EPA Office of Air and Radiation Office of Air Quality Planning and Standards (OAQPS)
Science Integration for Decision Making Fact-Finding Interviews
January 12, 2010
Research Triangle Park, North Carolina

Two members of the SAB Committee on Science Integration for Decision Making conducted three interviews in EPA's Office of Air Quality Planning and Standards (OAQPS): Drs. Rogene Henderson and Thomas Wallsten. For each interview, Dr. Anthony Maciorowski, Deputy Director of the SAB Staff Office, provided a brief introduction to the purpose of the interview and the Designated Federal Officer, Dr. Angela Nugent, took notes to develop a summary of the conversation. All interviewees were provided a copy of the committee's Preliminary Study Plan in advance.

Dr. Maciorowski noted in each interview that the purpose of the interview was to help SAB Committee members learn about OAQPS's current and recent experience with science integration supporting EPA decision making so that the SAB can develop advice to support and/or strengthen Agency science integration efforts. Dr. Maciorowski thanked participants for taking time for the interviews and thanked Dr. Bryan Hubbell for serving as liaison with the SAB Staff Office in planning the interviews

EPA OAQPS Managers' Perspective (9:00 a.m. - 10:30 a.m.) Participants:

Ms. Lydia Wegman, Director, Health and Environmental Impacts Division
Dr. Bryan Hubbell, Senior Advisor for Science and Policy Analysis for the Health and Environmental Impacts Division

The Health and Environmental Impacts Division has responsibility for managing EPA's National Ambient Air Quality Standards (NAAQS), air toxics and residual risk program, air components of the great waters program, and coordination with international organizations on air quality issues. OAQPS has an increased interest in climate change and its relationship with air quality. There is an increasing awareness that air quality problems are global and solutions are global as well. OAQPS has taken on new tasks related to international air quality. One example is a recent report to Congress on black carbon related to open fires in developing countries.

EPA's Office of Air and Radiation works with its two external scientific advisory groups, the Clean Air Scientific Advisory Committee (CASAC) (to integrate science related to air quality, atmospheric chemistry, exposure, epidemiology, and toxicology) and the Advisory Council on Clean Air Compliance Analysis (to integrate those sciences with economics). OAQPS works hand in hand with these committees as it develops the science to support regulatory actions. OAQPS also has benefited from National Research Council reports on air quality management in the United States and has undertaken expert elicitation work and meta-analyses at NRC's suggestion.

The 2007 ozone standard highlights issues related to science integration. Currently, the EPA Administrator is reconsidering the science made available in 2007 and may put different weight on different aspects of the science than EPA's previous Administrator. The previous

Administrator emphasized uncertainties associated with one key epidemiology study and set the ozone standard outside the range CASAC advised. The current Administrator is placing more weight on that study. Science is never 100% clear. Similarly, EPA is reconsidering whether there should be a separate secondary (welfare based) standard to protective sensitive vegetation from seasonal exposures to ozone. The previous administration, after receiving a communication from OMB, decided that the primary and secondary standards should be identical, but the current Administrator is reconsidering the science supporting the need for a separate secondary standard protective of ecological endpoints.

The Clean Air Act requires EPA to protect public health at a level "allowing an adequate margin of safety… requisite to protect the public health." Decisions about the NAAQS require judgment about the requisite level and the margin of safety. EPA administrators have differed in their interpretation of these terms and the different weights they place on science generated by OAQPS, CASAC advice, and science provided by external parties Courts historically have deferred to EPA if the Agency has provided adequate justification for standards.

OAQPS looks to ORD to provide the key science needed to support the NAAQS. At the start of each NAAQS review cycle, ORD convenes a public workshop to identify key new science published since the last NAAQS review that would inform EPA's NAAQS review. Currently, ORD develops an Integrated Science Assessment (ISA) reviewing the nature and significance of key science from multiple disciplines that will inform the NAAQS. After the ISA receives CASAC peer review, OAQPS uses the ISA to develop decision-relevant risk and exposure assessments and a Policy Assessment. All these key documents receive separate CASAC peer review. Once those reviews are complete, OAQPS develops a range of options for the standard for the Administrator to consider, and based on her decision, develops a proposed rule. The Office of Management and Budget coordinates an inter-agency review process for federal agencies with interest. The Department of Energy and U.S. Department of Agriculture play a major role, and the Council of Environmental Quality and Council of Economic Advisors also offer comments about EPA's options and the use of science.

