Map of Gas Generation



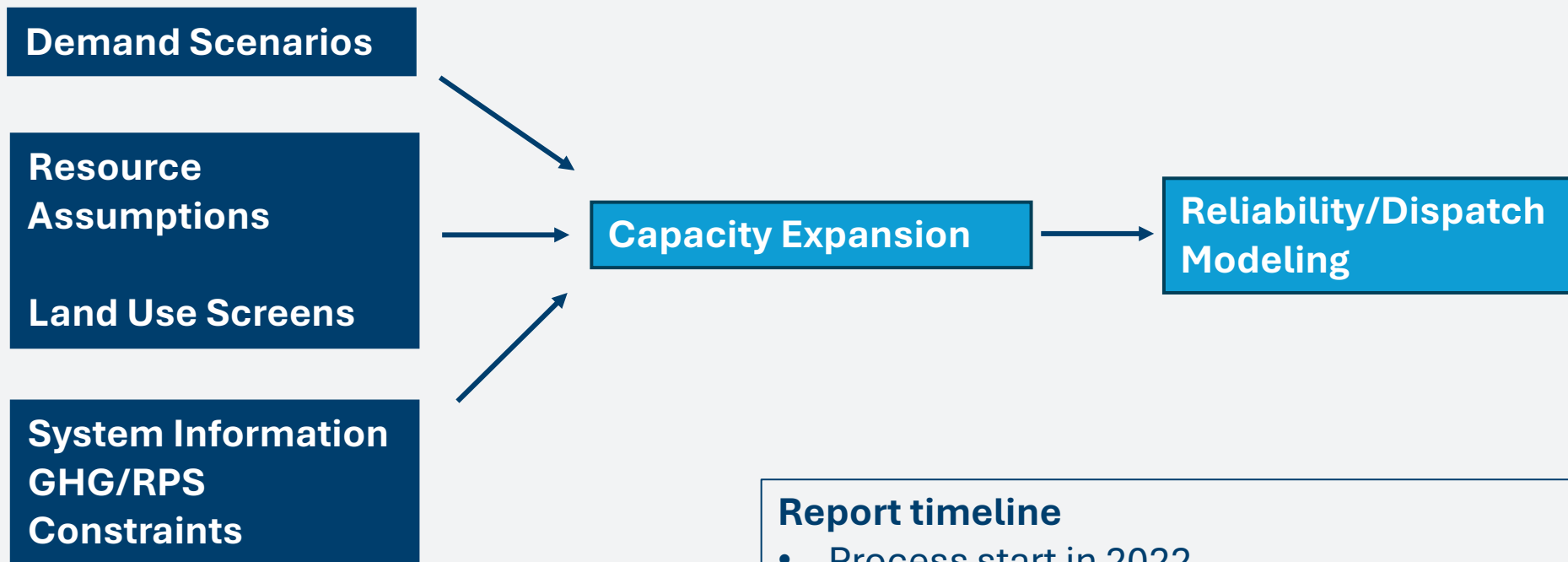
The Future Electric Grid





SB 100 Modeling Framework

Similar to IRP Modeling



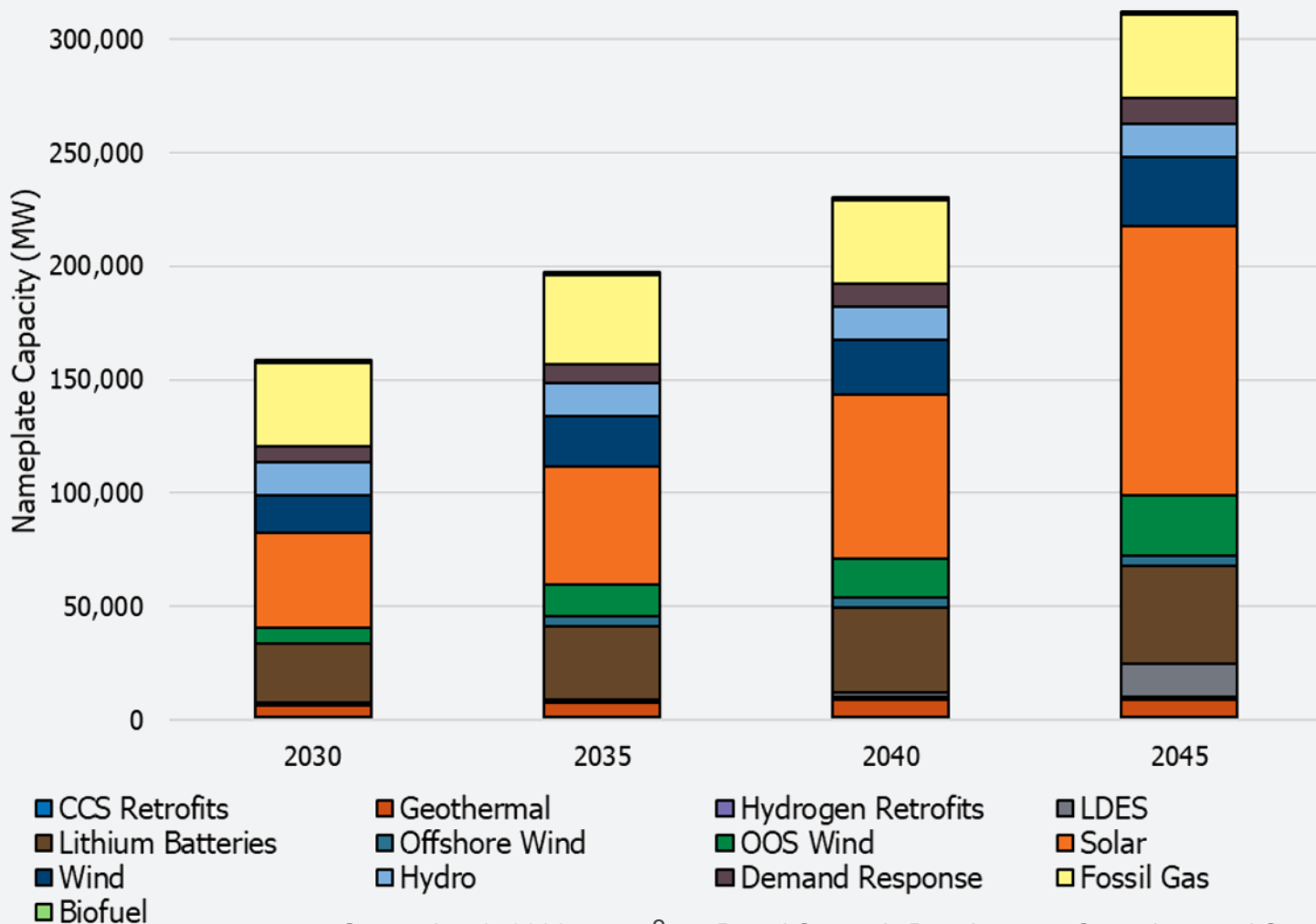
Report timeline

- Process start in 2022
- Multiple workshops held on elements of the report
- Modeling completed in early 2025 (pre-OBBA)
- Draft report to be released soon



