

United States Environmental Protection Agency (U.S. EPA)
Science Advisory Board (SAB)
Advisory Meeting
December 4-5, 2013
Meeting Minutes

Date and Time: December 4, 2013, 10:30 a.m. to 5:30 p.m.; December 5, 2013, 8:00 a.m. – 12:40 p.m. Eastern Time

Location: Washington Plaza Hotel, 10 Thomas Circle NW, Washington, DC 20005

Purpose: To receive remarks from the EPA Administrator and to engage in discussion with her; to conduct a quality review of a draft SAB report on recommendations for the Scientific and Technological Achievement Awards; to receive briefings on ORD research and EPA climate science and research; and to discuss information provided by the EPA on planned actions and their supporting science.

Meeting Participants:

SAB Members (See Roster¹)

Dr. Horace Moo-Young, Acting Chair	Dr. Kimberly L. Jones
Dr. David T. Allen, SAB Chair (by telephone)	Dr. Catherine Karr
Dr. George Alexeeff	Dr. Nancy K. Kim (December 4 only, by telephone)
Dr. Joseph Arvai	Dr. Francine Laden
Dr. Ingrid Burke	Dr. Elizabeth Matsui
Dr. Edward Carney	Dr. Surabi Menon (by telephone)
Dr. Terry Daniel	Dr. James R. Mihelcic
Dr. George Daston (December 4 only, by telephone)	Dr. Christine Moe (by telephone)
Dr. Costel Denson (by telephone)	Dr. Eileen Murphy
Dr. Otto C. Doering, III	Dr. James Opaluch
Dr. Michael Dourson	Dr. Amanda Rodewald
Dr. David Dzombak (December 4 only, by telephone)	Dr. James Sanders
Dr. T. Taylor Eighmy (by telephone)	Dr. Gina Solomon
Dr. Elaine Faustman	Dr. Daniel Stram
Dr. R. William Field	Dr. Peter Thorne
Dr. H. Christopher Frey	Dr. Paige Tolbert
Dr. John Giesy	Dr. Jeanne VanBriesen
Dr. Cynthia M. Harris (by telephone)	Dr. John Vena
Dr. Robert Johnston	

Liaisons to the SAB:

Dr. Sheela Sathyanarayana, Chair, Children's Health Advisory Committee
Dr. Katherine von Stackleberg, Chair, Board of Scientific Counselors

EPA presenters:

Ms. Gina McCarthy, Administrator, EPA
Dr. Robert Kavlock, Deputy Assistant Administrator for Science, ORD
Dr. Glenn Paulson, Science Advisor to the EPA Administrator
Mr. Peter Tsirigotis, Office of Air and Radiation (OAR)
Ms. Janet McCabe, Acting Assistant Administrator, OAR
Dr. Joel Scheraga, Senior Advisor for Climate Adaptation, Office of Policy
Dr. Andrew Miller, Associate Director for Climate in the Air, Climate, and Energy
Research Program, ORD
Dr. Paul Gunning, Division Director, Climate Change Division, Office of Atmospheric
Programs, OAR
Mr. Jim DeMocker, Director, Office of Policy Analysis and Review, OAR
Mr. Ben Hengst, Associate Office Director, Office of Transportation and Air Quality,
OAR
Mr. Jeff Peterson, Senior Policy Advisor, Office of Water

SAB Staff:

Dr. Angela Nugent, SAB Staff Office, Designated Federal Officer (DFO)
Mr. Christopher Zarba, Acting Director, SAB Staff Office

Other Attendees:

Attachment A lists members of the public who requested the call-in information for this meeting.

Meeting Materials:

All materials provided to the SAB for this meeting are available on the SAB website at:
<http://yosemite.epa.gov/sab/sabproduct.nsf/a84bfee16cc358ad85256ccd006b0b4b/8120e4a3a64d4ec685257c2200555d6b!OpenDocument&Date=2013-12-04>

Meeting Summary December 4, 2013:**Convene the meeting**

Dr. Angela Nugent, DFO, formally opened the meeting and noted that this federal advisory committee meeting of the SAB² had been announced in the Federal Register on November 13, 2013 (78 FR 68057-68058).³ She briefly noted that the EPA Science Advisory Board (SAB) is an independent, expert federal advisory committee chartered under the authority of the Federal Advisory Committee Act (FACA). The SAB is empowered by law - the Environmental Research, Development, and Demonstration Authorization Act (ERDDAA) - to provide advice to the EPA Administrator on scientific and technical issues that inform EPA's decisions. The DFO noted that the Federal Register notice announcing the meeting had provided the public with an opportunity to provide written and oral comment. There were no advance requests for oral comment and no written comments submitted in advance of the meeting. She noted that there would be an opportunity for the public to make clarifying comments on the second day of the meeting. She asked that any member of the public wishing to provide comment inform her by note or email by 11:30 a.m. on December 5, 2013.

Dr. Nugent stated that the SAB consists entirely of special government employees (SGEs) appointed by EPA to their positions. As government employees, the members are subject to all

applicable ethics laws and implementing regulations. The EPA has determined that advisors participating in this meeting have no financial conflicts of interest or appearance of loss of impartiality relating to the topics to be discussed at the meeting.

Mr. Christopher Zarba, Acting Director of the SAB Staff, welcomed members of the Board and expressed appreciation for their attendance and thanked Dr. Keith Moo-Young for serving as Acting Chair, since the SAB Chair, Dr. David Allen, was unable to attend the meeting in person.

Goals and agenda for the meeting

Dr. H. Keith Moo-Young, the Acting Chair of the SAB, welcomed the group. He summarized the purpose of the meeting, asked chartered SAB members to introduce themselves, and introduced the EPA Administrator.

Remarks from the Administrator and discussion with SAB Members and Liaisons

Administrator Gina McCarthy began her remarks by thanking SAB members for their service. She emphasized the importance of science to EPA's mission, both to understand the risks to be addressed and to develop solutions. She said that science drives agency decisions and that EPA requires both science and the law to do its work. She welcomed the SAB to "help think through" the science questions relating to EPA's actions regarding sustainability, environmental justice and climate change. She acknowledged the contributions of the Science Advisor to the Administrator, Dr. Glenn Paulson, and the significance of the appointment of the EPA's new Science Integrity Officer, Dr. Francesca Grifo. She also noted that EPA must begin to identify future environmental challenges. It would be helpful to seek SAB advice in identifying those challenges.

