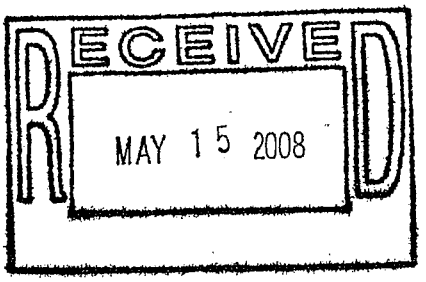
Kevin Kennedy



May 14, 2008

Ms. Mary Nichols
Chair, California Air Resources Board
1001 "I" Street
Post Office Box 2815
Sacramento, California 95812

Subject: Comments on the Economic Modeling of AB 32

Dear Ms. Nichols,

As representatives of the California cement industry, the Coalition for Sustainable Cement Manufacturing and Environment ("the Coalition")* welcomes the opportunity to provide comments on the California Air Resources Board's (CARB) economic modeling efforts related to AB 32. While the Coalition supports the broad goal of ensuring a sustainable future for California, it has concerns that the modeling work to date is likely to systematically underestimate the economic costs of AB 32 to the cement industry and to the California economy. It also is concerned that the problem of leakage in the cement industry — that is, an offsetting increase in global greenhouse gases outside of California as a result of AB 32 — is not being adequately addressed by the modeling efforts.

In preparing its comments, the Coalition has benefited from technical advice from Keybridge Research LLC, a Washington, DC-based economic research firm. Both the Coalition and Keybridge Research look forward to working with CARB on regulatory issues related to the impact of AB 32 on the cement industry and would be happy to meet with CARB staff to discuss the issues raised in this letter in greater detail.

Sincerely yours,

John T. Bloom, Jr.
Chairman, Executive Committee, Coalition for Sustainable Cement Manufacturing & Environment
Vice President & Chief Economist, U.S. Operations, Cemex

Robert F. Wescott, Ph.D.
President, Keybridge Research LLC and Technical Advisor to the Coalition
Washington, DC

CC:
Linda Adams, California Environmental Protection Agency
Darren Bouton, California Governor's Office
David Crane, California Governor's Office
Dan Dunmoyer, California Governor's Office
James Goldstene, California Air Resources Board
John Moffatt, California Governor's Office
Dan Pellisier, California Environmental Protection Agency
Chuck Shulock, California Air Resources Board
Cindy Tuck, California Environmental Protection Agency

** The Coalition includes Cemex, Inc., National Cement Company of California Inc., California Portland Cement Company, Mitsubishi Cement Corporation, Texas Industries, Inc. and Lehigh Southwest Cement Company.*

EXECUTIVE SUMMARY

In its efforts to achieve the emissions reduction targets specified by AB 32, the California Air Resources Board (CARB) is working with economic models to develop an economic impact analysis of alternative policy options. Through the stakeholder workshop process, cement industry representatives have both raised questions and expressed direct concerns about the overall modeling approach. The concerns are directed to both the general limitations of the models and their ability to provide insights on issues related to non-electric power sectors, such as the cement industry. Our key concerns are as follows:

- CARB's exclusive reliance upon a computable general equilibrium (CGE) model to estimate the economic effects of AB 32, as opposed to a traditional time-series forecasting model, is likely to significantly underestimate the economic costs of compliance. The economics literature shows that CGE models, which assume rapid and perfectly maximizing behavior, tend to understate the economic costs of adjusting to climate change policies by roughly half compared with other types of models.[1]

- CARB is using an unrealistically low estimate of future personal income growth in California and hence, overall economic growth, for the next 25 years. By applying the actual 2.4% annual average real per capita growth that California has experienced during the past 10 years, rather than the 1.5% assumed by CARB, the California economy would be 25% larger in 2030. This key assumption leads to an under-estimate of the economic costs of compliance with AB 32.

