

DOCKETED

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ITEM 4

SB 100 Report Resource Builds

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SB 100

Expands RPS

60% by Dec 31, 2030



PUC 399.11(a), 454.53 (a)

Establishes 100% Policy

It is the policy of the state that **eligible renewable energy resources and zero-carbon resources supply 100 percent of all retail sales** of electricity to California end-use customers by December 31, 2045 and 100 percent of electricity procured to serve all state agencies by December 31, 2045.



SB 100 Joint Agency Report

CEC, CPUC, and CARB to issue a Joint-Agency report every four years including the following:

- A. A review of the policy (technical, safety, affordability, reliability)**
- B. Reliability benefits and impacts**
- C. Financial costs/benefits**
- D. Barriers/Benefits of achieving the policy**
- E. Alternative scenarios and costs/benefits of each**



SB 100 Modeling

All modeling was conducted by consultant E3.

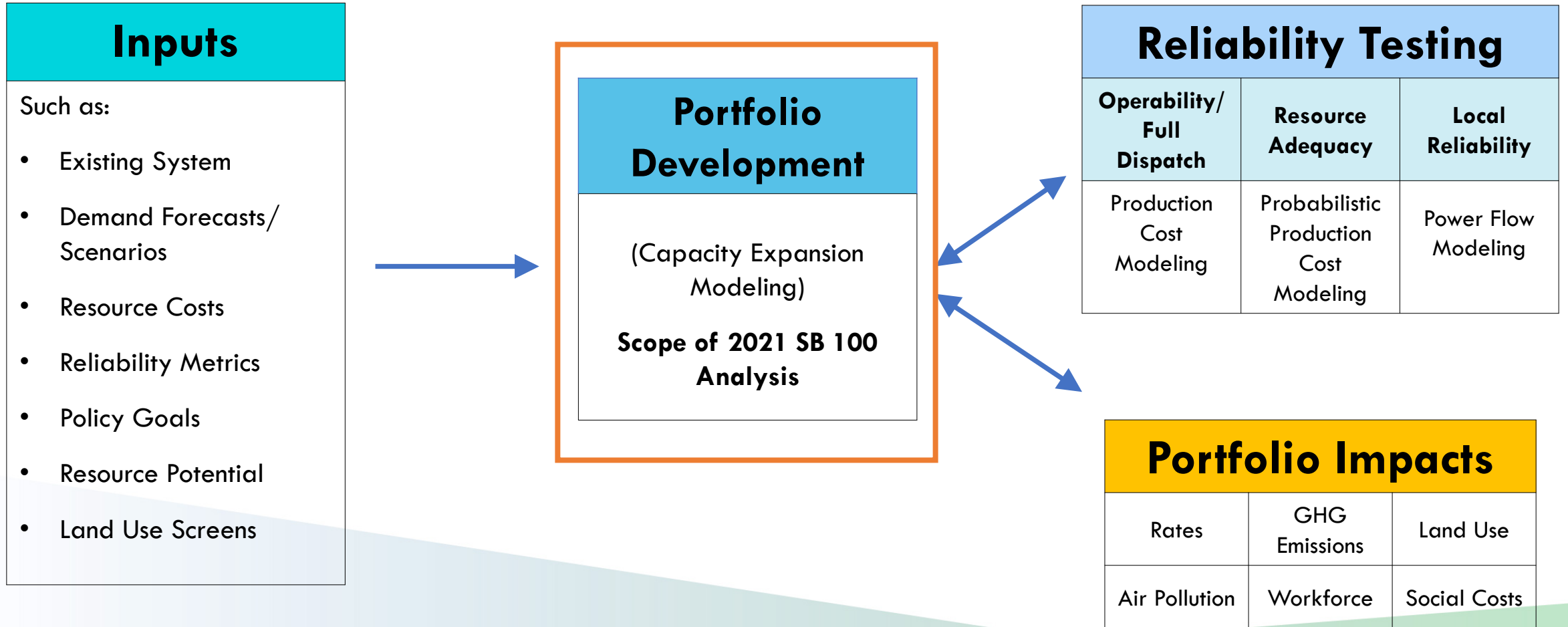
- RESOLVE California model:
 - Co-optimizes NPV of investment and operational costs, given reliability and policy constraints, to develop a *least-cost resource portfolio*

SB 100 portfolios are *not precise* but can inform tradeoffs around different pathways.

- A reliability assessment was *not* included in the scope of work for the 2021 Report.
- Portfolios do not reflect individual BA or LSE goals or decision-making.



SB 100 Scope of Analysis



Inputs, impacts, and tools listed are for illustrative purposes



Zero-Carbon Resources Included in Modeling

Technology	Eligibility Basis	Scenarios
Solar PV	RPS	Core and Study
Solar Thermal (existing only)	RPS	Core and Study
Onshore Wind	RPS	Core and Study
Offshore Wind	RPS	Core and Study
Geothermal	RPS	Core and Study
Bioenergy	RPS	Core and Study
Fuel Cells (green H2)	RPS	Core and Study
Small Hydro (existing)	RPS	Core and Study
Large Hydro (existing)	Zero-Carbon	Core and Study
Nuclear (existing)	Zero-Carbon	Core and Study
Zero-Carbon Firm Dispatchable Resource	Zero-Carbon	Study Only
Zero-Carbon Firm Baseload Resource	Zero-Carbon	Study Only