After the Administrator concluded her remarks, she engaged chartered SAB members in discussion. The SAB Chair, Dr. David Allen, noted that the SAB has provided advice or is developing advice on the topics of environmental justice, sustainability, air, climate and energy. He asked whether she saw other areas where the SAB should examine the impacts of climate change. The Administrator responded that the major substantive topic of discussion at the most recent EPA Senior Executive Service meeting was adaptation to climate change, which affects the entire agency. A major challenge for the EPA is to articulate climate change as a public health issue that impacts the most vulnerable populations, including children, the elderly and environmental justice communities. She welcomed an opportunity to talk with the SAB about how to prioritize adaptation activities so that the most vital needs are addressed in the most expeditious way.

An SAB member asked how the agency will maintain its commitment to science, given current budget challenges. The Administrator responded that EPA must plan in the face of budget uncertainties, where Congress has not passed a budget for many years. This uncertainty is difficult not only for the agency, but also for states that cannot rely on federal support. She stated that effective communication of EPA science to citizens is critical to broader public engagement with environmental science issues. The EPA must communicate how federal budget cuts affect not only the EPA but also the protections EPA brings to communities. The Administrator noted that she did not like across-the-board cuts and is talking with managers about the smartest ways to take cuts. Setting priorities is important.

Another member asked whether the Administrator supported the idea of building a risk assessment community outside the EPA. This idea has been discussed publicly by the Director of the Office of Research and Development's (ORD) National Center for Environmental Assessment (NCEA). The Administrator responded that risk assessments provide the critical underpinnings of agency decisions. She commended Dr. Kenneth Olden, the NCEA Director, for responding to recommendations from the National Research Council and for the credibility he brings with outside entities. She emphasized that EPA cannot rely just on its own resources for risk assessment. Capacity building outside the agency is important and the EPA must help to make that capacity robust, to understand it and embrace it.

Dr. H. Christopher Frey, chartered SAB member and Chair of the Clean Air Scientific Advisory Committee (CASAC), briefly summarized the major science challenges CASAC has identified for EPA: multimedia air quality management; secondary standards for oxides of nitrogen and sulfur oxides; revising the list of criteria pollutants; interactions between climate change and National Ambient Air Quality Standards (NAAQS); difficulty of establishing thresholds for health effects; and assessment of health effects close to background levels. He commended the EPA for developing a weight-of-evidence approach for causality of health effects, which may provide a model for reviews conducted as part of EPA's Integrated Risk Information System (IRIS). He noted that CASAC provides advice at the end of each NAAQS review cycle regarding research needs and asked what EPA is doing to advance the science supporting evaluation of criteria pollutants and whether it is possible to do more, partnering with other agencies. The Administrator welcomed an opportunity to talk with Dr. Frey about CASAC issues. She agreed that assessments of criteria pollutants provide a model for strengthening the IRIS process. CASAC's persistent attention to characterizing uncertainty has been very important and has provided the "push" to improve agency assessments. She expressed excitement over President Obama's appointment of Dr. Thomas Burke as the next Assistant Administrator for ORD. She expected him to provide strong leadership for risk assessment.

Another SAB member asked whether the Administrator had an interest in using decision science to help the agency make science-based decisions. He noted that decision science research shows that simply making science available does not necessarily improve decision making. The Administrator responded that she had a strong interest in talking with him about how decision science could be helpful. She noted that "economists don't have the answers" to all of decision makers' questions and that people don't always act in rational, science-based ways. Motivating individuals and organizations to change can be complex. The EPA's leadership has a strong interest in how to influence people's behavior by providing the right information to them.

The final question came from a chartered SAB member who asked how the Administrator insulates science from policy or political considerations. He noted that many questions at her confirmation hearing pertained to EPA's 316(b) rule. The Administrator responded that EPA scientists and the SAB should not be reluctant to do their jobs because of political concerns. The agency will do the best it can to explain agency science on Capitol Hill. She encouraged the SAB to "stick to SAB's historic work." The SAB should help the agency make sure that the EPA protects the Board from politics entering the science advisory process. The EPA must do its job to make sure that the SAB can do its job.

Dr. Moo-Young concluded the discussion by thanking the Administrator for taking time to meet with the Board.

Update on ORD Research and Plans for the 2014 SAB Meeting on ORD Strategic Research Directions

Dr. Robert Kavlock provided a slide presentation entitled “EPA Research Update.”⁴ The presentation gave an overview of ORD mission, budget and activities and summarized science highlights from 2013. It also projected activities for 2014, including the appointment of a new assistant administrator, the activities of ORD’s Board of Scientific Counselors, and 2014 expected research and science deliverables. He concluded with a brief discussion of plans for a meeting with SAB on strategic directions in the summer of 2014.

After Dr. Kavlock concluded his presentation, chartered SAB members asked several questions. The first question concerned the status of the Science to Achieve Results (STAR) and Greater Research Opportunities (GRO) Fellowships programs. An SAB member asked Dr. Kavlock to explain the decision process for transferring the fellowship programs to NSF. Dr. Kavlock responded that the President’s Budget called for consolidation of Science, Technology, Engineering and Math (STEM) fellowship resources and, as a result, STEM resources were transferred to the National Science Foundation (NSF). An SAB member then voiced concern about moving these programs to NSF because NSF may have different priorities from EPA.

The next question concerned the importance of ORD research roadmaps. An SAB member asked how they were being used and whether water was included as a cross-cutting area. Dr. Kavlock responded that ORD’s nitrogen and co-pollutant roadmap was playing an important role. He also noted the importance of the energy-water nexus. The SAB member emphasized the importance of the SAB’s reviewing and discussing the ORD’s cross-program roadmaps at a future SAB meeting.

An SAB member noted the importance of a systems approach to ORD’s work and singled out climate change as an example where it would be most helpful. She asked whether there was a reinvigorated interest in systems science at the EPA. Dr. Kavlock responded that there has been a strong effort in the Air, Climate, and Energy program on multi-media synthesis.

