

Summary Minutes of the United States Environmental Protection Agency (U.S. EPA) of the Science Advisory Board (SAB)

March 22-23, 2012

Date and Time: March 22, 2012, 10:00 a.m. to 6:30 p.m.; March 23, 2012, 9:00 a.m. - 1:00 p.m. Eastern Time

Location: The Washington Plaza Hotel, 10 Thomas Circle, NW, Washington, DC

Purpose: To conduct quality reviews of a draft report on the President's requested FY 2013 budget for EPA research and a draft report on science integration at EPA; to discuss a joint meeting of the SAB and Office of Research and Development's (ORD's) Board of Scientific Counselors (BOSC); to receive a briefing on ORD and sustainability science; and to discuss the scientific and technical bases for four proposed agency actions.

SAB and BOSC Members:

SAB Members

Dr. Deborah Swackhamer, Chair

Dr. George Alexeeff

Dr. David Allen

Dr. Pedro Alvarez

Dr. Joseph Arvai

Dr. Ingrid Burke

Dr. Thomas Burke

Dr. Terry Daniel

Dr. George Daston

Dr. Costel Denson

Dr. Michael Dourson

Dr. David Dzombak

Dr. Taylor Eighmy

Dr. Elaine Faustman,

Dr. John Giesy

Dr. Barbara Harper (by telephone)

Dr. Kimberly Jones

Dr. Bernd Kahn

Dr. Agnes Kane

Dr. Nancy Kim

Dr. Cecil Lue-Hing

Dr. Judith Meyer

Dr. James Mihelcic

Dr. Christine Moe

Dr. H. Keith Moo-Young

Dr. Eileen Murphy (by telephone, March 22, 2012 only)

Dr. James Opaluch

Dr. Duncan Patten

Dr. Stephen Roberts

Dr. Amanda Rodewald

Dr. James Sanders

Dr. Jerald Schnoor (by telephone, March 23, 2012 only)

Dr. Peter Thorne

Dr. Paige Tolbert

Dr. John Vena

Dr. Roberts Watts

Dr. Thomas Zoeller

Liaisons to the SAB:

Dr. James Johnson

Dr. Kenneth Portier

Dr. Pamela Shubat

Dr. Katherine van Stackleberg (by telephone, March 23, 2012 only)

EPA presenters:

Dr. Robert Kavlock, Deputy Assistant Administrator for Science, ORD
Dr. Peter Preuss, Chief Innovation Officer, ORD
Dr. Alan D. Hecht, Director for Sustainable Development, ORD
Dr. Joseph Fiksel, Sustainability Advisor, ORD

SAB Staff Office:

Dr. Angela Nugent, SAB Staff Office, Designated Federal Officer for the Chartered SAB
Dr. Vanessa Vu, SAB Staff Office
Mr. Thomas Brennan, SAB Staff Office

Meeting Summary March 22-23, 2012

The meeting generally followed the issues and timing as presented in the agenda.¹

Convene the meeting

Dr. Nugent formally opened the meeting and noted that the meeting had been announced in the Federal Register.² She noted that the Federal Register notice meeting announcement had provided the public with an opportunity to provide written and oral comment. There was one request for oral comment and no written comments had been provided by the public.

Goals and agenda for the meeting

Dr. Vanessa Vu reviewed the agenda, thanked the agency and the public for participation, and thanked SAB members and liaisons and SAB staff for the meeting preparations.

Dr. Deborah Swackhamer, the SAB Chair, welcomed the group and asked advisory members and liaisons and members of the public to introduce themselves. She reviewed the agenda.

Discussion of draft report from the SAB Research Budget Work Group³

Before the chartered SAB's discussion of the draft report, Dr. Robert Kavlock, ORD Deputy Assistant Administrator for Science, extended greetings from Acting Deputy Assistant Administration Lek Kadeli and from Dr. Kevin Teichman, working on indoor air issues at the National Institute of Standards and Technology. In response to a direct question from Dr. Swackhamer, Dr. Kavlock underscored ORD's commitment to implement the "Path Forward" vision previously articulated by former ORD Deputy Administrator Paul Anastas.

Dr. Kavlock noted that the SAB's draft report on the President's FY 2013 requested research budget affirmed support for funding ORD's six research programs and identified needs for strengthening support for several priority areas, including climate and energy, sustainability, and molecular design. ORD will make efforts to factor these recommendations into future research planning. He noted that the SAB called for budget items to strengthen integration across ORD's six research areas. He suggested that this concern was more properly addressed as an implementation, rather than a budget, issue, and that this implementation concern might better be

addressed at the July 10-12, 2013 meeting of the SAB and ORD Board of Scientific Councilors (BOSC). He noted that ORD has just announced that five or six new postdoctoral fellows would be added to focus on integration issues.

He also noted that the distribution of resources across progress resulted from ORD's 2011 program restructuring. ORD did not anticipate major shifts in resources across these programs.

After Dr. Kavlock concluded his remarks, Dr. Taylor Eighmy, Chair of the SAB Research Budget Work Group summarized the major points in the draft report and thanked members for their comments.⁴ The President's requested budget provides a modest increase in funding for ORD overall, with increases in four program areas and modest declines in two areas. Although some topics needing more funding, in the context of a declining budget for EPA, the budget was reasonable. Dr. Eighmy also noted that the report was prepared on an accelerated schedule and acknowledged the contributions of work group members, the DFO, and agency staff who addressed work group members' questions.

Dr. Swackhamer asked SAB members who had been asked to serve as lead discussants to summarize their written comments. The first lead reviewer, Dr. David Allen summarized brief comments to address the draft report's comments on the FY 2013 requested funding for the Air, Climate, and Energy program. He considered the draft report very well done. It addressed the charge questions and was clear and logical. He suggested that the report would be improved by adding a conclusion to address cross cutting themes and adequacy of resources.

