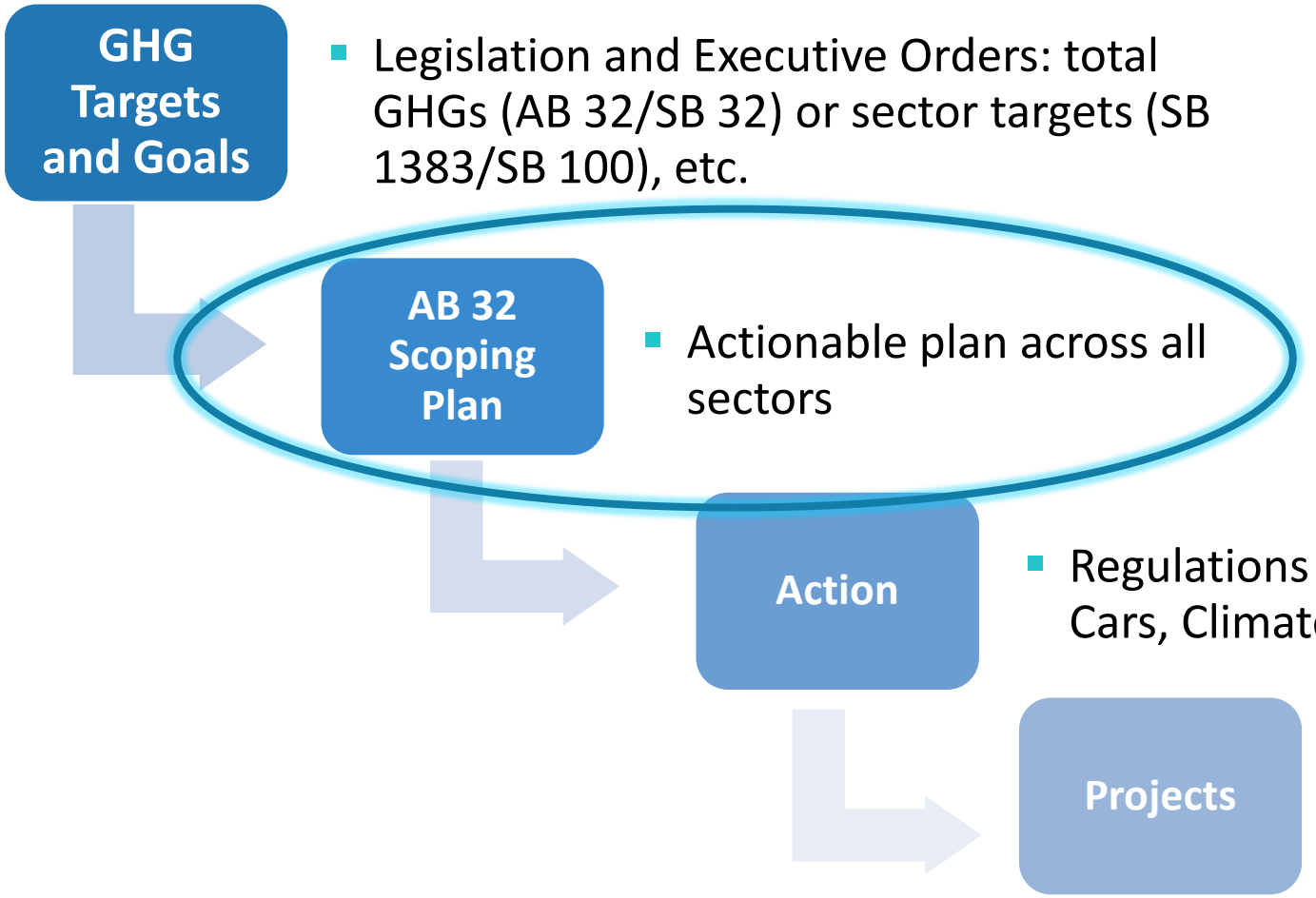
Draft Scenarios for Achieving Carbon Neutrality in the 2022 Scoping Plan Update

MARCH 30, 2022

AB 32 Climate Change Scoping Plan Statutory Requirements

- Scoping Plan(s) are action plans for CA to meet statewide GHG reduction targets
  - Scoping Plan(s) outline a suite of climate policies to address emissions across all sectors
  - Required to be updated at least every 5 years
  - 2017 SP (most recent) – cost-effective and technologically feasible path to achieve the 2030 target
- Provide direct GHG emissions reductions and air quality benefits
- Minimize emissions "leakage" – increase to non-CA GHG emissions
  - Ensure high-road jobs remain
- Facilitate sub-national and national collaboration
  - Develop exportable programs for partners to adopt
- Support cost-effective and flexible compliance