Another SAB member asked whether datasets from the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) program. Dr. Kavlock responded that the EPA will only see publicly available REACH information.

An SAB member asked whether ORD has considered the SAB’s recommendation that the agency use an independent monitor to consider peer review comments on Integrated Risk Information System (IRIS) assessments. Dr. Kavlock responded that ORD considers that IRIS assessments are getting much scrutiny, including peer review by the SAB’s Chemical Assessment Advisory Committee and that an independent monitor is not needed at this time.

Members made several points related to diminishing resources for research. One member spoke about the need to finalize work products that have remained in draft for a long time, such as some probabilistic risk assessments. Other members asked about the impacts of budget cuts on research more generally. Dr. Kavlock responded that ORD is taking a matrix management approach to its research portfolio. His office is setting priorities and conducting vulnerability assessments on ORD workforces by laboratories. One positive area is the federal post doctoral program which offers an opportunity for short-term appointments for younger scientists.

The final question came from the SAB Chair, Dr. David Allen, who asked about the focus for the 2014 SAB review of ORD research programs. Dr. Kavlock responded that ORD would be generally looking for SAB advice on new strategic directions for its six research programs. ORD's Board of Scientific Counselors will be asked to advise on how ORD addressed previous implementation advice. He welcomed the opportunity to talk through details about the 2014 review over the next couple of months.

Quality review of the draft SAB panel report, SAB Recommendations for EPA's FY2013 Scientific and Technological Achievement Awards

Dr. Moo-Young introduced the quality review by explaining that the SAB quality review process ensures that all draft reports developed by SAB panels, committees or workgroups are reviewed and approved by the Chartered SAB before being finalized and transmitted to the EPA Administrator. He noted that chartered SAB members are asked to address four quality review questions: (1) Were the charge questions to the committee adequately addressed?; (2) Are there any technical errors or omissions or issues that are not adequately dealt with in the draft report? (3) Is the draft report clear and logical?; and (4) Are the conclusions drawn or recommendations provided supported by the body of the draft report? Chartered SAB members provided responses to these questions in advance of the meeting. A compilation of their responses is posted on the SAB website.⁵

Dr. Moo Young introduced Dr. George Daston, Chair of the EPA SAB Panel on Scientific and Technological Achievement Awards (STAA) 2012-2014, and asked him to provide some background on the draft report.⁶ Dr. Daston began his comments by expressing appreciation for the extraordinary efforts of Mr. Edward Hanlon, DFO, and Ms. Diana Pozun, Management Analyst on the SAB Staff, who organized the STAA meeting on October 21 and 22, 2013, immediately after the government shutdown ended. Dr. Daston explained that the committee reviewed 105 nominations in 14 categories. The committee decided not to recommend any research for Level 1 awards. Such a decision does not set a precedent. In FY 2000, there were no Level 1 awards recommended, and the committee typically recommends very few Level 1 awards. The committee gave detailed attention to whether any Level 2 candidate papers could be elevated to Level 1; none of the papers met the Level 1 criteria. Dr. Daston also briefly summarized the committee's recommendations to strengthen the STAA program by extending the time limit for submissions and including new kinds of electronic media.

After Dr. Daston completed his remarks, Dr. Moo-Young asked the lead reviewers to briefly summarize their major comments. The first lead reviewer, Dr. Taylor Eighmy, commended Dr. Daston and Mr. Hanlon for a well-written report, accomplished under the constraints of the government shutdown. He considered it well organized and supported the report recommendations for improving the STAA process. He stated that he responded to all the quality review questions and considered the draft report ready to transmit to the Administrator. Dr. Nancy Kim, the second lead reviewer, stated that she agreed with Dr. Eighmy's conclusions and had only minor comments, provided in her written comments.

After the lead reviewers made their comments, other SAB members then provided additional comments and questions. In response to questions, Dr. Daston assured members that the STAA committee had appropriate expertise to cover all the nominated papers. He agreed to provide additional text to place the lack of Level 1 recommendations in context. Members discussed mentioning the need for investments in science to stimulate new ground-breaking research in the

cover letter. Members agreed that such a point is merited but that it may be more appropriate to communicate that message to the Administrator in another form that does not dilute the positive message regarding the Board's recommendations for awards.

After discussion had ended, Dr. David Allen moved that the report be accepted subject to revisions discussed at the meeting and provided to him as SAB Chair for final review. Dr. Edward Carney seconded the motion. The motion passed unanimously with no abstentions.

Update on Activities of the Office of the Science Advisor

Dr. Glenn Paulson, Science Advisor to the EPA Administrator, provided the SAB with a briefing entitled "Activities of the Office of the Science Advisor."⁷ He provided background on the functions of his office, the agency's Science and Technology Policy Council (STPC), and STPC activities relating to risk assessment, peer review, and other science activities (i.e., the Laboratory Enterprise Study, response to NRC Risk Assessment Reports, and Increasing Public Access to Data and Publications). He spoke of his role providing input on broad science and technology issues (including hydraulic fracturing research), overseeing the agency's scientific integrity program, and human subjects research.

After Dr. Paulson concluded his remarks, SAB members asked several questions. One member asked how EPA could improve communication about science integrity and hydraulic fracturing in the state of Wyoming. Dr. Paulson responded that Pavilion, Wyoming was one of three locations where PEA regional offices pioneered field investigations of hydraulic fracturing because of public contention about drinking water contamination. The EPA has passed along the results of its research to the state. He noted that the polarized discourse on this issue was not limited to Wyoming and that national debate on this topic often had "more heat than light." Another question concerned the need to increase the credibility of EPA science. Dr. Paulson responded that the agency might focus on enhancing communications in a science and research area, such as air pollution science, that was less emotionally laden than hydraulic fracturing. He agreed that there was a general need for concentrated efforts to communicate agency science more effectively. This effort might involve training scientists on science communication and providing better written summaries of EPA research papers.

An SAB member asked about public access to federally funded data and research. Dr. Paulson noted that such access comes at a cost. There are costs for the EPA to maintain repositories of data. In addition, some journals charge for open access. As a result, his personal view is that open access meant that less research will happen, because he views research funding as "a zero sum game."

