

# 2022 Scoping Plan Update – Scenario Concepts Technical Workshop



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AUGUST 17, 2021

# Workshop Goals

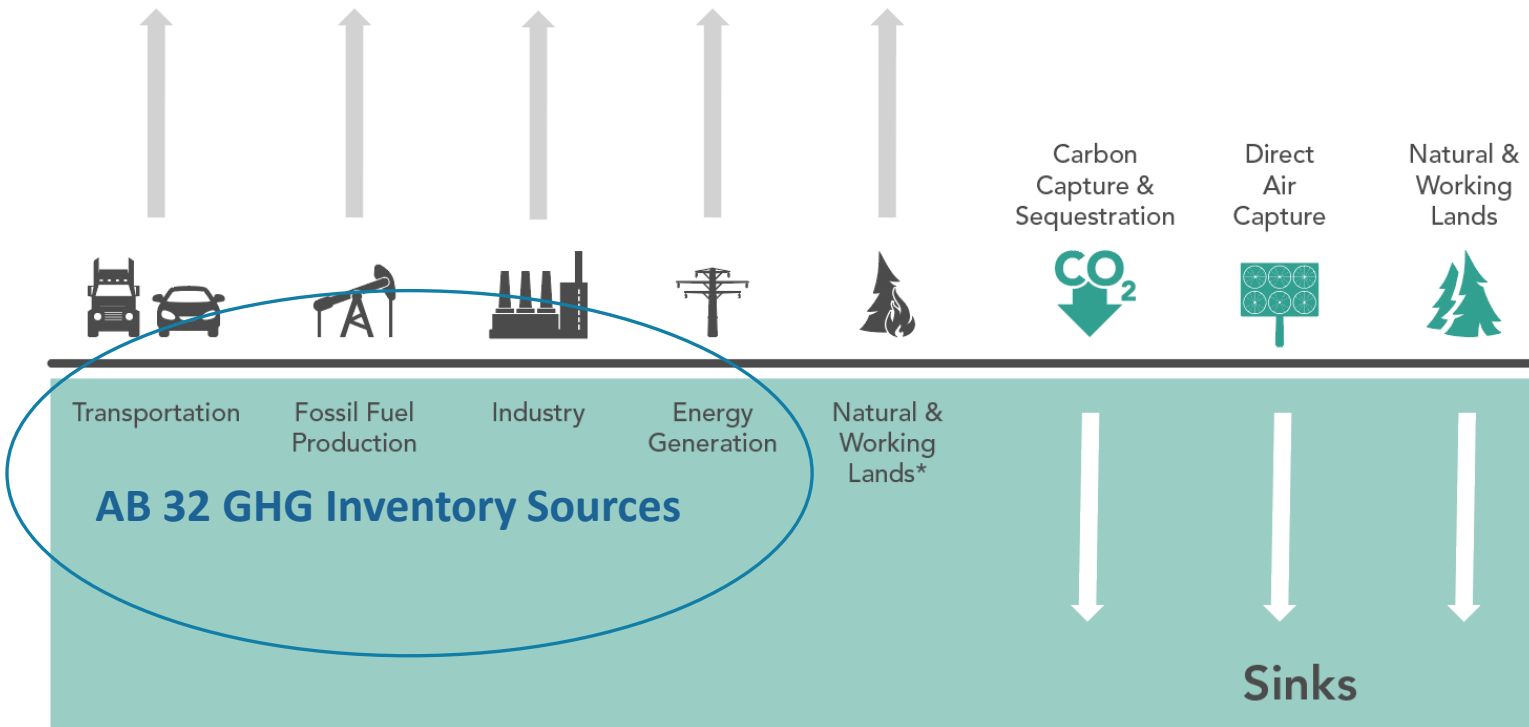
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- Introduce modeling tools
- Update to process in response to feedback from the EJ Advisory Committee at the August 3<sup>rd</sup> meeting
  - Step 1: Today's workshop on key questions and options for energy/technology to help construct scenarios
  - Step 2: End of September workshop to present proposed scenarios to model
  - Allows additional time for EJ Advisory Committee to provide their input
- Receive feedback on staff options and additional options for consideration in building modeling scenarios