- CARB's modeling approach is heavily focused on the electric power sector and does not provide the necessary detail to explain likely impacts on the industrial sector. It does not, for example, provide sector-by-sector cost abatement curves or investment functions for various manufacturing sectors. Without sector by sector cost abatement curves, the model can not be used to quantify the impact of policy options across industries and is therefore incapable of providing any guidance as to the equity of alternative policy options across industries. The modeling approach also does not appear capable of quantifying leakage – that is, an offsetting increase in global GHG emissions outside of California due to a shift in production to less regulated jurisdictions as a result of the new policy.

In light of these concerns, the Coalition for Sustainable Cement Manufacturing and Environment[2] recommends that CARB pursue the following actions:

- Develop a new baseline forecast for economic growth that is consistent with historical experience and accepted forecasting standards.

- Explicitly acknowledge and disclose the inherent limitations and tendencies of the modeling approach currently being employed or make necessary adjustments, which would include:

[1] Economic costs in this context refer to reduced real personal income by California residents.

[2] The Coalition for Sustainable Cement Manufacturing and Environment includes Cemex, Inc., National Cement Company of California Inc., California Portland Cement Company, Mitsubishi Cement Corporation, Texas Industries, Inc. and Lehigh Southwest Cement Company.

- Simulate macroeconomic impacts using both a CGE model and a traditional econometric forecasting model with cost abatement curves and investment functions for all industries at the same level of detail as the utility sector, and establish a transparent process for reviewing third-party modeling studies and incorporating those results into the policy decision making process.

- For the cement industry in particular, also include the demand response to price changes and the extent of leakage and its impact on the cement industry and global GHG emissions.

- For all sectors, provide greater transparency on assumptions used relating to technologically feasible GHG reductions and projected abatement costs.

I. INTRODUCTION

In its efforts to achieve the emissions reduction targets specified by AB 32, the California Air Resources Board (CARB) is using economic models to develop an economic impact analysis of alternative policy options. Through the stakeholder workshop process, cement industry representatives have raised both questions and expressed direct concerns about the overall modeling approach. The concerns revolve around both the general limitations of the models and their ability to provide insights on issues related to non-electric power sectors, such as the cement industry.

On a general level, the models being employed, though well-respected, suffer from well-known limitations and tendencies. Furthermore, the overall approach suffers from challenges that are common in efforts to link together disparate models that were originally constructed for significantly different applications with significantly different variable structures and different geographical coverage. In the interest of full transparency and pursuant to its statutory obligation to prepare the Scoping Plan, and ultimately regulations, CARB should explicitly acknowledge the imperfections and limitations of the model and explain how it will be used in developing the Scoping Plan and the regulatory rulemaking process.

Specifically, the modeling approach appears to have limited applicability to non-electric power sectors, such as the cement industry. It is possible that CARB has chosen to focus its modeling efforts more on the electric power sector than on other sectors for a variety of reasons.[3] However, it is unrealistic to expect that such a focus will provide valuable industry-specific insights into anything other than the electric power sector. Thus, given the current approach, we believe that any results specific to the cement industry should be considered indeterminate and any efforts to extend those results to development of the Scoping Plan and regulations of the cement industry would be improper. Rather, the Scoping Plan and regulations for the cement industry should be based on abatement measures that are technologically feasible and cost effective and minimize leakage as required by AB 32.

The following sections present the Coalition on Sustainable Cement Manufacturing and Environment's ("the Coalition") concerns in more detail. In an Appendix we also provide a list of specific questions. We respectfully request that CARB provide the Coalition written comments on these issues.

[3] For example, the electric power sector constitutes a plurality of GHG emissions. Furthermore, the electric power sector has a narrow and well-defined geography – making it easier to model than industries that produce internationally traded goods. Finally, the electricity sector has historically been the most measured and modeled sector within the economy, due to the fact that it has been a heavily regulated sector overseen by state public utility commissions. As a result, we understand that it is more expedient to adapt existing electricity models to a particular modeling approach than building customized models of other state sectors from scratch which is fine as long as all parties recognize and acknowledge that the results are indeterminate for industries outside the utility sector.

