

## **Draft Charge for the BOSC Subcommittee on Particulate Matter and Ozone Research**

**1.0 Objective.** The objective of this review is to evaluate the relevance, quality, performance, as well as the scientific and managerial leadership of ORD's Particulate Matter and Ozone Research (PM-O<sub>3</sub>) Programs. The panel's evaluation and recommendations will provide guidance to the Office of Research and Development to help:

- plan, implement, and strengthen the Program;
- make research investment decisions over the next five years;
- refine the integration of the ORD Program with those of other federal agencies
- prepare EPA's performance and accountability reports to Congress under the Government Performance and Results Act; and
- respond to evaluations of federal research such as those conducted by the Office of Management and Budget (OMB highlights the value of recommendations from independent expert panels in guidance to federal agencies<sup>1,2</sup>).

**2.0 Background Information.** Independent expert review is used extensively in industry, federal agencies, Congressional committees, and academia. The National Academy of Science has recommended this approach for evaluating federal research programs.<sup>3</sup>

Because of the nature of research, it is not possible to measure the creation of new knowledge as it develops—or the pace at which research progresses or scientific breakthroughs occur. Demonstrating research contributions to outcomes is very challenging<sup>4</sup> when federal agencies conduct research to support regulatory decisions, and then rely on third parties<sup>5</sup>—such as state environmental agencies—to enforce the regulations and demonstrate environmental improvements. Typically, many years may be required for practical research applications to be developed and decades may be required for some research outcomes to be achieved.

Most of EPA's environmental research programs investigate complex environmental problems and processes—combining use-inspired basic research<sup>6,7</sup> with applied research, and integrating several scientific disciplines across a conceptual framework<sup>8</sup> that links research to environmental decisions or environmental outcomes. In multi-disciplinary research programs such as these, progress toward outcomes can not be measured by outputs created in a single year. Rather, research progress occurs over several years, as research teams explore hypotheses with individual studies, interpret research findings, and then develop hypotheses for future studies.

In designing and managing its research programs, ORD emphasizes the importance of identifying priority research questions to guide the research. Similarly, ORD recommends that its programs develop a small number of performance goals that serve as indicators of progress. Short-term outcomes are accomplished when research is

applied by specific clients to strengthen environmental decisions or regulations. These decisions and resulting actions (e.g., the reduction of contaminant emissions or the reduction of uncertainties in risk assessment) ultimately contribute to improved environmental quality and health.

In a comprehensive evaluation of science and research at EPA, the National Research Council recommended<sup>9</sup> that the agency substantially increase its efforts to explain the significance of its research products and to assist clients inside and outside the agency in applying them. In response to this recommendation, ORD has engaged science advisors from client organizations to serve as members of its research program teams. These teams help identify research contributions with significant decision-making value and help plan for their transfer and application.

For EPA's environmental research programs, periodic retrospective analysis at intervals of four or five years is needed to characterize research progress, to identify when clients are applying research to strengthen environmental decisions, and to evaluate client feedback about the research. Conducting program evaluation at this interval enables assessment of research progress, the scientific quality and decision-making value of the research, and whether research progress has resulted in short-term outcomes for specific clients.

In 1998, Congress augmented the budget for PM-related research and mandated the establishment of a NRC Committee to assess the research needs PM. The NRC Committee has since published four reports of *Research Priorities for Airborne Particulate Matter*, with volume IV published in October, 2004.<sup>10</sup> The four volumes have provided guidance to the PM Research Program in the form of an initial ten (and eventually twelve) priority research areas (needs). In these same reports, the NRC has submitted peer-expert evaluations of the Agency's PM Research Program including its strengths and productivity, its short-comings, as well as identifying challenges for the future. Since 1998, ORD has aligned its research program with the NRC priorities, evolving the relative emphases on these priorities with the development of the science, client needs, and frequent peer reviews of all or selected parts of the Program.

It is essential to appreciate that the ORD PM Program comprises an intramural research program in health and implementation, as well as an extramural (grant funded) program, which is complimentary and integrated by design to meet the client Air Office needs. In completing the final report (IV), the NRC provided its assessment of the PM Research Program and its accomplishments, and delineated a series of challenges for the years ahead. These challenges were provided in the presentation of the Committee Chair, Dr. Jonathan Samet of Johns Hopkins University, to ORD at the completion of Report IV. The charge to the NRC Committee reviewing the PM Program is now complete, and the formal Committee will cease to exist; but it is expected that ad hoc committees will be convened at points in the future to revisit the Program priorities and directions.