The second lead reviewer, Dr. David Dzombak summarized comments on the report, with special attention to the section addressing the requested budget for the Safe and Sustainable Water program. He found the draft to be a very well written, well organized report. He suggested that the Board consider areas to disinvest, rather than call for increased resources for ORD programs and suggested that the Board might consider how ORD resources compared with investments in related EPA programs. He suggested that the report could be improved by making the tone of the letter more consistent with the neutral language of the report and by avoiding verbs such as "troubled."

The third lead reviewer, Dr. Amanda Rodewald, focused her comments on the draft report's text addressing funding for the Safe and Healthy Communities program. She noted that the Board had identified this program previously as the most visionary, integrative, and potentially most transformative ORD program. She observed that the program had received the largest percentage cut. The report's language describing the cut is very neutral. She advocated that the Board take "a stand" regarding whether the program will be able to meet its goals with the requested resources. The language should be clearer on this point.

The fourth lead reviewer, Dr. Thomas Zoeller, noted that the draft report was clear and well organized. He suggested that the letter to the Administrator should provide additional detail about the major recommendations in the report. He also stated that the letter should highlight the limited information available to assess the budget's adequacy for ORD programs. He had no issue with points raised regarding the requested funding for the Chemical Safety for Sustainability research program and agreed that the small proposed reductions in funding for the

Human Health Risk Assessment will make it difficult for that program to integrate new types of scientific information into risk assessments.

The fifth lead reviewer, Dr. James Johnson, provided comments on the section addressing funding for ORD's Homeland Security program. He found the section well written and asked whether more resources were needed for the water security program. He also suggested that the report more strongly endorse the Homeland Security's efforts to collaborate with other programs to leverage resources.

The sixth lead reviewer, Dr. Joseph Arvai, commented on the section of the report addressing Economics and Decision Science. He noted that the charge questions were handled well but that the mission statement did not clearly identify strategic research that reflected current work in decision science. The lack of clear objectives gave the impression of a research program "floundering without research directions."

The SAB Chair asked members to restrict their comments to budget-related topics and to defer discussions of strategic research directions to the SAB-BOSC meeting in July.

Dr. Eighmy responded to lead reviewer comments. He endorsed the idea of adding a conclusion section to address cross-cutting integration issues. He noted that the work group didn't identify additional cuts. One option for FY 2014 might be to request additional information about one or two programs for a more detailed examination of resource needs or for an examination of budget allocations at EPA outside ORD. He agreed to revise the report to make language consistent to address the appropriate degree of concern.

Regarding funding for the Safe and Health Community program, Dr. Taylor noted that the program was to receive nearly 40 percent of ORD's budget and that the reduction of 2.5 percent should be viewed in that context. He agreed that it was appropriate to acknowledge the success of the Homeland Security program in collaborations and successful product development.

Other members of the work group provided their comments. One member noted that the budget exercise was structured in terms of six research silos and provided no obvious accountability for integration across research programs. Another member expressed appreciation for the strategic research action plans made available to the work group for ORD's six research programs. These plans identified outputs but did not identify milestones for multi-year outputs. Several members voiced frustration with the "mismatch" of charge questions and the amount and type of information provided to the SAB. Both EPA and the SAB should consider the appropriate level of detailed advice that would be useful and the amount and nature of information that would help the SAB address those questions. There is a need in the future to better map information in the strategic research action plans to the budget and to briefing materials provided to the Board. The SAB Chair noted that these questions were not new ones. The key question for the SAB to address is "how does the requested budget line up with the research needs of the agency?" Dr. Kavlock noted that the SAB's report informs Congress as it considers EPA's budget for the upcoming fiscal year and also informs ORD as it plans for budgets in future years. SAB members agreed that the issue of how best to conduct future budget reviews would be a good topic to address during the July meeting.

Other Board Members and Liaison made the following additional comments related to revising the report:

- The report should consider whether to include exposure assessment as a cross-cutting issue. Have budget cuts disproportionately hit exposure science, a topic being emphasized in a current National Academy of Sciences report? Some areas being cut are new exposure tools in the Chemical Safety for Sustainability program, Beach Monitoring in the Safe and Sustainable Water Program, and exposure science in the Air Climate and Energy programs. The report should clarify whether the Beaches program had a dual use (supporting regulatory development and ongoing exposure monitoring).
- The report should revise the discussion of the beaches program to frame comment about reductions narrowly. Do not say reductions are appropriate unless that is thoroughly evaluated.
- The report should eliminate specific references to programs (e.g., new estuarine center) if not needed).
- The report should suggest that ORD use the Federal Technology Transfer Act more actively to save resources and to work more collaboratively with the Food and Drug Administration, Centers for Disease Control on risk assessment, perhaps using Toxnet as a starting point for risk assessment. ORD might consider how to share information about chemical assessments between ORD's National Center for Environmental Assessment and Homeland Security program.
- ORD had provided a sample table showing where different ORD programs had the lead for cross-cutting activities. The Sustainable and Healthy Communities had the lead for some activities. It might be useful to showcase these tables more clearly or discuss these examples.
- The report should clarify language about Dashboard and Evaluation on page 18 to communicate that ORD has responded to the SAB's recommendation for closer coordination between the Chemical Safety for Sustainability program and users of its science products.
- The report should communicate more clearly in the letter that a 29% decrease in real dollars over a decade for research is not appropriate when there are tremendous needs to understand climate change, unusual events, and exposure issues. Programs and regions have significant science needs. It is important to invest in research to prevent future problems.
- Overarching findings on page 3 line 16 can be incorporated in the cover letter. The report should incorporate discussion of science integration page 4, line 13-19 and language on decision science from page 25 in the letter.

