Science and Technology Advice to Congress: Then, Now and Looking Forward

The Current and Potential Role of the National Academies

Statement of

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Mr. Chairman,

Thank you for the invitation to testify today about the science and technology advice to the Congress. The subject is certainly a longstanding one with me that I have seen from many perspectives—from academia, to private science and engineering consulting, to a senior management role in the former Office of Technology Assessment (OTA), to managing a professional scientific society, to my current post at the National Academies. I appreciate the opportunity to share those experiences and perspectives with you and the Committee.

The breathtaking pace of science and technology over the past half-century—from the remarkable advances in medicine, to cell phones, to the Internet, to countless others—has delivered both staggering benefits to society as well as sobering challenges associated with the role of technology in virtually every aspect of our lives. Society, in reaping the benefits, must also be able to cope with the challenges.

Among the founding fathers' deepest concerns about the fledgling American democracy was that it could function well only when the electorate and, in particular, its institutions of government are well informed about the issues upon which it must decide.

James Madison or Thomas Jefferson might well have argued that a government poorly informed about science and technology issues, because such issues are often so complex and have such impact on society, is destined to make bad policy choices. Yet, today, it is becoming increasingly more difficult for anyone, or even any institution, to keep pace with the frontier of knowledge. How, then, can the Congress receive useful, relevant, informed, independent, authoritative and timely advice on the science and technology dimensions of the issues it faces? So your hearing today is important and timely.

Introduction

In the last decade the information revolution has dramatically expanded the quantity of information available to the Congress, but more information is certainly not necessarily better information. Indeed, a fundamental problem now is not really the lack of information; rather, it is how to gauge validity and usefulness within the flood of available information and advice.

Congress certainly has many possible resources at its disposal, ranging from universities, to independent think tanks, to existing Congressional agencies such as GAO, CBO, and CRS, and, of course, the National Academies. Other witnesses at this hearing will explore many of these options, so in my testimony I will focus on (1) the current and evolving role of the National Academies in providing advice to Congress, (2) what I consider to be an especially important gap in the current sources of advice for Congress, and (3) some thoughts related to a number of the options under consideration for filling this gap.

As an additional and more detailed discussion of some of these issues I would like to include for the record a report I prepared for a conference in Berlin earlier this year on precisely this topic: *Scientific Advice for Policy in the United States: Lessons from the National Academies and the former Congressional Office of Technology Assessment*.[1]

The Traditional Role of the National Academies

Today, among the most familiar sources of independent scientific and technical advice to Congress is the collection of organizations we now refer to as the National Academies, which include the National Academy of Sciences (NAS), the National Academy of Engineering (NAE), the Institute of Medicine (IOM), and their "operating arm," the National Research Council (NRC). In 1863 Congress chartered the NAS as an independent non-profit corporation to "whenever called upon by any department of the Government, investigate, examine, experiment, and report upon any subject of science or art." This charter was signed by President Lincoln during the height of the U.S. Civil War, and the president was among the first to call upon the Academy for advice.

Today, the NAS, NAE, and IOM are each honorary societies that elect new members to their ranks annually and all operate under the original NAS charter. The NRC assembles committees of academy members and other experts to carry out studies for executive branch agencies, but Congress also frequently mandates studies by the NRC spanning the entire spectrum of science and technology related issues. The NRC produces around 200 reports annually, of which approximately 25 are mandated by Congress.

The studies at the National Academies involve nearly 10,000 volunteers annually serving on expert committees and in the review process as well as over a 1,000 professional staff. In the science and technology advice world, the Academy is a substantial enterprise for providing advice to the federal government in a broad range of areas, although the role specifically for Congress has traditionally been a relatively small part of the overall Academy portfolio.

The key strengths of the NRC in providing advice to the Administration and to Congress are its long-established reputation for credibility, its convening power, and the integrity of its study process resulting in reports widely accepted as unbiased. Some features of these key strengths include the following:

- **Credibility.** Perhaps the principal strength of the NRC is its institutional credibility, enabled significantly by its association with the prestigious memberships of the NAS, NAE, and IOM. The process by which this nongovernmental institution conducts its work is designed to ensure the results are evidence-based and tightly reasoned, and its independence from outside influences and pressures from various interest groups including government agencies. It should also be noted that the Academies conduct several studies each

[1] Forthcoming in *Proceedings of the Symposium on Quality Control and Assurance in Scientific Advice to Policy*, Working Group on "Scientific Advice to Policy in Democracy," Berlin-Brandenburg Academy of Science & Humanities, Berlin, Germany, January 12, 2006.

year using our own endowment or foundation sources, often focusing on topics that the Academies believe to be important but that the government may not be willing or able to fund. Examples include the recent effort, ***Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future***, and the 2002 study ***Making the Nation Safer: The Role of Science and Technology in Countering Terrorism*** as well as many others very well known to this committee.