# Science-based Target: Achieve Carbon Neutrality (CO<sub>2</sub>e) Mid-Century

## Sources equal Sinks

### Sources



- Continue to reduce emissions from sources in AB 32 GHG Inventory
- Reduce emissions and increase sequestration in Natural and Working Lands
- Maximize all sinks with goal of achieving net negative

\*Natural and working land emissions come from wildfires, disease, land and ag management practices, and others

# Transparency on Oral Comment Process

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- Reminder to all commenters they need to unmute themselves to speak
- Dedicated time for EJ Advisory Committee Members after the conclusion of presentations
- During general comment period:
  - CARB staff will periodically announce approximate number of hands raised
  - No ceding of time to others
  - Any EJ Advisory Committee Members should use the dedicated time after presentations to make any comments to ensure they are heard
  - Please do not email us directly to ask that we give you priority
- Goal to post agendas for workshops at least 48 hours in advance

# Overview of Scoping Plan Modeling Tools

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# Modeling Tools Speakers

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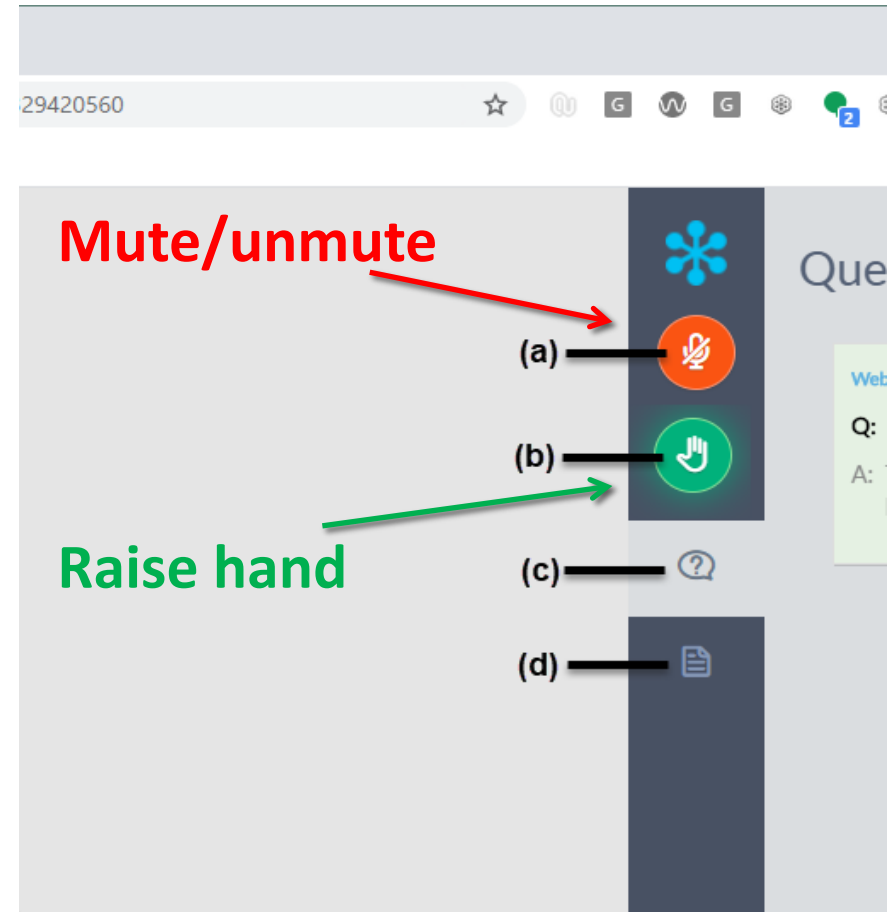
- Jessie Knapstein, E3
- Michael MacKinnon, U.C. Irvine
- Emily Wimberger, Rhodium
- Kevin Hamilton and Sharifa Taylor, EJ Advisory Committee

