

**U.S. Environmental Protection Agency
Advisory Council on Clean Air Compliance Analysis (Council)**

May 4-5, 2010

SAB Conference Center
1025 F Street, NW, Washington, DC 20004

Minutes of the Meeting

Attendees:

Council Members: Jim Hammitt (Chair), John Bailar, Michelle Bell, Sylvia Brandt, Linda Bui, Dallas Burtraw, Ivan Fernandez, Shelby Gerking, Wayne Gray, Alan Hansen, Nat Keohane, Jonathan Levy (by phone), Rich Poirot, Arden Pope, Ted Russell (see Council Roster¹)

SAB Staff Office: Stephanie Sanzone, Vanessa Vu, Marc Rigas

Other EPA Staff: Jim DeMocker, Rob Brenner, Brian Heninger, Ken Davidson

Other: James Neumann, Jason Price, Henry Roman, Industrial Economics; Lauren Davis, Brooks Depero, RTI; Andrew Childers, BNA Daily Environment Report; Maria Hegstad, Inside EPA.

Purpose:

The purpose of the meeting was to review and approve draft reports from the Council subcommittees, to review economic analyses prepared for the 812 Study, and to review a preliminary draft of the Second Section 812 Prospective Study on the Benefits and Costs of the Clean Air Act.

Meeting Materials:

All materials discussed at the meeting are available on the Council Web site, <http://www.epa.gov/advisorycouncilcaa>, at the [May 4-5, 2010 Council Meeting](#) page.

Summary of Discussions:

The meeting was announced in the Federal Register² and proceeded according to the meeting agenda³, as revised. Stephanie Sanzone, Designated Federal Office for the Council, convened the meeting and noted that the Council operates in accordance with the Federal Advisory Committee Act. This means that meetings are announced and open to the public, meeting minutes are prepared, and all materials prepared for or by the Council are available to the public. After a brief overview of the agenda and the materials provided to the Council, Ms. Sanzone turned the meeting over to Dr. Vu, Director of the SAB Staff Office, who extended her welcome and thanks to the members for their participation on the Council. Dr. Hammitt, Chair of the Council, added his welcome and reviewed the plan for the 2-day meeting.

The following is a summary of the issues discussed and conclusions reached during the meeting.

A. Overview of the Second Section 812 Prospective Study

Jim DeMocker, Senior Policy Analyst with EPA's Office of Policy Analysis and Review and head of the 812 Project Team, provided a brief history of the Second Prospective Study,

including component studies and previous peer reviews (see Presentation Slides⁴). Previous steps in the study have been reviewed by the Council or Council subcommittees, including the analytical plan for the study, development of emissions inventories for base years, use of an integrated model (CMAQ) to develop air quality scenarios for emissions reductions with and without the CAAA, and direct cost estimates for compliance. For the current round of reviews, Council subcommittees examined the CMAQ scenarios and proposed adjustments to the fine particle emissions (PM_{2.5}), estimates of health effects, and the ecological effects reports; draft Subcommittee reports are on the agenda for Council discussion. Materials being presented at this meeting of the Council also include revised direct cost estimates, economy-wide modeling of impacts from CAAA compliance (EMPAX-CGE model), health benefits valuation, certain of the welfare benefits (e.g., for materials damage and visibility), uncertainty, and the preliminary integrated 812 report.

DeMocker noted that quality checks by the Project Team had flagged some issues with the particulate material (PM) inventories, notably that several source categories were implausibly large. The team has been working to address these issues, to account for fugitive dust transfer and overestimation of non-EGU point sources. DeMocker asked whether the Council's Air Quality Modeling Subcommittee should review the final detailed description of the modeling results, including the adjustments to CMAQ outputs. After some discussion, the Council agreed that AQMS should review a product that described the adjustments that were made to the emissions inventories, and the application of the Modeled Attainment Test Software (MATS) to the CMAQ outputs.

DeMocker explained that the agricultural and commercial timber benefits from reduced ozone exposures are not yet available; the Agency is awaiting final peer review of the revised FASOM model, but these results would be included in the next draft of the integrated 812 report. He proposed that the Council plan to hold a second meeting in late summer to review the revised integrated report.