- **Convening Power.** A second major strength is the convening power of the NRC. That is, the experts invited by the NRC to participate in its studies generally accept the invitation and are willing to invest considerable time and energy on a *pro bono* basis. Studies are carried out by groups of volunteers who are broadly considered among the best experts on the issues to be studied, are free of conflicts of interest, and have very carefully balanced biases. Because of the breadth of membership in the academies and the links of the organization to the scientific and technical communities worldwide, the NRC is well equipped to identify and recruit leading experts to serve on study committees.

- **Study Process and Products.** Finally, another key strength that has continued to evolve over the years is the NRC study process itself that is designed to maintain balance and objectivity throughout a committee's work and that produces reports considered to be both unbiased and authoritative. A key quality control feature in the process is independent peer review. After consensus is achieved by a study committee and a draft report is prepared, the NRC process requires the committee to address all of the comments from a carefully selected collection of peer reviewers, whose identity is not revealed to the committee until the study is publicly released.

Challenges for Serving Congressional Needs

Over the years the NRC process has proved consistently to be a strong model for providing independent authoritative advice to government. Like any process designed to serve many needs, however, it is not perfectly tuned to serve all the needs of all parts of government that need science and technology advice. The most commonly cited issues associated with the NRC study process, especially perhaps as they relate to Congressional needs, are the following:

- **Cost.** It is often perceived to be expensive to commission an NRC study; even though committee members are volunteers whose time is contributed pro bono (except for travel expenses). At least in part this perception is due to the fact that a separate contract is negotiated for each individual study – unlike the central funding for agency advisory committees.

- **Timeliness.** The NRC process, which includes commissioning and contracting for the study, selecting and convening a study committee, arranging subsequent meetings among busy people who are serving on a volunteer basis, and navigating a report through peer review, editing, production, and release takes time. The

average time for an NRC study is 18 months, but can be longer. It should also be noted, however, that studies can be carried out quite rapidly given an important national need or specific agency or Congressional requirements. As examples, both *Rising Above the Gathering Storm* and *Making the Nation Safer*, noted earlier, were completed in about six months and a widely cited study, *Climate Change Science*, was completed in one month.

- **Sources of Sponsorship.** Most NRC studies are commissioned and paid for by federal agencies through contracts, even those mandated by Congress which adds the additional hurdle of enacting a law. On the one hand, this is beneficial in that it helps ensure that what the NRC does is relevant and important, and the diversity of support helps assure independence. On the other hand, it often takes 6–9 months through a government procurement process to initiate an NRC study even after a mandated study has been enacted in law (or included in report language). For those studies mandated by Congress, an additional delay often results from the time needed to enact the relevant legislation.

A Gap in Types of Advice Currently Available to Congress

The NRC study process is well developed and serves an important need of Congress—**an authoritative set of findings and recommendations from widely recognized experts, often leading to a specific recommended course of action**. In particular, NRC committees are usually assembled with the intention of achieving consensus recommendations supported by evidence. In a very controversial subject area with scientific and other uncertainties, if a broad set of perspectives are included in the study committee, as one might expect if the purpose is to include all possible scientific and other perspectives on a problem, a consensus might be difficult to achieve. This is why the NRC places a high priority on an appropriately balanced committee and a rigorous information-gathering phase of a committee's work, where such perspectives are heard.

Since the historical focus of the NRC process has been on delivering consensus-based advice on science and technology topics, the process is less well equipped to elaborate on the broader context of an issue and inform the policy debate with careful and objective analysis of the policy consequences of alternative courses of action, especially those that may involve value judgments and trade-offs beyond the scope of technical analysis. Consequently, it has been far less common for the NRC to assemble committees charged with identifying and evaluating the pros and cons of a range of alternative policy options, although it would certainly be possible to develop such a study process in the National Academies.

Both types of analysis just described are important to congressional deliberation depending upon the circumstances. With the closure of the former Office of Technology Assessment (OTA), the latter type of analysis as performed by a disinterested analytical organization is no longer readily accessible to the Congress and may need to be reconstructed in some way, either through adapting an existing organization or through

creation of an organization that is answerable directly to the Congress or perhaps creating a new process within an existing Congressional agency.