# Transition to E3, UCI, Rhodium Presentations

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# Questions and Public Comments

- Today
  - Environmental Justice Advisory Committee Members
  - Public
- Instructions
  - Use “raise hand” button to indicate you would like to speak
  - Unmute yourself after being called on as the next commenter

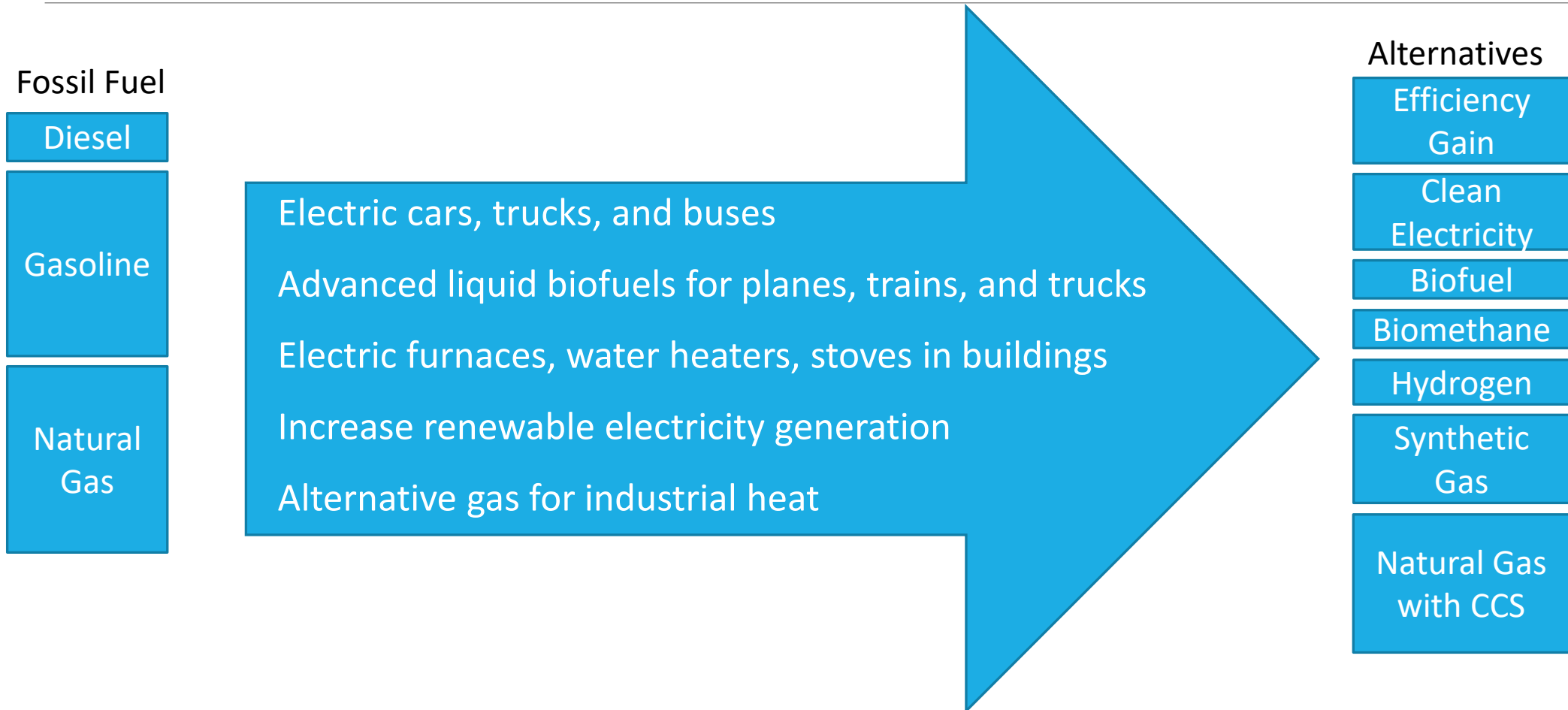




# Scenario Design Options

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# Transition from Fossil Fuel to Alternatives



