Rhodium Group

Initial Economic Modeling of California's Scoping Plan

Macroeconomic impacts across the four Scoping Plan scenarios

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Emily Wimberger
Climate Economist
ewimberger@rhg.com

Impacts are Measured In the Context of a Growing California Economy

- The California Air Resources Board and the California Department of Finance forecast that the California economy and employment will continue to grow relative to today's levels
  - The California economy is anticipated to grow 2% each year, from $3.2 trillion in 2021 to $5.1 trillion in 2045
  - Employment in California is anticipated to grow 0.7% each year, from 23.5 million jobs in 2021 to 27.7 million jobs in 2045
- The impact on Gross State Product and employment are shown as negative impacts relative to a growing California economy in 2035 and 2045—which translates to a very minor slowing of California economic and job growth

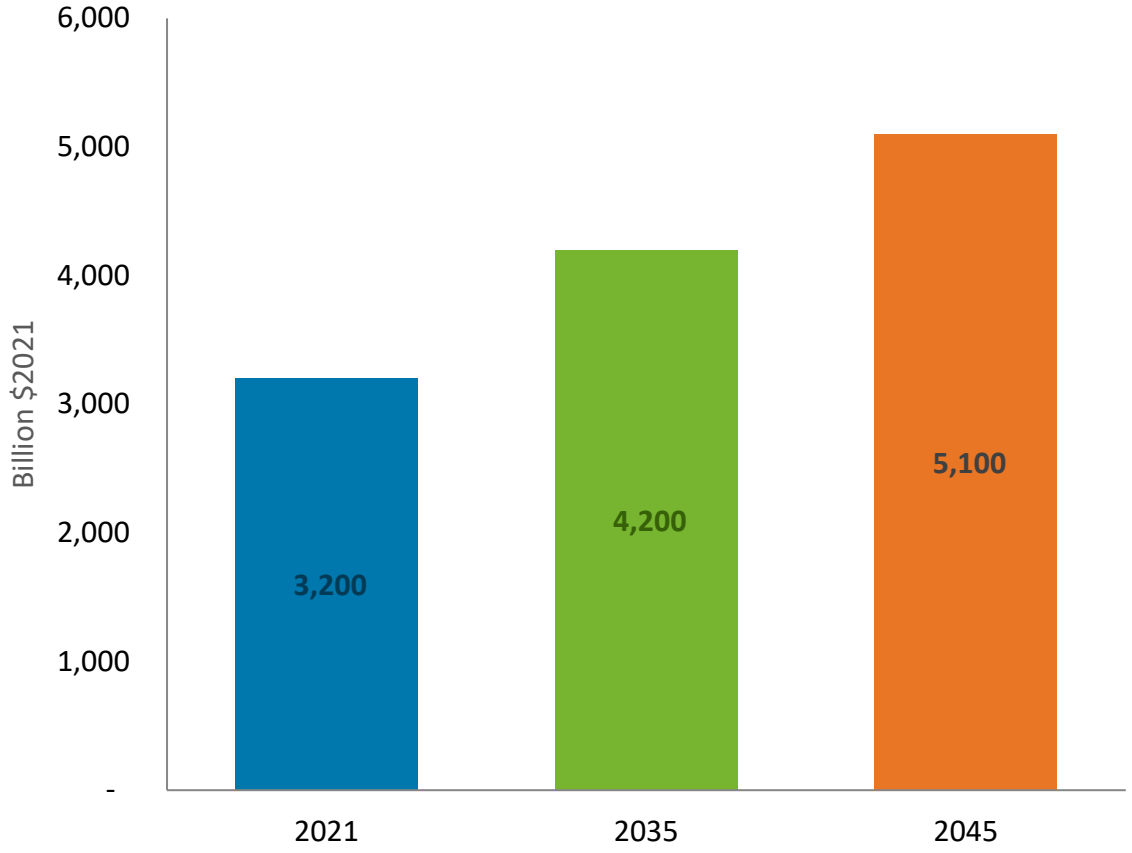
Source: California Air Resources Board

Projections of California Economic and Job Growth, 2035 and 2045

CARB projections based on Department of Finance forecasts

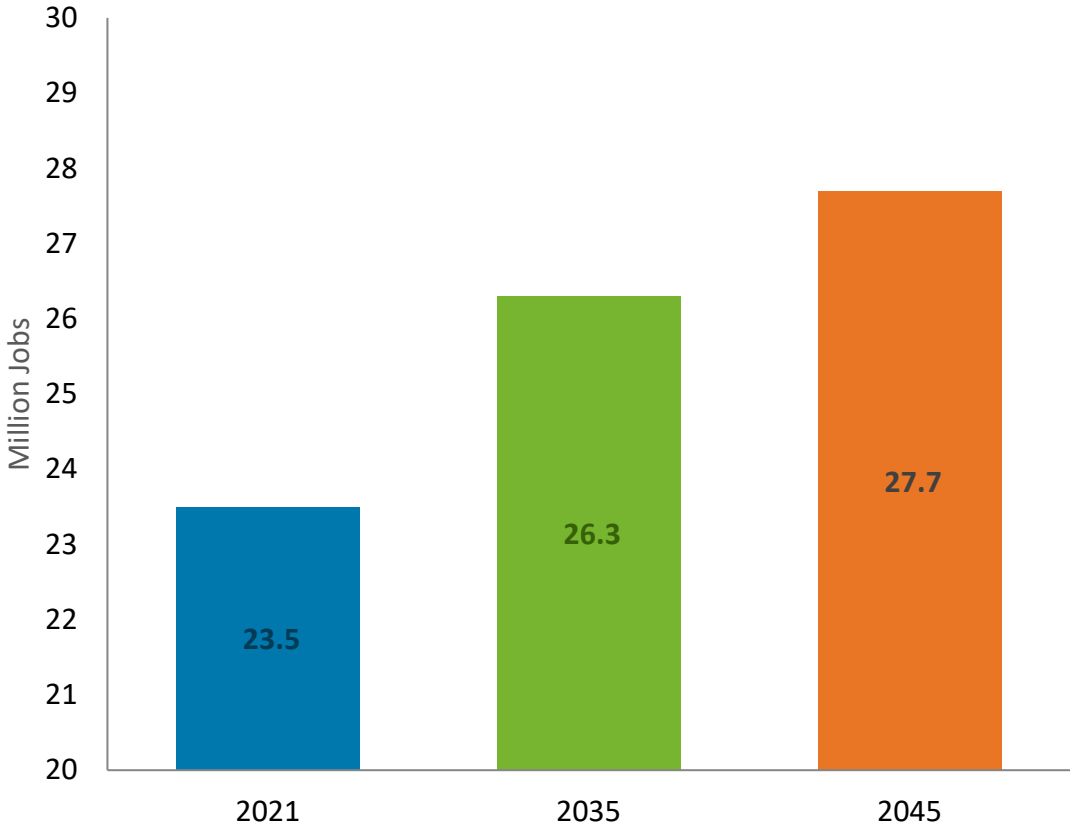
California Gross State Product Growth, 2035 and 2045