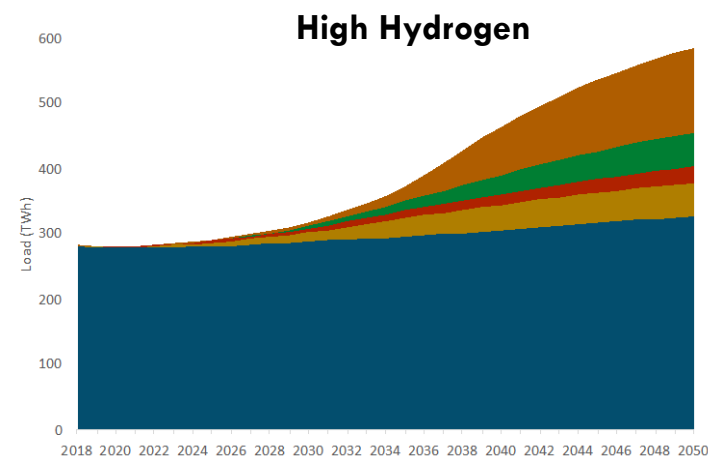
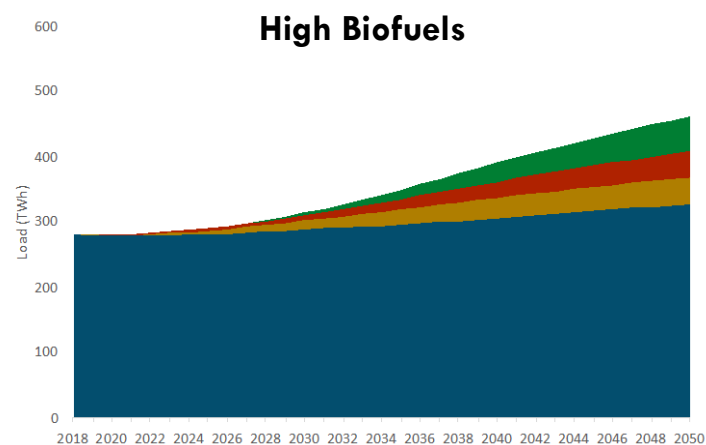
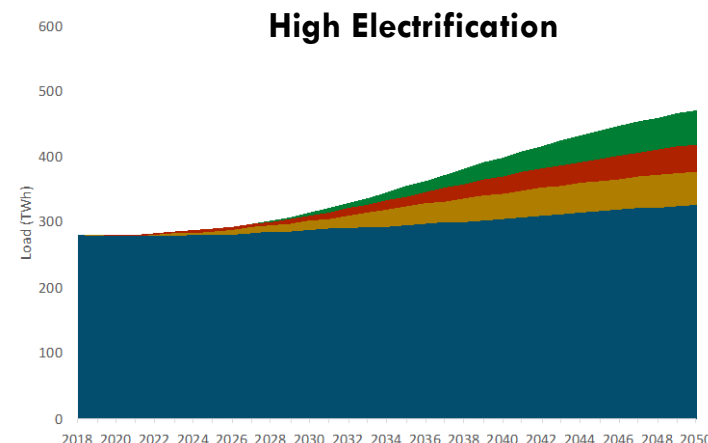
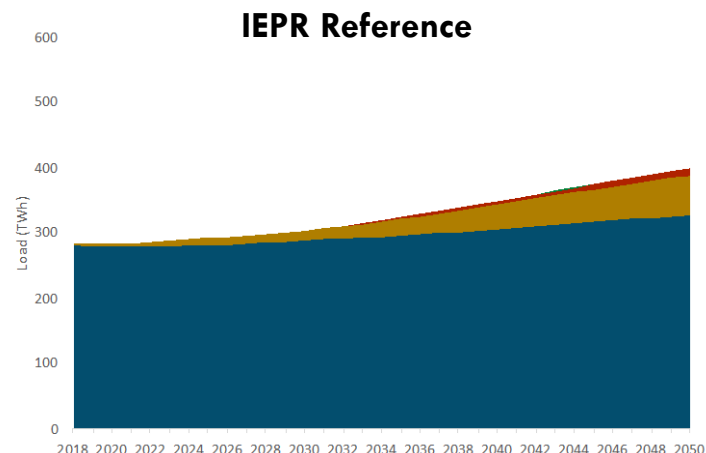


Core Assumptions: Demand Scenarios

PATHWAYS provides

RESOLVE:

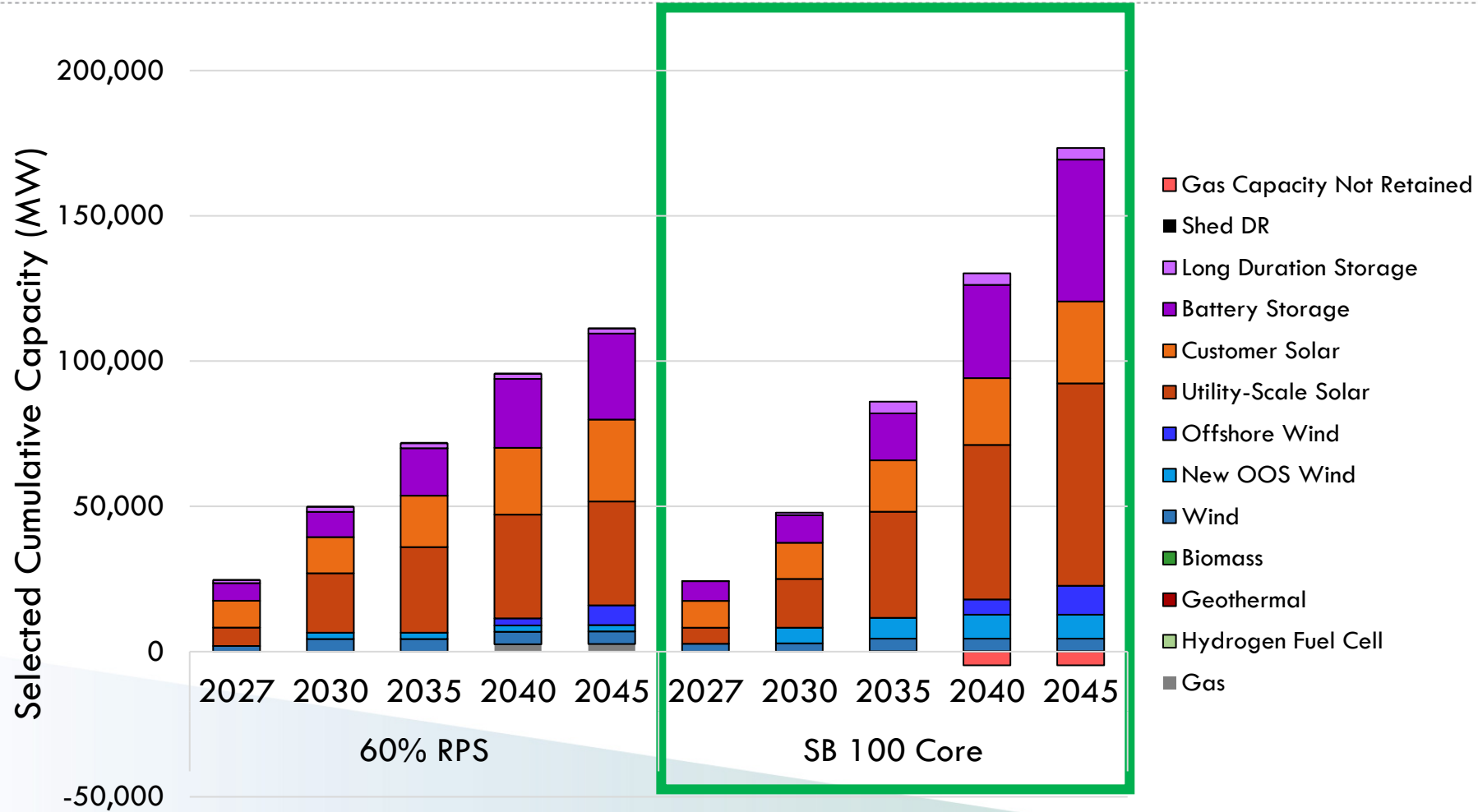
- Annual loads by category (TWh/yr)
- Some load shape information for load modifiers



- Hydrogen
- Building Electrification
- Other Transport
- Electric Vehicles
- Baseload net of EE