California's Climate Policy Framework



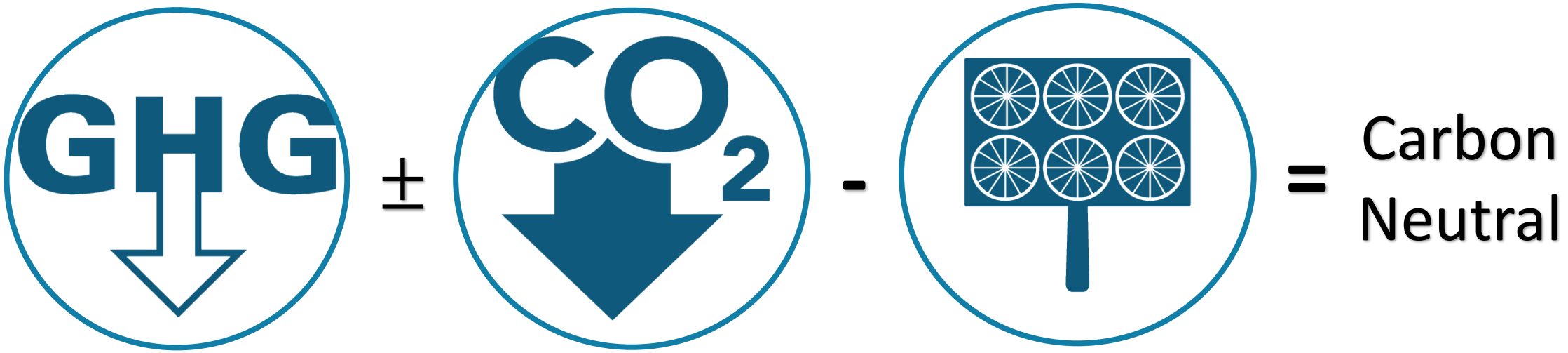
- Legislation and Executive Orders: total GHGs (AB 32/SB 32) or sector targets (SB 1383/SB 100), etc.
- Actionable plan across all sectors
- Regulations & Incentives: Advanced Clean Cars, Climate change investments, etc.

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

Input Received for Scenario Design

- More than 90 comments from industry, EJ organizations, and individuals on AB 32 Source scenarios
- Comments from EJ Advisory Committee
  - https://ww2.arb.ca.gov/sites/default/files/2021-12/EJAC%20Final%20Responses%20to%20CARB%20Scenario%20Inputs_12_2_21.pdf
  - https://ww2.arb.ca.gov/sites/default/files/2022-01/Scenario Slides for Jan25 EJAC Mtg_01242022.pdf
- More than 90 comments from topical experts, affected stakeholders, and EJ organizations on NWL scenarios
- Two EJ Advisory Committee Working Group meetings
  - https://ww2.arb.ca.gov/sites/default/files/2022-02/Draft%20EJAC%20NWL%20Workgroup%20Notes.pdf