Several members urged the Project Team, while the experience is still fresh, to put together points on what would make a future 812 report more targeted and accurate, and maybe less costly. For example, where can uncertainties be reduced, what lessons can be drawn about priority research needs, and where can data be used to check previous projections?

B. Discussion of the Health Effects Subcommittee Report

Dr. Bailar, Chair of the Health Effects Subcommittee (HES), summarized the findings in the HES draft report⁵, noting that the Subcommittee had been mostly pleased with the work that was presented to them. The charge to the HES had many specific questions about health effects from particulates and ozone exposures, and the nature of the time lag between exposures and effects. The health effects study also estimated the difference between the scenarios with and without CAAA for infant mortality, baseline disease incidence, sensitivity of outcomes to PM composition, and dynamic modeling of changes in the U.S. population. The HES concluded that the data sources and methods were sound and well-conceived. The 3 sources of PM mortality estimates (from the Harvard and ACS studies, and from the expert elicitation) were in pretty good agreement. The HES recommended that the Agency use a simpler analysis to characterize the effects distribution (rather than the Copula function), and this has been done in the revised

Agency materials. The HES agreed with the 20-year lag for PM2.5, with most of the benefits occurring in the early years. The HES also supported inclusion of reduced mortality from ozone in the primary benefits estimate. The Subcommittee report has a few recommendations for data choices, and Dr. Bailar noted evidence that EPA is taking these recommendations to heart in the 812 reports.

Dr. Keohane, lead discussant for the Council's review of the HES report, noted that the Subcommittee report was well done and clear, that the charge questions had been answered, and he recommended that the Council give some feedback to Dr. Bailar and authorize Drs. Bailar and Hammitt to sign the report and transmit it to the Agency.

During Council discussion of the draft HES report, the following clarifications or additions were suggested:

- For clarity, it would be helpful to know which of the HES recommendations had been addressed in the Agency's subsequent draft benefits report (e.g., the Copula function is not mentioned in the draft sent to the Council).
- The VSL is based on 20-year old literature and should be updated at some point.
- The discussion of uncertainty does not consider the sensitivity of the benefits to different VSL estimates. Since mortality numbers dominate the benefits, this is very important.
- It would be helpful to break down the PM mortality benefits in terms of subpopulations (e.g., different age groups, urban vs. rural, sensitive subpopulations), and in terms of benefits from reducing existing exposures vs. benefits from prevented increments in pollution.
- Some available epidemiological studies (e.g., a study in Atlanta supported by EPRI) were not considered and might have informed the discussion of PM differential toxicity. (However, a member of the HES noted that the subcommittee felt there was not consensus in the literature on the issue, and thus did not recommend that EPA attempt to do analysis using differential toxicity for PM constituents.) Council members agreed that the summary uncertainty tables should make clear that differential toxicity wasn't considered, and suggest the probable direction of the uncertainty on the benefits estimate.
- The HES report should be modified to clarify that HES does not share the Agency's concern about the potential for misinterpretation of sensitivity analysis for PM differential toxicity.

Council Action: the Council adopted the HES report, subject to minor editorial changes to be submitted to Drs. Bailar and Marc Rigas, DFO for the HES.

C. Discussion of the Ecological Effects Subcommittee Report

Dr. Fernandez, Chair of the Ecological Effects Subcommittee (EES), summarized the conclusions and recommendations in the EES draft report⁶. Materials provided to the Subcommittee included a literature review of ecological effects associated with air pollutants, two case studies in the Adirondack region of New York State, and a study of ozone effects on crops and commercial timber. (The valuation of ozone benefits was not provided to the EES, and in fact is not yet available.) The EES applauded the Agency for including ecological effects in the 812 project, and recommended some important improvements. The EES recommended that the Agency describe an overarching framework to place the analyses in context, and enhance the

ecological effects report to serve as a gateway to comprehensive information on the ecological effects of air pollutants and control of those pollutants.