SAB members also noted that some content taken from the strategic research action plans merited SAB review and comment. One member noted that the vision statement of the Sustainable and Health Communities program was very vague. Members agreed that this topic was appropriate for discussion in July.

After the Board concluded its discussion, the Chair requested a motion to determine whether the report was appropriate to transmit to the Administrator and under what conditions. Dr. George

Daston made a motion to accept the report with changes identified in written comments and in the Board's discussion and to have the revised report sent to the Board chair. Dr. Peter Thorne seconded the motion. The Board discussed the motion. One member noted that if decadal research funding trends were discussed, it should be stated factually without a policy judgment. The SAB chair and the workgroup chair agreed. The motion passed by voice vote with no members opposed and no abstentions.

SAB members then discussed mechanisms for providing the report to Congress. One member expressed concern that Congress had not requested written or oral testimony from the SAB this year. The SAB Director noted that the SAB Staff will brief Hill Staff about the report when it is complete and enquire whether the House Science, Space and Technology Committee would like additional information.

Planning for the July 2012 Meeting of the SAB and the Office of Research and Development's (ORD's) Board of Scientific Counselors

Dr. Robert Kavlock, Deputy Assistant Administrator for Science, ORD, provided a presentation entitled "Planning for July 2012 SAB/BOSC Meeting."⁵ He underscored ORD's commitment to integrated transdisciplinary research and welcomed the opportunity for joint advice from the SAB and the BOSC. He identified three topics for possible discussion: 1) progress in developing the six research programs; 2) integrating across the six programs; and 3) stimulating innovative research. He envisioned the meeting as offering an opportunity for each of ORD's six programs to provide an overview of progress in the past year, describe the impact of SAB/BOSC comments (Oct. 2011) on program development, and raise specific questions to SAB/BOSC for advice. There would be an opportunity to discuss case studies that demonstrate integration at different stages of development. Three possible case studies to explore integration might be climate change, nitrogen, and integration of results from Chemical Safety for Sustainability into Human Health Risk Assessment.

Dr. Peter Preuss, the ORD Chief Innovation Officer, provided a presentation on ORD innovation.⁶ He described ORD's innovation strategy, which aims to support innovation at the bench in ORD laboratories, demonstrate the power of transdisciplinary research, use open innovation to broaden the network of environmental problem solvers (building on the strong federal government program showcased at the website challenge.gov), and showcase research that exemplifies the principles of the "Path Forward" described by former Assistant Administrator Paul Anastas (i.e., by expanding an understanding of innovative research and sustainability). He suggested that it would be helpful to get SAB and BOSC advice about how to encourage innovation in the labs, how to apply design thinking in ORD to diverge from present approaches to identify creative choices and creative solutions, and how to measure/evaluate innovations.

After both presentations, SAB members and liaisons engaged in discussion with Drs. Kavlock and Preuss. They touched on the following points relating to the July meeting:

- It may be helpful to discuss one or more case studies where success has been difficult to achieve, such as the integration of economics and environmental justice.

- In July breakout groups, National Program Directors can discuss how sustainability is addressed in each of their programs.
- It would be useful to discuss the strategy and structural basis for integration of research programs, and identify where ORD needs integration vs. better coordination. Discussion of specific activities or case studies would be helpful.
- ORD should describe how its “communities of practice” described in EPA’s 2012 Budget in Brief, will operate.
- It would be helpful to hear how ORD plans to update the strategic research action plans (e.g., timing for updates, content of updates, especially related to milestones).
- There is a need for ORD to address how it will involve decision sciences in considerations of sustainability, tradeoffs, problem formulation, evaluation, and adaptive management, key issues for ORD’s six new programs.
- Evaluation is important for the innovation program; ORD is planning to work with the program evaluation group in EPA’s Office of Policy. Issues of timing and how to measure success are important to understand. Sometimes an innovation may not be successful for its intended purpose and is successful for other purposes, a difficult situation to evaluation.
- It may be useful to talk about innovation in terms of innovative problem formulation and possible use of futures scenarios.
- The July discussion should also include how to foster innovation across ORD and not only for recipients of Pathfinder Innovation grants.

SAB members spoke of the desirability of break-out groups to discuss ORD’s research programs in detail and also noted the importance of plenary presentations to break down stove pipes and feature discussions of how ORD research programs interact and fit together. The SAB Staff Office Director noted the importance of logistics. A full two-day meeting will be necessary to address the topics discussed and she asked members to commit to a two-day meeting.

ORD and Sustainability Science

Dr. Alan D. Hecht, Director for Sustainable Development, ORD and Dr. Joseph Fiksel, Sustainability Advisor, ORD, provided an “Update on EPA Response to NRC Report and ORD Sustainability Science.”⁷ Dr. Hecht described how EPA’s commitment to Dr. Paul Anastas “Path Forward” and awareness of the need to meet future environmental challenges led to EPA’s request for the National Academy of Science (NAS) 2011 report, *Sustainability and the U.S. EPA*, informally called the “Green Book.” In response to the report, ORD prepared a draft inventory of sustainability tools and approaches for EPA’s Science and Technology Policy Council. The goal is to provide guidance on how tools and approaches can be integrated to facilitate sustainability assessment. He also noted that EPA is participating in a wider federal government sustainability effort, where the White House National Science and Technology Council Committee on Environment, and Natural Resources had been renamed as the Committee on Environment, Natural Resources, and Sustainability. He also noted that EPA has participated in several months of listening sessions with stakeholders (November 2011-April 2012), where the role of science was identified as critical for sustainability.