II. The Modeling Process Should Recognize and Address the Limitations & Tendencies of CGE Models

There are two main types of economic models that are used for estimating the economic impact of climate change policies – traditional time-series forecasting models and computable general equilibrium (CGE) models. It is our understanding that the macroeconomic impact of various scenarios will be estimated by the EDRAM model – a CGE model that seeks a set of prices that put all markets in equilibrium simultaneously. Although CGE models are widely employed and well respected, they suffer from a set of well-documented limitations and tendencies in modeling climate change policies. Most notably:

- CGE models are unable to offer guidance on the nature or duration of disequilibrium states – that is, the critical dynamic adjustment process leading to the ultimate result.
- CGE models tend to produce more optimistic results than those produced by other equally respectable methods – namely, traditional time-series forecasting models.[4]
    - Specifically, in one of the most cited recent academic meta-studies of the properties of economic models used to estimate the effects of climate change policies, Barker, *et. al.*, (Cambridge University, 2006), found that stabilizing GHG by 2030 would lead to a cumulative average 3.4% reduction in real GDP by that year. This meta-study concluded that this estimated loss in GDP would be reduced by a cumulative 1.5% simply by relying upon CGE class models. In other words, CGE models, when used for climate change studies, tend to find only about half as much "economic pain" as other economic models find on average.
    - A key reason for this result is that CGE models implicitly assume perfect information and rational maximizing behavior on the part of businesses and consumers, who rapidly and completely respond to higher carbon prices. Traditional time-series forecasting models rely more upon historical behavioral patterns and typically find that in the real world information is imperfect and takes time to accumulate for decisions. They also find that there is substantial sub-optimal behavior—that is, that consumers do not necessarily make optimal decisions 100% of the time.

The Coalition believes that CARB should take additional steps to mitigate these concerns and provide for a more robust modeling exercise, including:

- Perform macroeconomic analysis using *both a CGE model and a time-series forecasting model* with all industries specified at the same level of detail as the utility sector and allow for full demand responses to prices – an approach that will both enhance stakeholder understanding of the dynamic adjustment process and provide a range of results that would be robust.

[4] See, for example, Terry Barker, Mahvash Saeed Qureshi, and Jonathan Kohler (2006) "The Costs of Greenhouse Gas Mitigation with Induced Technological Change: A Meta-Analysis of Estimates in the Literature," Cambridge University Tyndall Centre for Climate Change Research, Working Paper 89.

- *Ensure a transparent process* for reviewing third-party modeling exercises (especially those that employ a time-series forecasting modeling technique) and incorporate those results into its policy evaluation process.

III. CARB's Baseline Assumptions Likely Understate Future Economic Growth in California

Based upon a review of model documentation, it appears that Energy 2020 assumes an unreasonably low rate of personal income growth (and therefore economic growth) in its baseline scenario. This tends to artificially make the achievement of a GHG reduction target appear easier and less costly for industry and the California economy than is likely to be the case in reality. Specifically, according to the "Energy 2020 Model Input & Assumptions" manual provided by ICF, the model assumes that *nominal* income per capita will grow at an average annual rate of 1.5% between 2005 and 2030. This number would represent an unrealistically low assumption and the Coalition assumes that this should read "*real* income per capita will grow at an average annual rate of 1.5% between 2005 and 2030."

Even with this correction, however, the per capita income estimate is unjustifiably low. During the past decade (1997-2007) California's per capita income has increased from $26,490 to $41,571.[5] Adjusting these nominal per capita income values to real (inflation adjusted) terms using widely accepted economic formulas shows that real per capita income in California increased at an average annual compound growth rate of 2.4% a year between 1997 and 2007.[6]

By applying the actual 2.4% annual average real per capita growth that California has experienced during the past 10 years, rather than the 1.5% assumed by CARB, the California economy would be 25% larger in 2030.[7] To the extent that economic growth is a primary driver of GHG emissions within the model, CARB's assumption of sharply slower growth in the future is likely to dramatically understate a business-as-usual emissions trajectory in coming years and gives a grossly distorted picture of the GHG reduction challenge. As a result, the model will require fewer GHG reductions to hit AB 32 targets, and, consequently, it would greatly understate the real economic costs.