EES was concerned that the draft documents neglected the importance of nitrogen compounds at nutrients, and did not consider the importance of climate change in modifying the response of ecological receptors to regulated air pollutants in the future scenarios. Dr. Fernandez noted that data availability often defined the scope of the analyses. Although EES agreed with the approach of comparing with-CAAA and without-CAAA scenarios, EES members wanted more discussion of uncertainties and validation of model results against monitoring and response data. The EES also had questions about the forms of the data presented, and in particular was concerned that deposition of nitrogen and sulfur compounds be reported as equivalents of acidity, or reported separately, rather than as combined total mass of NO_x and SO_x (in kg/hectare).

To enhance future analyses, the EES report also recommends: (1) better linking of ecological functions with service flows/values, (2) continued support for environmental monitoring needed to answer these questions, (3) consideration of climate change impacts on ecological response mechanisms.

Dr. Brandt, led the Council's discussion of the EES report. She agreed with the points made in the EES report, but wanted additional discussion about the linkages between the ecological effects and valuation steps. She questioned why the literature review had not included references from the ecological valuation literature, and recommended that the Agency continue to support collaborative ecological/economic research, via the STAR program and other venues. She reiterated the EES point that the ecological effects should be presented in the broader context, i.e., by describing the range of effects and benefits associated with air pollutants, and describing how the specific analyses were selected.

Council members made the following points:

- The Agency documents did not describe why certain ecological benefit estimates were developed using geographically limited case studies and other estimates were developed nationally. The materials should say why regional cases cannot be “scaled up” to generate national benefit estimates.
- The Agency documents lacked adequate detail on the FASOM model, including details on model parameterization for the ozone yield loss analyses.
- The use of binary categories for fishable/not fishable in the Adirondack recreational fishing case study presents problems.
- Other sources of information on the total value of recreational fishing in New York State should be used to assess whether the Adirondack case study benefit estimate is reasonable.
- Several members asked whether the Adirondacks timber case was representative of other forested areas in the U.S., but Dr. Fernandez clarified that the acidic deposition exposures and tree species mix were specific to the region.

Council Action: The Council approved the EES report, subject to minor editorial revisions, and agreed that Dr. Brandt's comments would be incorporated in the Council's advisory report.

D. Applications of 812 Study Results.

Rob Brenner, Director of the Office of Policy Analysis and Review in the Office of Air and Radiation offered brief remarks on the value of the 812 studies to the Agency. He reflected on the progress that has been made in reducing air emissions since 1990, and noted that despite early controversy about the feasibility of cost-effective controls, the nation met initial air quality standards and vehicle standards, and went on to a second round of reductions. He noted that the 812 studies have provided reassurance to the business community and others that the time and resources invested in CAAA compliance have been worth it. Likewise, the environmental community has appreciated the retrospective look and lessons learned from control programs, and Congress has used the studies to see if the statute is having the intended effects. Brenner also noted that within the Agency, the 812 studies have been used to help set priorities for public health; to identify co-benefits from controls that reduce multiple pollutants (e.g., additional SO₂ reductions from rules targeting air toxics); and to improve regulatory impact analyses (RIAs). Looking to the future, Mr. Brenner suggested that the next major challenge for the air programs will be to integrate issues of climate change and greenhouse gases into existing efforts on air quality in ways that make sense for the business community and the environment. He noted that the Agency will want the Council's help with this set of issues in the future, in addition to seeking the Council's final review of the 812 study.

Several Council members urged the Agency to include discussion in the 812 report of data and methodological gaps identified as needing to be filled, as well as some discussion of ancillary benefits from doing this sort of integrated analysis.

E. Discussion of the Air Quality Modeling Subcommittee Report

Dr. Ted Russell, Chair of the Air Quality Modeling Subcommittee (AQMS), summarized the Subcommittee's conclusions, as reflected in the draft AQMS report⁷. He noted that the AQMS had been briefed by the Agency on errors that had been identified with the PM inventories, and on Agency plans to adjust CMAQ outputs using the Modeled Attainment Test Software (MATS). Based on preliminary information, the Subcommittee agreed this use of MATS was appropriate, but had requested to see the final adjusted emissions inventories and simulated future air quality scenarios. Chapter 4 of the draft integrated report includes some discussion of MATS and SMAT (species adjustment). These adjustments weren't described in the CMAQ modeling report, but are important for accounting for biases and uncertainties from CMAQ outputs. The Subcommittee asked for and received the uncertainty chapters and information on the proposed approach to correcting the inventories. At this point, the AQMS would prefer to see further MATS results and the next version of Chapter 4 in the integrated 812 report, before signing off on the work.