Dr. Joseph Fiksel introduced himself as the Director of the Center for Resilience at Ohio State University and explained that he had taken the temporary post of Sustainability Advisor to ORD to seek opportunities to introduce systems thinking to the EPA. He focused his presentation on an ORD collaboration with Region 1 to address nutrient pollution in Narragansett Bay. ORD collaborates with stakeholders to address sustainability goals to explore integrated (i.e., regulatory and voluntary) strategies for nutrient mitigation. The project used the “Triple Value (3V) Model,” a conceptual model linking the environment, economy and society, which gave scientists and stakeholders a common framework and language and offered an opportunity to identify opportunities for intervention, knowledge gaps, and research needs. He noted that the Safe and Sustainable Water Resources program and the Sustainable and Healthy Communities programs have used the model. The Narragansett research team populated the model with data to develop a working systems-dynamics simulation model. He described this model as a “crude model approximation of reality” that captured key trends and drivers. He described the “Dashboard” human interface that allows a nontechnical user to change variables and project implications.

He concluded his comments with a brief discussion of indicators and metrics, since the NAS “Green Book” emphasized the importance of sustainability metrics and the public listening sessions reiterated this theme. ORD has introduced several sustainability indicators for the 2012 Report on the Environment.

After the ORD presenters concluded their presentation, SAB members and Liaisons engaged them in a question and answer session. In response to questions, Dr. Fiksel clarified that the graphical interface had been used to support discussions at stakeholder meetings. The model is transferable and would take a month to populate with different data. Dr. Hecht responded to a question about ORD’s Homeland Security program by noting he was working with that program to broaden its efforts related to resilience, building on a National Council on Environment and Security conference held in January 2012. Dr. Fiksel clarified that resilience is not a well-understood concept across ORD.

An SAB member asked about ORD’s definition of sustainability. Dr. Hecht responded that the Green Book defined sustainability as both a goal and a process and that the NAS relied on the definition of sustainability from the National Environmental Policy Act, i.e., “to create and maintain conditions, under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic, and other requirements of present and future generations.”

An SAB member noted that the “Triple Value (3V) Model” did not show benefits from industries that invest in protection and innovation. Dr. Fiksel responded that the “benefit arrow” properly belonged in the model and had been eliminated for simplicity in this presentation. In response to another SAB member, he noted that the model could be used to help stakeholders better understand tradeoffs involved in choices. Modeling involves educating decision makers, the community, and sometimes states to understand trade-offs.

An SAB member and a liaison noted that the term “resilience” did not make sense in a public health context. Children may be resilient, but that may not mean they are healthy. She asked for a presentation focused on sustainability and public health. Dr. Fiksel responded that another

example could show the application of the model in a public health context. Health is a driver of resilience, but resilience doesn't equal health. EPA has discussed these issues in the context of environmental justice and children's health and is sensitive to these concerns. The model might also be used in integrating social impact assessments and community vulnerability considerations that affect children's health.

Yet another SAB member stated that the "Triple Value (3V) Model" is useful but requires true investment in decision science to reap benefits. Simply showing information and tools to people is not the same as studying the alignment of the outcome of decisions with people's priorities. Dr. Fiksel agreed that people need more than data to make decision-support tools such as his model operational. ORD has "not crossed the threshold" into decision science that would make the model most useful. He noted that the tool is primarily being used within EPA and not generally currently being used in program offices. ORD potentially envisions the tool being used to help develop regulations and/or policies promoting green infrastructure for treatment of wastewater and storm water. It may also be used for policies related to greenhouse gases and biofuels, where there are complex considerations and a variety of regulatory and voluntary management approaches that could be used.

An SAB member asked how ORD is identifying problems at different scales that would be most appropriate for using the "Triple Value (3V) Model." Dr. Fiksel responded that ORD has not yet identified where there are decisions at the national-scale that would be appropriate to the use of the model.

Dr. James Johnson, SAB Liaison and Chair of the National Advisory Committee on Environmental Policy and Technology (NACEPT), noted that NACEPT was meeting to provide advice to the Administrator regarding EPA actions in response to the NAS report, especially as they relate to sustainability objectives, metrics, and fostering an agency culture related to sustainability.

The SAB Chair noted that the language chosen to describe the model will be very important to promote the interdisciplinary collaboration that will be needed. She also noted that the July meeting might benefit from a discussion of sustainability and resilience and ORD's role in developing science to support EPA's work in these areas.

Discussion of draft report from the SAB Committee on Science Integration for Decision Making⁸

Dr. Thomas Burke, Chair of the SAB Committee on Science Integration for Decision Making, described the ambitious efforts undertaken by the committee to talk with hundreds of EPA scientists, managers, and leaders in all 10 EPA regional offices and major program offices. The SAB conducted its fact-finding efforts at a time when EPA was experiencing great changes since 2008. The report has had to adapt to the changing science environment at a time when EPA science was under great scrutiny. The committee developed the report to reflect major themes heard during the interviews and to make the report relevant to current EPA science. The field work conducted by SAB committee members provides an opportunity to provide advice to change the culture of science in ways that will be important to EPA's future success integrating

science for decision making. Although EPA regions and program offices develop and use their science in very different ways, common themes emerged from the discussions regarding the need for science integration. He acknowledged the contributions of chartered SAB members Drs. Terry Daniel, Taylor Eighmy, and John Giesy, as well as the NACEPT Liaison, Dr. James Johnson and many other committee members.

The advisory activity was prompted by a request from former Administrator Stephen Johnson, who asked for advice on how EPA could better integrate science into agency decisions. This request had “some of its origins” in the 2009 NAS report, *Science and Decisions: Advancing Risk Assessment* (sometimes called the “Silver Book”), which emphasized the importance of problem formulation.

The SAB’s science integration report repeats this theme. EPA has no consistent process for problem formulation, which structures EPA to “ask the right scientific questions” and get the right expertise. In some cases at EPA, problem formulation is not done; in other cases, it is “hit or miss.”

Although EPA might emphasize the importance of science integration, the necessary implementation steps are not in place and very often EPA program offices’ “silo” approach to environmental problem solving is a barrier to science integration. Managers are not accountable for science integration.