SB 100 Report Reference Scenario Buildout

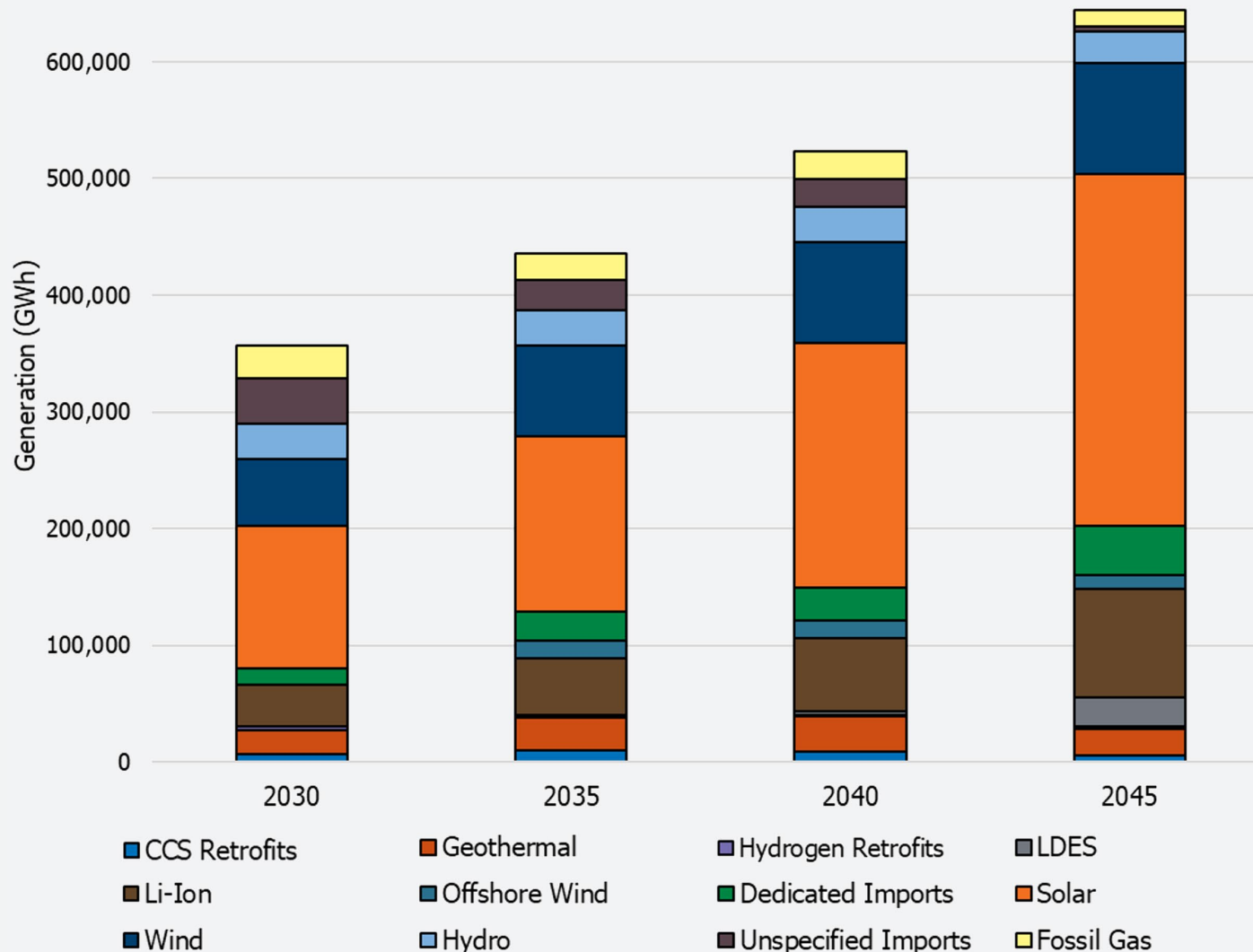
Statewide Existing, Planned, and Selected Capacity



- Between 2025 and 2045, the system builds:
 - 97 GW of solar
 - 45 GW storage
 - 24 GW of wind
 - 27 GW of out of state wind
 - 1.6 GW of CCS Retrofits
- Total system capacity rises from **150 GW** to **310 GW**