Another SAB member asked if a new STPC committee devoted to sustainability will benefit from the insights and experience of EPA's Risk Assessment Forum. She suggested that the Forum is knowledgeable about a variety of techniques and methodologies that will be useful for sustainability. Dr. Paulson agreed that there will be a need for cross-fertilization and cross-membership between the two groups. He also noted the challenge of such cross-agency groups making progress on cross-agency topics. Scientists serving on these groups donate time outside their normal jobs. There are broad resource management challenges involved in such cross-agency efforts.

Discussion of Planned Agency Actions and their Supporting Science

Dr. James Mihelcic, Chair, of the SAB Work Group on EPA Planned Actions for SAB Consideration of the Underlying Science, began the discussion by thanking Mr. Thomas Carpenter, the DFO supporting the work group. Dr. Mihelcic then provided a summary of the work group's recommendations.⁸ He described how the Chartered SAB charged the work group to identify actions in the Spring 2013 regulatory agenda on which the SAB might wish to provide advice and comment on the adequacy of the supporting science. He noted that the workgroup had reviewed information provided by the agency related to major new planned actions in the Spring 2013 regulatory agenda and had made two recommendations for Board decisions on the following:

- That the SAB review the science supporting the *Standards of Performance for Greenhouse Gas Emissions from New Stationary Sources: Electric Utility Generation Units* (2060-AQ91), and
- That the SAB evaluate the science supporting the proposed rule, *Revision of 40 CFR Part 192--Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings and Uranium In Situ Leaching Processing Facilities* (2060-AP43), when details of the proposed rule are available and at that time determine if commentary is appropriate to provide to the Administrator.

After Dr. Mihelcic's introduction, other work group members provided brief comment. One member noted that at least one analysis conducted by the National Energy Technology Laboratory (NETL) in support of the greenhouse gas rule appeared to be a highly influential scientific assessment that would trigger peer review, as required by guidance from the Office of Management and Budget (OMB). The EPA was not provided a satisfactory description of the peer review conducted. He also noted that the rule's requirement for carbon capture and storage (CSS) promotes CSS as a best system of emissions reduction. He asked whether the assessments supporting the rule had established the technical feasibility of this technology, as required by law. Another work group member asked for the scientific rationale established for emissions from coal-fired plants, as compared to gas-fired plants, and the justification for the averaging time used.

Other members expressed preliminary questions and views. One member suggested that the SAB could make a contribution to the EPA by providing advice on the technical assessments supporting the proposed rule. Another member asked Dr. Mihelcic to clarify whether the work group's concerns primarily relate to CSS. Dr. Mihelcic agreed that the primary concern related to the scientific and technical basis for the CSS provision.

At this point, the DFO introduced Mr. Peter Tsirigotis from the EPA's Office of Air and Radiation. The EPA had requested time for him to provide additional perspectives on the work group's recommendations related to *Standards of Performance for Greenhouse Gas Emissions from New Stationary Sources: Electric Utility Generation Units* (2060-AQ91). Mr. Tsirigotis provided a slide presentation describing technical support for EPA's proposed standards for this action⁹. He discussed the following topics: building off existing science and regulatory structures; EPA considerations when developing a new source performance standard (NSPS); topics raised by Science Advisory Board (SAB) workgroup; setting separate standards for coal-fired and gas-fired units; inter-related focus on scientific underpinnings of the "best system of

emission reductions” (BSER) determination; availability/feasibility of CSS technologies; cost of CSS technologies; and long-term coordination with SAB on science topic related to CSS.

After the conclusion of Mr. Tsigotis’s presentation, the SAB Acting Chair asked SAB members for follow up questions. In response to questions, Mr. Tsigotis noted that the EPA proposed the degree of partial capture partly based on cost and partly based on what is technologically feasible. The level of 1,100 pounds per megawatt-hour was established because it represented the lower range of what could be achieved by partial CSS. New performance standard requirements instruct EPA to consider available technologies. He responded that he would enquire whether the NETL peer review was available so that the SAB would have additional information regarding the peer review of the feasibility of CSS. He noted that this EPA rulemaking was not setting new requirements for sequestration, but instead was proposing controls for the “carbon capture piece,” which would separate carbon dioxide from the waste stream. He noted that there were “four legs” to the requirement for best system for emissions reductions: technical feasibility of control options; reasonableness of costs; size of emission reductions; and whether the system promotes the implementation and further development of technology. He noted that there were precedents for requiring novel technology to address controversial pollutants prior to previous mass deployment of new technology. Examples include catalytic reduction of oxides of nitrogen for power plants and new industrial boilers. In response to a question requesting a precedent for requiring new technologies that might force generation of a by-product with environmental consequences, Mr. Tsigotis noted that in the case of mercury, EPA required limits on mercury emissions and expected technology would require capture of carbon contaminated with mercury. Other laws would then control the disposal of contaminated carbon.

After the question period, SAB members engaged in discussion. Work group members provided brief reaction to Mr. Tsigotis’s presentation. The work group chair voiced frustration at learning new information late in the process of evaluating the descriptions of the planned actions provided by the agency. He voiced concern that the agency had not provided evidence of significant peer review. Another member noted that he considered the CSS requirements as introducing new technology.

Dr. Moo-Young noted that the agenda provided for an opportunity for the SAB to deliberate and reach a decision on this action on December 5, 2013, after receiving briefings from agency officials on EPA climate mitigation and adaptation activities.

Dr. David Allen introduced a motion to accept the recommendation of the work group regarding the *Revision of 40 CFR Part 192 -- Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings and Uranium In Situ Leaching Processing Facilities (2060-AP43)*. The work group recommended that the SAB evaluate the science supporting the proposed rule when details of the proposed rule are available and at that time determine if commentary is appropriate to provide to the Administrator. Dr. Daniel Stram seconded the motion. There was no discussion. The motion passed unanimously.

The Board returned to the topic of Science to Achieve Results (STAR) graduate fellowships, a topic related to Dr. Kavlock’s presentation earlier in the day. Members discussed developing a letter to the Administrator pointing out the importance of STAR fellowships to advance science to meet the agency’s mission and to train future environmental scientists. Members discussed the value of elevating this issue. Members noted that the letter could discuss the functions such fellowships serve particularly in the context of an extremely constrained ability to hire full-time

scientists and restructure the workforce to develop new methods and science needed by the Agency.

