Session 2

Evaluation of Costs and Benefits of Alternatives

**Email questions to CCPlan@arb.ca.gov**

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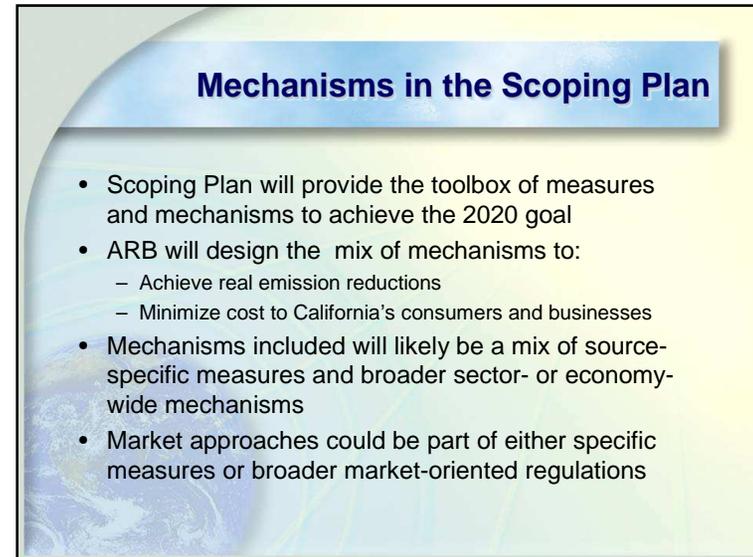
Mechanisms in the Scoping Plan

- Scoping Plan will provide the toolbox of measures and mechanisms to achieve the 2020 goal
- ARB will design the mix of mechanisms to:
  - Achieve real emission reductions
  - Minimize cost to California's consumers and businesses
- Mechanisms included will likely be a mix of source-specific measures and broader sector- or economy-wide mechanisms
- Market approaches could be part of either specific measures or broader market-oriented regulations
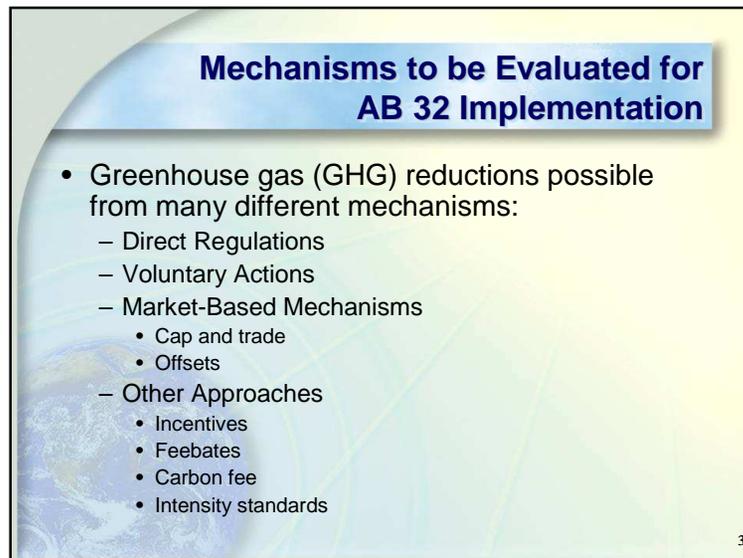
Mechanisms to be Evaluated for AB 32 Implementation

- Greenhouse gas (GHG) reductions possible from many different mechanisms:
  - Direct Regulations
  - Voluntary Actions
  - Market-Based Mechanisms
    - Cap and trade
    - Offsets
  - Other Approaches
    - Incentives
    - Feebates
    - Carbon fee
    - Intensity standards

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Designing the Scoping Plan

- In adopting measures and mechanisms as part of the Scoping Plan, the Board is governed by AB 32 requirements to:
  - Be equitable, minimize costs and maximize total benefits, encourage early action
  - Avoid disproportionate impacts
  - Ensure that voluntary reductions get appropriate credit
  - Consider cost effectiveness, overall societal benefits
  - Minimize administrative burden
  - Minimize leakage
  - Consider significance of sources

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Possible Use of Market Mechanisms

- Direct regulations on GHG sources required under AB 32
- ARB allowed to employ market-based compliance mechanisms
- Regulations must ensure
  - Reductions are real, permanent, quantifiable, verifiable, and enforceable
  - Reductions are in addition to any reduction that is required or would otherwise occur
  - If applicable, reduction is equivalent to direct emission reduction in timing and amount

Required Steps Prior to Inclusion of Market Mechanisms

- Prior to inclusion of market-based approaches, the Board must
  - Consider potential for cumulative and localized impacts
  - Prevent increase in criteria or toxic emissions
  - Maximize additional environmental and economic benefits

Local Impacts

- AB 32 requires consideration of localized impacts before a market system can be implemented
- While greenhouse gases are a global problem, criteria and toxic air pollutants are often emitted by the same sources
- Measures adopted under AB 32 may provide additional benefits by reducing existing public health and pollution problems

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AB 32 and Non-GHG Pollutants

- AB 32 calls for ARB to avoid increasing the harm from criteria or toxic air pollutants
- AB 32 requires the program to be implemented, where possible, in a manner that enhances reductions of these pollutants
- Many measures and mechanisms will reduce both GHGs and other pollutants

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Environmental Justice and Community Impacts

- ARB staff will work with the Environmental Justice Advisory Committee (EJAC) and other interested parties to ensure that our evaluation of possible local impacts adequately addresses local concerns

- Workshops will be held in communities to seek public input

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Cost Effectiveness

Cost Effectiveness

- AB 32 calls for the maximum technologically feasible and cost-effective greenhouse gas emission reductions
- Determining cost effectiveness will require ARB to develop method for evaluating the cost of reducing emissions from different sources and with different measures