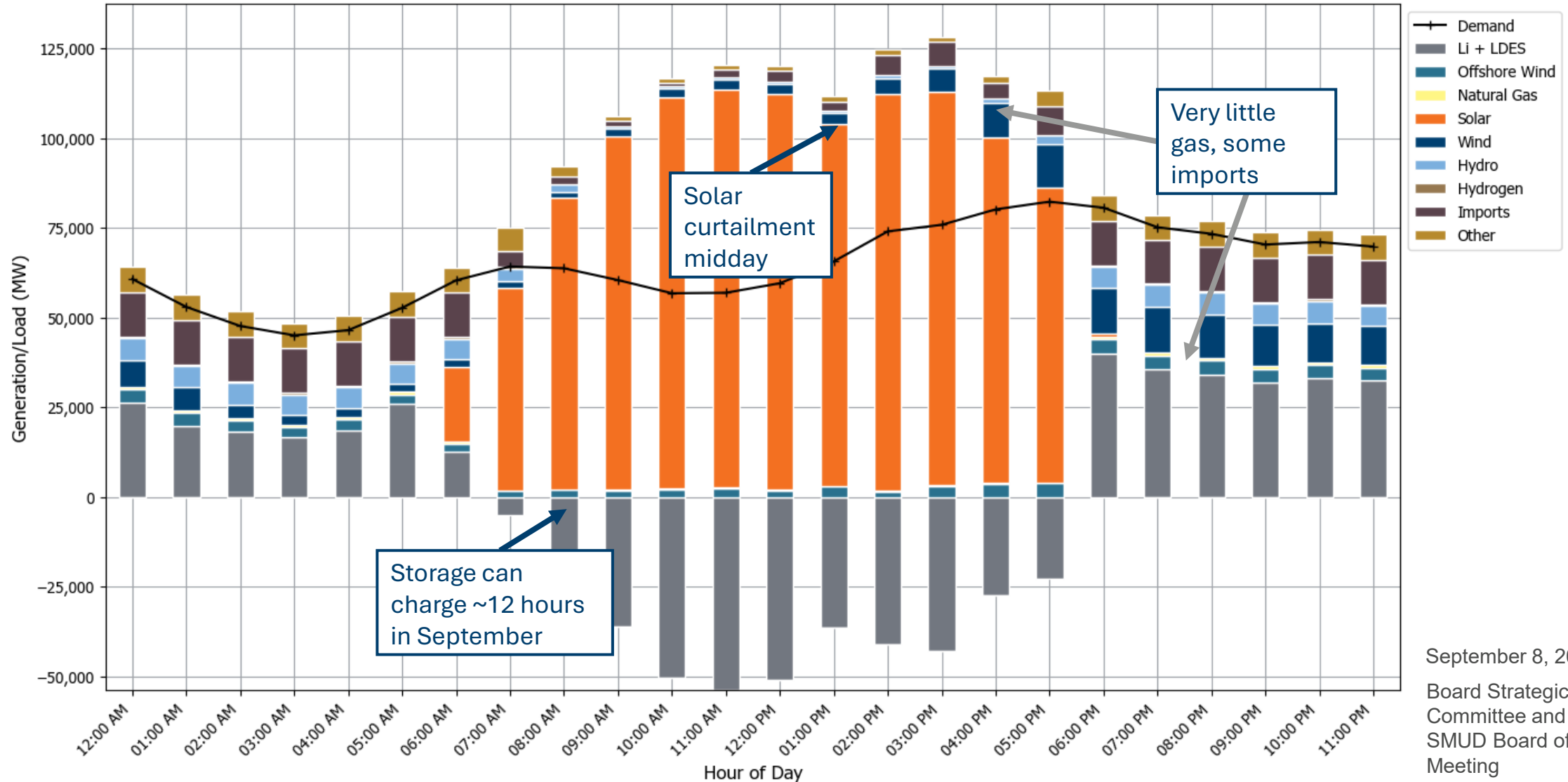
Reference Scenario Annual Generation



- Total generation nearly almost doubles from 2030 to 2045 to meet electrification and storage charging load.
- Solar and wind generation rises, providing **67%** of energy in 2030 and **85%** in 2045.
- Generally, trends persist across all modeled scenarios