Beginning in 1997, ORD gradually redirected its long-standing Ozone Research Program, initially in health and ecology, to allow for the growth and emphasis in health

research in PM. Agency supported ozone-specific research in these areas is currently minimal. More recently, an analogous adjustment has occurred in the implementation program as well. In the latter case, the atmospheric science research in ozone and PM were merged in research of atmospheric processes and modeling, as they are inextricably linked in the air environment. With the disinvestment in the ozone-specific research and its emergence in a more integrated form within the PM Program efforts in atmospheric chemistry and co-pollutant health research, these two largely independent research programs have been fully merged, and is evidenced by plans to revise the Multi-Year Plans (MYP) for PM and Ozone into a merged, single MYP.

In 2003, the PM Program underwent review by OMB using a novel approach to assess program success. This review is termed the Program Assessment Rating Tool (PART), which, in brief, focused on (1) the relevance of the PM Program to its clients, (2) the clarity and specificity of its long-term goals and resultant outcomes that could be linked explicitly with measurable improvements in health and the environment, (3) research progress and performance, and, finally, (4) the resource management ensuring high-quality research. Overall, the PM Program scored well in this process, except in the areas designated in (2) requiring demonstrated measurable outcomes in public health and the environment. As the PM and Ozone Programs have been merged and enter a second PART review, the intent is to use this BOSC assessment of the Program's new structure, its management and leadership, as well as its scientific achievements and directions to guide preparations for the PART (spring/summer 2004).

### **3.0 Draft Charge Questions for ORD's Particulate Matter - Ozone Research Program**

The following charge questions will help evaluate the relevance, quality, performance, as well as management and scientific leadership of ORD's Particulate Matter - Ozone Research Program:

#### **1. Program Design and Demonstrated Leadership**

- Does the new draft PM-O<sub>3</sub>MYP structure reflect the identified science needs of the Program and show integration and leveraging of human and fiscal resources?
  - Is the PM-O<sub>3</sub> MYP structure strategic by design, implementation and review?
  - Does the PM-O MYP structure provide a reasonable "road-map" of the Program demonstrating a well-thought-out plan, identifying critical paths, clear goals, priorities and schedules?
  - Is the extramural Program adequately integrated into the Program MYP and goals?
  - Does the PM-O<sub>3</sub>MYP structure reflect an "outcome" orientation that provides measures demonstrating the true impact on public health and the environment?
  - Is the ORD PM-O<sub>3</sub> Program responsive to the recommendations of the NRC in terms of products and outputs?

- Are the near and long-term visions of the Program consistent with the NRC-noted “challenges for the future”?
- Is ORD sufficiently coordinating research across categories of the risk assessment paradigm (source, exposure, health, assessment, and management)?
  - Is the work within the Labs and Centers integrated to maximize resource investment?
- Is EPA-ORD providing evident and appropriate science leadership and Program management?
  - Are there changes or refinements in management or science leadership that are needed to improve the Program?
- Is the EPA-ORD sufficiently communicating its results to its clients and the broader scientific community?
  - What can be done to improve communication and access to information by regulatory and science communities?
- Are there important interagency or extramural collaborations that should and can be improved to advance the Agency’s research agenda?
  - To what extent has the EPA established and utilized other agencies (inside and outside the government) in advancing the EPA’s research agenda?
  - Is the interaction and leadership role of EPA-ORD with other federal agencies through the CENR effectively providing national coordination?

## 2. Science Quality

- Is the science being conducted by EPA-ORD research Labs and Centers of recognized high quality and appropriate to the perceived needs?
- Is program integration across Labs, Centers, and science discipline making full advantage of research opportunities?
- Does the program ensure high quality research through competitive, merit-based funding? If funds are not competitively awarded, what process does the program use to allocate funds? Does this process ensure that quality is maintained?

## 3. Relevance

- Does the PM-O<sub>3</sub>MYP structure and Research Program clearly reflect its focus and the rationale behind its research direction and out-year emphasis?
- Are the potential public benefits in term of public health protection and pollution abatement clearly articulated?
- Has the PM-O<sub>3</sub> Program effectively engaged stakeholders in its assessment processes, and provided useful information and tools in a timely manner?
- Has the Program begun to establish a process for using the results of assessments, along with stakeholder feedback, to identify key research gaps and to update the Program’s research agenda?