What Carbon Neutrality Means



Continue to reduce emissions from sources in the AB 32 GHG Inventory

Emissions and sequestration from natural and working lands

Technological Carbon Dioxide Removal

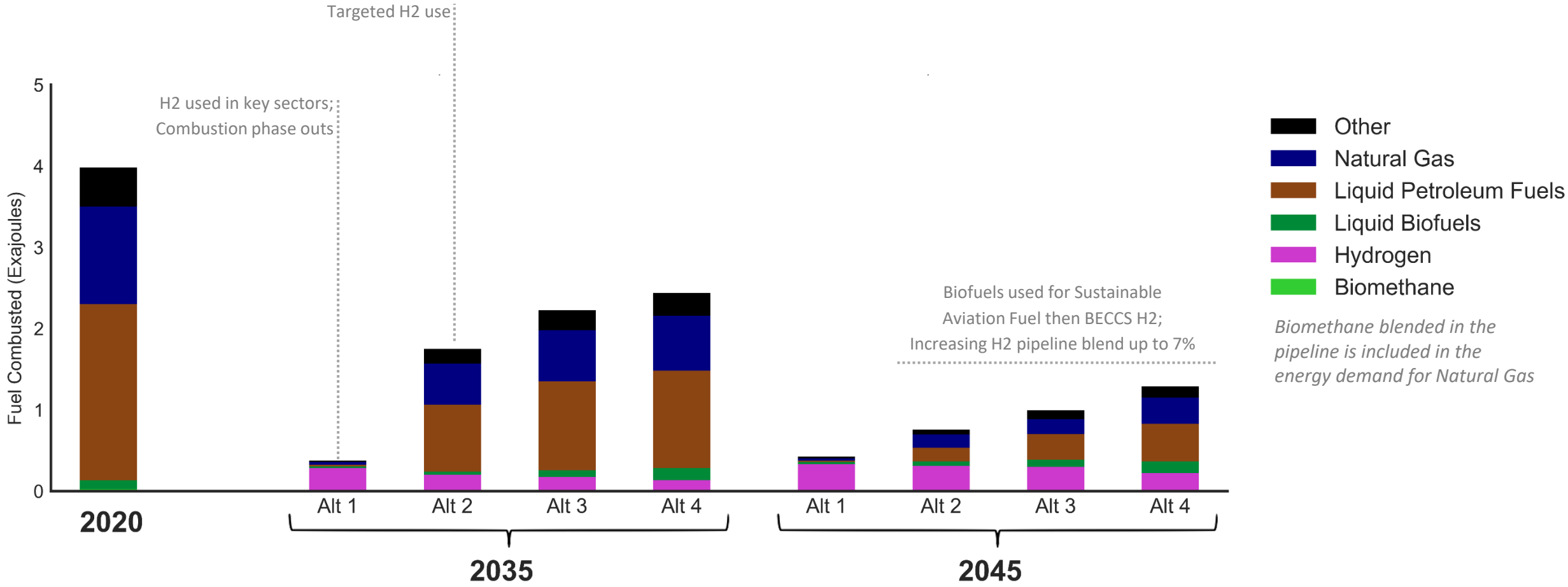
AB 32 Sources Scenarios Overview

2035	Alternative 1: Nearly complete phaseout of combustion, limited reliance on engineered carbon removal, restricted applications for biomass derived fuels, and ambitious innovation in electric technology and aggressive consumer adoption trends (e.g. electric aviation adoption and 100% electrification by 2035).
2035	Alternative 2: Use full suite of technology options, including engineered carbon removal
2045	Alternative 3: Use a broad portfolio of existing and emerging fossil fuel alternatives and alignment with statutes and Executive Orders
2045	Alternative 4: Use existing and emerging technologies, slower rate of clean technology and fuel deployment and consumer adoption.

Key Metrics

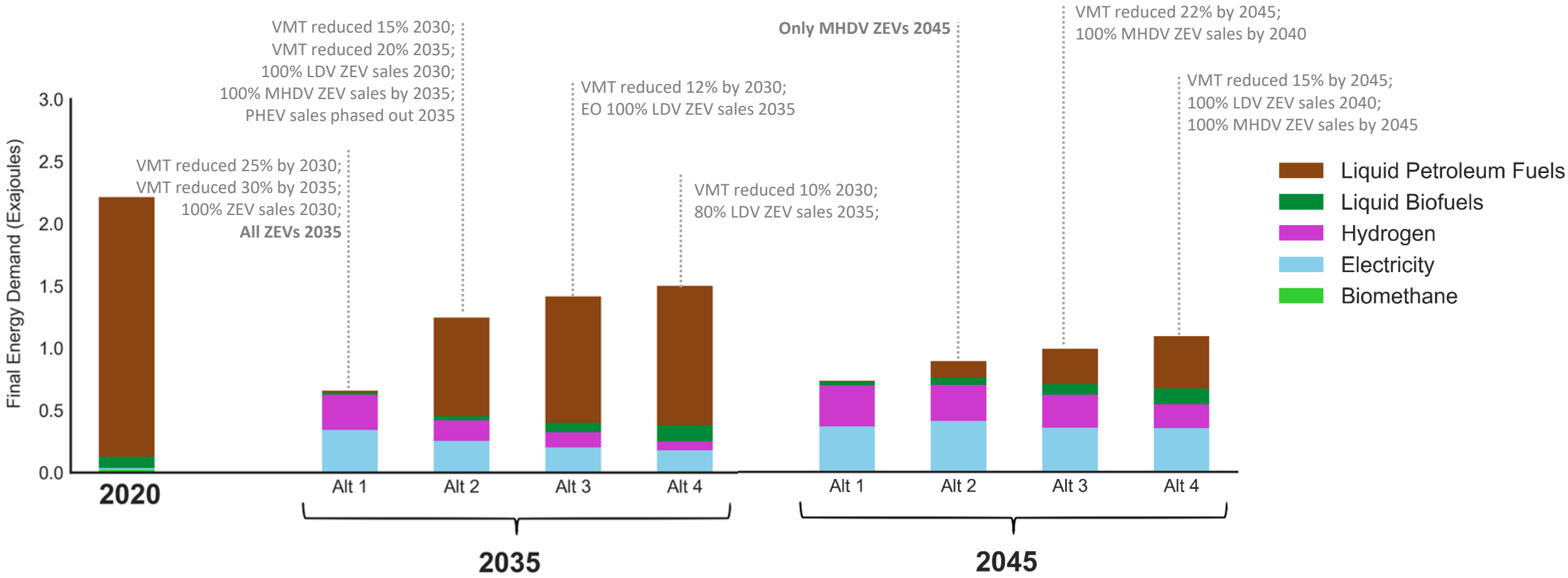