SB 100 Requires Significant Resource Build

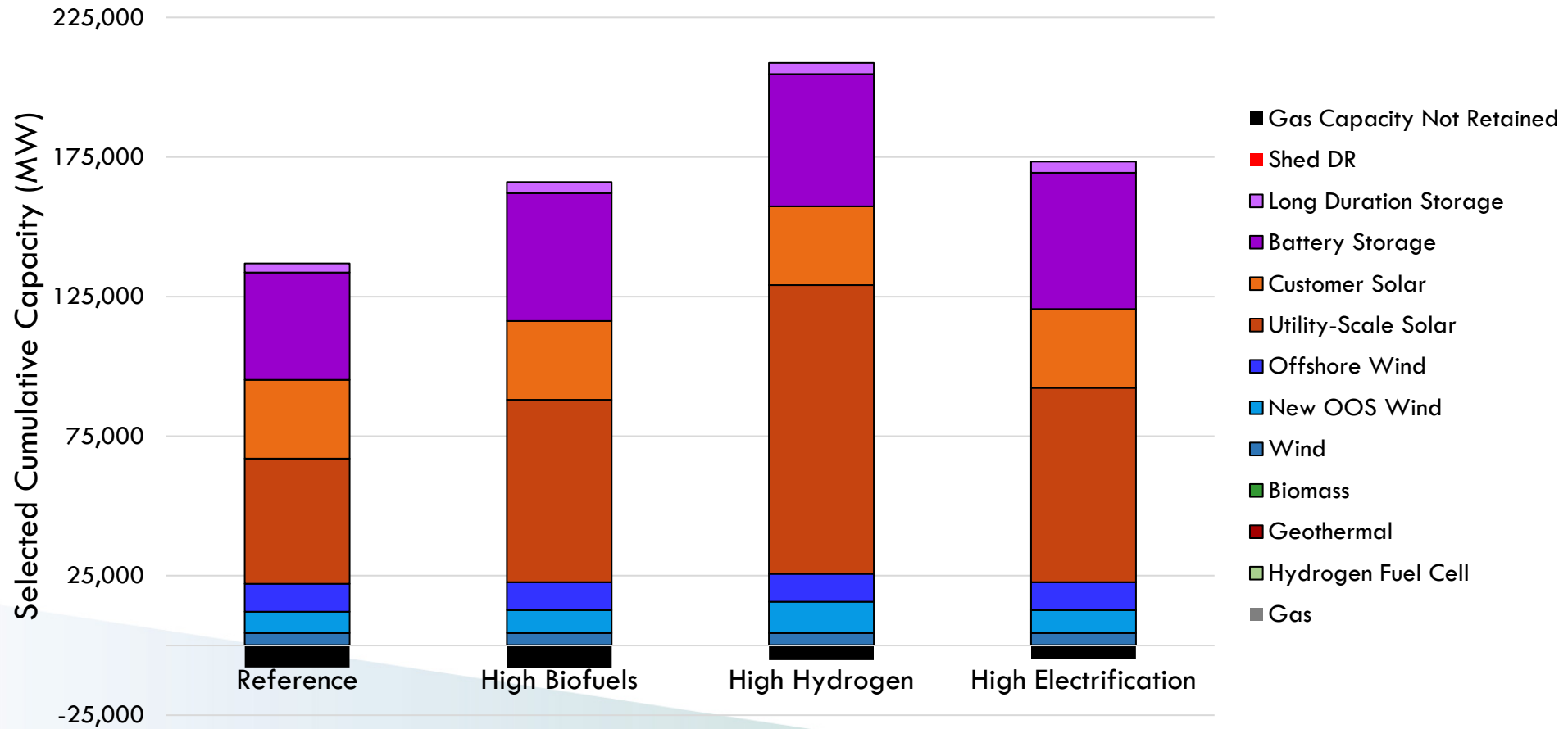


Customer solar shown here is a demand-side assumption. No additional customer solar was selected.

As of 2019, there is 80 GW of in-state capacity in California.



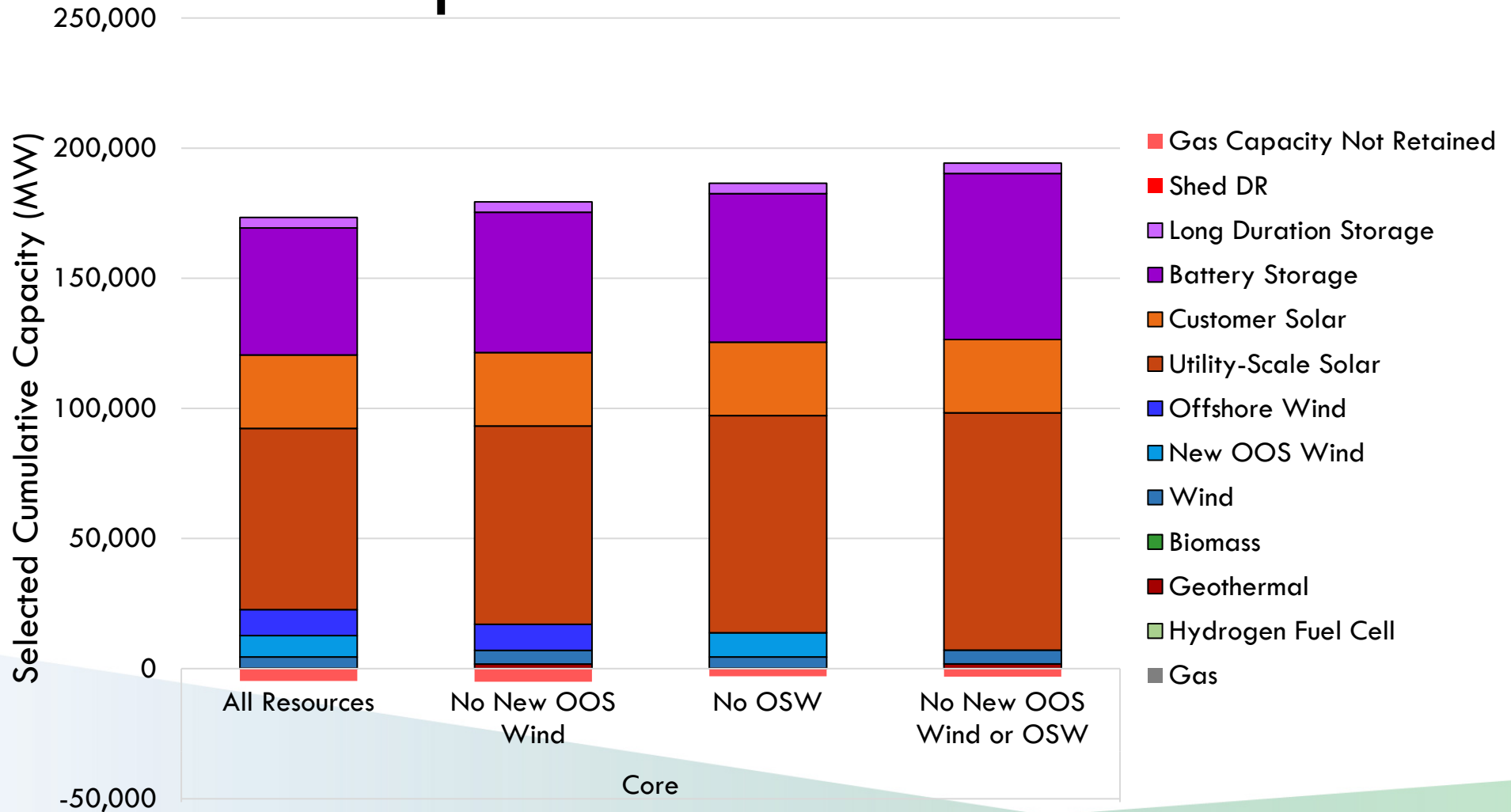
Economy-wide Decarbonization Impacts Resource Requirements