Council members suggested the following clarifications to the AQMS draft report:

- Amend the AQMS report to clarify that the MATS adjustments were applied for more than 3 cities, and explain how this issue impacts visibility assessment.
- Reconsider the wording of AQMS Recommendation 3, since expanding the analysis beyond the CAAA would be beyond the scope of the 812 study. The recommendation could be directed at future broad Agency analyses, rather than to the 812 Project Team.
- Revise technical correction 11 to clarify that nearest neighbor averaging is used to correct for advection errors, not spatial variability.

Council members discussed the following concerns that relate to the Agency materials, including the preliminary integrated 812 report:

- Uncertainty is a theme throughout the 812 assessment. Sources of uncertainty are listed for each chapter, but it is difficult to determine the relative priority for the various sources of uncertainty.
- The MM5 meteorological model doesn't include climate change. The role of MM5 (and its limitations) in the air quality modeling is not clear. The Agency documents should say clearly that climate over the 20-30 year timeframe is assumed constant.
- The 812 study assumes attainment, yet there is not attainment in 2000. This raises the question of how to interpret the assumed unidentified local controls for 2000.
- The integrated report should include more discussion on what MATS does.

Council Action: The Council approved the AQMS report, subject to minor revisions.

F. Update on Adjustments to Air Quality Modeling Inputs and Results

Jim DeMocker summarized the changes that are being made to PM baseline inventories, and the scaling approach that will be used to revise the air quality projections for PM without re-running CMAQ (see Presentation Slides⁸). He noted that time and resource constraints made it impractical to re-run CMAQ, but that the primary PM components are fairly linear and non-interactive, so the scaling approach is being used to get revised total PM mass. Prior to the meeting, the Council was provided with "change pages" to the review documents that reflect a flat 10% correction for the PM. However, the final versions of the 812 documents (for health benefits and the integrated 812 report) will show the actual results of the scaling procedure.

Council members were concerned that the changes sound ad hoc, and concluded that the AQMS should review Chapter 4 in the integrated report, as well as a written description of the correction procedures and the resulting PM estimates.

Council Action: The Council requested the Agency to prepare a technical report summarizing the various adjustments that were made to the PM inventories, application of MATS to adjust CMAQ outputs, and the results of those adjustments. The Council directed the AQMS to review the technical report and report back to the Council on these issues. The AQMS review would be conducted prior to the Council's review of a revised integrated report.

G. Introduction to Council Reviews of Economic Analyses and Integrated 812 Report

Ms. Sanzone noted that Dr. Levy would recuse from discussion of the PM differential toxicity work contained in the benefits report. Dr. Hammitt reviewed the Charge to the Council⁹, which asks the Council to comment on the data and methods used in the analyses, as well as the validity and utility of the study.

H. Health Benefits Valuation and Uncertainty

Henry Roman, Principal with Industrial Economics, Inc., provided an overview of the health benefits valuation and uncertainty portions of the 812 project (see Presentation Slides¹⁰).