The Coalition believes that the baseline growth assumption is a fundamental flaw and advises that CARB develop a new underlying growth assumption that is consistent with recent historical experience and accepted economic forecasting standards.

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[5] Source is U.S. Department of Commerce, Bureau of Economic Analysis, State Personal Income 2007, online at www.bea.gov.

[6] Calculations performed by Keybridge Research LLC. Nominal to real adjustment was calculated using the U.S. national personal consumption deflator from the U.S. Bureau of Economic Analysis NIPA table 2.4.4.

[7] Calculations performed by Keybridge Research LLC.

IV. The Modeling Effort Offers Little Policy Relevance, Insight, or Guidance for Non-Electric Power Sectors and Does Not Shed Light on Leakage

The CARB modeling effort has primarily focused on the electric power sector and provides little of the needed detail on other industrial sectors that will be critical to meeting AB 32 targets. Energy 2020 is fundamentally an energy and electric-power-sector model that is poorly suited to capture the true impacts within the industrial sector. Even the combination of the Energy 2020 model and the EDRAM macroeconomic model provide only a very limited ability to capture the dynamics of key industries, including the cement industry. Although some share-down demand estimates may be available for different industries, the modeling system fails to acknowledge a number of key aspects of the manufacturing sector that would need to be addressed to provide meaningful results, including the following:

- Detailed GHG cost abatement curves for each industry based on an assessment of the current state of technologically feasible options.
- A fully articulated supply-side for manufacturing industries, including a detailed industry-specific investment function for the California cement industry.
- The likely effects that AB 32 might have on capital costs in each California manufacturing industry.
- Industry-by-industry product demand elasticities that can capture demand responses to price changes, including impacts beyond first-order effects.

This lack of model detail for non-electric power sectors has been repeatedly evident in CARB responses to workshop questions:

- CARB representatives have stated that Energy 2020 will not be simulating the demand response to price increases in energy-intensive goods – a fundamental element of any complete economic impact assessment.
- Based on CARB comments, it is our understanding that investment decisions and costs in non-electric power sectors will not be based upon customized industry abatement cost curves, but rather upon generic functions relating investment costs to efficiency gains. Our concern is that the generic investment-efficiency curves specified in Energy 2020 may greatly understate the true investment costs for industries such as cement. Indeed, California cement is among the most efficiently produced cement in the world and employs a variety of energy and process practices that are among the most technologically advanced. As a result, California cement producers are likely to be currently operating on the high end of a generic industry cost curve, and marginal efficiency gains per dollar of capital spending are very likely to be significantly lower in California compared to national industry averages or averages in cement industries in other countries.
- It is our understanding that EDRAM only provides one aggregate investment function. As a result, we are left with the assumption that EDRAM will not actually simulate investment decisions by sector, but will "share down" investment spending from this aggregate account based on fixed weights

calculated from historical data. Without a fully articulated industry-by-industry investment breakdown (ideally at the 100 industry level), however, any modeling effort is likely to understate the negative investment effects in the most affected industries. This is particularly troublesome for an industry like cement, which faces very high capital investment costs (both initial and on a going forward basis) and high energy costs (particularly in California).

In addition, leakage — an offsetting increase in global GHG emissions outside of California that occurs through a shift in production to less regulated jurisdictions as a result of the policy — is not satisfactorily addressed in the current modeling structure. In addition to the estimating the leakage that would occur within the cement industry (as cement manufacturing might be shifted out of California to other jurisdictions), a comprehensive modeling system would also estimate the leakage that might occur from a shift away from cement to, say, non-California produced steel or asphalt, used in construction and paving applications in California. Minimization of leakage is both a fundamental concern of California companies and a legal requirement of AB 32. Any failure to address leakage will undermine the climate change objectives of AB 32 and have significant and irreversible effects on California's manufacturing industry. CARB representatives have suggested that the modeling efforts will not be able to provide insights about leakage in the industrial sector, though it is unclear if such statements refer to the entire modeling process or only the initial simulations.

