THE NATIONAL ACADEMIES
REPORT IN BRIEF

EVALUATING RESEARCH EFFICIENCY IN THE U.S. ENVIRONMENTAL PROTECTION AGENCY (2008)

The federal government constantly seeks more effective tools to evaluate the performance of research and development (R&D) programs to ensure that resources are being used efficiently. For instance, Congress passed the Government Performance and Results Act in 1993, and the Office of Management and Budget (OMB) designed the Program Assessment Rating Tool (PART) in 2002. Most recently, the Environmental Protection Agency (EPA) asked the National Academies to help develop better assessment tools to comply with PART, with an emphasis on efficiency. As a result, a committee of experts was appointed to evaluate how EPA and other agencies were attempting to comply with the efficiency measures of PART. The committee explored the following questions:

- What efficiency measures are currently used for EPA R&D programs and other federally funded R&D programs?
- Are these efficiency measures sufficient? Are they outcome-based?
- What principles should guide the development of efficiency measures for federally funded R&D programs?
- What efficiency measures should be used for EPA's basic and applied R&D programs?

COMMITTEE'S FINDINGS

1. The key to research efficiency is good planning and implementation. EPA has a sound strategic planning architecture that provides a multi-year basis for the annual assessment of progress and milestones for evaluating research programs, including their efficiency.
2. All the metrics examined by the committee that have been proposed by OMB or accepted by OMB to evaluate the efficiency of federal research programs have been based on the inputs and outputs of research-management processes, not on their outcomes.
3. Ultimate-outcome-based efficiency metrics are neither achievable nor valid for this purpose.
4. EPA's difficulties in complying with the PART questions about efficiency (questions 3.4 and 4.3) have grown out of inappropriate OMB requirements for outcome-based efficiency metrics.
5. An "ineffective" PART rating of a research program can have serious adverse consequences for the program or the agency.
6. Among the metrics proposed to measure process efficiency, several can be recommended for wider use by agencies.
7. The most effective mechanism for evaluating the investment efficiency of R&D programs is an expert-review panel, as recommended in earlier COSEPUP and BEST reports. Expert review panels are much broader than scientific peer review panels.

COMMITTEE'S RECOMMENDATIONS

To comply with questions 3.4 and 4.3. of PART, EPA and other agencies should only apply quantitative efficiency metrics to measure the process efficiency of research programs. Process efficiency can be measured in terms of inputs, outputs, and some intermediate outcomes; it does not require ultimate outcomes.

For compliance with PART, evaluation of the efficiency of a research program should not be based on ultimate outcomes because they: (1) usually cannot be predicted or known in advance; (2) may occur long after research is completed; and (3) usually depend on actions taken by others. Although PART guidance encourages outcome-based metrics, it also describes the difficulty of applying them. For most research

programs, ultimate-outcome-based efficiency measures are neither achievable nor valid. Therefore, the committee recommends that OMB and other oversight bodies focus on evaluating the process efficiency of research—how program managers exercise skill and prudence in using and conserving resources. For evaluating process efficiency, quantitative methods can be used by expert-review panels and to track and review the use of resources in light of goals embedded in strategic and multi-year plans.

EPA and other agencies should use expert-review panels to evaluate the investment efficiency of research programs. The process should begin by evaluating the relevance, quality, and performance of the research.
Investment efficiency indicates whether an agency is "doing the right research and doing it well." In other words, is the program manager investing in research that is relevant to the agency's mission and long-term plans, and being performed at a high level of quality? Evaluating quality and relevance requires expert judgment based on experience; no quantitative measures can capture this. The best mechanism for measuring investment efficiency is the expert-review panel. EPA should continue to obtain input for PART compliance by using expert review through its Board of Scientific Counselors or its Science Advisory Board. Expert review provides an independent forum for evaluation of research and complements the efforts of program managers in reviewing research activities.

The efficiency of research programs at EPA should be evaluated according to the same overall standards used at other agencies.
Some metrics proposed by EPA to comply with PART have been rejected by OMB, but were accepted for use by other agencies. Additionally, some agencies have addressed PART with approaches that are not aligned with their long-term mission. These approaches are not sufficient, referring only to individual portions of programs, quantifying activities that are not research activities, or reviewing processes that are not central to an agency's R&D programs. The committee calls on EPA and other agencies to address PART through consistent government-wide standards and practices.

OMB should have oversight and training programs for budget examiners to ensure consistent and equitable implementation of PART in agencies that have substantial R&D programs.
OMB budget examiners are responsible for working with agencies to comply with PART. OMB decisions about whether to accept or reject metrics for evaluating the efficiency of research programs have been inconsistent and can unfairly damage the reputation of agencies and diminish the credibility of the evaluation process. It is critical that the implementation of PART be both consistent and equitable in all federal research programs.

COMMITTEE ON EVALUATING THE EFFICIENCY OF RESEARCH AND DEVELOPMENT PROGRAMS AT THE U.S. ENVIRONMENTAL PROTECTION AGENCY
Gilbert S. Omenn (Chair), University of Michigan, Ann Arbor
George V. Alexeeff, California Environmental Protection Agency
Radford Byerly, Jr., University of Colorado, Boulder
Edwin H. Clark II, Earth Policy Institute
Susan E. Cozzens, Georgia Institute of Technology
Linda J. Fisher, E. I. du Pont de Nemours and Company
J. Paul Gilman, Oak Ridge Center for Advanced Studies
T.J. Glauthier, TJG Energy Associates, LLC
Carol J. Henry, Independent Consultant
Robert J. Huggett, College of William and Mary
Sally Katzen, George Mason University School of Law
Terry F. Young, Environmental Defense

Richard Bissell (Study Director), Committee on Science, Engineering, and Public Policy
Deborah Stine (Study Director), Committee on Science, Engineering, and Public Policy (up to August 2007)
Eileen Abt, Board on Environmental Studies and Toxicology
Jennifer Saunders, Board on Environmental Studies and Toxicology

For More Information
Copies of *Evaluating Research Efficiency in the U.S. Environmental Protection Agency* are available from the National Academies Press; call (800)624-6242 or (202) 334-3313 (in the Washington metropolitan area), or visit the NAP web site at www.nap.edu. For more information on the project, contact staff at (202) 334-2644 or visit the Policy and Global Affairs web site at www.nationalacademies.org/pga.