Council members raised the following issues:

- The Weibull distribution is a good empirical fit for the data, but the document should provide the equation for the distribution and be clear that it does not represent anything specific in nature. Also the document should explain which criteria are satisfied by the distribution (perhaps in an appendix).
- Cessation Lag: The HES agrees with use of the 20-year distributed lag for PM, but the report might refer to some more recent studies to show that other results do fall within the Weibull distribution in the 812 report.
- The benefits chapter of the integrated report should focus much more on the results, and a context for interpreting the size of the benefits, and less on the methods for generating the numbers. The estimated benefits in 2020 of almost \$2 trillion from avoided PM mortality swamp the other categories of benefits.
- The discussion of mortality benefits should make clear that averting or defensive behaviors are not considered in the estimates, and that the VSL being used is based on old, and quite variable, studies.
- It would be helpful to indicate the relative contribution to the health benefits that is coming from reductions to air pollution (relative to the base year) versus from prevention of air pollution (the difference between the with-CAAA and without-CAAA scenarios). The report might include tables that show air quality results with/without the CAAA, as well as 1970 values for benchmarking.
- The exposure scenarios from the modeling could be placed in context by showing how the concentration ranges compare to the exposure gradients in the large epidemiology studies (e.g., the Six Cities studies). This comparison helps to demonstrate that the projected exposures are within the range of observed experience, and lend credence to the CR functions that underlie the benefits estimate.
- It would be useful to have a narrative about what is driving the \$1.9 trillion benefits, both in the benefits report and in the integrated report, i.e., that the benefits are mostly driven by the CR functions, not by an unusually high VSL.
- The discussion of health benefits might refer back to other health benefits (e.g., from reduced exposure to lead) that were evaluated for the First Prospective Study, just to keep these other categories of benefits “on the table.”
- The benefit estimate is very large because a small air pollutant risk is being applied to the entire population (i.e., the relative risk to an individual is low, but the exposure is ubiquitous).
- The Agency should think carefully about the intended audiences for the various 812 reports, perhaps focusing the integrated report more on presentation and interpretation of the results, and leaving the technical details in the stand-alone documents (and perhaps making these technical documents appendices to the summary 812 report).
- The large difference between PM and ozone effects, with PM benefits dominating the 812 benefit estimates, may seem to contradict the Agency’s current efforts to revise the ozone standards to be more stringent. The Agency should be prepared to discuss the difference between the 812 analyses (which look at benefits from a counterfactual scenario of large changes in ozone with and without regulation) versus the analyses to support the ozone standard (which look at incremental benefits of changes to the existing standard).

I. Welfare Benefits Valuation

Jim Neumann, Principal at Industrial Economics, Inc., presented an overview of the welfare benefits valuation, including materials damage, visibility, agricultural/timber benefits from reduced air pollution, and lake acidification benefits for Adirondack lakes¹¹. Following the overview, **Dr. Hansen** led the Council's discussion of the welfare benefit analyses.

1. Visibility: The greatest improvements in visibility (displayed using the log-based deciview scale) are seen in the eastern U.S. Neumann described the approaches used to estimate benefits to recreational visibility (in national parks) and residential visibility (in metropolitan areas). The recreational visibility benefits were estimated using the same method as in the First Prospective, based on willingness to pay (WTP estimates from 1990, and benefit transfer to parks in 3 regions of the U.S.). A new method was used to estimate residential visibility benefits, based on 3 WTP studies and benefit transfer to MSAs with similar characteristics. He noted that the WTP value of visibility in San Francisco was much higher than for other locations, perhaps because of unique spectacular vistas in the area. Elevation was used as an indicator of mountain views, e.g., in Denver.

Council members noted the following:

- The estimates for recreational visibility benefits include the impact of the Clean Air Interstate Rule (CAIR) in the with-CAAA scenario.
- There are few valuation references (and the Chestnut and Rowe study is not well peer-reviewed), and there is no justification given for why some locales value views 10 times more than other locales.
- The methods for valuing visibility were not internally consistent (e.g., one WTP study included household income as a variable, and one did not) and some results are given in visual range and others are in deciviews.
- Uncertainty associated with visibility benefits estimates is not discussed.
- It may not be possible to separate out "perceived health effects" from poor visibility, because people's sense of wellbeing is affected by poor visibility apart from direct health effects from exposure.
- Annual average visibility may not be the best metric for valuation, since survey photos used in the WTP studies likely were not selected to represent this level of visibility, the relevant visibility is that during daylight hours, etc. One approach might be to develop annual averages using daylight values only.
- Despite some limitations on the visibility valuation, there are very few studies to draw upon. Although expensive to conduct, studies to value visibility are very important and should be funded, given the size of the estimated benefits.