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Evaluating Costs

- Evaluation will need to address
  - Costs:
    - Direct and indirect costs
    - Who bears the costs
  - Benefits
    - GHG reduction benefits
    - Other environmental and societal benefits
  - Method to attribute costs to GHG reductions v. other policy goals (e.g. criteria emission reductions)
- Different measures and mechanisms will need to be evaluated on common basis

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How Cost Effectiveness Will Be Addressed

- Cost effectiveness must be evaluated in light of the entire set of measures needed to reach both the 2020 goal and much greater reductions needed in the decades beyond 2020

- The Scoping Plan will include the information needed to compare measures based on cost effectiveness

- The determination of what is cost-effective requires policy judgment and is not purely technical in nature

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Determination of Cost Effectiveness

- ARB is unlikely to establish a single cost level that marks the line for cost effectiveness across all sectors and measures

- Some measures with high costs from a GHG-reduction perspective may be included in the Scoping Plan because they support other policy goals, and also reduce GHG emissions

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Future Discussions of Cost-effectiveness

- ARB will further address cost effectiveness as the Scoping Plan is developed
- ARB will seek input on:
  – The technical approach to determining the cost of various reductions measures
  – How costs should be allocated when measures produce benefits beyond GHG reductions
  – The policy considerations that should inform the judgment of what is 'cost-effective'

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Economic Impact Assessment

Modeling and Analysis

Economic Assessment

- Extensive economic analysis is planned and will:
  - Build on existing information on the costs and benefits of GHG reductions measures
  - Be used to evaluate the overall economic costs and benefits of different approaches to implementing AB 32, including various mixes of regulatory and market approaches
- Analysis will be done on several levels, including:
  - Broad perspectives, e.g., sector targets vs. economy-wide targets
  - Groups of sector-specific measures similar to the CAT analysis
  - Individual measures under a more traditional regulatory process

Build on Existing Research

- Climate Action Team Report and the Macroeconomic Update

- CEC Scenario Analyses Project completed for *2007 Integrated Energy Policy Report*

- Market Advisory Committee Report

Collaborate and Build on Ongoing Modeling Efforts

- California Public Utilities Commission with E3 Consulting

- Western Climate Initiative (WCI)

ARB Modeling

ARB
- Environmental Dynamic Revenue Assessment Model (E-DRAM)
- Energy 2020 – Developed for ARB by ICF International and Systematic Solutions, Inc. (SSI)

Collaborative Efforts
- David Roland-Holst of UC Berkeley - BEAR Model
- Economic Policy Research Institute

ARB Modeling

- Economic Analysis Stakeholder Meetings
  - First meeting: January 28, 2008
  - Tentative dates: February 29 and March 17

E-DRAM

- E-DRAM is a computable general equilibrium (CGE) model of the California economy.

- E-DRAM was developed by Professor Peter Berck of the University of California, Berkeley in collaboration with the Department of Finance and the Air Resources Board.

- E-DRAM has been peer reviewed and is available for public use.

Previous Uses of E-DRAM

- March 2006 Climate Action Team Report and the September 2007 Macroeconomic Update

- CEC and ARB analysis of reducing petroleum dependency (AB 2076)

- ARB analysis of vehicle climate change standards (AB 1493)

- ARB State Implementation Plan analysis

E-DRAM
Major Model Outputs

- Change in output
- Change in prices
- Change in employment
- Change in personal income
- Change in consumer spending

ENERGY 2020

- ENERGY 2020 is a multi-sector energy analysis system that simulates the supply, demand and price for all fuels.

- Supply side includes: electricity generation, oil extraction and refining, gas production, coal mining, combined heat and power (CHP), ethanol production and renewables.

- Demand side includes end uses for residential, commercial, industrial, transportation and other defined sectors.

ENERGY 2020 Use for Climate Policy Analysis

- Illinois – GHG Reduction
- Michigan – GHG Reduction
- Vermont –GHG and Energy Plan
- Hawaii – GHG and Oil Dependency
- Government of Ontario – Climate change options
- Environment Canada – Climate change plans
- Canadian Analysis and Modeling Group (AMG) -climate change measures and emissions trading
- Canadian National Round Table on Environment and Economy – Long-term energy and climate change strategy

ENERGY 2020 Major Model Outputs

- Fuel Usage for all fuels
- Electricity generation, capacity, prices
- Oil and gas imports and exports
- Emissions – GHG and other criteria pollutants
- Sector investment
- CO_2 price

Economic Feedback

ENERGY 2020
1. Energy prices
2. Energy demand investments
3. Energy supply investments
4. Carbon price

E-DRAM
1. Sector output
2. Personal income
3. Employment
4. Population
5. Interest rates and inflation

How Will the Results from the Multiple Modeling Efforts Be Used?

- Provide assessment of the relative cost of different approaches to achieving California's emission reduction goals
- Validate results across models or identify significant differences that warrant further analysis
- Assist in designing complementary policies

Scenarios Analysis Workshop April 4

- ARB will analyze several different broad policy approaches, such as sector-specific targets or an upstream cap and trade system
- Several scenarios of this type for evaluation are being developed now
- Preliminary modeling results for several key scenarios will be discussed at the April 4 workshop

Scenarios Analysis

- Analysis of scenarios will include:
  - GHG emission reductions
  - Overall economic and societal costs
  - Who pays for reductions
- Additional analysis will be undertaken to evaluate localized impacts and effects on criteria and toxic air pollution emissions
- Stakeholder meetings on economic analysis and mechanism design will be held to discuss the analytic effort, scenario design, and modeling results

Questions and Comments?

E-mail questions to CCPlan@arb.ca.gov

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