CARB forecast in billion $2021



California Employment Growth, 2035 and 2045

CARB forecast

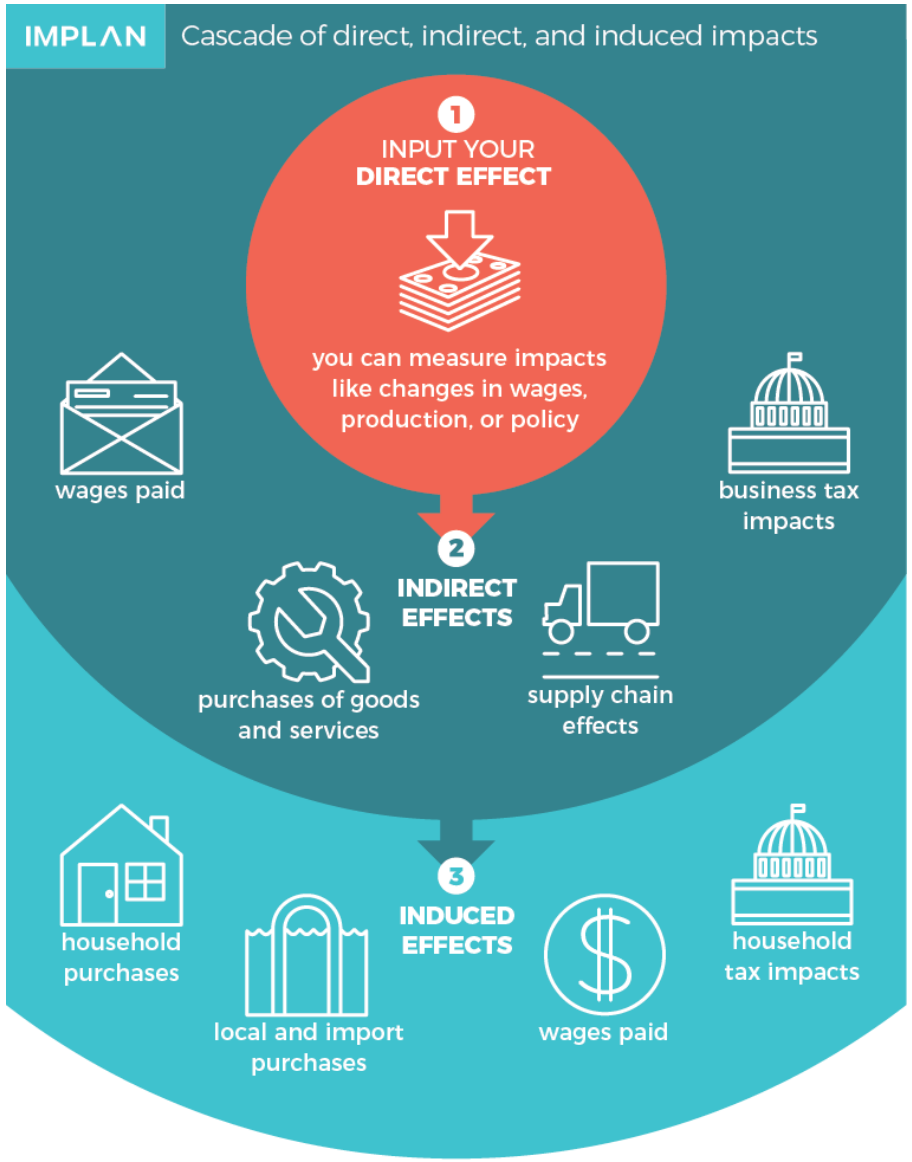


Source: California Air Resources Board

Macroeconomic impacts are estimated using IMPLAN

- IMPLAN is an input-output modeling system that uses annual, regional data to map economic relationships across industries, households, and governments in an economy
- The data contains 546 sectors representing private industries in the US classified by NAICS code
- Impacts can be assessed at the state and county level
- IMPLAN data updated annually from more than 90 sources including:
  - US Bureau of Economic Analysis (BEA)
  - US Department of Agriculture (USDA)
  - US Bureau of Labor Statistics (BLS)
  - US Census Bureau
  - National Center for Education Statistics (NCES)

IMPLAN estimates the economic impact to changes in an economy



Source: IMPLAN

Inputs

Costs and savings from PATHWAYS representing changes in spending by businesses and households

Outputs

Changes in spending and employment across the California economy, California businesses, households

