2017 Climate Change Scoping Plan Update
February 9, 2017
Outline

- Background
- Overview of Proposed Plan
- Additional Detail on Alternatives
- Refinements to the Economic Analysis
- Estimating Health Impacts
- Schedule
- Discussion
Most aggressive climate target in North America: 40% reduction in GHGs by 2030 compared to 1990 levels

Builds on California’s success reducing GHGs

Aligns California with the rest of the world in climate change fight

Proposed Plan draws on the successes and the lessons learned from the previous plans

Proposes continuing major successful programs that have served as a model for other states and jurisdictions around the world

Proposed Plan achieves GHG reduction target and continues to make our communities and economy more resilient and equitable at the same time
New Directives and Legislation

- **Executive Order B-30-15**
  - Reduce GHG emissions 40% below 1990 levels by 2030
  - Update Scoping Plan to incorporate 2030 GHG target

- **Senate Bill 32 (SB 32) codifies 2030 GHG target**

- **AB 197**
  - Consider the social costs of GHG reductions
  - Prioritize measures resulting in direct emission reductions
  - Follow existing AB 32 requirements—including considering cost-effectiveness and minimizing leakage
Objectives for Scoping Plan

- Achieve 2030 target
- Provide direct GHG emissions reductions
- Provide air quality co-benefits
- Minimize emissions leakage
- Support climate investment in disadvantaged communities
- Protect public health
- Facilitate sub-national and national collaboration
- Support cost-effective and flexible compliance
- Support Clean Power Plan and other federal action
Building on an Existing Foundation

- Existing programs are delivering the emissions reductions needed to achieve the 2020 target
  - Program infrastructure exists to support continuation of existing programs
  - High compliance rates demonstrate regulated entities are able to successfully comply with existing programs

- Gross domestic product (GDP) has continued to grow
  - California is ranked as world’s fifth largest economy
  - Per capita and per dollar of GDP GHG emissions have declined
Foundational Plans for 2030

SB 375 Sustainable Communities Strategies

Revised Proposed SLCP Strategy (pdf)

California Transportation Plan 2040

Mobile Source Strategy

2030 Target Scoping Plan

California Water Action Plan 2016 Update
Proposed Scoping Plan Scenario

- *SB 350 – increase renewable energy and energy efficiency
- *SB 1383 – Short-Lived Climate Pollutant Reduction Plan
- *SB 375 – support sustainable community development
- *Mobile Source Strategy – help State achieve its federal and state air quality standards
- *Low Carbon Fuel Standard
- *Sustainable Freight Action Plan

New Refinery Efficiency Measure – 20 percent by 2030
- Fewer GHG emissions per barrel of a refined product

Post-2020 Cap-and-Trade Program
- Trading and offset usage limit of 8 percent

*Existing commitments included in any Scoping Plan Update
Figure II-2. Proposed Scoping Plan Scenario – Estimated Cumulative GHG Reductions by Measure (2021–2030)

- **Cap and trade**
- **SLCP**
- **Mobile Sources CFT and Freight**
- **Energy efficiency (Res, Com., Ind. Ag. & TCU)**
- **50% RPS**
- **Refinery (20% reduction)**
- **Low Carbon Fuel Standard (18%)**
- **Demand response and flexible loads**

*Total non Cap-and-Trade Measures*
Natural and Working Lands

- Goal: Manage California’s Natural and Working Lands, including green space in urban areas, to be a resilient net sink of carbon in 2030, 2050 and beyond.
- Continued efforts to model a reference case and management practices to inform performance targets.
- By 2018, develop an Integrated and Working Lands Action Plan to detail how this sector becomes a net carbon sink.
- SB 1383 goal to reduce methane emissions from livestock manure and dairy manure management operations.
Proposed Plan Meets All Objectives (1 of 2)

- High probability of meeting 2030 target with hard cap
- Provides direct GHG emissions reductions from all sectors
- Provides air quality co-benefits through both command and control regulations and the Cap-and-Trade Program
- Protects public health through climate leadership, co-benefits, and investment in disadvantaged communities
- Minimizes emissions leakage through free allocation
Proposed Plan Meets All Objectives (2 of 2)

- Supports climate investment in disadvantaged communities by continuing to provide proceeds for GGRF
- Facilitates sub-national and national collaboration through linkage of Cap-and-Trade programs
- Supports cost-effective and flexible compliance by allowing trading
- Supports Clean Power Plan and other federal action because the Cap-and-Trade program can be used to comply with CPP
Alternatives Evaluated