Given the combination of these modeling weaknesses concerning the industrial sector, the Coalition believes that any quantitative indications about the likely affects of AB 32 on the cement industry are indeterminate at best.

V. Concluding Comments

CARB has made a number of choices in its economic modeling work — from selection of model type to choice of key forecasting assumptions — that heavily bias the results in the direction of minimizing the likely true economic and industry costs of compliance with AB 32. The Coalition believes that these choices could easily understate the true costs by half or perhaps even more. Although the modeling effort may capture the dynamics in the electric power sector, it is poorly equipped to provide detailed analysis of the effects of AB 32 on other industries, and especially the cement industry. A key limitation is a likely inability to accurately assess the risks and costs of manufacturing and industrial-sector leakage. Although the modeling effort relies upon credible and well respected models, the aggregate effect of cobbling together multiple models with different regional coverage, different industrial detail, and different variable structure suggests that any estimated impacts on a specific industry, like cement, are indeterminate and ill-suited for guiding the development of the Scoping Plan and related GHG regulations.

APPENDIX I: SPECIFIC QUESTIONS ON THE MODELING PROCESS

1) Please explain or refer us to a document that describes the goals of the modeling and how the model results will be used. For example, to what extent will the draft Scoping Plan rely on the results from the preliminary modeling effort in choosing an initial regulatory approach? Is it the intent of the preliminary modeling effort to address individual industrial sectors, or is this intended for some future modeling effort? How will the absence of detail in the preliminary modeling effort affect the validity of these choices?

2) Please explain the relationship of the CARB economic modeling effort to the existing CAT modeling effort and the parallel modeling effort at CPUC.

3) Please provide an overall schedule for the modeling efforts, including the second phase of the modeling in which detailed cap & trade options, including offsets, will be addressed.

4) Please indicate how investment in individual industries is modeled in Energy 2020. How is it modeled in EDRAM? Given that they seem to rely upon different sector breakdowns, how is this information linked between the two models?

5) Will the limitations of the modeling effort be documented in any reports generated?

APPENDIX II: BACKGROUND ON TECHNICAL ADVISORS

Keybridge Research LLC is a Washington-DC based economic, financial, and public policy research firm. The firm serves G-7 governments, major financial institutions and companies, and leading industry associations. Among the firm's clients are Fortune 500 companies and well-known international financial-sector firms in the U.S., Europe, and Asia. Keybridge is particularly well known for its economic research, quantitative analysis, statistical and modeling capabilities, and ability to assist clients with the development of strategic plans. Keybridge Research maintains a network of high-profile experts, including Nobel-prize winning economists, leading academics, and former senior G-7, Federal Reserve, White House, Treasury, and International Monetary Fund officials, who assist with projects and participate in strategic planning and research activities.

Dr. Robert F. Wescott is President and Founder of Keybridge Research LLC, the Washington, DC-based economic research firm. He has nearly 30 years of professional experience working on macroeconomics, energy economics, and public policy issues. He concentrates on energy issues, energy modeling and analysis, financial risk assessment, and strategic planning. Before founding Keybridge, Dr. Wescott served as Special Assistant to the President for Economic Policy at the White House and as Chief Economist at the President's Council of Economic Advisers. From 1982-93 he was Senior Vice President and Chief Economist at Wharton Econometrics (WEFA Group—today known as Global Insight, Inc.), the private economic modeling and analysis firm, where he oversaw all economic modeling, forecasting, and consulting operations. Dr. Wescott also was a senior official in the Research Department of the International Monetary Fund where he did research on global economic risks and policy challenges. In 1990 he was research director at the International Center for the Study of East Asian Development in Kitakyushu, Japan. He holds a Ph.D. in economics from the University of Pennsylvania, 1983. He graduated magna cum laude with a B.A. in economics from Bucknell University in 1977, where he was elected to Phi Beta Kappa.