# Carbon Neutrality Timeframe

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- 2030 target in SB 32: 40% below 1990 levels
  - **Increase ambition in 2030?**
- Science calls for carbon neutrality (CN) by mid-century;
  - **Achieve CN in 2045, 2035, or other year?**

# Carbon Neutrality Timeframe – Options\*

Carbon Neutrality by 2035	
Option A	
<ul style="list-style-type: none"><li>• Exceed SB 32 2030 target</li><li>• Carbon neutrality by 2035</li></ul>	
Carbon Neutrality by 2045	
Option B	Option C
<ul style="list-style-type: none"><li>• Aim to exceed SB 32 2030 target</li><li>• Carbon neutrality by 2045</li></ul>	<ul style="list-style-type: none"><li>• Aim to meet SB 32 2030 target</li><li>• Carbon neutrality by 2045</li></ul>

\*Represents staff initial thinking. Requesting additional options for consideration.

# Role of Engineered Carbon Removal

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Carbon capture and sequestration

- **With fossil fuel combustion (e.g., industry, electricity generation, refineries). Yes or no?**
- **With industrial process emissions (e.g., cement). Yes or no?**

Refrigerant emissions and other sources of non-CO<sub>2</sub> emissions may remain.

- **Compensate for these remaining emissions with direct air capture with sequestration? Or, what is the alternative?**

# Role of Engineered Carbon Removal – Options\*

Carbon Neutrality by 2035	
<b>Option A</b>	<b>Option B</b>
<ul style="list-style-type: none"><li>• Exclude CCS</li><li>• How to address non-energy emissions such as HFCs?</li></ul>	<ul style="list-style-type: none"><li>• Include CCS</li><li>• Include carbon removal from the atmosphere</li></ul>
Carbon Neutrality by 2045	
<b>Option C</b>	<b>Option D</b>
<ul style="list-style-type: none"><li>• Include CCS</li><li>• Include carbon removal from the atmosphere</li></ul>	<ul style="list-style-type: none"><li>• Rely more on CCS than in options B and C</li><li>• Rely more on carbon removal from the atmosphere than options B and C</li></ul>

\*Represents staff initial thinking. Requesting additional options for consideration.

# Carbon Free Electricity Grid

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SB 350 calls for a 2030 Renewables Portfolio Standard (RPS) of 60%

SB 100 requires 100% retail sales of electricity be zero carbon by 2045

- **Do we accelerate the 2030 RPS target?**
- **What year do we have a zero-carbon electricity grid?**
- **Any role for biomass combustion to generate electricity?**
- **Any role for combustion of renewable natural gas (RNG) or renewable hydrogen to replace fossil gas for reliability?**

# Carbon Free Electricity Grid – Options\*

## Carbon Neutrality by 2035

### Option A

- SB 100 No Combustion Scenario
- Total load coverage
- Excludes combustion-based generation regardless of fuel

### Option B

- SB 100 Accelerated Timeline Scenario
- Uses all available technologies

## Carbon Neutrality by 2045

### Option C

- SB 100 using all available technologies to get to zero, including transmission losses (total load coverage)

### Option D

- SB 100 Core Scenario (24 MMT in 2045)
- Uses all available technologies

\*Represents staff initial thinking. Requesting additional options for consideration.



# Vehicle Miles Traveled (VMT)

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SB 375 requires development of local Sustainable Communities Strategies (SCS), which outline how regions will reduce per capita VMT.

VMT is expected to keep growing as the population grows.

The recent AB 74 ITS transportation carbon neutrality paper assumed a 15% reduction in per capita VMT in 2045.