A separate division in OAQPS supports regional implementation of air quality standards by providing assistance with air quality modeling. The Health and Environmental Impacts Division also develops air toxics risk assessments and provides science support to regions. The Division develops the National Air Toxics Assessment (NATA) that provides data at the census tract level. NATA is limited by the available data. The division provides tools and training to states and regions so they can conduct area-specific air toxic assessments.

EPA may not consider costs in setting the NAAQS, but EPA has developed benefit-cost assessments because the NAAQS are significant regulatory actions that trigger benefit-cost requirements of Executive Orders 12866 and 13422. OAQPS uses different air quality exposure and risk analyses for assessments designed to help set NAAQS standard compared with air quality analyses used as input for NAAQS benefit assessments. The exposure and risk assessments designed to help set NAAQS standards focus on 15 areas where EPA has greatest confidence about the science related to key impacts. Benefit assessments, in contrast, focus on the total benefits of implementing regulations in the future. Because they are aimed at implementation, and because they will be compared with comprehensive cost estimates, benefits

analyses are as comprehensive as possible. Because of their different purposes, the analyses have different linkages to air quality and exposure data.

Although benefits analyses are difficult to communicate and no decision is ever made on the basis of benefit-cost analysis alone, the public and other federal agencies have shown great interest in OAQPS benefit assessments. The value of reduced risks of premature mortality and chronic disease impacts, including heart attacks and chronic bronchitis represents 95% of total benefits for the particulate matter NAAQS. OMB's previous Administrator of Information and Regulatory Affairs, John Graham, was persuaded by the benefit-cost analysis to support EPA's non-road diesel rule, particulate matter NAAQS, and the Clean Air Interstate rule.

Communication of uncertainties plays a big role in science integration for decision making. Agency analysts invest large amounts of time and money in uncertainty analyses, but it is difficult to communicate uncertainty to busy managers. OAQPS may have only 45 minutes to describe to the Administrator the science rationale and uncertainties underlying the NAAQS. Many important nuances can be lost.

In addition, the characterization of uncertainty creates an "uncertainty feedback process." The more uncertainty surrounds regulatory science, the more EPA encounters delays. Industry uses the uncertainty and delays to argue that EPA should wait until more science develops.

EPA analysts are not ready to conduct value-of-information analyses to guide their overall analytical approach. The policy-relevant question is framed as "what is the right level of the standard to protect public health." OAQPS presents a range of possible levels supported by the science, but typically an Administrator does not want to explore the populations who would and would not be protected by different levels within that range. Instead, the policy discussion revolves around the uncertainties involved in protecting public health at different points within the range. OAQPS provides information regarding numbers of potential non-attainment areas at different points within the range.

Impediments to science integration include:

- Availability of knowledgeable, experienced staff
- Lack of time to conduct analyses because of court-ordered deadlines
- Providing a continuous flow of resources to support costly risk and exposure analyses
- Lack of a paradigm or approach for analyses supporting environmental justice policies
    - Need for problem formulation to clarify environmental justice policy goals for the NAAQS program, residual risk, and air toxics
- Need to increase understanding of fate and transport and continuously improve air quality modeling and monitoring.

Meeting with Scientists in the Office of Air Quality Planning and Standards OAQPS (12:00 - 1:30 p.m.) Participants:

Mr. Tyler Fox, Leader of the Air Quality Modeling Group
Dr. David Guinnup, Leader of the Sector-Based Assessment Group
Dr. Bryan Hubbell, Senior Advisor for Science and Policy Analysis for the Health and Environmental Impacts Division

The discussion focused on the work of the Air Quality Modeling Group (AQMG), which provides input for OAR risk and exposure analyses, regulatory actions, and benefit analyses and provides guidance to states to help develop State Implementation Plans, and the risk and benefits analyses conducted by the Health and Environmental Impacts Division. The AQMG works with ORD and the atmospheric chemistry community to develop and apply air quality models. The group also evaluates air quality models against ambient monitoring data in light of the specific policy questions to be addressed.