## 4. Demonstrated Outcomes

- Does the Program have a limited number of specific long-term performance measures that focus on outcomes and meaningfully reflect the purpose of the program?

- Has the Program made significant progress in the conduct of the planned research and in answering the key science questions related to public health and pollution abatement?
- Does the Program have ambitious targets and time-frames for long-term measures?
  - Has the Program made adequate progress in meeting its long-term goals?
  - Are there baselines and appropriate targets for the Program’s annual measures?
  - Have the Program’s research products been consistent with the program’s goals and supportive of client needs?
  - Are the research program’s findings incorporated into regulations and standards, published in the peer-reviewed literature, or do they otherwise demonstrate superior scientific quality?
- Do independent evaluations of sufficient scope and quality indicate that the Program is effective and is achieving results?
  - Does the Program demonstrate improved efficiencies and cost effectiveness in achieving Program goals each year?
- Do EPA-ORD and Program leadership make adjustments in the Program’s science and emphasis to meet the evolving science and research needs?
  - Is the Program appropriately structured to allow for flexibility in direction and emphasis?

#### **4.0 Potential BOSC Approach for Program Review**

- Hold conference call/s in the month preceding a face-to-face meeting.
  - ▶ Goal: Familiarize Subcommittee with Review objectives, introduce review materials, and make assignments for face to face meeting.
    1. The DFO distributes background materials and documents requested by the Subcommittee four weeks in advance of the first conference call.
    2. ORD presents background materials to the Subcommittee during the first call for initial orientation;
    3. The Subcommittee reviews and comments on the charge; and
    4. The Subcommittee asks clarifying questions about the program under review
    5. The Subcommittee Chair makes review and writing assignments to Subcommittee members in advance of a face-to-face meeting.
- Hold a 2 to 3 day face-to-face meeting for the program review at a location where a critical mass of ORD scientists is located.
  - ▶ Goal: A draft Subcommittee report is available for circulation and comment at the end of the face-to-face meeting that thoroughly addresses all charge questions.
    1. The first segment of the meeting: ORD presentations and poster sessions, Subcommittee questions and discussion, identification of issues for further resolution.

2. The second segment of meeting: the subcommittee discusses prepared written assignments in context of presentations and discussion, identifies and agrees to areas for change, elaboration or other adjustment of the text as necessary.
  3. The third segment of meeting: the subcommittee revises written assignments and assembles them into a draft report.
- As necessary, hold one to two conference calls to complete the draft report in the month following the face-to-face meeting.
    - ▶ Goal: A report approved by the Subcommittee is available for BOSC Executive Committee discussion/approval at the May 2005 BOSC Executive Committee Meeting, with final draft completed by the end of April.

## References

- 1 Budget Data Request 04-31. Executive Office of the President, Office of Management and Budget. March 22, 2004. "Completing the Program Assessment Rating Tool (PART) for the FY06 Review Process," pages 50-56.
- 2 Memorandum for the Heads of Executive Departments and Agencies. Executive Office of the President, Office of Management and Budget. June 5, 2003. "FY 2005 Interagency Research and Development Priorities," pages 5-10.
- 3 Evaluating Federal Research under the Government Performance and Results Act (National Research Council, 1999).
- 4 The House Science Subcommittee. Letter to Dr. Bruce Alberts, President of the National Academy of Sciences, from F. James Sensenbrenner, Jr. and George E. Brown. October 23, 1997.
- 5 The Government Performance and Results Act: 1997 Government wide Implementation Will Be Uneven. U.S. General Accounting Office. (GAO/GGD, 1997).
- 6 Building a Foundation for Sound Environmental Decisions. (National Research Council, 1997).
- 7 "Renewing the Compact between Science and Government," Stokes, D.E., in *1995 Forum Proceedings, Vannevar Bush II—Science for the 21st Century*. Pages 15-32. Sigma Xi, 1995.
- 8 Risk Assessment in the Federal Government: Managing the Process. (National Research Council, 1983).
- 9 Strengthening Science at the U.S. Environmental Protection Agency. (National Research Council, 2000, p 141).
- 10 National Research Council of the National Academies: *Research Priorities for Airborne Particulate Matter IV*, The National Academies Press, Washington, DC. 2004 ([www.nap.edu](http://www.nap.edu); Report IV - <http://www.nap.edu/books/0309091993/html/>)

## **Appendix I**

OSTP/OMB Research and Development Investment Criteria included as a PDF file.