Resource Technology Pursued Impacts

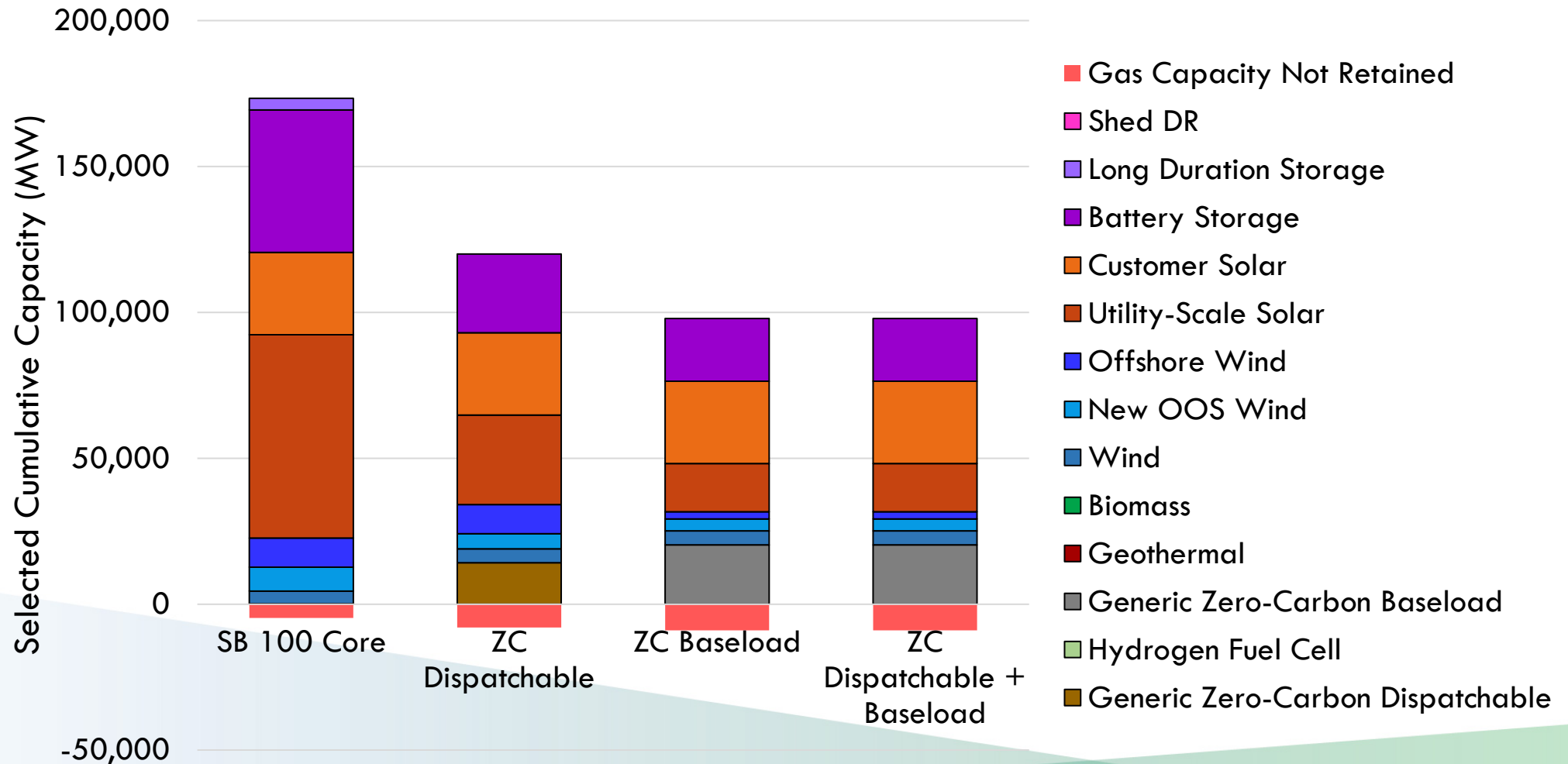
Resource Requirements





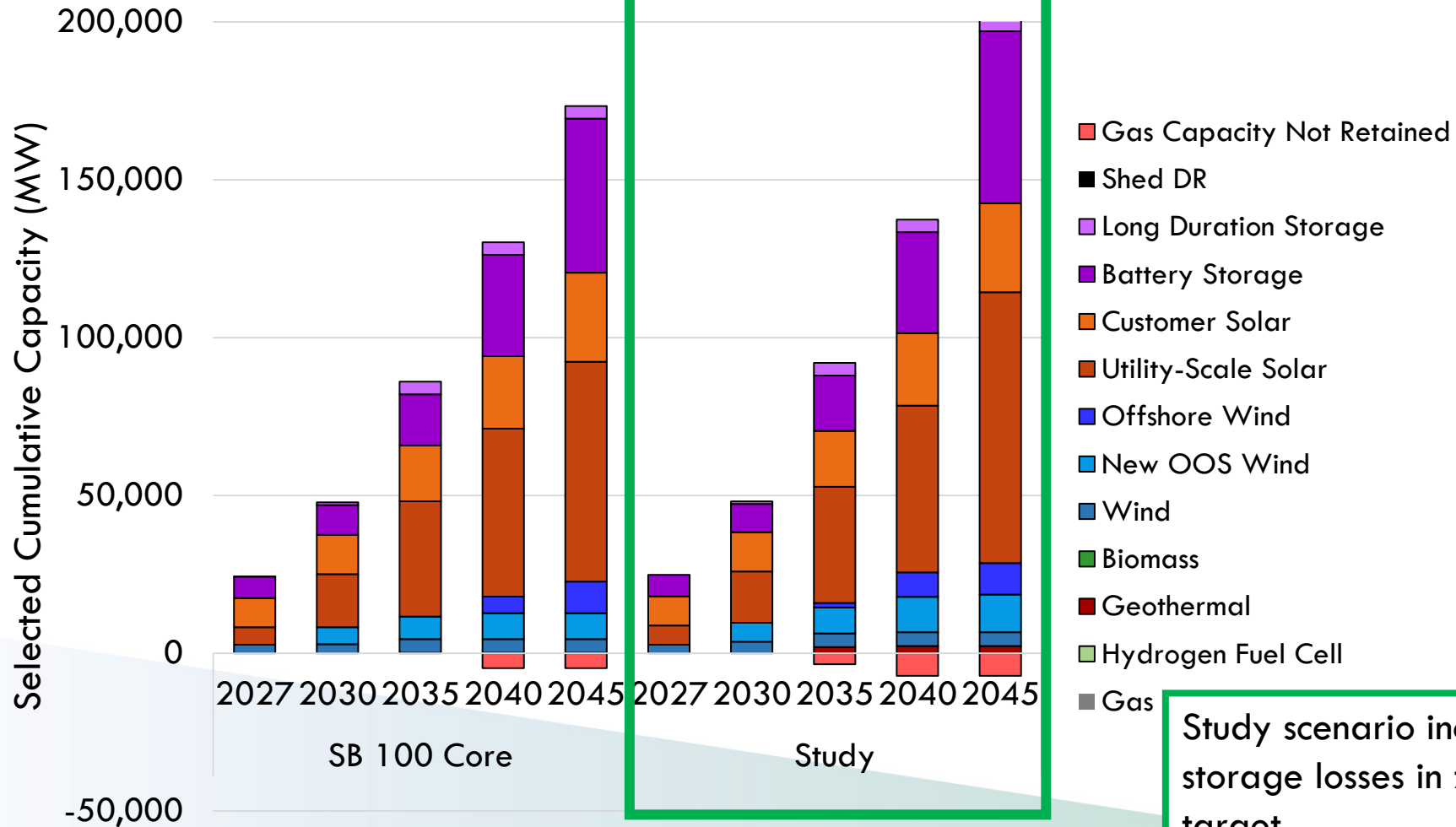