Translation of PATHWAYS direct costs to IMPLAN

Carbon Dioxide Removal

- PATHWAYS direct costs for liquid solvent Direct Air Capture (DAC) technology powered by off-grid solar
- PATHWAYS costs are modeled by changing expenditures in the solar electricity industry
- The cost of DAC is passed through to consumers, reducing household spending

Stock costs

- Modeled as changes in commodity by subsector (residential lighting, light duty vehicles, commercial cooking, etc.)
- Changes in commercial ventilation from PATHWAYS are modeled as changes to air purification and ventilation equipment in IMPLAN
- The cost of stock is passed through to consumers, reducing household spending

Demand change measure costs

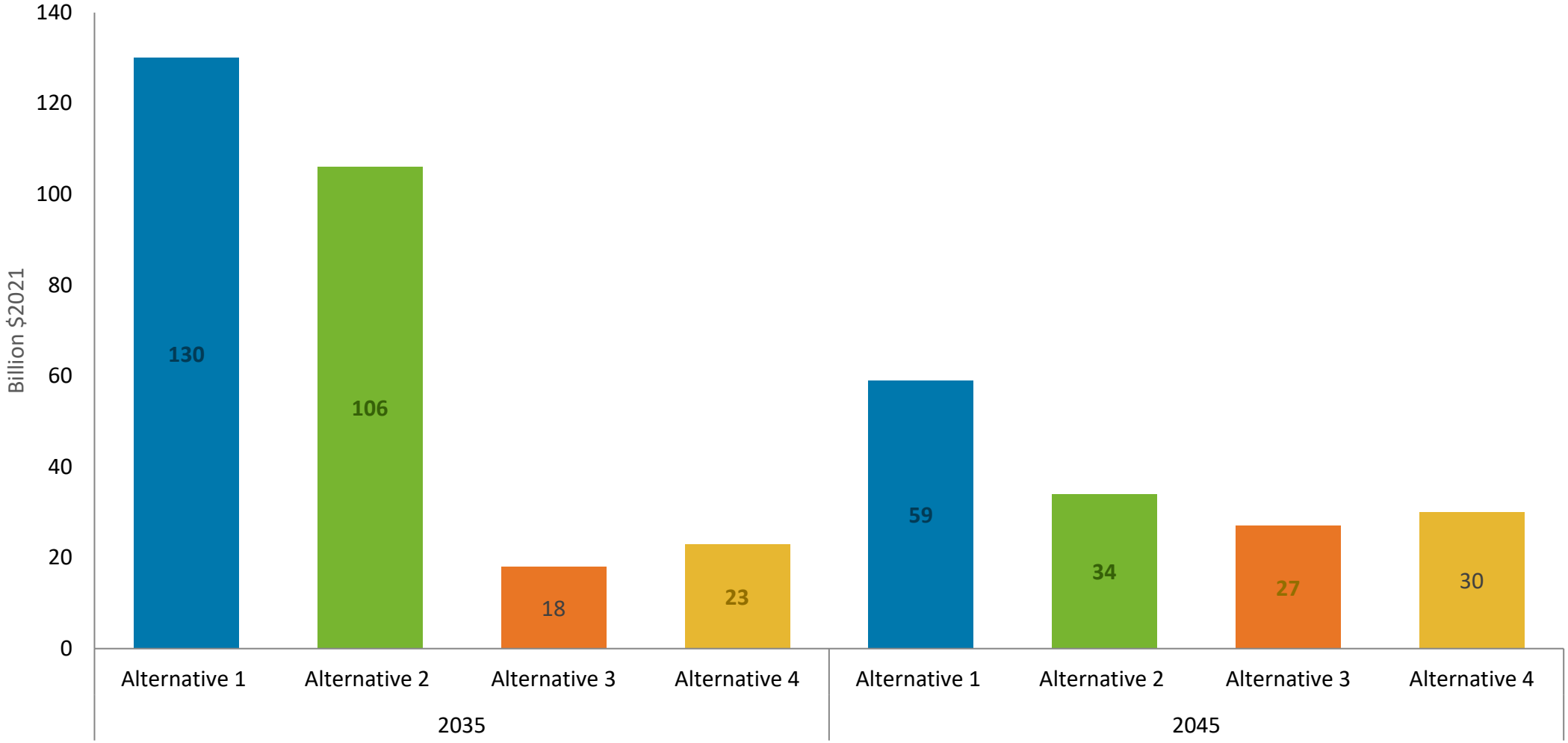
- Reflect energy efficiency across subsectors
- Modeled as changes in industry by subsector
- For example, a cost for a demand change in fabricated metal is modeled as a change in the output of fabricated metal
- The cost of the demand change is passed through to consumers, reducing household spending