- **Increase ambition of per capita VMT reductions?**

# Vehicle Miles Traveled (VMT) – Options\*

## Carbon Neutrality by 2035

### Options A

- VMT per capita reduced 20% below 2020 levels by 2045

## Carbon Neutrality by 2045

### Option B

- Align with Draft 2020 Mobile Source Strategy, 18% VMT per capita reduction by 2045 relative to 2020 base year

### Option C

- Align with AB 74, 15% per capita reduction by 2045 relative to 2020 base year

\*Represents staff initial thinking. Requesting additional options for consideration.

# Vehicle Fleet Electrification

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## Zero Emission Vehicle (ZEV) EO (N-79-20)

- 100% sales of light-duty vehicles are zero emission by 2035
  - **Change?**
- All drayage trucks are zero emission by 2035
  - **Change?**
- All heavy/medium duty vehicles are zero emission by 2045, and off-road vehicles by 2035, where feasible
  - **Change?**

# Vehicle Fleet Electrification – Options\*

## Carbon Neutrality by 2035

### Option A

- Light duty: 100% ZEV sales in 2025
- Medium duty and heavy duty: 100% ZEV sales in 2030
- Transit buses: 100% ZEV sales by 2030
- Off-road: Aggressive electrification

### Option B

- Light duty, medium duty, and heavy duty: 100% ZEV sales in 2030
- Transit buses: 100% ZEV sales by 2030
- Off-road: Less aggressive electrification than Option A

## Carbon Neutrality by 2045

### Option C

- Light duty, medium duty, and heavy duty: 100% ZEV sales in 2035
- Transit buses: 100% ZEV sales by 2030
- Off-road: Aggressive electrification where feasible

### Option D

- Light duty, medium duty, and heavy duty: 100% ZEV sales in 2040
- Transit buses: 100% ZEV sales by 2030
- Off-road: Aggressive electrification where feasible

\*Represents staff initial thinking. Requesting additional options for consideration.

# Petroleum Fuels

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Governor Newsom directive to CARB to evaluate a phase out of crude oil extraction in California by 2045, recent letter to evaluate carbon neutrality by 2035

- **Change extraction phase out date, what date?**
- **Any phase down of refinery operations to supply CA fuels?**
- **Do we produce any renewable fuels from waste biomass in-state at converted refineries?**
- **Should there be limits on imported crude?**

# Petroleum Fuels – Options\*

## Carbon Neutrality by 2035

### Option A

- Oil & gas extraction ramped down linearly to 100% phase out by 2035
- Petroleum refining ramped down linearly to 100% phase out by 2035

### Option B

- Oil & gas extraction ramped down linearly to 100% phase out by 2035
- Petroleum refining ramped down in line with in-state petroleum demand

## Carbon Neutrality by 2045

### Option C

- Oil & gas extraction ramped down linearly to 100% phase out by 2045
- Petroleum refining ramped down in line with in-state petroleum demand

### Option D

- Oil & gas extraction ramped down in line with remaining petroleum demand
- Petroleum refining ramped down in line with in-state petroleum demand

\*Represents staff initial thinking. Requesting additional options for consideration.

# Short Lived-Climate Pollutant Methane

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California needs to reduce emissions of short-lived climate pollutants (SLCP), including methane, per SB 1383. Dairy operations and landfills account for 3/4 of Statewide methane emissions. If the gases are not captured, they are vented to the atmosphere or flared both having adverse environmental impacts.

- **How should we use biogas captured from dairies and landfills - electricity generation, industrial heat, transportation fuel, other?**
- **What would be the long-term operations for dairies in the state?**

# SLCP Methane – Options\*

## Carbon Neutrality by 2035

### Option A

- Excludes biomass derived fuels

### Option B

- Includes biomass derived fuels from landfills and dairies

## Carbon Neutrality by 2045

### Options C

- Same as Option B

\*Represents staff initial thinking. Requesting additional options for consideration.