Resource Technology Pursued Impacts

Resource Requirements





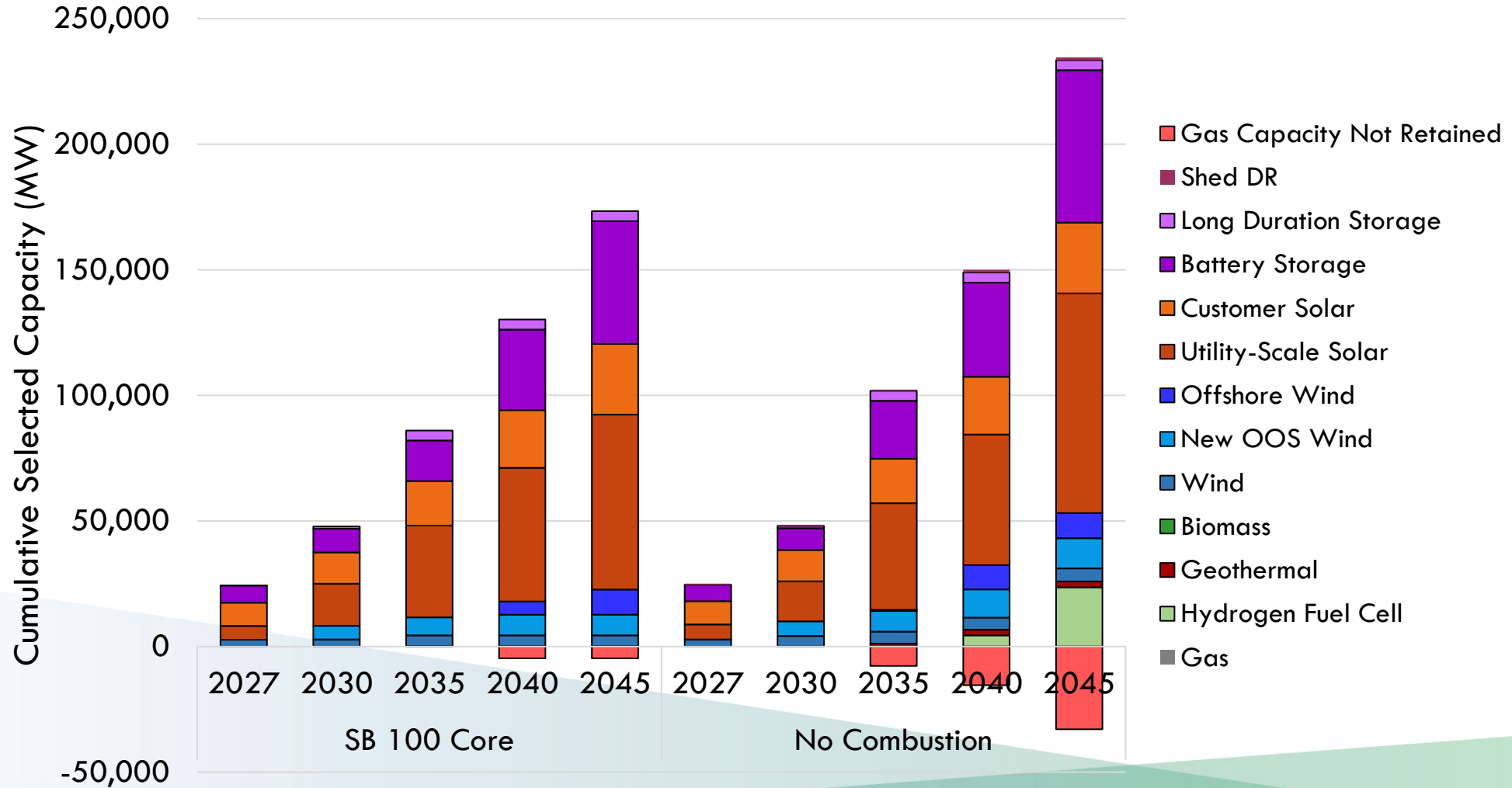
Going Beyond SB 100 Impacts Resource Requirements