2. Agricultural and Forest Ozone Benefits: The analyses used modeled and monitored W126 cumulative **ozone** estimates for daytime exposures during the growing season. Neumann acknowledged that the C-R functions are somewhat old and based on laboratory studies, but they have been evaluated in many settings. The benefits from reduced ozone exposures are displayed by crop, in terms of relative yield loss. For valuation, the FASOM model merges a timber model and an agricultural simulation model, and allows optimization of welfare across sectors (switching from one crop to another, from crops to timber, etc.). A new version of FASOM is in peer review now, so final FASOM results should be available soon.

Council members made the following points about the ozone benefits chapter:

- The effects of PM on crop yield loss should be discussed as a source of uncertainty in the estimates of ozone-related benefits.
- The chapter should include a comparison of the various ozone exposure metrics (e.g., using a scatter plot) to allow readers to assess whether the metrics differed greatly.
- It would be preferable to weight benefits based on the location of crop production, not just as the average for FASOM regions.
- The Council would like to see the revised benefits chapter with FASOM results sooner than in the “final” integrated 812 report.

Council Action: The Council agreed that the ozone valuation work should have an in-depth review once a more detailed description of the FASOM modeling and results are available.

3. Materials Damage: The analysis of avoided materials damage relied on an existing inventory for the U.S. of materials that might be subject to damage from SO₂ deposition. Acid exposure estimates were developed using the APEEP model, a reduced form air quality model, for the with-CAAA and without-CAAA scenarios. Valuation then is based on reduced maintenance and repair costs on an annual basis.

During the discussion, Council members made the following points:

- The document should explain why the analysis uses APEEP rather than the CMAQ estimates for air quality, and should reference the earlier prospective study for discussion of the limitations of APEEP.
- The space and time estimates of materials damage should be placed in context. For example, the estimates appear very precise, but what percent of the problem is captured by modeling SO₂ only?
- The analysis deliberately excludes acidity from the damage functions (i.e., the equations for the damage functions for the four materials include an acidity term, but it is held constant over time so that only spatial variation is considered). However, changes in SO₂ also produce changes in acidity.
- The materials damage benefits do not consider the value of cultural works of art (e.g., the Statue of Liberty, grave markers) that are impacted by changes in air quality.

4. General comments by Council members on the welfare benefits:

- Even though the welfare benefit estimates are much smaller than the PM health benefits, don't send the message that these other categories of benefits are unimportant.
- In the integrated report, distinguish between small benefits versus unknown benefits (e.g., no measures are available for many of the ecological benefits).
- There may be instances where WTP studies could complement direct measures of avoided costs.
- Where available, other studies of total use and non-use values (e.g., the RFF study on values in the Adirondack region) should be used to check that more narrow 812 valuation analyses appear reasonable.

- Be clear that the welfare analyses are limited looks at the possible universe of welfare benefits (i.e., “looking under lamp posts”), and that the 812 study is a learning lab for developing methods for evaluating different categories of benefits.

J. Direct Cost Report

Jason Price, Senior Associate with Industrial Economics, Inc., presented an overview of the direct costs assessment¹². He noted that the methods had been presented to the Council in 2007, so his presentation would focus on changes to the methods since that time. The team estimated costs independently for each source category, developed cost estimates that were consistent with the emissions reductions, and then estimated incremental change in costs. (An alternate approach, finding the difference between total estimated costs for the with-CAAA and without-CAAA scenarios, was considered too labor-intensive.) A 5% discount rate was used in the analyses.

Price highlighted the following changes since the 2007 Council’s review of the direct cost methods:

- Learning curve effects (i.e., the percent decline in cost with each doubling of technology application): the literature suggests approximately 20% decline in the cost of pollutant reduction with each doubling of technology application. To be conservative, the Project Team used 5 to 10% as learning curve adjustments. (The Council had previously suggested using 10% as a default.)
- Local controls: The Council had suggested separating out unidentified local controls, but imposing a cap on costs associated with these controls. In 2007, the cap was \$10K/ton for both sets of local controls. In the current report, the cost cap for local controls was increased to \$15K/ton.
- In addition to estimating direct costs, the current study also considers benefit adjustments (labor force changes and medical expenditures) when estimating costs as input to the EMPAX-CGE model.