Significantly, regions and program offices are isolated from ORD. Two thirds of EPA’s scientific staff are located in program and regional offices. Scientists outside ORD are responsible for translating science into decisions and voiced frustrations about accessing and using ORD science to solve their specific problems. To obtain needed science, program and regional scientists developed their own networks, drawing on science at the state or local level, colleges and universities, other federal agencies, or non-governmental organizations where science was available to them. The SAB committee concluded that there is a need for EPA to have a stronger community of science to encourage cross-silo communication, mentoring and outreach, and collaboration. There is a need for new measures of success for EPA science. Science should be measured in terms of science integration for decision making and not just in terms of publication success. EPA needs to develop an approach for attracting, training, retraining and mentoring scientists that addresses the importance of transdisciplinary science.

Dr. Burke acknowledged the written quality review comments from chartered SAB members and liaisons.⁹ He noted that many commenters asked for more examples but that the committee found that there were no examples of science integration that did not have some problematic aspect.

Dr. Elaine Faustman, the first lead reviewer, commended the committee for extensive fact-finding and supported the three recommendations in the report. She suggested that the report mention the 1992 ecological risk assessment framework’s emphasis on problem formulation and explore whether that framework informed decisions or resulted in lessons learned. She suggested that it may have been more useful to use the science integration diagram from the Silver Book,

which emphasized problem formulation. She suggested that the revised figure be shown or explanation provided for omitting it.

She suggested that the report provide more support for discussion of sustainability and its link to science integration. She also called for the report to provide a definition of science not just as an “enterprise” that builds knowledge, but also the knowledge itself. She also asked that the mission of EPA be expanded to include protection of human health.

Dr. Ingrid Burke commended the report for its important focus and message. She suggested that the letter to the Administrator be strengthened to convey more clearly that program and regional science is separate and somewhat disconnected from ORD research and that science integration was not happening consistently.

Dr. Burke supported the three major recommendations. She suggested that the more detailed recommendations in Appendix D should be nested, if possible in the discussion of the three major recommendations. She also suggested that the report might also make a recommendation regarding translation of science, drawing on literature and study of “metrics for translation” developed by extension scientists, who study how their science is used.

She suggested that the report refer to “Science Integration Councils,” rather than “Science Policy Council.” She also suggested that the report refer to science to “inform” decision making, rather than to “support” decision making.

Dr. George Daston, the third lead reviewer, found the report a “bit vague and generalized” and called for more specifics. He suggested that the report more clearly communicate the charge questions. If they diverged from the questions originally provided by Administrator Johnson, the report should better explain how the questions evolved. He called for additional details and findings from the interviews beyond the description of the National Ambient Air Quality Standard review, which is unusual, because it is a major, mandated review process. He suggested that the scientific response to the Gulf Oil Spill and the work conducted by the National Center for Computational Toxicology might provide good examples. He called for the report to provide stronger recommendations and to highlight changes that can be made immediately. The conclusions generally are reasonable, but should be more detailed. He took issue with the second recommendation, which seemed to recommend rewarding managers for integrating more science. He argued, instead, that managers should be rewarded for outcomes where science integration was instrumental. He took issue with the third recommendation, which included support for exchanges of scientists between program or regional offices and ORD for developmental details. He argued that ORD’s depth of expertise would be diluted by such exchanges.

Dr. Otto Doering, the fourth lead reviewer suggested that information in the conclusion drawing from the Ash Commission be moved to the introduction. He suggested that clearer charge questions, based on the committee’s experience with the EPA interviews, be presented in the scoping section, even if these questions diverged from the charge questions in the letter from Administrator Johnson.

Dr. Doering suggested that the report drop figure 1 because it contained outdated terms. He suggested that the report use the figure from the Silver Book or create a new figure. He recommended that the definition of integrated science be simplified.

Dr. James Sanders found the report a short, clearly written and straight-forward report. He would have liked more support for the findings and recommendations. He asked that the report communicate more clearly that the interviews were available as a stand-alone document. He suggested that the letter provide additional explanation for each finding and recommendations so that the reader can more easily understand the findings and major recommendations.

After the lead reviewers finished their remarks, Dr. Burke noted that the committee grappled with these issues. It should be feasible to move recommendations in Appendix D into the body of the report. He committed to considering possible case examples, such as science supporting the Gulf Oil Spill, Region 3's use of the Multi-criteria Integrated Resource Assessment (MIRA), or the estuary program. He also noted the call to provide more support for the recommendations, to consider using the Silver Book diagram or redrawing the figure, and providing additional support for the sustainability references.

After Dr. Burke finished his brief response, other members of the committee provided comments. Dr. Johnson noted that the committee had found it difficult to use examples, because different members of the committee made objection, on different grounds, to the use of every example chosen. Dr. Terry Daniel supported the idea of crafting fresh charge questions without being tied directly to the original language provided by Administrator Johnson.

Dr. John Giesy noted that the impetus for this report resulted from criticism of EPA past practices that generally are no longer a problem. Rather than criticize those past practices, the committee chose to make positive recommendations to strengthen EPA science. Recommendations for this report were especially tricky. The committee found EPA scientists to be resourceful and innovative in solving their problems, often in unexpected ways. The committee did not have grounds to criticize regions or program offices for these strategies nor did it have grounds to criticize ORD, because ORD cannot conduct all the research and science needed by regions. As a result, it became difficult to develop recommendations that were clear and pointed at the high level of this report, which addressed an overview of EPA science. The messages from the interviews cannot be neatly diagramed; "they were all over the map" addressing how program and regional offices were "doing things and not doing things." The committee decided to keep the message simple and address only a few key points.