- **No Cap-and-Trade** – rely on direct measures for all reductions
- **Carbon Tax** – replace Cap-and-Trade with a carbon tax
- **All Cap-and-Trade** – no refinery measure and no enhancement to Low Carbon Fuel Standard (keep at 10% reduction in CI)
- **Cap-and-Tax** – require each facility/entity to reduce emissions annually with no trading, emissions would be taxed

*Focus of discussion for today*
All Cap-and-Trade Alternative

- Relies on Cap-and-Trade
- No refinery measure
- No enhancement to Low Carbon Fuel Standard (keep at 10% reduction in CI)
- Less certainty about amount of greenhouse gas reductions at refineries
Cap & Tax: Overview

- The Cap-and-Trade Program would mostly be replaced by a Cap & Tax Regulation post-2020.
- Emissions from each covered entity would be subject to a declining annual cap.
- Each metric ton of GHG emissions from covered entities would be subject to a tax at the social cost of carbon.
- Penalties would be assessed for any annual emissions above an individual entity cap.
- No trading of emissions allowances and no use of offset credits.
Cap & Tax: Sectors Covered

Percentage of total emissions by sector from 2014 GHG emissions inventory:

- Industrial (21.1 %)
- Recycling & Waste (2.0 %)
- High GWP Gases (3.9 %)
- Agriculture (8.2 %)
- Residential & Commercial (8.7 %)
- Transportation (36.1 %)
- Electric Power (20.0 %)

<table>
<thead>
<tr>
<th>Cap &amp; Tax Option</th>
<th>Sectors Covered by Cap &amp; Tax</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option A</td>
<td>All sectors</td>
</tr>
<tr>
<td>Option B</td>
<td>Transportation, industry, electric power, and residential and commercial#</td>
</tr>
</tbody>
</table>

# These are sectors currently covered by the Cap-and-Trade Program.
## Cap & Tax: Achieving the 2030 Target

<table>
<thead>
<tr>
<th>Sector</th>
<th>2021-2030 Annual Emissions Reductions (%)</th>
<th>PREFERRED: Cap &amp; Tax Option A - Uniform Across All Sectors</th>
<th>Cap &amp; Tax Option B - Only Cap-and-Trade Sectors*</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Transportation</td>
<td>4.5</td>
<td></td>
<td>4.7</td>
</tr>
<tr>
<td>*Industry</td>
<td>4.5</td>
<td></td>
<td>4.7</td>
</tr>
<tr>
<td>*Electric Power</td>
<td>4.5</td>
<td></td>
<td>4.7</td>
</tr>
<tr>
<td>*Residential &amp; Commercial</td>
<td>4.5</td>
<td></td>
<td>4.7</td>
</tr>
<tr>
<td>Agriculture</td>
<td>4.5</td>
<td></td>
<td>3.5</td>
</tr>
<tr>
<td>High GWP Gases</td>
<td>4.5</td>
<td></td>
<td>5.4</td>
</tr>
<tr>
<td>Recycling &amp; Waste</td>
<td>4.5</td>
<td></td>
<td>1.4</td>
</tr>
</tbody>
</table>
Annual GHG emissions caps under Cap & Tax Option A for a hypothetical food processing facility with emissions equal to 65,000 MTCO\textsubscript{2}e in 2020.
Cap & Tax: Example Caps for a Hypothetical Natural Gas Supplier

Annual GHG emissions caps under Cap & Tax Option A for a hypothetical natural gas supplier with emissions equal to 20,000,000 MTCO$_2$e in 2020.
Cap & Tax: Additional Details

- Set the tax at the social cost of carbon same as the carbon tax alternative
- Cap decline, not tax, would be main driver of emissions reductions
- Additional work would be needed to address new industry moving to the State
- Would need regulation to set individual caps for all entities, including establishing a base year
- Staff does not believe each sector can reduce at this level year over year
- Expected to be more cost than proposed plan and may result in loss of industry, jobs, and GDP
Refinements to the Economic Analysis
Planned Refinements to the Economic Analysis

- Regional impacts
- Macroeconomic analysis of all scenarios
- Health impacts
Regional Impacts Assessment

