

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
- CO₂ price

Economic Feedback

ENERGY 2020	E-DRAM
1. Energy prices	1. Sector output
2. Energy demand investments	2. Personal income
3. Energy supply investments	3. Employment
4. Carbon price	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?

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