Study scenario includes T&D and storage losses in zero-carbon target.



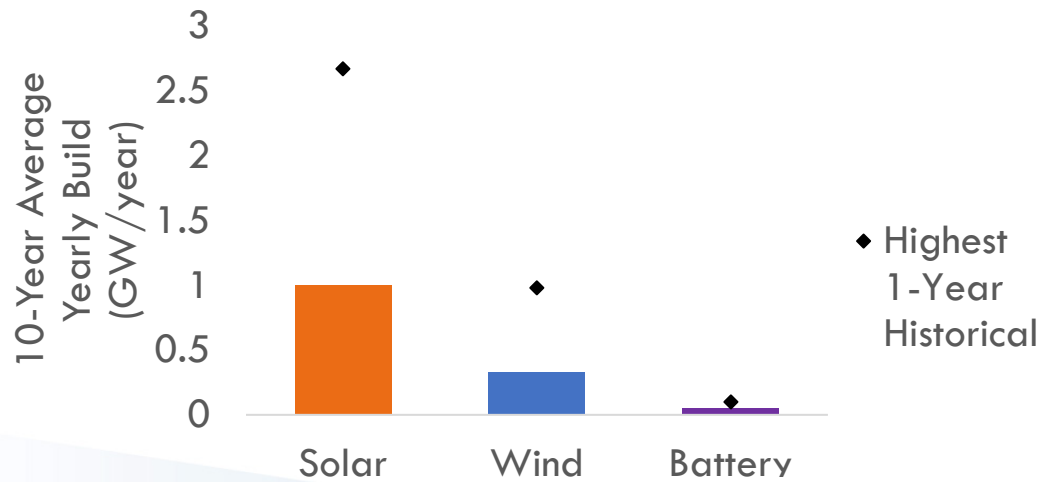
Going Beyond SB 100 Impacts Resource Requirements



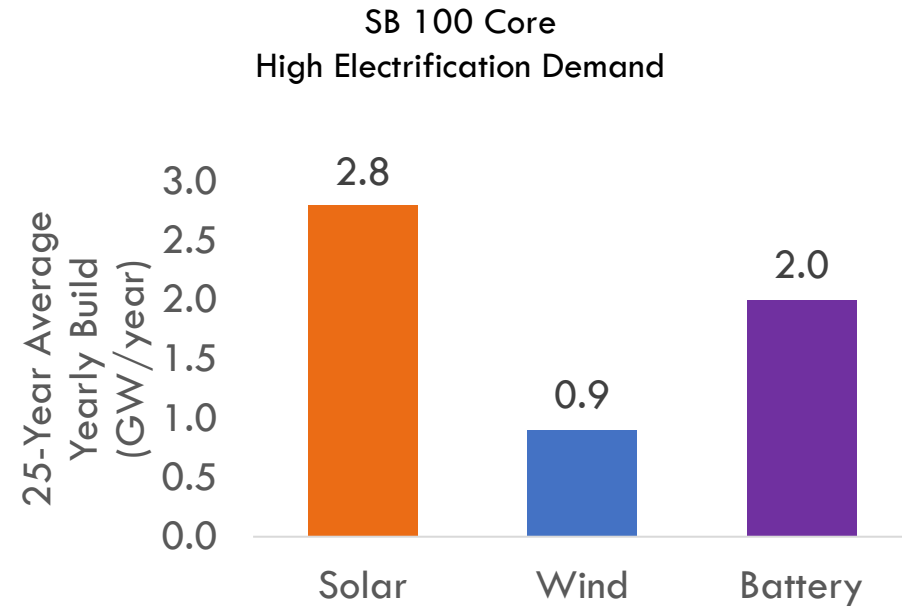


Resource Build Rates

Average Build Rate to Date



Average Build Rate to 2045





Factors that May Impact Resource Build

- Electrification/electric demand
- Changes to gas fleet
- Portfolio diversity
 - Offshore wind, out-of-state wind, geothermal, etc
 - Clean firm resource development/deployment
 - DER deployment
 - Load flexibility
- Land-use constraints