Reference Scenario Sample Summer Peak Day

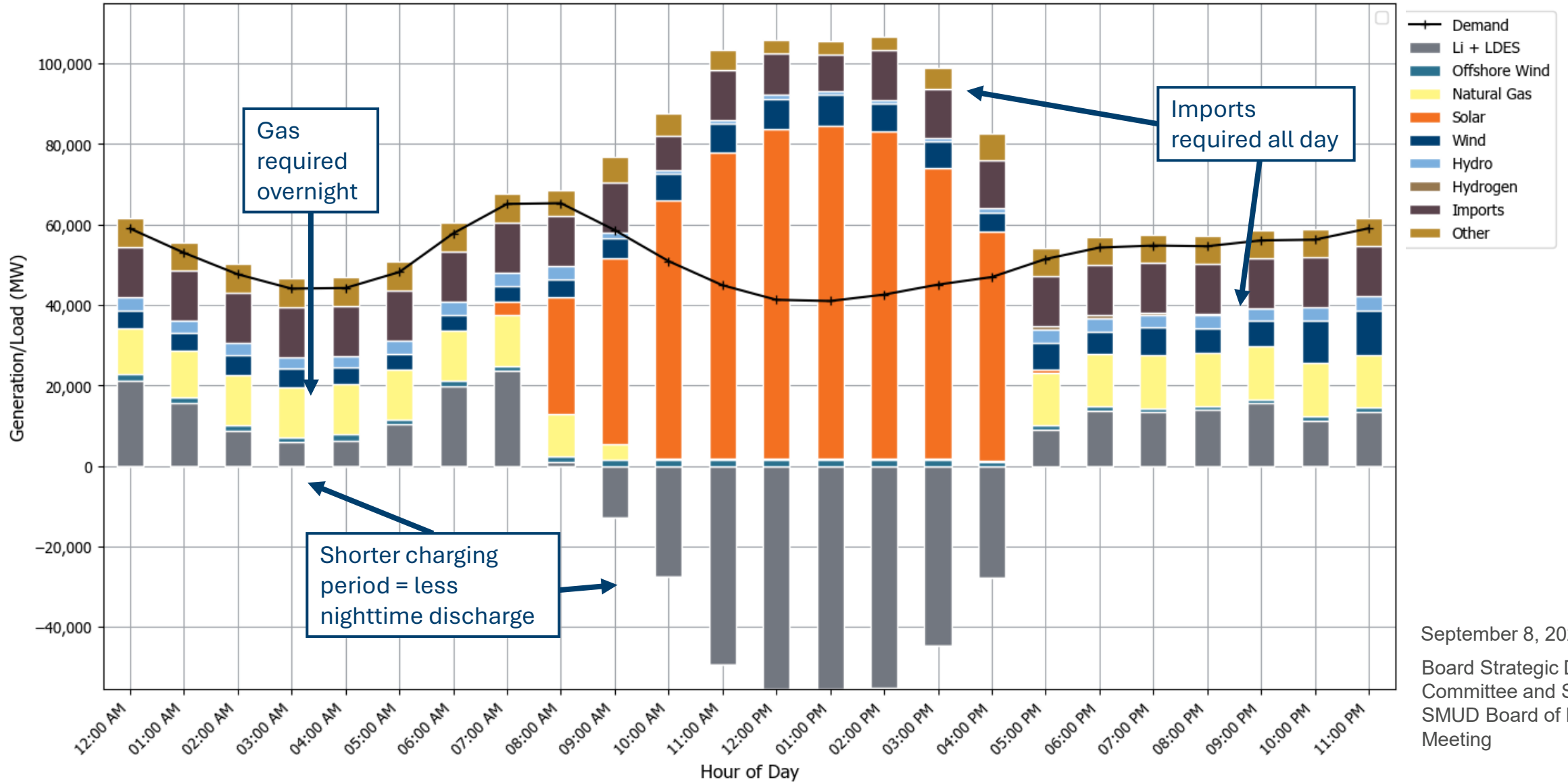


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Board Strategic Development
Committee and Special
SMUD Board of Directors
Meeting