# Woody Biomass and Solid Biomass Waste

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Landfill organics diversion goals, phase out of agricultural burning, and wildfire mitigation efforts may provide large quantities of solid biomass waste that can be responsibly utilized.

- **Should biomass play a role in producing energy?**
- **How should we best utilize solid biomass waste?**
  - Produce renewable hydrogen for use in zero emission fuel cells?
  - Produce liquid fuels?
  - Produce RNG for industrial or electricity sector?
  - Composting/soil reincorporation?
  - Do we need multiple paths to handle the volume of waste?

# Woody Biomass and Solid Biomass Waste – Options\*

## Carbon Neutrality by 2035

### Option A

- Excludes biomass derived fuels

### Option B

- Includes biomass derived fuels from forests, agriculture, and municipal solid waste streams

## Carbon Neutrality by 2045

### Options C

- Same as Option B

\*Represents staff initial thinking. Requesting additional options for consideration.

# Residential and Commercial Building Decarbonization

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## New buildings

- **All new buildings use electric appliances only starting in what year?**

## Existing buildings

- **In what year should sales of gas appliances be phased out?**
- **Even with a gas appliance ban for new purchases, we may need to retrofit existing buildings to replace existing gas appliances. What percent of existing buildings are retrofitted to be all electric and by what year?**
- **While transitioning to electric appliances, do we keep fossil gas or RNG or both?**

# Residential and Commercial Building Decarbonization – Options\*

## Carbon Neutrality by 2035

### Option A

- All new buildings use electric appliances by 2026
- 100% all-electric appliance sales for all buildings by 2030
- All buildings retrofitted to electric appliances by 2035

### Option B

- All new buildings use electric appliances by 2026
- 100% all-electric appliance sales for residential buildings by 2035 and for commercial by 2045
- Not all existing buildings retrofitted to electric appliances

## Carbon Neutrality by 2045

### Option C

- All new buildings use electric appliances by 2026
- 100% all-electric appliance sales for residential buildings by 2035 and commercial by 2045
- Some existing buildings retrofitted to electric appliances

### Option D

- All new buildings use electric appliances by 2029
- Less existing buildings retrofitted to electric appliances

\*Represents staff initial thinking. Requesting additional options for consideration.

# Industry (Manufacturing, Construction, and Agriculture)

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- What to do with industries that can't electrify due to technology availability? (cement, glass, steel, etc.)
  - **What would be their energy source (RNG, renewable hydrogen, natural gas, some combination)?**
  - **What would be their long-term operations in the state?**
  - **How do we meet the statutory requirement to minimize leakage?**

# Industry (Manufacturing, Construction, and Agriculture) - Options\*

## Carbon Neutrality by 2035

### Option A

- Electrify all manufacturing, construction, and agricultural applications, where feasible.
- Where not feasible, assume ban on combustion requires shut down.

### Option B

- Electrify most manufacturing, construction, and agricultural applications, where feasible.
- Include combinations of all other zero carbon fuels and technology, where feasible.

## Carbon Neutrality by 2045

### Option C

- Electrify most manufacturing, construction, and agricultural applications, where feasible.
- Same as Option B.

### Option D

- Modest electrification and substitution of hydrogen.
- Same as Option B.

\*Represents staff initial thinking. Requesting additional options for consideration.

# Environmental Analysis

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- Environmental Analysis (EA) being prepared analyzing potentially significant adverse impacts caused by reasonably foreseeable actions.
- Meets requirements of CARB's certified program under the California Environmental Quality Act (CEQA).
- The CEQA Environmental Checklist (CEQA Guidelines Appendix G) is used to identify and evaluate potential indirect impacts.
- The EA will be an appendix to the Staff Report.