Fuel costs

- Changes in expenditures across fuel and energy categories (electricity, gasoline, diesel, pipeline gas, etc.)
- The impact of a change in energy or fuel cost is modeled as a change in the industry that produces the fuel or energy
- A reduction in diesel costs in heavy duty trucking is modeled as a change in the petroleum refining industry in IMPLAN

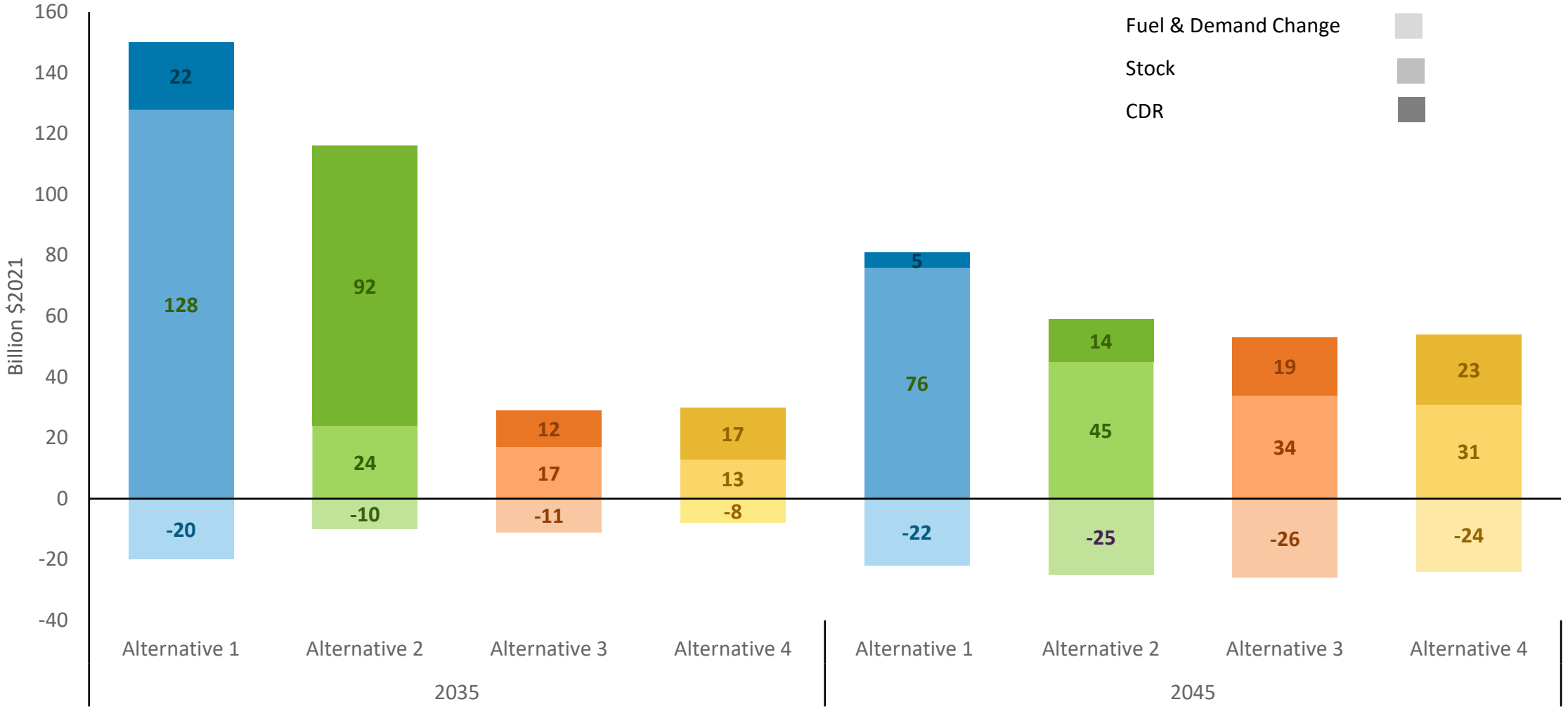
Direct Cost by Scenario, 2035 and 2045

Costs from PATHWAYS in a single year relative to the growing California economy



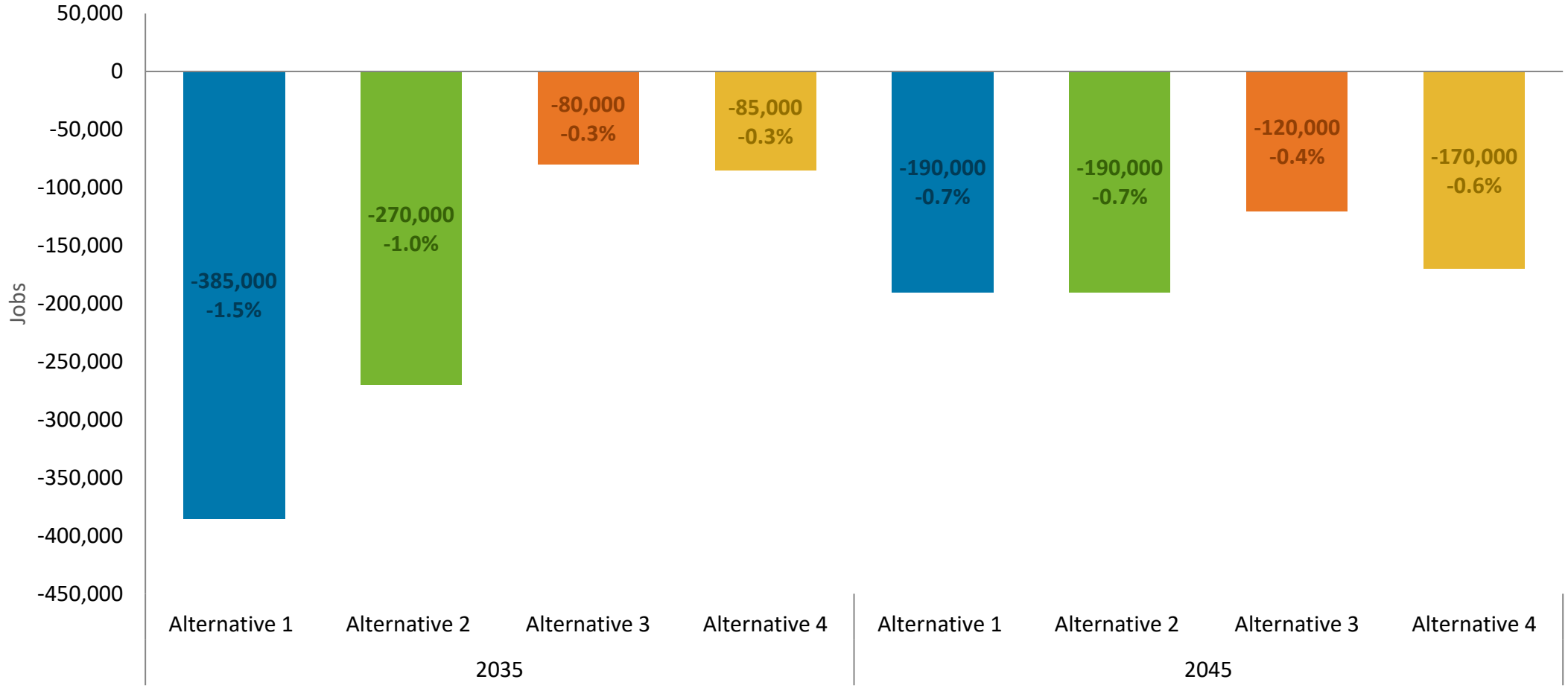
Direct Cost by Scenario, 2035 and 2045

Costs and savings from PATHWAYS in a single year relative to the growing California economy