As an example illustrating the analysis gap just noted, consider the case where Congress may be interested in the future of the nation's electric power system, following a major blackout. The salient issues could be posed in two alternative ways:

- One type of study would be to seek an authoritative set of recommendations for making the system more secure and reliable in the wake of blackouts or threats of terrorist attacks on the nation's infrastructure. In such a study, the well established NRC approach would be to assemble a committee of experts, review what is known about the power system and where it is headed, and deliver specific engineering and operational recommendations about how to improve system reliability and performance. Indeed, we currently have such a study underway to assist the Department of Homeland Security.

- In another type of study, Congress might be interested in exploring the technical as well as societal, environmental, economic, regulatory, or other broad implications of alternative scenarios for the future of the nation's electric utility industry, perhaps once again precipitated by a blackout. Not only technical, but also political, economic, social, environmental, and probably many other kinds of tradeoffs and value judgments are involved in characterizing a series of scenarios for the future structure of the industry, ranging from moving toward a national centrally controlled grid to fully deregulating wholesale and retail electricity segments of the industry.

These two types of studies are not necessarily mutually exclusive, but unlike the first case, in the second case a set of consensus recommendations is not the principal objective, and the collection of stakeholders and experts necessary to carefully identify and explore these alternatives would be considerably different than for the study committee structured to reach an evidence-based, tightly reasoned consensus recommendations based on scientific evidence and on specific technical issues.

In short, and perhaps at the risk of being simplistic, the first type of analysis is designed **to illuminate the scientific and technical aspects of a problem to help in directing a specific course of action** while, in the second case, the analysis is designed principally **to inform the Congressional debate, including perspectives that may go beyond science and technology about the broader implications of alternative actions related to the science and technology issues being considered**, but both types of analysis are very important to Congressional deliberations.

Evolving Study Processes at the NRC

The fact that the NRC process does not now accommodate the second form of advice noted above does not mean that it could not; indeed, NRC processes to do change from time to time in response to government needs. As a case in point -- the horrific terrorist events of September 11, 2001 spurred widespread interest in findings ways to

contribute to the understanding of the science and technology dimensions of homeland security and countering terrorism. Specifically, many government agencies expressed urgent needs for immediate advice in these areas. In response, the NRC used its convening power to assemble small groups of experts who then provide advice as individuals, rather than as a group constituting an NRC committee. Such "real-time" advice, which is done orally and not by a written report, does not carry the imprimatur of the NRC study process, especially the quality control aspects of committee deliberation and peer review of a written report. It does, however, provide a new means of satisfying a real need of the government, i.e., providing timely input to policy makers and other organizations, including the Government Accountability Office (GAO) with whom we now have a longstanding relationship along these lines.

Additional Congressional needs vary widely, including such deliverables as (1) "instant education" on a complex science and technology issue, (2) "translations" of authoritative reports to more readable and understandable language tuned to the needs of broad policymakers, (3) summaries of landmark authoritative reports, and (4) updates or adaptations of existing reports and information to current needs, and (5) readily available and trusted expert consultants on call to help with quick turnaround questions and interpretations of complex technical information. Some of these capabilities are accessible to varying degrees through the Congressional Research Service and through various other means. Missing, however, especially since the closure of OTA, is an ability to provide comprehensive analysis in any organized or readily accessible way by an organization directly accountable to Congress.

Collaboration and a GAO Experiment

In an experiment to test the feasibility of developing a "technology assessment" capability in the Government Accountability Office (GAO), a first-of-a-kind GAO technology assessment report on biometric technologies was released in 2002. The NRC did not participate in developing this assessment, but it did use its contacts to assist the GAO in identifying individuals with the proper expertise. There are some shortcomings in the approach adopted by the GAO in carrying out its first attempt at a technology assessment, most notably the lack of a substantive and accountable peer review process. Nevertheless, the experiment has been more successful than many anticipated and the GAO seems receptive to incorporating improvements suggested by a review group commissioned to review the GAO approach. In particular, the group identified a number of significant organizational challenges that it felt were necessary to refine the GAO approach, such as the incorporation of a mechanism for peer review, which could then possibly evolve into a more mature technology assessment capability within the legislative branch.