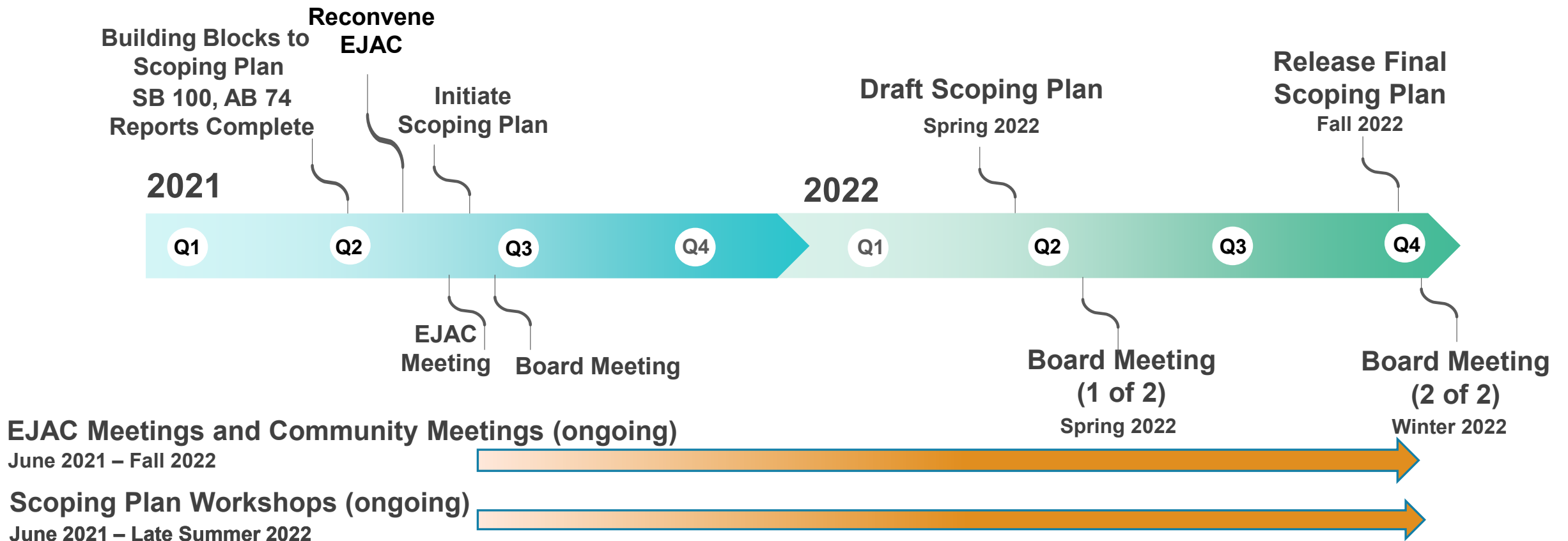
# Environmental Analysis to be Prepared

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- The EA will include:
  - Description of reasonably foreseeable actions taken in response to the proposal
  - Programmatic level analysis of potential adverse impacts caused by reasonably foreseeable actions
  - Feasible mitigation measures to reduce/avoid significant impacts
  - Alternatives analysis
- Input is invited at this early stage on appropriate scope and content of the EA
- The Draft EA will be released for 45-day public comment period



# 2022 Scoping Plan Update Schedule



# AB 197 for Reference

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Each scoping plan update developed pursuant to Section 38561 shall identify for each emissions reduction measure, including each alternative compliance mechanism, market-based compliance mechanism, and potential monetary and nonmonetary incentive the following information:

- (a) The range of projected greenhouse gas emissions reductions that result from the measure.
- (b) The range of projected air pollution reductions that result from the measure.
- (c) The cost-effectiveness, including avoided social costs, of the measure.

...“social costs” means an estimate of the economic damages, including, but not limited to, changes in net agricultural productivity; impacts to public health; climate adaptation impacts, such as property damages from increased flood risk; and changes in energy system costs, per metric ton of greenhouse gas emission per year.