Dr. Moo Young concluded the conversation by reviewing plans for discussion and disposition of this topic and the remaining recommendations of the SAB Work Group on EPA Planned Actions for SAB Consideration of the Underlying Science.

The DFO recessed the meeting at 5:30 p.m.

December 5, 2013:

The DFO reconvened the meeting at 8:00 a.m.

How the EPA is Addressing Climate Change and the Role of Science and Research in Support of EPA Adaptation and Mitigation Efforts

Dr. Moo-Young introduced three EPA speakers to give an overview of EPA's efforts to address climate change and the role of science and research in that effort: Ms. Janet McCabe, Acting Assistant Administrator, Office of Air and Radiation; Dr. Joel Scheraga, Senior Advisor for Climate Adaptation, Office of Policy; and Dr. Robert Kavlock, Deputy Assistant Administrator for Science, ORD.

Ms. McCabe provided a slide presentation entitled "Climate Change Mitigation: EPA's Role in President Obama's Action Plan."¹⁰ The presentation gave an overview of: President Obama's Climate Action Plan; the scientific foundations for EPA actions under the plan; the contributions of carbon pollution as the major driver of climate change; EPA mitigation actions; carbon pollution standards for new power plants and existing power plants; 21st century transportation sector efforts; cutting energy waste; reducing methane and hydrofluorocarbons; and international efforts to address climate change.

Dr. Scheraga provided a slide presentation entitled "An Overview of EPA's Climate Change Adaptation Plan."¹¹ The presentation described climate change and EPA's mission. It provided examples of the importance of climate adaptation to that mission and described the efforts of a cross-EPA work group on climate change adaptation, including the draft *EPA Climate Change Adaptation Plan* and regional and program implementation plans. It described EPA's priority efforts to build adaptive capacity and develop decision support tools and resources to inform adaptive management decisions.

Dr. Kavlock provided a slide presentation entitled "ORD Climate Research: Overview and Context."¹² The presentation described the purpose and scope of ORD's climate research within the context of the President's Climate Action Plan and Executive Order. He noted that ORD's climate research program is a very small part (\$12.3M in total extramural funding and 29 FTE) of the \$2 billion federal research budget. Dr. Kavlock described ORD's research related to climate and sustainability and its relationship to EPA's strategic plan. He concluded with a brief discussion of potential future issues and directions.

After the conclusion of the three EPA presentations, the Acting Chair asked SAB members for questions. One member asked whether the EPA had considered what it learned from its experience taking a life-cycle/supply chain approach to research supporting its biofuel initiatives

as it evaluates green house gas emissions from power plants. Dr. Kavlock responded that the biofuel approach revealed important scientific insights and that ORD's sustainability focus allows for a systems approach that looks across media. Ms. McCabe noted that the Clean Air Act in the context of the New Source Performance (NSP) section does not give EPA responsibility to look at lifecycle effects. The agency is cognizant of this approach. Much analysis of the power sector goes into NSP standards and carbon pollution guidelines for existing power plants under 111(d) of the Clean Air Act. The EPA relies on analyses from the Department of Energy for characterization of the power sector and options for alternative technologies. Dr. Scheraga stated that the EPA's adaptation plan addresses cross-media impacts of climate change. The plan encourages programs to look for cross-media effects and avoid "maladaptation." The EPA is also considering the relationship of mitigation and adaptation strategies. The agency wants to ensure that it identifies and takes advantage of ancillary benefit opportunities.

Another member asked for a summary of the concerns articulated by regulated entities when EPA published a proposal in April 2012. Ms. McCabe responded that commenters requested that the rule distinguish requirements for coal and gas-fired plants. Industry commenters also voiced concern about the level set and the availability, reliability and affordability of technologies to meet the standard.

The same member asked whether scientists at the working level share information within the EPA and among agencies. Dr. Scheraga highlighted the importance of this question for public confidence in federal activities. There is federal leadership on this question and a community of practice in the federal government that promotes and ensures coordination. He mentioned two Memoranda of Understanding supporting coordination: one among the EPA, Housing and Urban Development and the Department of Transportation and a second between the EPA and the Federal Emergency Management Agency integrating adaptation strategies into investments. He noted that many EPA science products are produced in partnership with other federal agencies. Ms. McCabe noted that OMB manages a formal process for interagency coordination. The EPA supplements this process by supporting its scientists to informally coordinate with scientists in other agencies.

Another member asked whether EPA has efforts underway to create green infrastructure to address climate adaptation-related environmental problems associated with combined sewer overflows. Dr. Scheraga responded that the Office of Water's acting Assistant Administrator and EPA's Office of Sustainable Communities have a strong interest in green infrastructure and that the EPA Administrator is encouraging communities to use green infrastructure.

A member asked about the role of habitat protection and restoration and biosequestration in EPA's adaptation plans. Dr. Scheraga responded that the EPA has integrated climate adaptation criteria into funding for wetlands restoration and recently made a Great Lakes Restoration Initiative award in this area.

A member asked the EPA speakers for their personal views on whether there is any new science associated with the proposed rule for new power plants and whether this science has received peer review using EPA's established procedures. He asked the EPA panelists to comment on the relationship between ORD and the program office in establishing the rule. Ms. McCabe responded that the rule involved no new science and that the EPA had followed established procedures. In her view, there was no new science that required peer review.

A chartered SAB member then asked the speakers to identify the critical science needs and research gaps that need to be filled to achieve the EPA's mission in the area of addressing climate change. Dr. Kavlock responded that the most critical gap was the development of decision support tools that communities will be able to use. The EPA will need to know how to influence people's behaviors so that they act in their long-term best interest, rather than their short-term interest.

Ms. McCabe responded that the New Source Performance program requires the EPA to look at technologies people are already using and allows the EPA to provide encouragement and incentives for more technologies to be developed. As new technologies emerge, the EPA may have science and engineering needs related to these emerging technologies. Research relating to potential emissions will likely be one area of interest.

A member asked whether and how the EPA is leveraging its resources through partnerships with the NSF and the National Institutes of Health (NIH). Dr. Kavlock responded that ORD is actively working with NIH's Center for Safe and Molecular Design and that the Director of ORD's National Center for Environmental Research is working with NSF.