After members of the Committee on Science Integration for Decision Making who were also members of the chartered SAB concluded their remarks, other members provided comment. One member noted that the report is important because it addresses science beyond ORD, the SAB's usual customer. The committee has engaged EPA's scientific community outside ORD and has an important message to communicate to the Administrator. It should communicate that message clearly to help the agency strengthen its use of science. The recommendations are systematic and fundamental. The SAB should complete this report and follow-up to see that recommendations receive attention and are addressed. The recommendations are important to decisions made in program offices, regions and states that look to EPA as a model. Other SAB

members supported this view and suggested that the SAB consider how to continue efforts to better understand science outside ORD and how to provide advice to support it.

Members made the following additional suggestions to consider in strengthening the report:

- Consider commenting on how to communicate uncertainties in science assessments. The report might emphasize the importance of “getting the science right” and communicating it effectively.
- Highlight any findings related to states.
- Edit the report with consideration to where text can be pulled out of context to be misconstrued and cause problems for EPA.
- Highlight EPA institutions that foster integration: the Science Policy Council, Risk Assessment Forum, and historical Integrated Risk Information System consensus work groups. Dr. Burke responded that the committee found all these topics complex and had not reached agreement on conclusions to include them in the report.
- Make it clearer that the type and level of integration can depend on the type and significance of the decision to be made.

Members discussed the importance of clarifying the nature of the committee’s fact-finding. Members of the Committee on Science Integration for Decision Making explained that, although there was an ambitious interview protocol, the dynamics of the discussion depended on the “dynamic of who was in the room.” The interview summaries are available and are cited in the report, but they do not provide an objective data set. The committee used the interview summaries as a base set of information to extract themes. One theme that came across in many interviews is that that science integration played little or no part in interviewees’ work. Those interviewees reported that the law prescribed what was necessary, or that they didn’t have time for science integration, or that they were following precedent. Other interviewees made different kinds of efforts to integrate science. The major take-home message is that there’s no one way for integrating science to support EPA’s decisions. “It’s all over the map. There are a lot of really dedicated people. They don’t have resources they need for science. There isn’t time for them to get training and learn and get ready for all the decisions they need to make. Approaches differ at every level of organization and across programs.” The Committee decided to distill a few key findings and recommendations. The available interview materials defy deeper analysis.

Members agreed that the report would be strengthened by a description of the “messy” nature of the interviews and the “incredible group of EPA scientists” meeting challenges in different ways. The report should explain that it distilled only a few clear themes relating to the need for education, networking, data sharing, and convening the right people.

After the discussion had concluded, Dr. Swackhamer asked for a motion to dispose of the report. Dr. Ingrid Burke made a motion to accept the report with changes discussed during the quality review and to have the revised report sent to the Board Chair. Dr. Duncan Patten seconded the motion. The Board discussed the motion. The motion passed by voice vote with no members opposed and with one abstention from Dr. Michael Dourson.

The DFO recessed the meeting at 6:30 p.m.

Friday, March 23, 2011

The DFO reconvened the meeting at 9:00 a.m.

Discussion of the scientific and technical bases for several rules proposed by the Office of Air and Radiation

Dr. Deborah Swackhamer provided background about a pilot activity undertaken by the SAB in response to a new EPA initiative to strengthen coordination with the SAB by providing the SAB with information about proposed agency actions. This initiative was described in a January 2012 memo from Office of Policy Associate Administrator Michael Goo, as provided to the SAB in Attachment A of the meeting material entitled "Screening Consideration of Four EPA Proposed Regulatory Actions and Supporting Science."¹⁰ She noted that this new process is intended to provide the SAB a meaningful opportunity to provide advice and comment, where appropriate, on the science supporting proposed agency actions, even when there isn't an explicit request for SAB advice. The initiative is consistent with language of the Environmental Research and Development Demonstration Authorization Act of 1978.

As the SAB develops an implementation process for this initiative, the Board conducted a pilot exercise to evaluate four proposed rules to determine the information needed to provide advice and comment on the supporting science. The pilot exercise focused on two sets of proposed regulations. On December 23, 2011, the SAB Staff Office was informed by EPA's Office of Air and Radiation of proposed rules relating to: 1) standards for air toxics from boilers and incinerators and 2) greenhouse gas emissions and fuel economy standards for light-duty vehicles.

To assist the SAB deliberations, SAB members Drs. David Allen, Peter Thorne and Jerry Schnoor agreed to serve as lead discussants. In that capacity, they worked with SAB staff to conduct fact-finding and have developed initial recommendations to the chartered SAB on information needed to evaluate if the SAB should develop advice and comment relating to the OAR proposed rules.

After Dr. Swackhamer's introduction, SAB members briefly discussed the nature of this new activity. There are 164 actions identified in EPA's semi-annual regulatory agenda that the SAB might consider. The SAB Staff Office Director noted that the SAB DFO, Dr. Angela Nugent, was leading an agency work group to identify a process for screening actions for SAB attention and to identify the supporting information that would be publicly available. Chartered SAB members would decide the agency actions that would be the focus of SAB review and the actual review process would be conducted by experts following the standard SAB process for identifying the appropriate type of panel of experts to conduct the review. SAB members agreed that the process would need to take account of EPA's time constraints and still meet the requirements of the Federal Advisory Committee Act. They also noted that although the effort would be time-intensive, SAB advice might provide a new opportunity to provide science advice to strengthen EPA decision making.

EPA's proposed rule addressing 2017 and Later Model Year Light-duty Vehicle Greenhouse Gas Emissions and CAFE Standards

Dr. Jerald Schnoor, the lead discussant of the science supporting EPA's proposal related to the 2017 and Later Model Year Light-duty Vehicle Greenhouse Gas Emissions and CAFE Standards, summarized his findings via teleconference. Dr. Schnoor summarized the background for this proposed rule and his major findings, documented in Attachment G of the meeting material entitled "Screening Consideration of Four EPA Proposed Regulatory Actions and Supporting Science." He noted that the proposed rule under consideration amended EPA's rule promulgated on April 1, 2010. To evaluate the science issues, he considered the historical evaluation criteria for determining whether science issues merited SAB attention (Attachment D), the proposed rule, public comments, Agency fact sheets and technical documents, and information gathered through agency fact-finding conducted with the assistance of SAB DFO Ms. Stephanie Sanzone (Attachment F).