	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Annual Build Rates Historic Max Builds: Solar: 2.7GW Battery: 0.3GW	Solar: 10GW Battery: 5GW	Solar: 5GW Battery: 3GW	Solar: 7GW Battery: 2GW	Solar: 6GW Battery: 2GW
Vehicle Early Retirements US-wide Cash for Clunkers $3B and 690k vehicles	LDV: 16M 5-16 yr. old MHDV: 1.4M 5-16 yr. old	LDV: 0 MHDV: 0.6M 10-20 yr. old		
Residential Early Retirements	7M electric homes. Appliances 5-16 yr old			
Hydrogen Demand & Electrolysis Need Total CA Capacity: 83GW	Percent 2020 US: 19% Solar: 47GW	Percent 2020 US: 18% Solar: 44GW	Percent 2020 US: 17% Solar: 41GW	Percent 2020 US: 13% Solar: 31GW
Petroleum Refining Remaining	2035: 0% 2045: 0%	2035: 25% 2045: 8%	2035: 33% 2045: 13%	2035: 39% 2045: 18%
Total CCS Needs Industrial & Refining	2035: <1MMT 2045: <1MMT	2035: 8MMT 2045: 2.4MMT	2035: 10MMT 2045: 4MMT	2035: 11MMT 2045: 5MMT
Residual Emissions Current global DAC 0.01 MT/year	2035: 48MMT 2045: 37MMT	2035: 154MMT 2045: 76MMT	2035: 0MMT 2045: 100MMT	2035: 0MMT 2045: 120MMT