Another member asked whether the EPA has data or information about the effects of climate change on releases from brownfields or contaminated sites, and, if not, does the agency have research underway or planned to address this topic? Dr. Scheraga responded that he would find information to respond to this question and provide it through the DFO to the SAB.

The last questions and comments came from SAB members regarding communication of agency science. Is EPA making it a priority to raise the level of communication of agency science to the public? Dr. Kavlock responded that Administrator McCarthy has made it a priority to communicate effectively about agency science at the individual community level. This was a major topic of discussion at the agency's recent senior executive retreat. Dr. Scheraga noted that the President's Adaptation Plan includes language regarding development of resources to support community decisions about adaptation to climate change. The EPA is seeking opportunities in the federal community for establishing and promoting mechanisms for information sharing across communities. Ms. McCabe agreed that effective communication is critical. The President's speech in June 2013 started a public conversation about climate science that is very important. After hearing the panelists' responses, a member noted that the EPA would benefit from "giving a little more thought to case studies that showcase EPA's unique niche" in addressing the impacts of climate change. Such case studies will increase the visibility of the EPA's role. She encouraged the agency to "partner but ...not lose your uniqueness."

Climate Change Science and Research

Overview of EPA's Role in Climate Science and Research

Dr. Moo-Young introduced the panel of EPA speakers to give an overview of EPA's efforts role in climate science and research: Dr. Andrew Miller, Associate Director for Climate in the Air, Climate, and Energy Research Program, ORD; Mr. Paul Gunning, Division Director, Climate Change Division, Office of Atmospheric Programs, OAR; Mr. Jim DeMocker, Director, Office of Policy Analysis and Review, OAR; Mr. Ben Hengst, Associate Office Director, Office of Transportation and Air Quality, OAR; and Mr. Jeff Peterson, Senior Policy Advisor, Office of Water.

Dr. Miller provided a slide presentation entitled “Overview of EPA’s Role in Climate Science and Research.”¹³ The presentation included: Coordination and interactions at the federal, EPA, and ORD levels; the U.S. Global Change Research Program and the role of the EPA and interagency working groups; EPA’s participation in the National Climate Assessment; internal EPA coordination and interactions; research planning and communication; and identifying future directions.

The Office of Air and Radiation (OAR) presentation was provided jointly by Mr. Gunning, Mr. DeMocker, and Mr. Hengst and was entitled “OAR Mitigation Related Actions: Key Science-related Activities of Interest.”¹⁴ The presentation identified OAR as responsible for EPA’s greenhouse gas inventory. It described the Greenhouse Gas Reporting Program; OAR’s reliance on science from the Intergovernmental Panel on Climate Change (IPCC), the U.S. Global Change Research Program, and National Research Council; recent SAB review activity related to greenhouse gas permitting; mobile source greenhouse gas rules and supporting analyses; plans for future transportation and climate activities; and plans for economy-wide modeling and an upcoming SAB review.

Mr. Jeff Peterson provided a slide presentation entitled “National Water Program Tools for Adapting Water Programs to a Changing Climate.”¹⁵ The presentation provided context for the Office of Water’s development of adaptation tools. He described his office’s involvement in the agency’s draft Climate Change Adaptation Plan. He also noted that the tools build on the Office of Water’s 2012 *National Water Program Strategy: Response to Climate Change* and fit into a larger effort to adapt water programs to a changing climate. He briefly described three climate adaptation tools developed by the Office of Water: the Climate Resilience Evaluation and Awareness Tool (CREATe) developed by the Climate Ready Water Utilities program, the Water Climate Workbook, and the Climate Change Extension to the Stormwater Calculator.

After the conclusion of the three presentations, the Acting Chair asked SAB members for questions.

An SAB member asked the EPA panelists to identify the most significant science gap faced by the EPA. Dr. Miller responded that the greatest gap is not knowing what the world will look like in 25 years and what will be the nation’s capacity to respond to these changes.

Another member asked whether the EPA draws on international sources of information and methods in constructing its greenhouse gas inventory. Mr. Gunning responded that EPA has participated in U.S. activities under the International Framework Convention for Climate Change since 1990. The EPA is the lead federal agency for publishing a summary of greenhouse gas emissions and sinks. This effort requires collaboration with other agencies, universities, and industry groups. The EPA uses methods that have been developed through a robust international process run by the IPCC. Development of Tier 1 reports requires several rigorous review processes, including annual publication for public review, a separate expert review process that targets academics and industry experts in various sectors, and international review as part of the Framework Convention. EPA is continually reevaluating the inventory, focusing on sectors with the most significant emissions. He noted that the EPA is following IPCC guidelines closely to use information about uncertainty to strengthen the inventory over time. An entire section of the inventory is dedicated to characterizing uncertainty. Eighty percent of emissions result from combustion of fuels. This report is informed by extraordinarily robust information about

combustion and movement of fuels. The other 20% of emissions result from greenhouse gases other than carbon dioxide. There is a robust discussion for all source categories.

An SAB member asked Mr. Gunning about IPCC guidelines on geological sequestration of carbon emissions. Mr. Gunning committed to providing a response and any documentation of public comments on scientific issues related to Subpart RR, which requires reporting of greenhouse gases (GHGs) from facilities that inject carbon dioxide underground for geologic sequestration, and the EPA's responses to those comments.

A member then asked whether there was a process for transferring information within the agency between climate assessments and assessments of criteria air pollutants. He noted a critical need for such an exchange.

Another member asked about the basis of the EPA's assumptions about the energy industry for its upcoming economy-wide models and the economic analyses supporting rulemaking. Mr. DeMocker responded that EPA relies on the U.S. Energy Information Administration for information about the nature of the energy sector, fuel use, and capital investment. He emphasized that the EPA is aware of the importance of incorporating the beneficial effects of the EPA's programs in any computable general equilibrium (CGE) modeling effort. Customary CGE modeling does not account for health benefits, household economic welfare, labor effects and other market effects. The EPA welcomes SAB advice on how to use economy-wide tools to integrate these kinds of information with models of other sectors that deal with things like fuel switching.