Whether the GAO is capable of such reforms on a larger scale remains to be seen, but it seems fair to conclude that the initial GAO experiment has yielded evidence sufficient to continue the experiment. We are pleased that the NRC's modest role in this experiment, by providing experts to talk with GAO, appears to have been one of the successful features of this approach and may constitute a way in which the National Academies can contribute to a renewed technology assessment capability within the

legislative branch, in addition to its more traditional response to congressionally mandated requests for assistance. Such a mechanism provides the GAO a degree of access to the National Academies' considerable network of technical expertise. If needed, the Academies would also be willing to conduct similar studies commissioned by GAO to aid in responding to important Congressional requests.

The Former Office of Technology Assessment

By comparison with and in contrast to the NRC study process, the former Office of Technology Assessment (OTA) study process used an authoritative committee of volunteers as an advisory panel rather than assuming authorship of the study itself, which was produced by professional staff. As with NRC reports, OTA reports were also subject to a rigorous peer review. On the one hand, this approach permitted easier regulation of the role of the committee, particular if achieving a consensus in a broad controversial area was unlikely, but, on the other hand, such a practice also sacrificed the authoritativeness of the volunteer experts as authors of the report, an important feature of the NRC process.

Because the former OTA panels were advisory, and not the report's authors, the necessity of reaching a consensus was seldom an issue. Indeed, OTA was prohibited in its enabling legislation from making recommendations, so the panel was created to try to collect the views of all important stakeholders rather than to try to produce consensus recommendations (although consensus findings and conclusions were provided and viewed as important by requesting Congressional committees). Instead, the OTA project teams sought to analyze and articulate the consequences of alternative courses of action and elaborate on the context of a problem without coming to consensus recommendations on a specific course of action, which would be difficult anyway with a diverse group with points of view that prevented consensus on many controversial issues.

If required to come to a consensus set of recommendations, even if it were permitted under the enabling legislation, the former OTA model would likely be unworkable for controversial subjects with many opposing points of view. Nonetheless, the type of study undertaken by the former OTA was an important input to Congressional deliberation and it has not yet been reproduced in the Legislative Branch agencies or elsewhere, including the National Academies. The Academies could carry out such studies but that would require some changes in its study procedures for such studies as indicated above.

Conclusions

The National Academies have enjoyed a longstanding and effective working relationship with Congress on even the most contentious issues. There are, no doubt, many characteristics of that relationship that could be improved, both to perform the traditional NRC role more effectively and to provide some opportunities to expand that role.

The gaps I mentioned earlier in the mechanisms for providing useful, relevant, informed, independent, authoritative and timely advice on the science and technology issues to the Congress are becoming more and more noticeable. There are certainly a variety of options for filling these gaps, some of which might involve the Academy and some that would not. Many of them are worthy of serious consideration and we in the National Academies look forward to playing a role in this very important area in whatever mechanism develops. Thank you again for the opportunity to share my thoughts with you today and I look forward to addressing any questions the Committee might have.

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Peter Blair joined the National Research Council's (NRC) Division for Engineering and Physical Sciences as its first Executive Director in 2001, responsible for the NRC's portfolio in defense, energy and environmental systems, information and telecommunications, physics, astronomy, mathematics and operations research, aeronautics and space science and engineering, materials, manufacturing and engineering design, and civil engineering infrastructure.

Prior to his appointment at the NRC, from 1996-2001, Dr. Blair was executive director of Sigma Xi, the Scientific Research Society and publisher of *American Scientist* magazine, as well as an adjunct professor of public policy analysis at the University of North Carolina at Chapel Hill.

From 1983-1996 Dr. Blair served in several capacities at the Congressional Office of Technology Assessment (OTA), concluding as Assistant Director of the agency and Director of the Industry, Commerce and International Security Division where he was responsible for the agency's research programs on energy, transportation, infrastructure, international security, space, industry, commerce, and telecommunications. He received the OTA's distinguished service award in 1991.

Prior to his government service, Dr. Blair served on the faculty of the University of Pennsylvania with appointments in the graduate groups of energy management, regional science, and public policy and was a co-founder of Technecon, Inc., a Philadelphia engineering-economic consulting firm specializing in investment decision analysis of energy projects and in developing, financing, and managing independent power generation projects.

Dr. Blair holds a B.S. in engineering from Swarthmore College, an M.S.E. in systems engineering and M.S. and Ph.D. degrees in energy management and policy from the University of Pennsylvania. He is the author or co-author of three books and over a hundred technical articles in areas of electric power systems engineering, energy and environmental policy, computer modeling of energy systems, regional science and input-output analysis, and commercialization of new technology.