Phase Down Reliance on Fossil Fuels

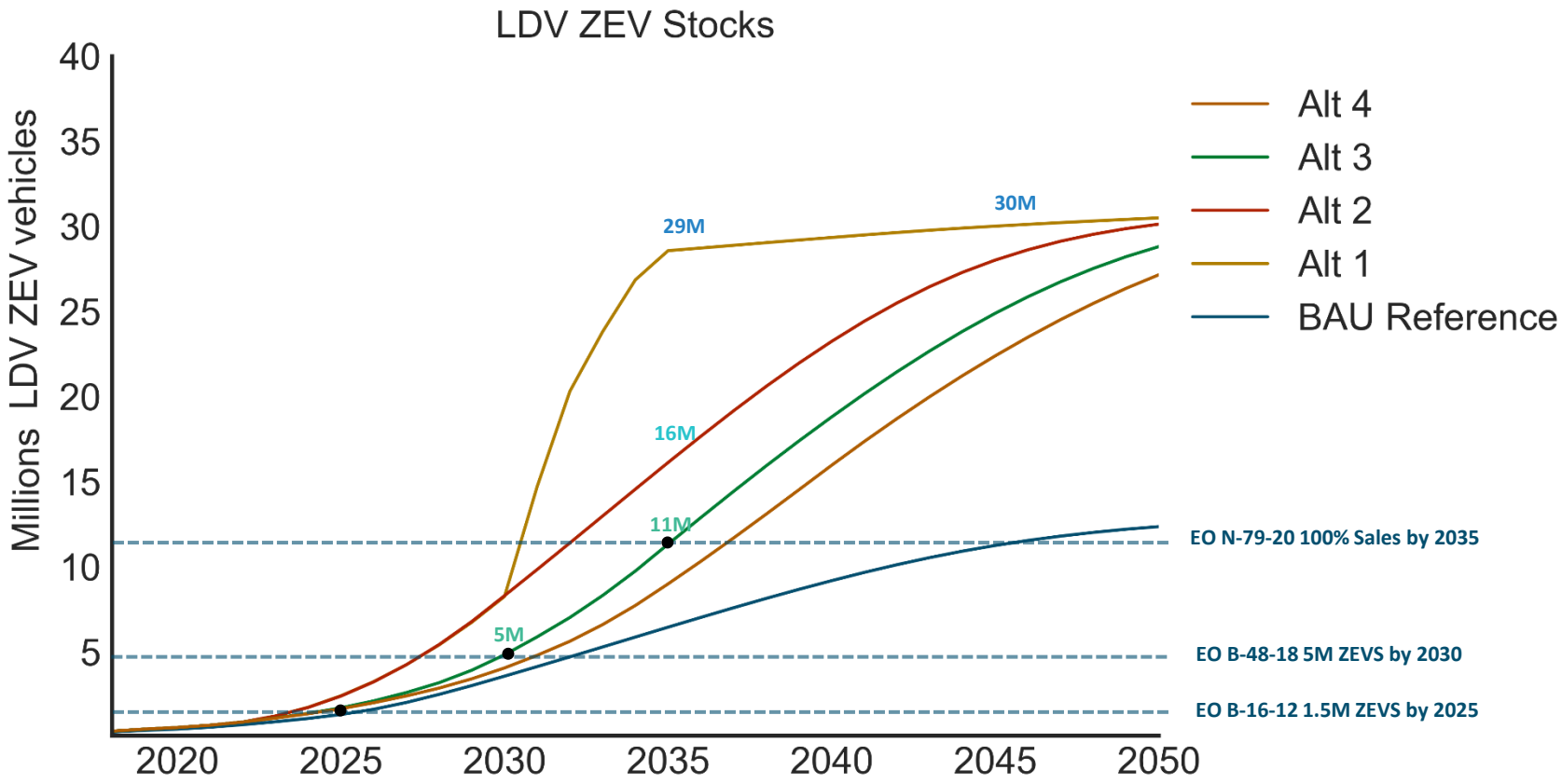


Biomethane blended in the pipeline is included in the energy demand for Natural Gas