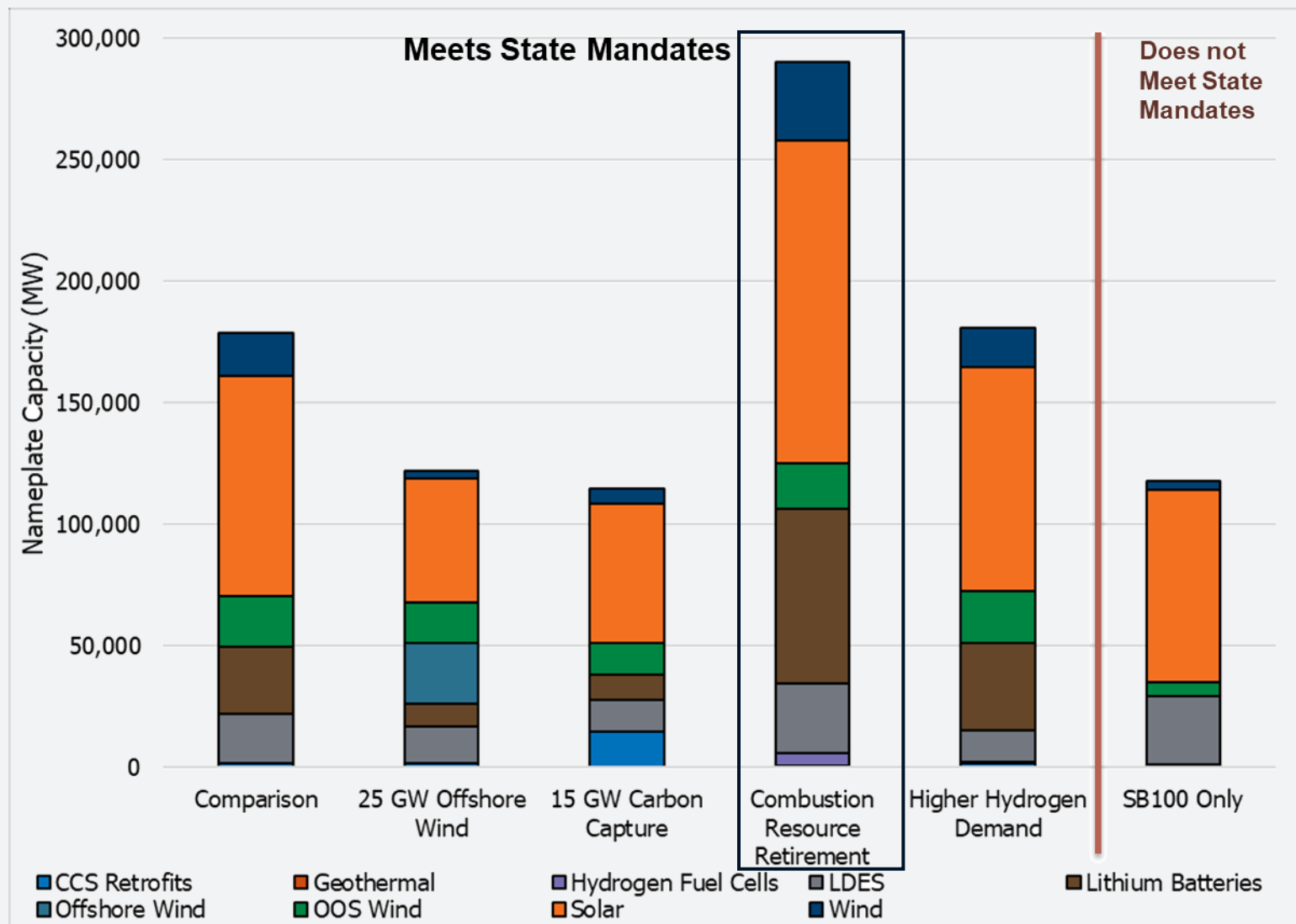


Reference Scenario: Sample Winter Day