OAQPS uses economists and physical scientists to develop and explain models that integrate information across different scientific disciplines. Decision makers often have difficulty understanding technical aspects of models and complex model outputs.

OAQPS primarily provides grants, guidance, and technical support to states for air quality modeling and some limited support to regional modelers. OAQPS relies on regional modelers to know local conditions, but one interviewee commented on reductions in scientific and technical expertise in the modeling area in some regional offices.

There is great potential for regional modelers to develop conceptual models of air quality problems specific to their regions/local areas and plans for field study, monitoring and modeling specific to the geography, meteorology, and political issues. SIPs have not resulted in reduced air pollution, compared to effects from reductions from national Federal programs on utilities and mobile sources, and sector-based Maximum Achievable Control Technologies rules for air toxics. . Regional modelers have a role to play in identifying drivers that could reduce pollution in their unique areas.

Resources for monitoring "ebb and flow." EPA needs air quality monitoring for regulatory, scientific (including health effects studies), and model evaluation purposes, but resources for modeling are limited. Placement of monitors and monitoring strategies are principally determined by regulatory needs, but it is important to use monitors to drive future health research. Both the NAAQS and air toxics programs need air quality monitors: while there are about 1,000 ozone monitors nationwide (with only a few in rural areas), there are only 29 monitors providing information on ambient concentration trends for selected air toxics.

It is difficult to coordinate OAQPS's research needs in the modeling, exposure, and air toxic areas with ORD's research efforts, a very different situation from ORD's partnership with OAQPS for the NAAQS process. As a result, OAQPS often turns to universities and experts outside EPA when science questions arise that OAQPS scientists can't address and for which ORD is not positioned to respond in timely manner for policy purposes.

Uncertainty analyses associated with air quality models are highly complex. OAQPS uses such information primarily to evaluate models and to identify strategies for improving modeling science and performance. Uncertainties are difficult to communicate to decision makers and are most often communicated through discussion of different scenarios via “sensitivity analyses”. OAQPS does not generally quantify these complex model uncertainties as part of regulatory analyses.

Air toxics offer a contrast to the NAAQS modeling program. EPA's limited information for air toxics principally relies on emissions inventories voluntarily provided by states. EPA conducts investigations and administers industry questionnaires to understand emissions and exposures to air toxics. EPA focuses on known sources, such as petroleum refineries, which have developed methods for quantifying emissions. ORD provides some science on emissions measurement and factors that could serve as surrogates for air toxics. None of these methods provides information that decision makers can use with great confidence. OAQPS uses uncertainty analysis to determine where to target resources. One area could be variable exposures to populations within an exposure pattern. Another area may be emissions of ammonium, hydrogen sulfide, and volatile organic compounds in animal feeding operations.

The discussion turned to new modeling efforts related to climate change issues. New opportunities for science integration include:

- Collaboration with ORD to link global and regional-scale models that will allow regions to evaluate climate change policies and their effectiveness
- Working with states and others on model applications that would evaluate particulate matter or ozone strategies that can reduce pollutants and also mitigate greenhouse gases.
- Modeling of black carbon and ozone and their contribution to climate change.

The discussion concluded with a discussion of drivers and impediments to science integration.

- Limits of monitoring are bringing people increasingly to air quality modeling.
- Air quality modeling offers a tool for science integration because many processes resulting in air pollution are nonlinear.
- Formulation of problems is often driven by politics, not science. In California and the Chesapeake Bay, for example, decision makers dismissed agriculture as a potential source of air pollution for which to seek controls
- Effective modeling depends on problem formulation/conceptual modeling, but states and the Agency often do not engage in problem formulation or don't document the process
    - Near-roadway exposure analysis, for example involves many complex factors: diurnal emissions profiles and microscale meteorology and chemistry.
    - Dialogue across scientific communities is needed to identify key questions and most important variables.
    - Need to foster expertise through experiences gained from in-house applications of models and enable value added interpretations to decision makers . EPA cannot simply refer a model to a contractor to plug in values, run the model, and generate results that will likely not be useful to decision makers.