# AB 197 for Reference

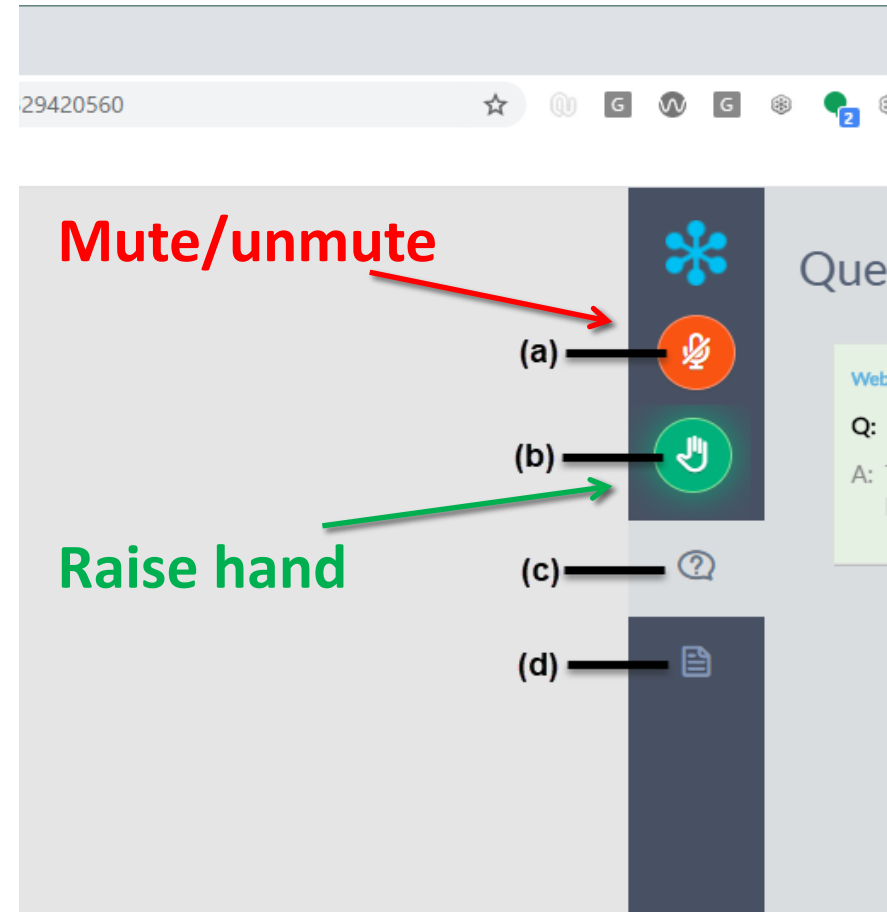
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In adopting measures to help achieve statewide GHG targets and protect the most impacted communities, CARB shall:

- Consider social costs of GHG emissions
- Prioritize measures that result in direct emission reductions in both stationary and mobile sources
- Also, follow requirements in AB 32:
  - Consider cost-effectiveness, minimize costs and maximize total benefits to California
  - Do not disproportionately impact low-income communities
  - Do not interfere with efforts to achieve air quality standards and reduce toxic air emissions
  - Consider overall societal benefits
  - Minimize leakage
  - Consider significance of contribution of source/category to statewide GHGs

# Questions and Public Comments

- Today
  - Environmental Justice Advisory Committee Members
  - Public
- Instructions
  - Use “raise hand” button to indicate you would like to speak
  - Unmute yourself after being called on as the next commenter



# Closing – Staying Engaged

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- Written comments
  - [https://www.arb.ca.gov/lispub/comm2/bcsubform.php?listname=sp22-concepts-ws&comm\\_period=1](https://www.arb.ca.gov/lispub/comm2/bcsubform.php?listname=sp22-concepts-ws&comm_period=1)
  - Comment closing date September 3, 2021 (11:59 pm)
- Additional resources
  - [www.arb.ca.gov/our-work/programs/ab-32-climate-change-scoping-plan](http://www.arb.ca.gov/our-work/programs/ab-32-climate-change-scoping-plan)
  - Workshops, EJ Advisory Committee Meetings, supporting materials, Board Meetings