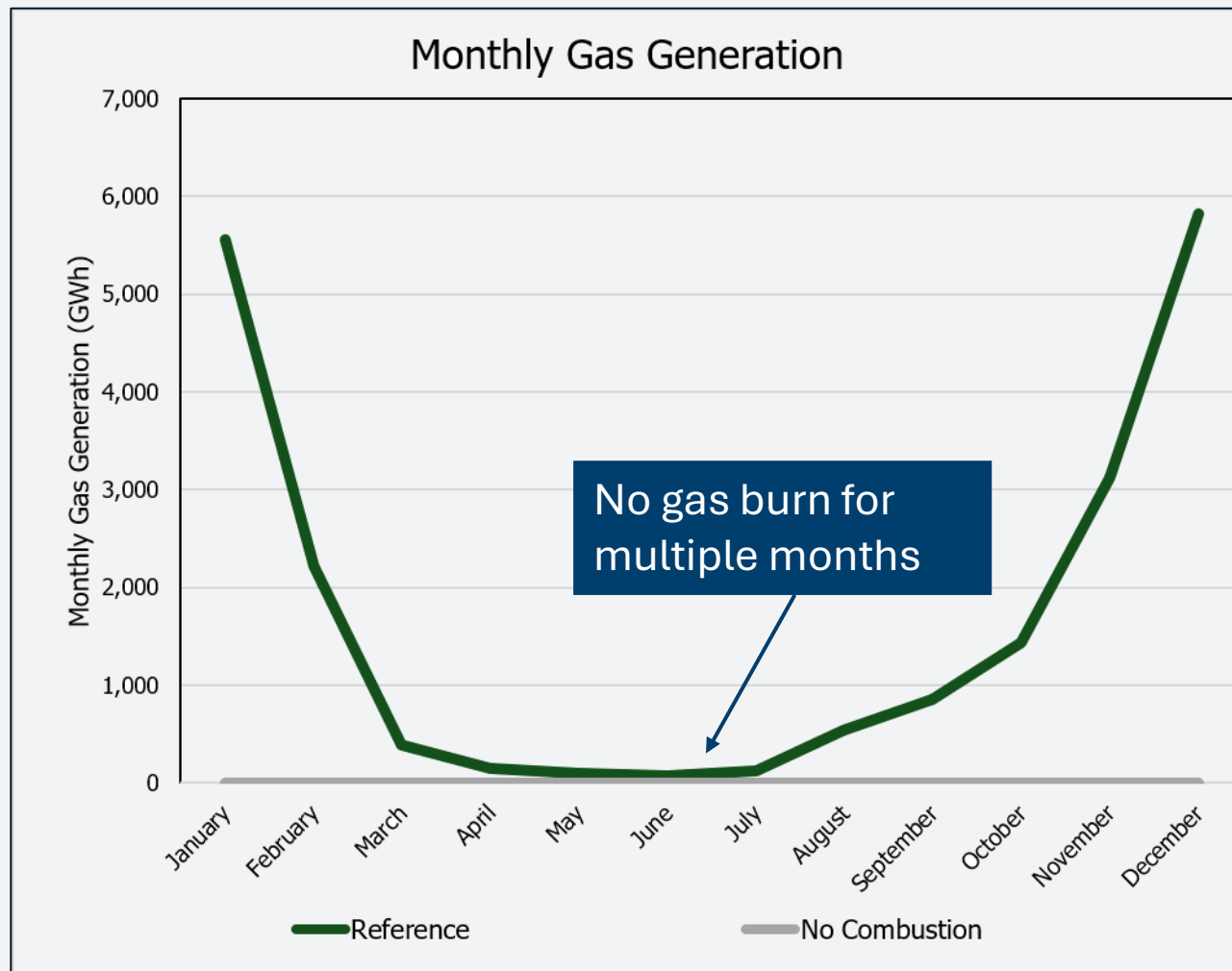
Larger Buildout of Renewables Required for Combustion Retirement