Employment by Scenario Including CDR, 2035 and 2045

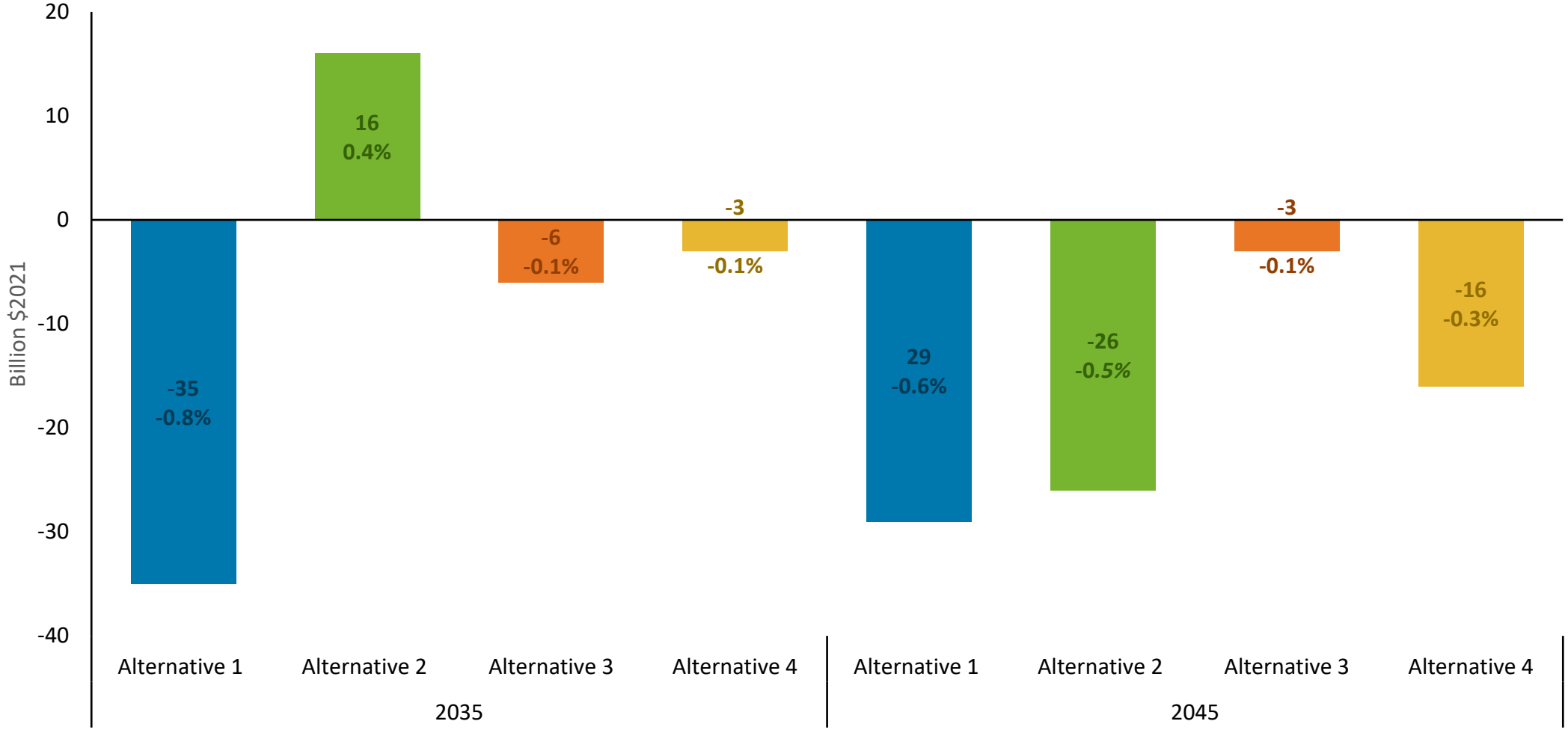
Impact from IMPLAN in a single year relative to California employment that grows from 23.5 million in 2021 to 27.7 million in 2045



Initial results from PATHWAYS costs assuming CDR is liquid solvent DAC technology powered by off-grid solar relative to BAU. Jobs are defined in IMPLAN as an annual average that accounts for seasonality and follows the same definition used by the BLS and BEA. Percentage change is relative to CARB 2035 and 2045 employment forecasts.

Gross State Product by Scenario Including CDR, 2035 and 2045

Impact from IMPLAN in a single year relative to the California economy that grows from $3.2 trillion in 2021 to $5.1 trillion in 2045



Initial results from PATHWAYS costs assuming CDR is liquid solvent DAC technology powered by off-grid solar relative to BAU. IMPLAN reports value added which is equivalent to an industry's contribution to Gross State Product or GSP. Percentage change is relative to CARB 2035 and 2045 Gross State Product forecasts.