Dr. Schnoor noted that the proposed rule is mostly an extension of the previous rule (April 1, 2010) establishing standards for 2012-2016 model year vehicles. There are no new scientific or technical issues with the possible exception of the advanced technical credits for electric vehicles and (partially) plug-in electric vehicles (PHEVs). These proposed credits are intended to provide incentives to facilitate market penetration of the most advanced vehicle technologies as rapidly as possible. He recommended that there is not a major new scientific issue associated with these regulations, and it should not be a high priority for SAB action.

After Dr. Schnoor concluded his remarks, SAB members asked several questions. In response to a query, Dr. Schnoor noted that he might have made a different recommendation if he were reviewing the April 2010 rule, where there was a new major regulatory initiative. He noted that he spent approximately six hours considering information related to the pilot. Mr. William Charmley, from EPA's Office of Air and Radiation, Office of Transportation and Air Quality, responded to a question about EPA's lifecycle analysis for electric vehicles. He noted that the cost-benefit analysis included upstream emissions, including projected increased electricity use, as compared with previous tailpipe analyses.

SAB members discussed the pilot's significance for future SAB activities. One member noted that it may be more appropriate for the SAB to focus on new science issues, rather than whether EPA is applying existing science correctly. Another member noted that the economic analysis supporting the rulemaking may raise science issues; how consumers value fuel economy is a complex topic that may merit SAB attention.

EPA's proposed air toxic rules for boilers and incinerators

Drs. David Allen and Peter Thorne, the lead discussants for SAB pilot examination of the science underlying EPA's proposed air toxic rules for boilers and incinerators, summarized their findings and experience with the pilot. Dr. David Allen provided comments on proposed rules published in December 2011 that amended four final rules issued in March 2011 that set national emission standards for control of hazardous air pollutants from industrial, commercial and institutional boilers at major and area source facilities, revised the definition of non-hazardous

secondary material to clarify the scope of biomass and other solid wastes used as fuels, and emissions from commercial and industrial solid waste incineration units. The December 2011 rules were major rules because they had estimated costs of \$1.5 billion; affected a large number of boilers; and were estimated to result in major risk reductions.

For both lead reviewers, the most significant science issue was the proposal to replace numerical dioxin limits with workplace standards. EPA assumed that dioxin emissions would scale with reductions of fuel burned. Dr. Allen considered this rule “fell squarely in middle” – it might merit SAB attention because of the significance of the rulemaking and the novel science issue. More information would be needed to determine whether workplace standards involving tuning up boilers and changing temperatures would necessarily result in changed emission of dioxin.

Drs. Allen and Thorne reported that they had participated in a very useful fact-finding session with senior EPA staff organized by Ms. Sanzone documented in Attachment F. Dr. Allen concluded that historical SAB evaluation criteria are not well suited to evaluating the significance of science supporting rulemaking. The SAB will need more focused criteria that will allow the SAB to rank order different proposed agency actions and their related science in terms of relative significance for SAB attention. For him the key questions were: 1) whether the science was new; 2) whether the right science was done; and 3) whether the science was done right.

Dr. Thorne commented on the proposed rule addressing commercial and industrial solid waste incineration units. He noted that these regulations generally imposed more restrictive limits for a wide variety of incineration units, from very large to small units that might operate in a laboratory and would also affect Portland cement kilns.

Drs. Allen and Thorne spent approximately 12 hours reviewing documents for the pilot and “felt fairly confident” in concluding that the proposed changes did not involve much new science that should be examined by the SAB.

After the lead discussants concluded their remarks, Mr. Timothy Hunt from American Forest and Paper provided public comment, supported by a factsheet on dioxin workplace standards¹¹ and a bar chart comparing dioxin limits in U.S. regulations.¹² American Forest and Paper supports EPA’s December 2011 proposal to use workplace standards, rather than a numeric standard because dioxin levels are below the limits of detection given current measurement protocols. Drs. Allen and Thorne questioned whether EPA might use a longer, 24-hour sample, rather than a one-hour sample, and noted that costs of such sampling might be the barrier to such a requirement. Mr. Hunt did not respond.

In response to other questions, Mr. Hunt noted that many industry stakeholders supported the December proposal because it made the standard achievable and affordable. He also noted that the rule was highly technical. Public comment was difficult because EPA’s accelerated schedule made it impossible for stakeholders to develop test data as part of their public comment. If the SAB were to provide comment on such issues, “timing would be critical,” and the SAB would need to set priorities to focus on the most significant issues within the complex context of the regulatory decisions to be made. He noted that the Maximum Achievable Technology rules were

not based on health effects and were technology-based standards. An SAB member noted that science integration issues relate to whether technology-based standards meet health-based concerns.

Another SAB member expressed the view that the regulated industry and public interest groups often have a good sense of the scientific issues related to regulations. Comments from these groups can help inform the SAB about whether to decide to review the science associated with a proposed rule.