- Combustion Retirement scenario forces retirement of 35 GW of fossil gas plants and 1.5 GW of biofuel plants.
- Requires an additional 135 GW of resources compared to Comparison.
- Builds 5 GW of non-combusting hydrogen fuel cells to provide winter power.
- \$10B+/year higher costs in 2045



Modeling Does Not Account for All Grid Services



- CEC's PLEXOS model is a zonal/regional statewide model
 - Does not account for local transmission constraints
 - Doesn't account for all characteristics and grid services that the gas generators provide
- ↓
- Further analysis required to understand impacts of local constraints and full suite of grid services



Overall Trends

SB 100's modeled scenarios share some common generation and market dynamics, including:

- All scenarios demonstrate a need for large amounts of renewable and zero carbon resources and *in particular*, **clean-firm resources** by 2045, where demand forecast shows a system that peaks in both summer and winter.
- **Generation capacity:** Solar and storage provide the majority of generation capacity by 2045 with solar and wind together providing 85% of all generation.
 - OSW and hydrogen resources are not selected by model because they are not cost competitive as modeled.
 - By 2045, all scenarios select additional clean-firm and LDES capacity to meet increased load and serve winter-peaking need.



Overall Trends, continued

- **Gas generation:** Gas usage drops across all scenarios as more clean resource capacity is added to the system, but gas power plants are retained for reliability. Gas use is concentrated in low-renewable periods of winter.
- **Curtailement:** Curtailement is no longer limited to spring because of the widespread deployment of solar.
- **Imports:** Out of state imports drop in the spring and summer but rise in the winter. California becomes a net exporter in the spring.



Considerations for Individual Utilities

- Better together: Larger footprints = “more optimal” portfolios and dispatch
 - The Western Interconnection is ultimately one giant machine
 - EIM → EDAM → Pathways?
- Local priorities
- Local constraints
 - Transmission constraints

Questions?



➤ Contact information: Liz.Gill@energy.ca.gov

Appendix





2025 SB 100 Report Modeling Assumptions

State Goals

- **SB100/SB 1020:** Percent of retail sales must be from renewable and zero-carbon resources by 2030, 2035, 2040, 2045 (not including transmission, distribution, or storage losses)
- **SB 350:** 2030 GHG planning target range from CARB Board Resolution 22-21
- **AB 1279:** 85% statewide anthropogenic GHG emissions reductions and carbon neutrality by 2045
 - 2045 electric sector GHG emissions from CA 2022 Scoping Plan

Reliability Requirements

System must meet

- 17% statewide planning Reserve Margin (PRM) in the capacity expansion model
- 0.1 loss of load expectation (LOLE) target in the reliability model
- No unserved load in the dispatch model

Year	SB100/SB1020 Retail Sales Target	GHG Emissions	Planning Reserve Margin
2030	[60% RPS]	30 MMT	17%
2035	90%	25 MMT	17%
2040	95%	16.9 MMT	17%
2045	100%	6.9 MMT	17%

Existing/Planned Resource Assumptions

- **Existing resources:** Quarterly Fuels and Energy Resources data
- **CPUC jurisdictional Planned Resources:** 2023 Preferred System Plan
- **Non-CPUC jurisdictional Planned Resources:** based on Supply Form filings through 2030
- Planned resources built through 2030 are included in all scenarios as part of the baseline build.