Data Observations

Initial macroeconomic impacts across scenarios including CDR

Future Employment Growth

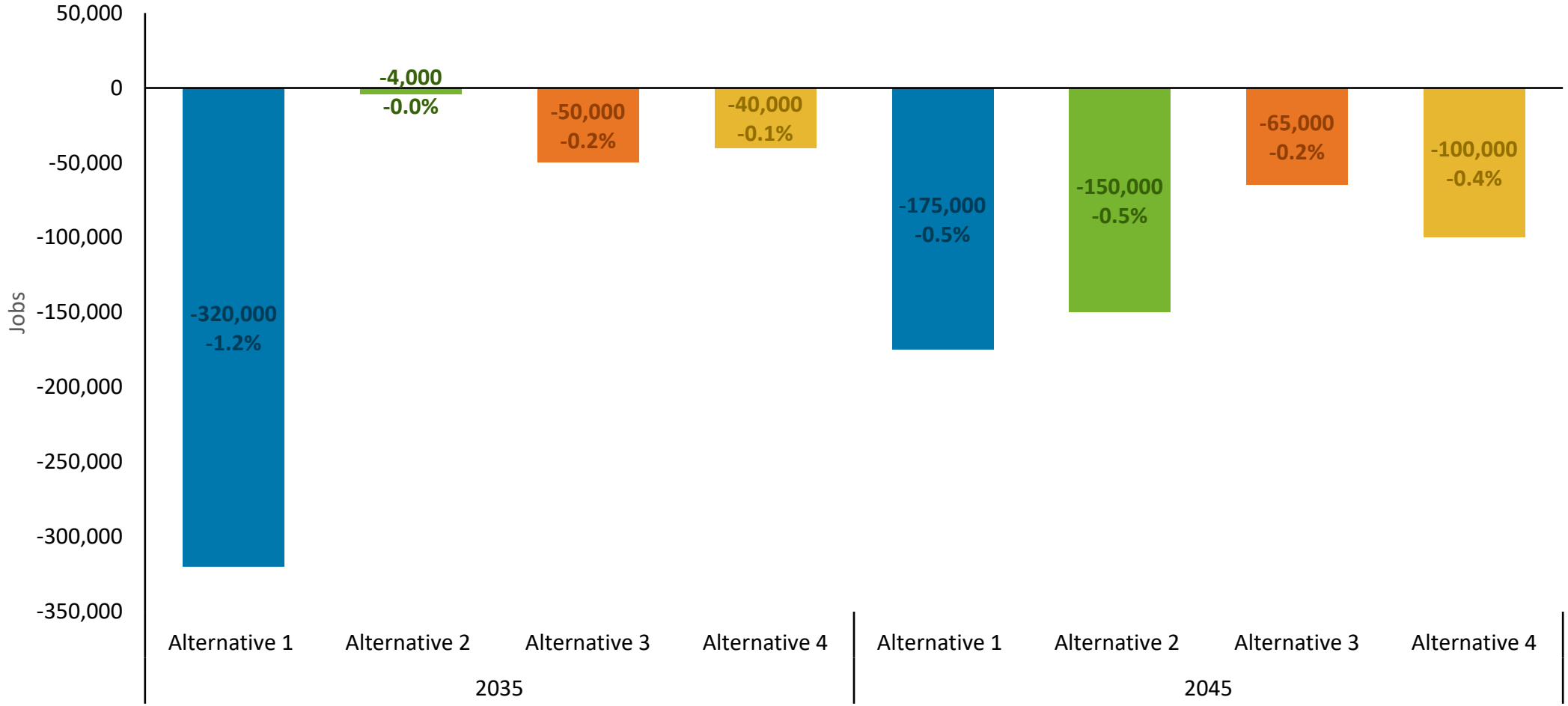
- The California workforce is forecast to grow from today's levels through 2045
- All alternatives slow the growth of employment, but the impact is small, resulting in at most a 1.5% slowing of job growth relative to projected levels in 2035 and 2045
- Alternative 1 has the largest impact on California job growth, resulting in nearly a 5-time greater slowing of job growth in 2035 than Alternative 3
- Alternative 3 has the smallest impact on job growth in 2035 and 2045
- As modeled, Direct Air Capture in California can result in 35,000 to 260,000 jobs in California in 2035 and 12,000 to 17,000 jobs in 2045

Future California Economic Growth

- All scenarios have a relatively small impact on the California economy which is forecasted to grow from today's levels through 2045
- The impact is less than a 1% slowing of economic growth in 2035 and 2045 (when CARB forecasts the economy to grow by 3.3% each year)
- Alternative 2 shows a positive impact on the California economy in 2035 due to the large reliance on CDR which results in growth in the solar industry, providing a net benefit to California
- Across scenarios, Direct Air Capture in California can provide $2 to $21 billion to the California economy in 2035 and $2 to $6 billion in 2045