A member of the chartered SAB asked Mr. Peterson if the EPA can determine whether it is reaching its target audience for the tools developed by the Office of Water and whether the EPA is offering training for the tools. She also asked if the EPA will be evaluating how tools are used and whether the tools are being used as the agency hoped they would be used. Mr. Peterson responded that the situation differs with respect to the three tools. The CREATE tool is the most developed and the EPA is holding webinars and outreach events to orient users to the tool. The Watershed Workbook is in the peer review phase; outreach will follow after that. The EPA will rely on the well-established outreach existing for the stormwater calculator for the climate extension tool. The Office of Water typically builds evaluation procedures into its strategic planning work. Another member asked if outreach to communities is part of the tools. Mr. Peterson responded that the Watershed Workbook is focused on building a broad basis of understanding about climate change on the part of a wide range of publics. The Office of Water sees that as a key part of framing vulnerability assessment. The Workbook includes a detailed process for engaging the public in thinking about vulnerabilities, what they could do about them, how they could make tradeoffs and the most viable actions to take. The Workbook is intended for a broad group of citizens and is not aimed at a small group of decision makers.

An SAB member then asked Mr. Peterson how the Office of Water's tools are adapted to be place-specific and how uncertainty is communicated in those tools. Mr. Peterson responded that the tools offer a range of scenarios that users can choose. For some of the tools, users can enter their own data with a range of uncertainty. Another member asked about the extent to which water program tools address crop and annual impacts on watersheds. Mr. Peterson responded that the tools currently don't address large landscape scales; they are designed for a more limited, place-based scale. There is an effort to apply the stormwater calculator on a large basin basis in the upper Midwest, but this effort is only preliminary. Another member asked whether the

CREATE tool could be used or adapted for manufacturing plants. Mr. Peterson acknowledged that such an application could be possible.

The next question pertained to the EPA's efforts to reduce methane, which traps heat 20 times more than carbon dioxide. Mr. Gunning acknowledged that methane is a critical greenhouse gas, but it is short lived and as a result has impacts in a shorter timeframe than carbon dioxide. To address methane emissions, the EPA has developed partnership programs with oil and gas industries and the waste management industry. The agency is cooperating with the agricultural industry and the coal industry. These programs are complemented by regulatory activities. In 2010, the EPA implemented new source performance standards for the oil and gas sector through a regulation focused on volatile organic compounds (VOCs), which implemented effective controls of methane along with VOCs. There are ongoing interagency discussions about methane strategy.

A member asked whether EPA was planning research to address indoor air and climate change. Dr. Miller responded that an ORD Request for Applications on that topic was in process and was a priority.

An SAB member tasked about budget implications for addressing climate change, since the science and research needs are greater than available resources. Dr. Miller responded that ORD is prioritizing its activities and looking to work with others to meet agency needs and leverage resources. ORD may scale down some activities, be more focused, and may not be able always to address long term needs. ORD is looking for the most immediate impact for its tools.

Next, an SAB member asked about the EPA's strategy for communicating the differences between different models (e.g., national vs. regional, national vs. sectoral, top-down vs. bottom-up) used to inform agency decisions. Mr. DeMocker responded that EPA must find better ways to communicate about models. This issue is especially important because some assume that economy-wide modeling is a powerful tool that will predict many different kinds of outputs at a granular scale. The EPA will have challenges in communicating the capabilities of these different tools. He looked forward to receiving advice from the SAB on effective communication concerning application of such models. Dr. Miller responded that the EPA "can be trapped" by emphasizing the robustness of models it has designed, because science is always changing. It is difficult to communicate uncertainty and "the impact of [communicating] uncertain models is much less" than communicating a simple message. Mr. Hengst noted that the EPA met with tangible success in its modeling work on lifecycle emissions for renewable fuel additives. The agency used models that examined indirect effects and complex land-use changes. Different models generated different results. A nongovernmental organization played a helpful role by providing a "guide for the perplexed" that compared the models. Different groups outside EPA issued papers comparing the differences among the models and these comparisons were helpful to the agency.

A member asked about EPA's purpose in developing an economy-wide CGE model, since welfare estimation is not one of its strengths. Mr. DeMocker responded that the EPA recognizes the strengths and weaknesses of those tools and has used them in the past (e.g., the 812 Study of the Costs and Benefits of the Clean Air Act) to inform a variety of questions. The EPA realizes that economy-wide modeling is not helpful for fully evaluating two different regulatory actions. In general tools inform but do not dictate decisions. The EPA looks forward to talking with the SAB about the appropriate application of CGE economy-wide models.

The last question addressed the state of science with regard to climate change impacts on human health. Mr. Gunning responded that a review of literature on climate impacts on health will inform the next National Climate Assessment. Once the EPA has that information, it can look more comprehensively at those issues.

Discussion of Planned Agency Actions and their Supporting Science (continued from December 4, 2013)

Clarifying Comments from the Public or EPA Clarifying Remarks

The DFO noted that two members of the public had requested an opportunity to provide brief clarifying remarks for consideration by the Board. Ms. Theresa Pugh, Director of Environmental Services for the American Public Power Association, provided brief remarks and followed up with written comments.¹⁶ She stated that geologic sequestration of carbon dioxide was not commercially demonstrated. She spoke of a lack of established science on water quality impacts and sequestration in a variety of geological formations. Ms. Shannon Angielski, Associate Director of the Coal Utilization Research Council, also provided brief remarks and followed up with written comments.¹⁷ She stated that CSS was not commercially demonstrated or economically feasible at the scale necessary. She stated that a commercial-scale project fully integrated with an electricity generation unit did not currently exist. In her view, the technology has not been demonstrated at commercial scale for electrical generating units (EGUs).

Continued discussion by SAB Members and Liaisons

The Acting Chair asked Dr. Mihelcic to respond to the additional briefings and information provided related to the outstanding action, *Standards of Performance for Greenhouse Gas Emissions from New Stationary Sources: Electric Utility Generation Units*.