Dr. Bui, led the Council’s discussion, and commended the Project Team for making the description of the direct cost work as transparent as possible. She did raise questions about the learning curves that were used, noting that much of the existing literature relates to old technologies from the 1980’s and 1990’s and may not be as relevant for today. She questioned the use of learning curve values as high as 22%.

Council members raised the following issues about the direct cost report:

- Although estimates of learning curves show differences for different industries, there may not be enough evidence to justify using different rates across different industries. The document should make clear that learning curves are being used as a proxy for technological change.
- The document should more clearly describe how the \$15K figure was developed for the cost of unidentified local controls.
- The document implies that the specific sequence of controls is important to the estimate of costs, but if the issue is just to avoid double-counting, make that clear.
- Much of the costs are driven by automobiles and fuels (NO_x, CO and VOC emissions). However, benefits are being driven by PM_{2.5} reductions from EGU controls.

- The discussion of uncertainties should describe assumptions about optimizing behavior (e.g., if the model doesn't allow optimizing behavior, the results will overestimate costs).
- The report takes a very engineering-focused approach to costs, whereas benefits estimates are much more econometric-focused. There are econometric-based cost numbers for some sectors (e.g., Title IV) and these could be used to show that the 812 cost estimates are within the ballpark.
- Even though the 812 study is not a cost-effectiveness study, it is interesting to look at where the costs and benefits coming from. EGU controls will look inexpensive, and vehicle controls will look expensive.
- The model may be overestimating costs because the assumption of least-cost compliance is unrealistic and technological innovation is not well captured.

K. CGE Modeling Report

Brooks Depro and **Lauren Davis**, with Research Triangle Institute, presented an overview of results from the EMPAX-CGE, an economy-wide model to capture how people and businesses might react to CAAA programs¹³. The model simulates final product markets and interactions among them in order to translate direct costs and consider behavioral choices (e.g., changes in prices and incomes). The model is single country, but does consider trade.

Dr. Gray led the Council discussion of the CGE modeling report. Council members agreed that the report represents an attempt to include market benefits (i.e., fewer work loss days means more labor inputs to the economy, reduced medical costs frees up resources for other uses) in the economic modeling. However, using the term “benefits” may confuse the distinction between these smaller market benefits and the much larger total benefits based on WTP/VSL. Council members recommended that a term such as “employment-adjusted costs” be used in place of “benefit-adjusted costs” to avoid this confusion.

Council members offered the following additional comments on the draft CGE report:

- The report should discuss why the CGE, which allow tradeoffs, produces higher cost estimates than the direct costs report. The usual assumption is that partial equilibrium models are not as accurate because they don't allow people to adjust their behavior, so it would be useful to discuss possible reasons for the differences between the direct cost and CGE estimates. For example, how much of the CGE estimate reflects labor/leisure choices and how much reflects less investment?
- When evaluating the impact of environmental regulations, economic models allow adjustment of the utility function so that households have to consume larger quantities of good to maintain utility. However, this is usually thought of in terms of changes in prices (as a result of CAAA) and changes in the consumption bundle. The results of the CGE modeling, which show increased oil consumption (increased industry output of petroleum) with the CAAA, are counter-intuitive. This may be a function of labeling changes in expenditures as an output.

L. Integrated 812 Report

Jim DeMocker gave a brief overview of the objectives for the integrated 812 report, including the intended audience and the strategy for linking the summary report to in-depth technical reports¹⁴. He noted that the integrated report was directed at a technically informed and

interested audience, with links to the in-depth reports. The preliminary draft represents his attempt to balance readability with the need to include sufficient technical detail. The objective was to tell the story, present the results and key assumptions and limitations, but not the details of data and methods, and to keep the document to about 100 pages.