Discussion of lessons learned from the pilots

Chartered SAB Members and Liaisons addressed the following points in discussing the future evaluation of the science supporting proposed Agency actions:

- Members discussed the need to know answers to key questions:
 - What are the science issues?
 - Is EPA's evaluation of the literature sufficient?
 - What was the methodology used?
 - Was the analysis well done?
 - What was the problem formulation associated with the action (e.g., why the proposed action is needed, what methodology/science/data is needed; how will the data be gathered and assessed to support the action).
- Refining/updating SAB's historical evaluation criteria would be useful
- Members discussed how the evaluation should be done
 - One option – a subgroup of approximately six chartered SAB members could evaluate the set of proposed rules and propose a ranking or triage
 - Another option: the whole chartered SAB could evaluate the entire list and delegate more detailed exploration of high priority actions to a small group that would work with the SAB Staff to do fact finding and then return to the chartered SAB with recommendations.
 - Another option – SAB would develop criteria and EPA could do initial screening. The SAB and SAB staff could focus attention on EPA offices that typically do not seek review or advice from the SAB.
- Members generally agreed it would be desirable to engage in the early stage of regulatory development.
- The SAB should keep in mind that the goal is to identify a small (e.g., two or three) number of actions for SAB attention.
- There might be a “checklist” of questions that EPA staff could address to provide background on the science supporting a planned Agency action.
- EPA could provide the SAB with its Data Quality Objectives to help the Board to screen for appropriate actions for attention.
- EPA could provide information about key technical documents and associated peer review plans/history and summary of science issues identified by public commenters.
- Both EPA and stakeholders can provide the SAB with information about whether new or controversial science is associated with the proposed action.

- The output or work product of the SAB’s screening would be a letter to the Administrator identifying the proposed action and related science the SAB decides to review/provide comment on
- The SAB should examine how the FIFRA Scientific Advisory Panel provides advice on science supporting rulemaking.
- The SAB will need to develop a process for: 1) evaluating the backlog of planned and proposed agency actions (164 actions) and 2) examining actions on a semi-annual basis, as EPA releases its semi-annual regulatory agenda.

The SAB Chair noted that the Board had reached several areas of agreement: 1) involvement is appropriate early in the process; 2) a three-stage evaluation process is appropriate (the full Board sees the whole list and screens actions down to 10; a subgroup looks in depth at those 10 to make recommendations on a few actions for SAB attention; the full Board decides the actions to take on as SAB advisory activities); 3) there is a need to further develop/refine criteria.

She also noted that the Board had not agreed on how to conduct the initial screening and how to meet the many concerns about resources, time, and staff needed to address this new activity. She called for formation of a small group to focus on how best to conduct the initial screening. The following SAB members were identified: Drs. David Allen, Michael Dourson; Elaine Faustman; David Dzomback; Duncan Patten; Jerry Schnoor; Deborah Swackhamer; and Peter Thorne.

Action Items/Next Steps

Dr. Deborah Swackhamer thanked participants for the successful meeting and expressed appreciation for ORD and EPA staff involvement.

The DFO adjourned the meeting at 12:30 p.m.

Respectfully Submitted:

Certified as Accurate:

/Signed/

/Signed/

Dr. Angela Nugent
SAB DFO

Dr. Deborah Swackhamer
SAB Chair

NOTE AND DISCLAIMER: The minutes of this public meeting reflect diverse ideas and suggestions offered by committee members during the course of deliberations within the meeting. Such ideas, suggestions, and deliberations do not necessarily reflect definitive consensus advice from the panel members. The reader is cautioned to not rely on the minutes represent final, approved, consensus advice and recommendations offered to the Agency. Such advice and recommendations may be found in the final advisories, commentaries, letters, or reports prepared and transmitted to the EPA Administrator following the public meetings.

Members of the public attending the public meeting:

Amy Battaglia, EPA
James Berlow, EPA
Dan Costa, EPA
Bill Charmley, EPA
Bob Wayland, EPA
David Cozzie, EPA
Ed Hanlon, EPA
Jenny Hopkinson, Inside EPA
Michael Loughran, EPA
Steve Potts, EPA
Alexandra Reyes, CQ Transcriptions
Stacy Rabkin, EPA
Matt Richards, EPA
Gail Robarge, EPA
Chris Saint, EPA
Stephanie Sanzone, EPA
Phil Sayre, EPA
Greg Susanke, EPA
Kevin Teichman, EPA
Marilyn Tenbrick, EPA
Tim Watkins, EPA
Larke Williams, EPA

Materials Cited

The following meeting materials are available on the SAB Web site, <http://www.epa.gov/sab>, at the page for the [March 22-23, 2012](#) meeting: <http://yosemite.epa.gov/sab/sabproduct.nsf/a84bfee16cc358ad85256ccd006b0b4b/b7520f11667edf858525795600699ba9!OpenDocument&Date=2012-03-22>

¹ Agenda

² Federal Register Notice Announcing the Meeting

³ Science Advisory Board Comments on the President's Requested FY 12 2013 Research Budget (March 13, 2012 Draft)

⁴ Comments from Board Members and Liaisons on the draft report "SAB Comments on the President's Requested FY 2013 Research Budget (March 13, 2012 Draft) as of noon 03/21/12.

⁵ Planning for July 2012 SAB/BOSC Meeting, Presentation by Robert Kavlock

⁶ ORD Innovation, Presentation by Peter Preuss

⁷ Update on EPA Response to NRC Report and ORD Sustainability Science, Presentation by Alan Hecht and Joseph Fiksel

⁸ Science Integration for Decision Making at the U.S. Environmental Protection Agency (Draft 03/05/12)

⁹ Comments from Board Members and Liaisons on the draft report entitled "Science Integration for Decision Making at the U.S. Environmental Protection Agency (Draft 03/05/12)" (rec'd as of 03/22/12). .

¹⁰ Screening Consideration of Four EPA Proposed Regulatory Actions and Supporting Science

¹¹ American Forest and Paper, Why EPA's Work Practices for Dioxin/Furan in the Industrial Boiler MACT Are Scientifically Justified (March 23, 2012)

¹² Comparison of Dioxin Limits in Various U.S. Regulations, bar chart provided by Tim Hunt, American Forest and Paper