Dr. Mihelcic expressed frustration that the EPA has provided important additional information for consideration by the Board at chartered SAB meetings after the work group has prepared its report. Based on the information provided to date, in his view, OAR has taken a narrow legal view of the planned action, focused on release of carbon dioxide into the atmosphere and informed the SAB that other regulations, which they did not describe in detail, dealt with carbon sequestration. The agency considers that there is no new science associated with the rulemaking and that the EPA can use the rule to force development of new technology. Since other major agency leaders have informed the SAB about the EPA's commitment to sustainability, which requires a systems focus, he expressed a wish for a greater systems focus for the science supporting the rulemaking because CSS is a major component of controlling carbon emissions from EGUs. It did not appear that OAR involved ORD in developing the science supporting the rule. He also noted that there was no information presented that confirmed that key information was adequately peer reviewed. He recommended that the work group revise its recommendations to address new information obtained and then provide that recommendation to the SAB for a decision. Other members of the work group supported Dr. Mihelcic's recommendation.

Chartered SAB members then discussed Dr. Mihelcic's recommendation. Several members voiced concern over EPA reliance on science provided by the Department of Energy where the EPA did not adequately characterize the peer review. One member asked the work group to clearly identify the science questions that the SAB would address in any potential review.

Another member expressed concern that the Board not embark on a year-long review of science associated with this action unless there would be a material benefit/improvement overall for the rulemaking. Several members spoke of the need for the work group to gather some additional information to more clearly identify the science questions and delineate science from policy determinations. A work group member agreed and noted that the key issue is feasibility. The work group must gather information to determine whether the state of availability of CSS technology is a scientific issue or a policy determination, outside the SAB's purview.

Dr. David Allen moved that the SAB ask the work group to revise its recommendation memorandum, in cooperation with him, the SAB Chair, and also develop a draft letter to the Administrator for consideration by the Board at a public teleconference to be scheduled in January. Dr. Joseph Arvai seconded the motion, which passed unanimously with no additional discussion.

Closing remarks

Dr. David Allen spoke of plans to prepare a letter to the Administrator on behalf of the SAB thanking her for her visit with the Board on December 4, 2013. The Board would mention a desire to interact with her on priority science questions. Chartered SAB members supported such a letter.

Dr. Allen also mentioned that he would work with the SAB Staff Office to draft an additional letter for discussion at the Board's next public teleconference, where the SAB would briefly identify areas discussed by the Administrator and agency leadership where SAB advice could be particularly useful. Chartered SAB members also supported the drafting and discussion of such a letter.

Members also discussed developing a third letter expressing concern over changes to the EPA's STAR fellowship grants. The group agreed that such a concern should be communicated in an additional short letter dedicated to that topic.

The Acting SAB Chair expressed thanks to all participants in the meeting. The SAB Chair and the SAB Office Director expressed special appreciation to Dr. Moo-Young for leading discussions at the meeting.

The DFO adjourned the meeting at 12:40 p.m.

Respectfully Submitted,

Certified as Accurate,

Signed
Dr. Angela Nugent
SAB DFO

Signed
Dr. H. Keith Moo-Young
Acting 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 to 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.

Attachment A: Members of the public attending the public meeting:

Anthony Adragoner, Bloomberg BNA
Tom Armitage, EPA
Nancy Beck, ACC
Caroline Behringer, EPA
Rona Birnbaum, EPA
Tom Brennan, EPA
Tom Carpenter, EPA
Kaitlin Chell, Lewis-Burke Assoc.
Dan Costa, EPA
Kevin Crofton, EPA
Benjamin Deangelo, EPA
Andrea Drinkard, EPA
Alisa Fisher, EPA
Iris Goodman, EPA
Rich Guerand, Hunton
Ed Hanlon, EPA
Bill Irving, EPA
Stacy Katz, EPA
Chris Knight, Inside EPA
Jamie A. Lang, EPA
Barbara Martinez, EPA
Erica Martinson, Politico
Sarah Mazur, EPA
Melissa McCullough, EPA
Mike McDonald, EPA
Karen R. Obenshain, Fuels, Technology & Commercial Policy Edison Electric Institute
Washington, DC
Donna Perla, EPA
T. Peterson, Federal Emergency Management Agency
Steve Potts, EPA
Theresa Pugh, APPA
Matt Richards, EPA
Gail Robarge, EPA
Stephanie Sanzone, EPA
Greg Sayles, EPA
Rita Schoeny, EPA
Matt Segosisa, EPA
Matt Seymoura, EPA
Holly Stallworth, EPA
John Vandenberg, EPA
Alan Vette, EPA
Diana Wong, EPA

Materials Cited

The following meeting materials are available on the SAB Web site, <http://www.epa.gov/sab>, at the page for the [December 4-5, 2013](http://www.epa.gov/sab) teleconference meeting: <http://yosemite.epa.gov/sab/sabproduct.nsf/a84bfee16cc358ad85256ccd006b0b4b/8120e4a3a64d4ec685257c2200555d6b!OpenDocument&Date=2013-12-04>

¹ Roster of SAB members

² Roster of SAB members

³ Federal Register, (78 FR 68057-68058)

⁴ Robert Kavlock Presentation – EPA Research Update

⁵ Preliminary Comments from Members of the Chartered SAB on the SAB Draft Report: SAB Recommendations for EPA’s FY2013 Scientific and Technological Achievement Awards

⁶ *SAB Recommendations for EPA's FY2013 Scientific and Technological Achievement Awards (11/22/13 draft)*

⁷ Glenn Paulson Presentation - Activities of the Office of the Science Advisor

⁸ Memo from the SAB Work Group on EPA Planned Actions for SAB Consideration of the Underlying Science with recommendations for chartered SAB consideration.

⁹ Peter Tsirigotis Presentation - Standards of Performance for Greenhouse Gas Emissions from New Stationary Sources: Electric Utility Generating Units

¹⁰ Janet McCabe Presentation - Climate Change Mitigation: EPA's Role in President Obama's Action Plan

¹¹ Joel Scheraga Presentation - An Overview of EPA’s Climate Change Adaptation Plan

¹² Robert Kavlock Presentation – ORD Climate Research: Overview and Context

¹³ Andy Miller Presentation - Overview of EPA’s Role in Climate Science and Research

¹⁴ Paul Gunning Presentation - OAR Mitigation Related Actions: Key Science-related Activities of Interest

¹⁵ Jeff Peterson Presentation - National Water Program Tools for Adapting Water Programs to a Changing Climate

¹⁶ Letter from Theresa Pugh, American Public Power Association, December 9, 2013

¹⁷ Statement of Shannon Angielski, Associate Director, Coal Utilization Research Council