Impact on Employment by Scenario Without CDR

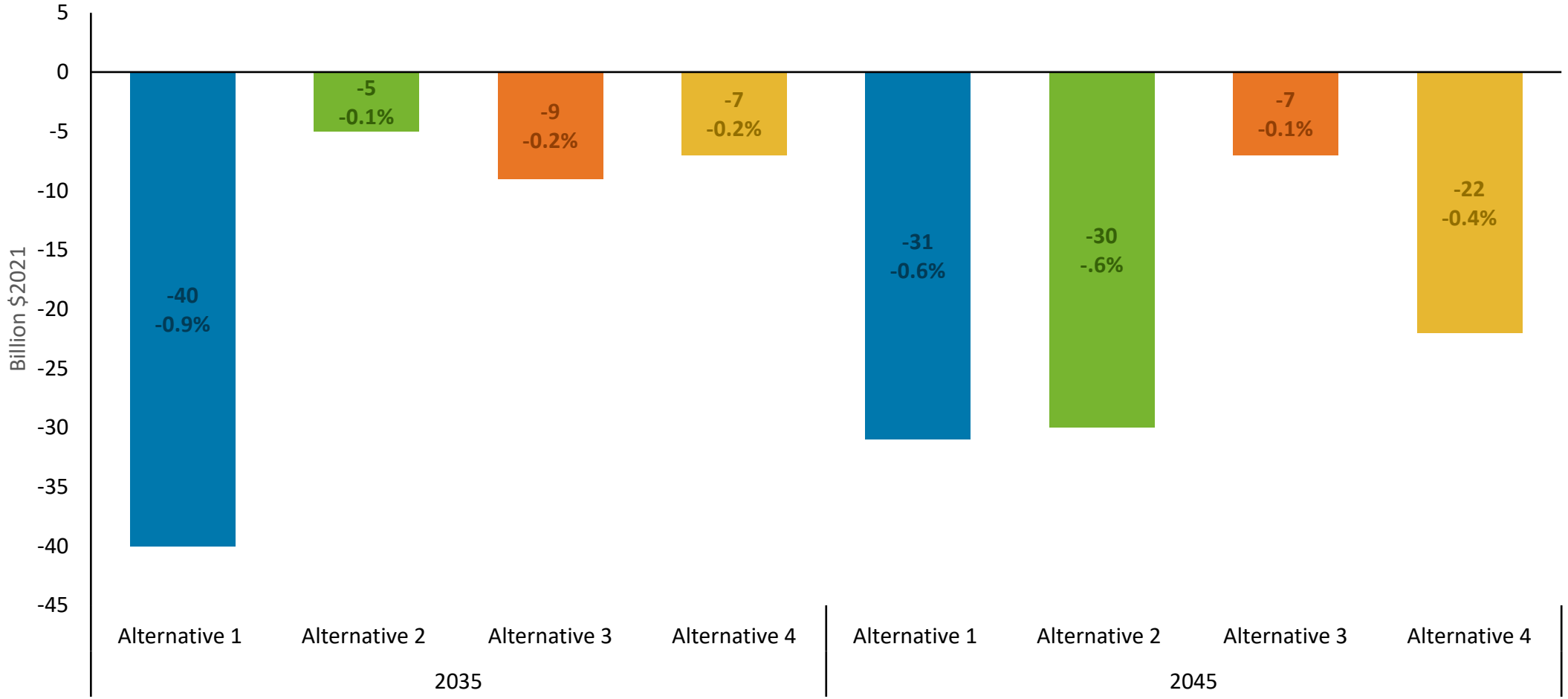
Impact from IMPLAN in a single year relative to California employment that grows from 23.5 million in 2021 to 27.7 million in 2045



Initial results from PATHWAYS costs without costs associated with CDR relative to the BAU. Jobs are defined in IMPLAN as an annual average that accounts for seasonality and follows the same definition used by the BLS and BEA. Percentage change is relative to CARB 2035 and 2045 employment forecasts.

Impact on Gross State Product by Scenario Without CDR

Impact from IMPLAN in a single year relative to the California economy that grows from $3.2 trillion in 2021 to $5.1 trillion in 2045



Initial results from PATHWAYS costs without costs associated with CDR relative to the BAU. IMPLAN reports value added which is equivalent to an industry's contribution to Gross State Product or GSP. Percentage change is relative to CARB 2035 and 2045 Gross State Product forecasts.

Data Observations

Initial macroeconomic impacts across scenarios without CDR

Future Employment Growth

- The California workforce is anticipated to grow from today's levels through 2045
- All alternatives slow the growth of employment, but the impact is small, resulting in at most a 1.2% slowing of job growth relative to projected levels in 2035 and 2045
- Without CDR, Alternative 2 has a very modest reduction in jobs as CDR accounts for 87% of the direct costs. Without CDR, Alternative 2 has very small impacts on employment and will not achieve carbon neutrality

California Economy

- All scenarios have a relatively small impact on the California economy which is forecasted to grow from today's levels through 2045
- The impact is less than a 1% slowing of economic growth in 2035 and 2045 (when CARB forecasts the economy to grow by 3.3% each year)
- Alternative 1 has the largest impact in GSP in 2035 and 2045, while Alternative 2 has the lowest impact in 2035 and Alternative 3 in 2045 when CDR is not included in the analysis

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NEW YORK | CALIFORNIA | HONG KONG | PARIS
TEL: +1 212-532-1157 | FAX: +1 212-532-1162
www.rhg.com

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