Key Takeaways from Modeling

- The initial analysis suggests SB 100 is technically achievable through multiple pathways.
- Construction of clean electricity generation and storage resources must be sustained at record setting build rates.
- Diversity in energy resources lowers overall costs.
- Retaining some natural gas power capacity may minimize costs while ensuring an uninterrupted power supply during the transition to 100 percent clean energy.
 - Increased energy storage and advancements in zero-carbon firm resources and storage can reduce natural gas needs.
- Further analysis is needed.

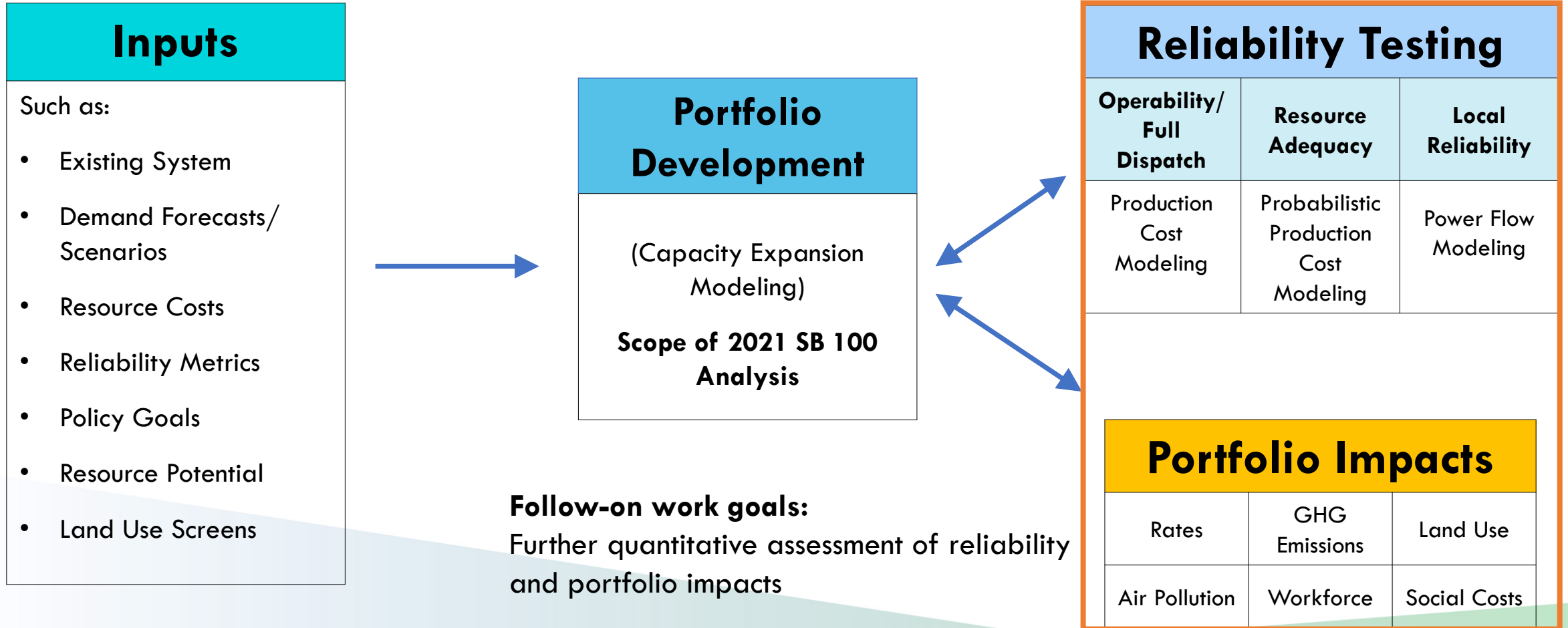


Further Analysis Recommendations

- Verifying that scenario results satisfy the state's grid reliability requirements across a range of conditions.
- Continuing to evaluate the potential effects of cost-saving emerging resources, such as offshore wind, long-duration storage, green hydrogen technologies, and demand flexibility.
- Assessing environmental, social, and economic costs and benefits of the additional clean electricity generation capacity and storage needed to implement SB 100.
- Holding annual workshops to support alignment among the joint agencies and continuity between SB 100 reports.



Further Analysis and Related Work



Inputs, impacts, and tools listed are for illustrative purposes



Further Analysis and Related Work

- SB 100
 - Alternative resource build options
 - Net-energy benefits
 - Reliability (long-term)
- Related Work
 - Role of DERs
 - Load Flexibility
 - Reliability (near- and mid-term)
 - Demand Scenarios

SB 100 Annual Workshop: Fall 2021 / Winter 2022



Thank you!

The 2021 SB 100 Joint Agency Report and Summary Document
can be found at:

<https://www.energy.ca.gov/sb100>