- Estimate the regional impacts of all Scoping Plan scenarios
- Analyze how the Scoping Plan scenarios will affect regional economic growth, industry output, wages, and employment
- Estimate the impact of the Scoping Plan scenarios on Disadvantaged Communities
REMI California County Model

- Representative of 58 regions and 160 sectors of the CA economy
- Accounts for regional differences in economic and demographic characteristics
  - Local consumption is estimated using data from the US Bureau of Economic Analysis (BEA) and the Census Bureau
  - Each county has distinct characteristics including industry output, personal income, and price indexes for housing and energy
- Allows for flow of population and employment between counties
California County Interactions in REMI California County Model

Trade and Commuter Flow Linkages

Disposable Income -> Local Earnings -> Local Demand

Local Earnings -> Disposable Income

Output -> Local Demand

Commuter linkages based on historic commuting data

Flows based on estimated trade flows
## Translation of Inputs in REMI California County Model

<table>
<thead>
<tr>
<th>REMI Policy Variable</th>
<th>County Conversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital cost by Industry</td>
<td>Proportional to industry output at county level</td>
</tr>
<tr>
<td>Fuel cost for all industrial sectors</td>
<td>Proportional to industry consumption in each fuel category at the county level</td>
</tr>
<tr>
<td>Changes in final demand by industry</td>
<td>Proportional to industry output in county</td>
</tr>
<tr>
<td>Consumer spending for reduced fuel purchases</td>
<td>Proportional to personal consumption expenditure in each spending category at the county level</td>
</tr>
<tr>
<td>Production cost by industry</td>
<td>Proportional to industry output at the county level</td>
</tr>
<tr>
<td>Transfer payments</td>
<td>Proportional to population by county</td>
</tr>
<tr>
<td>Consumer price</td>
<td>Proportional to county personal expenditure in each category</td>
</tr>
</tbody>
</table>
REMI California County Model Outputs

- County economic growth
- County employment
- County wages
- County-level industry output
- Can be used to estimate economic impacts of disadvantaged communities
Disadvantaged census tracts are identified using CalEnviroScreen 2.0

Methodology

- County employment information from American Community Survey (ACS) provides census-tract level estimates of jobs by occupation.
- Compare to the county-level estimates of jobs by occupation as output by the REMI California County Model.
- Estimate the employment impact on disadvantaged census tracts.
DAC Impact Methodology

- County-level impact to jobs by occupation (REMI county output)
- Disadvantaged census tracts’ share of occupational employment (CalEnviroscreen 2.0)
- ACS occupational employment by census tract

= Disadvantaged tracts’ share of occupational job impacts
Results

- Estimate economic impacts relative to the baseline
- Estimate results by:
  - County
  - Regional area
  - Disadvantaged communities
- Metrics of interest
  - County economic growth
  - Employment
  - Wages
  - Sector value add
Economic Modeling of Scenarios
All Cap-and-Trade Economic Modeling

- Include PATHWAYS results that exclude the refinery measure and any enhancement to Low Carbon Fuel Standard in REMI.
- Apply range of allowance prices in a similar manner as the Proposed Plan including free allowance allocation and return of auction proceeds through the GGRF and a per capita dividend.

Allowance price range

<table>
<thead>
<tr>
<th>($2015)</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>C+TFloor Price</td>
<td>$15.40</td>
<td>$19.70</td>
<td>$25.20</td>
</tr>
<tr>
<td>C+TReserve Price</td>
<td>$72.10</td>
<td>$73.00</td>
<td>$78.40</td>
</tr>
</tbody>
</table>
Cap & Tax Economic Modeling

- Based on uniform reductions from estimated 2020 GHG levels as modeled in PATHWAYS

- Reductions are modeled by sector and not individual facilities
  - Provides flexibility among facilities in a sector that does not exist when regulating individual facilities
  - The estimated cost of complying with Cap & Tax as modeled in PATHWAYS will likely be much lower than actual cost of compliance

- Include tax on all GHG emissions at social cost of carbon
  - No tax modifications to ensure competitiveness of CA businesses
  - All tax revenue is returned to CA consumers as a dividend
Cap & Tax Considerations

- Additional reductions are introduced to each sector on top of reductions achieved under the ‘No Cap-and-Trade’ scenario.

- Limited information on mitigation potential in the industrial sector.