Council members offered the following comments on the preliminary 812 report:

- All of the 812 component studies should be made readily available, perhaps by including links to all of the technical documents on one Web page.
- The integrated document should focus primarily on results and their interpretation, with links to the technical reports that include details of the methodologies.
- The document should provide a narrative on why the benefits are so large, discussion of what is driving the costs, etc.
- Special attention should be given to uncertainty, including some overall notion of how the various sources of uncertainty listed in the document tables are affecting the total benefit and cost numbers.
- Clarify what is being estimated, and what factors are being held constant and outside the analysis (e.g., population growth is exogenous, economic growth is exogenous, climate change is exogenous and assumed to be zero, transborder emissions are exogenous and fixed).
- Consider moving comparisons to the First Prospective to an appendix, since there were many changes in data and methodologies between the two studies.
- Place the study in context by providing summary graphs of changes in monitored air quality over time, perhaps going back to 1970.
- In summary tables of benefits, include estimates of “natural values” (e.g., changes in incidence, ecological benefits) in addition to monetized values. Make the point that even the upper-bound estimates of monetized benefits are an underestimate of true benefits because many categories of benefits are not included.

Jim DeMocker agreed to develop a complete set of underlying materials that support the final integrated 812 report, and to prepare summary tables that list the subcommittee recommendations and whether or not they are addressed in the final integrated report. He requested feedback on whether any of the underlying 812 studies needed to go back to the subcommittees for a final review.

Council Action: The Council agreed to convene a second meeting in late summer or early fall to review a revised set of 812 materials. Dr. Vu emphasized that the Agency would need to provide materials 30 days in advance of the Council meeting.

M. Next Steps

Dr. Hammitt requested that Council members comply with the following schedule for preparation of a Council advisory letter:

- May 10: Council members provide suggested points for the advisory letter to the Chair, with a copy to the DFO.
- May 24: the Chair will prepare a draft letter for Council review
- June 7: Council comments on the draft letter due to the DFO

Based on the nature of the comments received by June 7, he and the DFO will decide on next steps (e.g., whether another round of comment, or a teleconference call, is needed). Jim DeMocker noted that the Project Team needs to complete a revised draft of the integrated 812 report by early August in order to meet the Agency's schedule.

The DFO adjourned the meeting at 3:30 p.m.

Respectfully Submitted:

/s/

Stephanie Sanzone
Designated Federal Officer

Certified as Accurate:

/s/

Dr. James K. Hammitt, Chair
Advisory Council on Clean Air
Compliance Analysis

Materials Cited

The following meeting materials are available on the Council Web site, <http://www.epa.gov/advisorycouncilcaa>, at the [May 4-5, 2010 Council Meeting](#) page:

¹Council Roster, May 4-5, 2010

² Federal Register Notice Announcing the Meeting, Vol 75 Number 73 Pages 19969-19971

³ Final Agenda, Advisory Council on Clean Air Compliance Analysis, May 4-5, 2010

⁴Presentation by Jim DeMocker on Status and Review History for the Second Section 812 Prospective Study

⁵ Review of EPA's Draft Health Benefits of the Second Section 812 Prospective Study of the Clean Air Act (draft dated March 24, 2010)

⁶ Review of Ecological Effects for the Second Prospective Clean Air Act Amendments Section 812 Benefit-Cost Report (draft dated April 19, 2010)

⁷ Review of Air Quality Modeling for the Second Section 812 Prospective Study of Benefits and Costs of the Clean Air Act (draft dated April 7, 2010)

⁸ Presentation by Jim DeMocker on Primary PM Adjustments for the Second Section 812 Prospective Study

⁹ Charge to the Council

¹⁰ Presentation by Henry Roman on Health Benefits and Uncertainty Analyses for the Second Section 812 Prospective Analysis

¹¹ Presentation by James Neumann on Visibility, Ecological, and Materials Damage Benefits for the Second Section 812 Prospective Study

¹² Presentation by Jason Price on Direct Costs for the Second Section 812 Prospective Report

¹³ Presentation by Brooks Depro et al. on CGE Modeling for the Second Section 812 Prospective Study

¹⁴ Presentation by Jim DeMocker on Reporting for the Second Section 812 Prospective Study