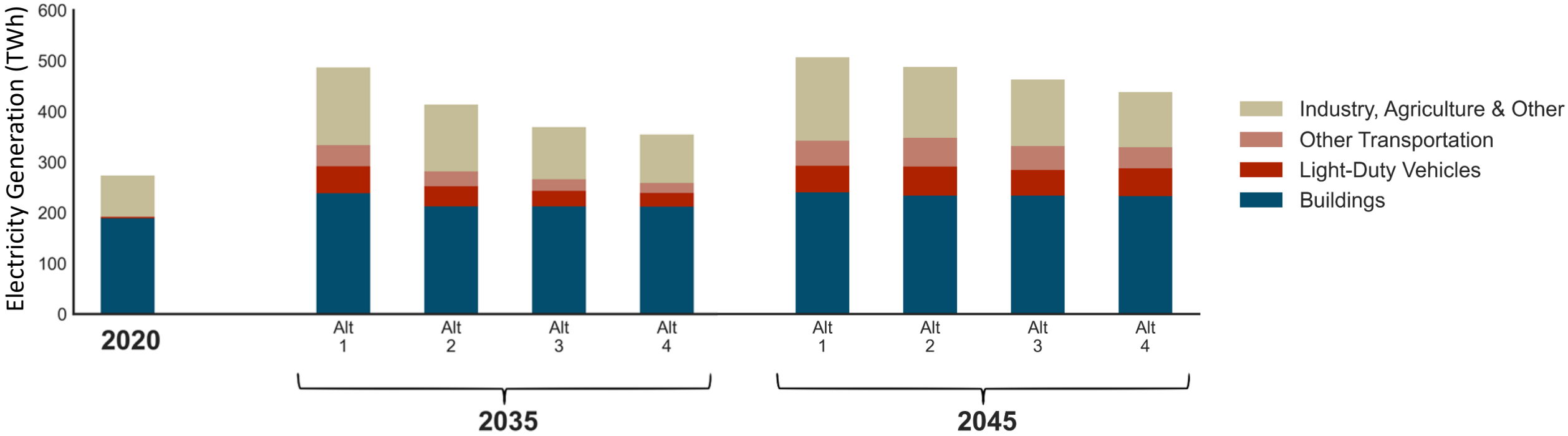
Transportation Sector Transition



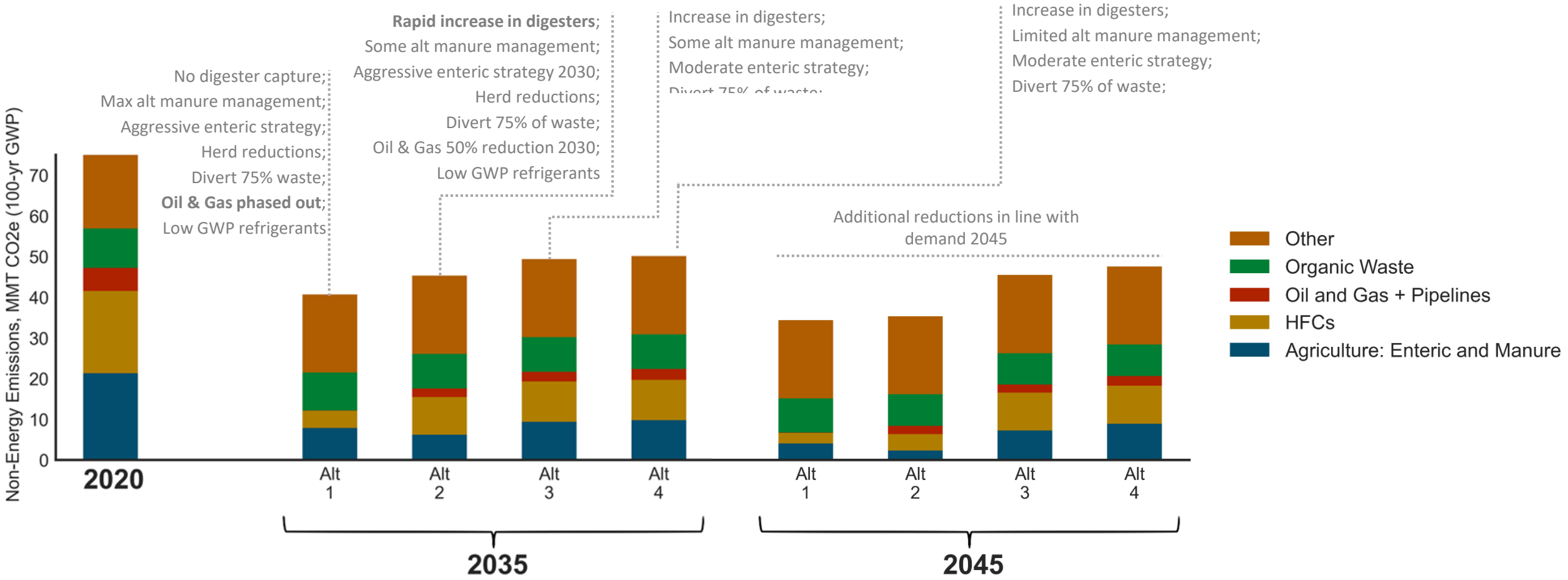
California Vehicle Stock Transition



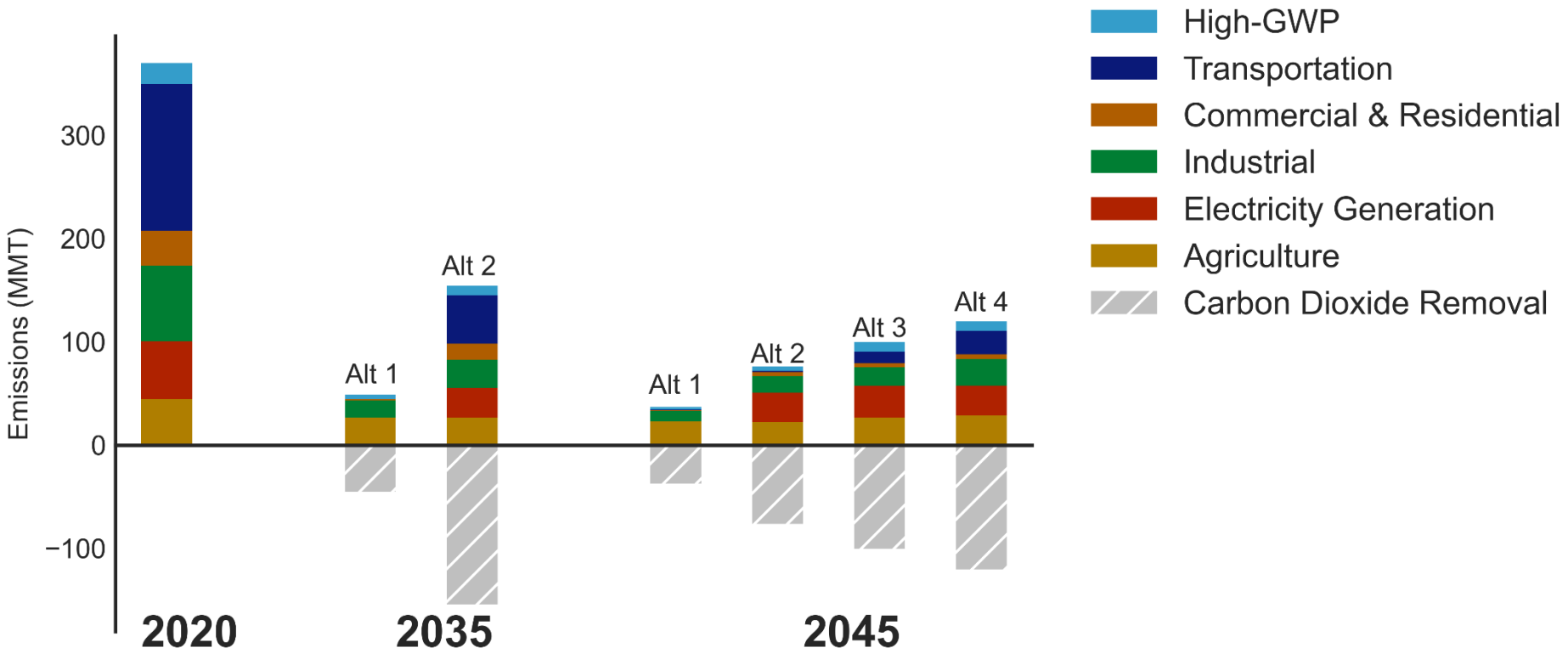
Electric Sector Transition



Non-Combustion Emissions



Potential Role of Carbon Dioxide Removal to Achieve Carbon Neutrality

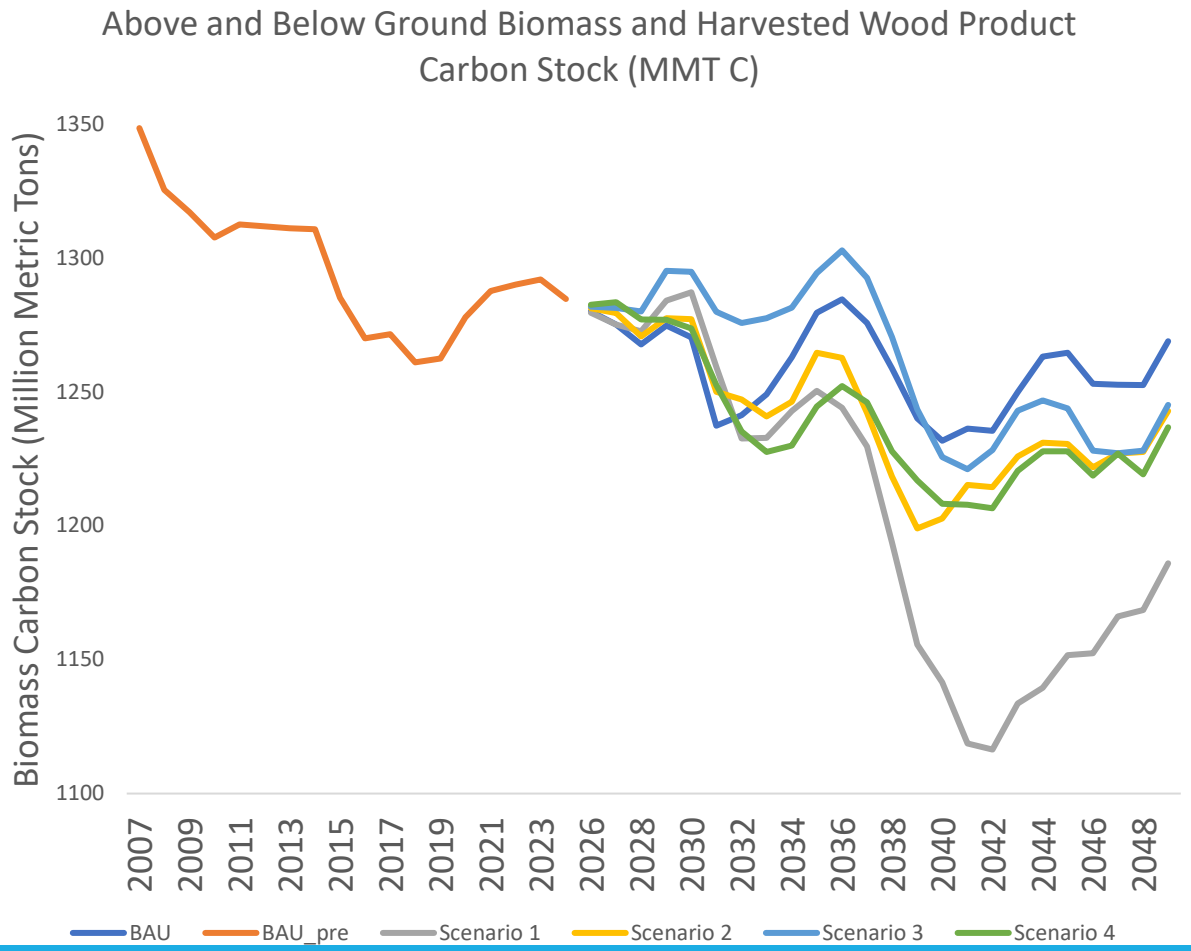


Emissions shown after CCS, before CDR

Natural and Working Lands Carbon Alternatives

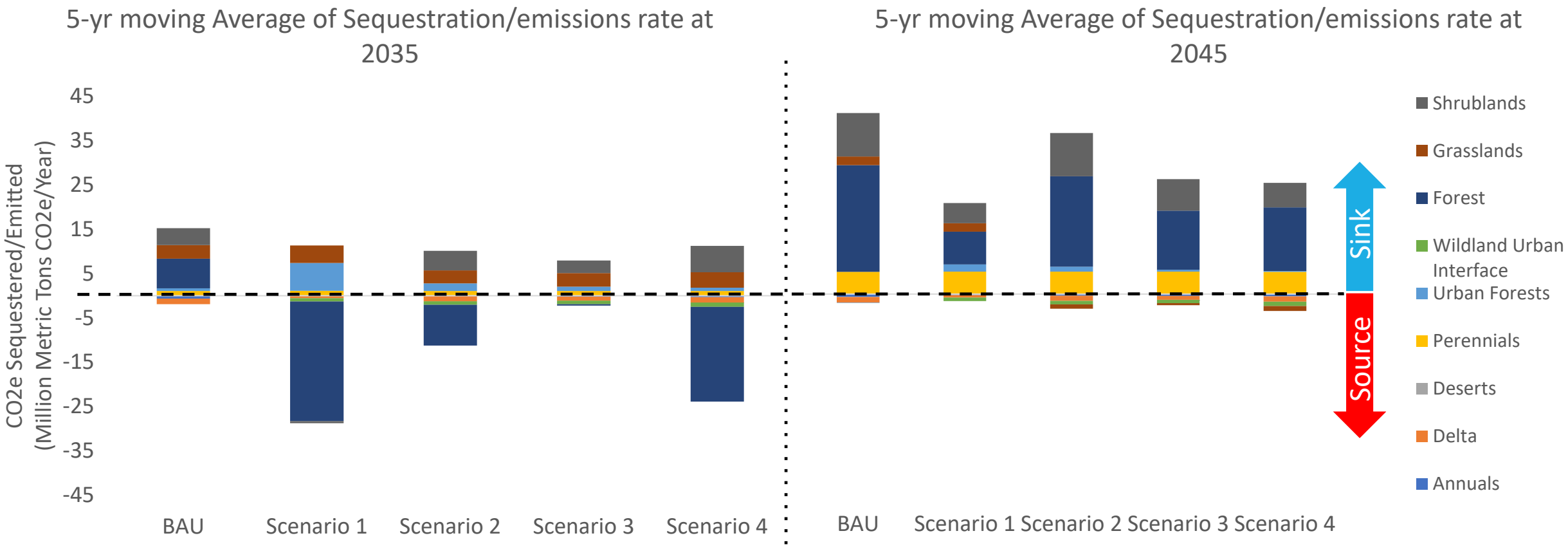
- NWL Alternative 1: Prioritize maximizing short term carbon stock at 2045
- NWL Alternative 2: Balanced mix of strategies from current commitments/plans
- NWL Alternative 3: Prioritize restoration and climate resilience
- NWL Alternative 4: Prioritize forest wildfire and other fuel reduction efforts

Results Example – Forest Carbon



- Forests are largest carbon stock pool in the State
- Modeling included wildfire impacts on carbon stocks