- May require modeling reductions in output or production to achieve the 2030 target.
  - The economic impact of reductions in output or production are introduced outside of PATHWAYS.
## Potential Methods to Model Cap & Tax by Sector

<table>
<thead>
<tr>
<th>Sector</th>
<th>Proposed Cap &amp; Tax Measures (Build off modeling for no cap-and-trade scenario)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>Additional reductions from dairy manure methane</td>
</tr>
<tr>
<td>Res. &amp; Comm.</td>
<td>Additional electrification of buildings</td>
</tr>
<tr>
<td>Electric Power</td>
<td>Potential small increase in RPS</td>
</tr>
<tr>
<td>High GWP</td>
<td>No change</td>
</tr>
</tbody>
</table>
| Industrial        | 10-15% electrification of manufacturing  
10-15% additional reductions from refining, oil & gas, and industrial manufacturing - potentially from reduced output/production |
| Recycling/Waste   | Additional reductions from waste                                                                                                       |
| Transportation    | Remove the early retirement of LDVs from No Cap-and-Trade Scenario                                                                       |
Preliminary Direct Cost Ranking of Scenarios

- All Cap-and-Trade
- Proposed Plan
- Carbon Tax
- No Cap-and-Trade
- Cap & Tax

Lower Direct Cost

Higher Direct Cost
Preliminary Direct Cost Ranking of Scenarios

- All Cap-and-Trade
- Carbon Tax
- No Cap-and-Trade
- Cap & Tax

Lower Direct Cost    Higher Direct Cost
Health Economic Analysis

- Quantify and monetize the estimated avoided health impacts resulting from implementation of the Scoping Plan scenarios.

- Monetized impacts may include:
  - Avoided premature mortality
  - Avoided hospitalizations
  - Avoided emergency room visits
  - Health benefits due to increased mobility
Health Impacts in REMI

- Identifying ways to potentially introduce monetized health impacts in macroeconomic modeling
- Changes in consumer spending on health related costs
  - Physician visits and hospitalization
- Changes in productivity due to avoided sick days
- Potentially incorporating avoided premature mortality
Estimating Health Impacts
Some actions that reduce GHG emissions can lead to reductions in ozone and PM2.5 precursors, and TACs
- Reduced adverse health impacts
- Reduced cancer risk

SCSs can lead to more walkable communities
- Increase in physical activity and improved overall health
- Active Transport can lead to VMT reductions
Mortality Reductions Due to Decreases in Air Pollution

- US EPA has determined that PM2.5 exposure is a causal factor in premature mortality

- Estimate prevented
  - Premature mortality
  - Hospitalizations
  - Emergency Room visits

- Estimate mortality reductions from Proposed Scenario and 4 Alternatives
Methodology for Quantifying Mortality Reductions

- Same methodology as used for other ARB regulations
- Emission reductions from Scoping Plan lead to lower PM2.5 concentrations (Table III-1)
- Relate lower PM2.5 to improved health
- Adjust for population growth between 2010 and 2030
Regular physical activity reduces the risk of many adverse health outcomes.

Individuals who are active for approximately 12 minutes/day have a 20% lower risk of dying early than those who are active just 5 min/day. Those who are active an hour a day have a 40% lower risk.

Walking or bicycling for transportation contributes to your physical activity total.
Active Transportation: Health Benefits of Physical Activity

Comparative Risk Assessment Methodology

1. Determine premature deaths attributable to baseline levels of physical activity
2. Estimate the increase in physical activity due to adoption of active transportation
3. Estimate the reduction in premature deaths from the baseline to the future scenario

Baseline Premature Death and Illness Rates

Projected Premature Deaths and Illness

- Projected health benefit of active transportation adoption is the difference between the baseline and scenario.
- Endpoints may include obesity, hypertension, heart disease, diabetes, and death
- Seeking comments on this methodology
Schedule

- CEQA comment period: January 20 – March 6
- Workshops today and in early March
- EJAC and Community Meetings
- February Board Hearing
- April 2017: Release Final Proposed Scoping Plan
- April 2017: Final Board consideration
Discussion

- The full text of “The 2017 Scoping Plan Update: The Proposed Plan for Achieving California’s 2030 Greenhouse Gas Target” is available at:
  www.arb.ca.gov/cc/scopingplan/scopingplan.htm

- Stakeholders and the public are encouraged to submit comments by 5:00 PM PST on March 6, 2017
  www.arb.ca.gov/lispub/comm/bclist.php