



Economic Analysis of the Draft Scoping Plan

Air Resources Board
September 26, 2008 Workshop
Sacramento, CA

Overview

- Objective
- The Models
- Modeling Assumptions
- Impacts on the California Economy
- Impacts on Businesses
- Impacts on the Consumers
- Green Jobs
- Next Steps

Objective

Role of Economic Analysis

- Evaluate the economic impact of the Scoping Plan
- AB 32 establishes broad evaluation requirements for the Scoping Plan. Section 38561 (d) directs the ARB to:
 - Evaluate the total potential costs and total potential economic and noneconomic benefits of the plan for reducing greenhouse gases to California's economy, environment and public health, using the best available economic models, emission estimation techniques, and other scientific methods.
- The evaluation focuses on:
 - Characterizing macroeconomic impacts of the Draft Plan on California
 - Impacts on business, particularly small business
 - Impacts on consumers

Economic Analysis of Scoping Plan

The Models

Economic Analysis Models

- Environmental Dynamic Revenue Assessment Model (E-DRAM)
- Berkeley Energy and Resources Model (BEAR)
- Energy 2020

Environmental Dynamic Revenue Assessment Model (E-DRAM)

- E-DRAM is a computable general equilibrium 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 Air Resources Board
- E-DRAM has been peer reviewed and the model code is available for public use
- E-DRAM has been used by ARB to assess macroeconomic impacts of regulations and policies for over 10 years

E-DRAM

Major Model Inputs

- **Costs of Measure**
- **Savings of Measure**
- **Inputs and Assumptions in Appendix I**
- **Measure Details in Measure Documentation Supplement**

E-DRAM

Major Model Outputs

- Change in Output
- Change in Gross State Product
- Change in Employment
- Change in Personal Income
- Change in Per Capita Income

Berkeley Energy and Resources Model (BEAR)

- Similar Structure to E-DRAM
- Similar Data Sources
- Similar Inputs/Outputs
- Additional Features
 - Technology Module
 - Emission Policy Analysis
 - Transportation Services

Economic Analysis of Scoping Plan

The Assumptions

E-DRAM Baseline/Business-as-Usual

- Department of Finance Projections
- Bureau of Labor Statistics Projections
- ARB GHG Emission Projections
- Energy Sector Related Projections

Business-As-Usual Case

Economic Indicator	2007	2020	Diff	Ave Annual
Real CA Output (\$Billion)	2,535	3,597	1,063	2.7%
GSP (\$Billion)	1,811	2,586	775	2.8%
Personal Income (\$Billion)	1,464	2,093	628	2.8%
Per Capita Income (\$Thousands)	38.6	47.6	9	1.6%
Employment (Millions)	16.4	18.4	2	0.9%

Modeling Assumptions

- All Measures Translated into Costs and Savings (if applicable)
- Annualized Costs
- Annual Savings
- Inputs and Assumptions in Appendix I
- Measure Details in Measure Documentation Supplement

Economic Analysis of Scoping Plan

The Impacts

Impacts on California Economy

Economic Indicator	BAU	Plan	Change	% Diff
Real CA Output (\$Billion)	3,597	3,624	27	0.8
GSP (\$Billion)	2,586	2,590	4	0.2
Personal Income (\$Billion)	2,093	2,106	14	0.6
Per Capita Income (\$Thousands)	47.6	47.72	0.16	0.3
Employment (Millions)	18.4	18.51	0.1	0.6

Carbon Price of ~\$10 per ton of CO₂e

Sector Output Impacts (\$BILLIONS)

Sector	2007	BAU	Plan	%CH
Ag., Forestry & Fishing	76	109	113	3.7%
Mining	26.6	28.7	30	4.5%
Utilities	51	72	61	-15.9%
Construction	114	164	166	1.5%
Manufacturing	673	943	947	0.4%
Wholesale Trade	120	171	173	0.8%
Retail Trade	207	296	291	-1.5%
Transport. & Warehousing	76	109	110	1.0%
Information	164	235	238	1.0%
Finance, Ins. & Real Estate	391	559	571	2.1%
Services	636	910	925	1.7%
Total	2,535	3,597	3,624	0.8%

Economic Analysis of Scoping Plan

Consumer Impacts

Household Employment Impacts Methodology

- Data Sources:
 - CA Employment Development Department's Industry and Occupation Staffing Pattern Projections and Wage data
- Calculate shares of jobs in each industry by wage category (low, medium, high)
- Apply shares to E-DRAM employment projections for each industry
- Estimate net change in employment

Household Employment Impacts

- In 2020, relative to BAU:
 - ~ 40,000 more low wage jobs (<\$15/hr) in 2020 relative to BAU
 - ~ 30,000 more medium wage jobs (\$15-\$30/hr) in 2020 relative to BAU
- Some sectors may experience losses relative to BAU, though workers can transition to similar jobs in other sectors

Household Expenditure Impacts Methodology

- Data Sources:
 - Bureau of Labor Statistics Consumer Expenditure Survey (2005-2006)
 - Expected Sector Price Changes from E-DRAM
- Adjust baseline expenditures by projected price changes
 - Assume 5% decrease in electricity bills and no change in natural gas bills from proposed efficiency measures from E3 modeling
 - Additional savings from Pavley (\$300-\$400/hh)

Household Expenditure Impacts

Income Group	Net Savings (2007\$)	% of Total Expenditures
Low Income (<100% Poverty)	\$400	2%
Low Income (<200% Poverty)	\$400	2%
Middle Income	\$500	1%
High Income	\$500	1%
All Households	\$500	1%

Economic Analysis of Scoping Plan

Business Impacts

Business Impacts Methodology

- Dun & Bradstreet Data
- Energy Spend Per Dollar of Revenue
- State-by-State Energy Expenditure Per Dollar of Revenue
- Industry Data by Business Employee Size and Revenue Size
- Simulate the Impact of a Change in Average Energy Bill on Affected Industries
- Five Percent Reduction in Electricity Bill (E3)
- No Change in Natural Gas Bill

Business Impacts

- Improved California Business Competitiveness
- No Adverse Impact on Business in General
- Large Business Will Be More Responsive
- Large Business Greater Ability to Invest in Energy Saving Technologies

Small Business Impacts

- Small Business Spend More on Energy Per Dollar of Revenue
- Reduced Energy Bill Will Bring about More Benefits to Small Business
- Program Design Will Need to Address Up-front Costs to Small Business

Green Technology Jobs

- Green Job Creation:
 - Energy efficiency
 - Renewable Energy
 - Venture Capital Investment
 - Export market access

Conclusions

- Model Inputs Drive the Findings
- Plan Has a Positive Impact on the Economy
- Economic Impacts Not Uniform Across All Sectors Relative to BAU
- Plan has a Positive Impact Business Including Small Business
- Plan Has a Positive Impact on Consumers

Next Steps

- **Revise Analysis for Proposed Scoping Plan**
- **Evaluate Stakeholder Comments**
- **Evaluate Peer Reviewer Comments**
- **Refine Modeling Approach to Support Regulatory Development**

For Additional Information

- ARB Climate Change Web Site
(To stay informed - sign up for list serve)
www.arb.ca.gov/cc/cc.htm
- California Climate Change Portal
www.climatechange.ca.gov
- Comments on the Draft Scoping Plan
www.arb.ca.gov/cc/scopingplan/spcomment.htm
- General Climate Change Contact: Rich Varenchik
rvarench@arb.ca.gov
626 575-6730