- Scenario 2,3,4 = significant increase in management from BAU, which decreases severity of fires, while not negatively impacting overall forest carbon stock.
- Post-2050 modeling in progress given forest timelines
- Additional results forthcoming on reduced forest fire emissions, health, and economics to show overall effect of expanded forest management

All NWL Sequestration/emissions Rate at a Given Year



Summary

INDUSTRY AND ENERGY

- All scenarios achieve drastic reductions in fossil fuel combustion
  - Deliver air quality and GHG benefits
- There is no path to zero without carbon dioxide removal
  - Short-lived climate pollutants persist beyond combustion phase out
- Rates of clean technology and energy deployment are unprecedented
- Need to keep clean energy options open

NATURAL AND WORKING LANDS SCENARIOS

- Climate action needed to improve ecosystem climate resilience
  - Protect ecosystems against future climate change
  - Ensure provision of services to nature and society
  - Protect communities
- High-levels of action on forests can decrease wildfire risk and improve forest health without substantial carbon loss
- Increasing actions on other lands can improve carbon storage and reduce emissions from this sector
- Natural variability exists - the ability for NWL to contribute to CN is dependent on future climate change and varies from year to year

Additional Analyses for 2022 Scoping Plan Update

- Health and Economic Analyses
  - AB 197 social cost of carbon, cost per ton of measure, estimated air quality
  - Economic (health, macro, household, jobs)
- Public Health
- Environmental (CEQA)

Next Steps – Prior to Release of the Draft 2022 Scoping Plan Update

Workshops

Modeling results workshops (March/April)

Transportation sector workshop (April)

Board Engagement

1st Board meeting (June)

Environmental Justice Advisory Committee

2 standing meetings per month

Topical Workgroup meetings as needed

Community Meetings

EJAC-led community meetings with CARB staff assistance

2022 Scoping Plan Update Schedule