42nd EXECUTIVE COMMITTEE FACE-TO-FACE MEETING SUMMARY

Washington Plaza Hotel
Washington, DC

September 15, 2009

TUESDAY, SEPTEMBER 15, 2009

Welcome and Introductions

Dr. Gary Sayler, University of Tennessee, BOSC Executive Committee Chair

Dr. Gary Sayler, Chair of the Executive Committee of the Board of Scientific Counselors (BOSC), welcomed the BOSC members to the 42nd face-to-face meeting of the Board. He mentioned that although two Executive Committee members could not attend—Drs. Dennis Paustenbach and Barry Ryan—there were enough members in attendance to provide a quorum. Dr. Sayler noted that the agenda is quite full because it was compressed to a 1-day meeting. He mentioned that Dr. George Lambert had completed his term on the Science Advisory Board (SAB) and therefore will no longer be the liaison to the BOSC from the SAB. Dr. Sayler regretted that there was no opportunity to thank Dr. Lambert for his service as liaison to the BOSC. The SAB will have to select a replacement. Dr. Giesy asked if he could serve as the SAB liaison to the BOSC; he is on the SAB and will be completing his term on the BOSC in early 2010. Dr. Sayler said he would pose that question to Dr. Kevin Teichman when he meets with him.

Overview of the Agenda

Dr. Sayler reviewed the meeting agenda, which included review of the June and August meeting minutes, the remarks of the Designated Federal Officer (DFO), presentations on implementing decision analysis methods and an update from the Decision Analysis Workgroup, brief updates from the chairs of the program review and standing subcommittees, presentation and discussion of the draft Clean Air Program Review Report, the Office of Research and Development (ORD) update from Dr. Fred Hauchman (who was standing in for Dr. Teichman), presentations on ORD performance activities for the performance review process, SAB activities, and future business. There also will be time for public comments at 2:00 p.m.

Review of June 2009 Meeting Minutes

Dr. Sayler asked if the members had any corrections to the minutes from the June 4-5, 2009, Executive Committee meeting. Dr. Giesy said that he did not have any corrections for the minutes but noted that he was listed as a vettor for the Endocrine Disrupting Chemicals (EDCs) Program Review Report. Given that the review has been delayed, he probably will no longer be a BOSC member when that report is ready for review. He suggested that the Executive Committee identify someone else to vet that report.

Dr. Sayler asked if there were any additional comments. When there were none, Dr. Sayler called for a motion to accept the minutes. Dr. Martin Philbert moved to accept the minutes of the June meeting, and Dr. Charles Haas seconded the motion. The minutes for June 2009 were approved unanimously by the BOSC.

Review of August 2009 Meeting Minutes

Dr. Sayler asked if there were any comments on the minutes for the August 6, 2009, Executive Committee conference call. No comments were offered so Dr. Sayler called for a motion to accept the minutes. Dr. Haas moved to accept the minutes, and Dr. Giesy seconded the motion. The minutes for the August 2009 conference call were approved unanimously by the BOSC.

BOSC DFO Remarks

Ms. Lorelei Kowalski, U.S. Environmental Protection Agency (EPA)/Office of Research and Development (ORD), BOSC Designated Federal Officer (DFO)

Ms. Lorelei Kowalski, DFO for the BOSC Executive Committee, welcomed the BOSC members to the meeting. She mentioned that ORD has been working to fill the vacancies on the Executive Committee and she expects that there will be five new members at the February 2010 meeting. The terms for Drs. John Giesy and Cliff Duke end in spring 2010, so ORD will need to find replacements for them soon.

Ms. Kowalski reviewed the Federal Advisory Committee Act (FACA) procedures that are required for all BOSC meetings. She stated that the BOSC is a Federal Advisory Committee that provides independent, scientific peer review and advice to EPA's ORD, and it is her responsibility as the DFO to ensure compliance with all FACA rules. As Dr. Sayler noted, Drs. Paustenbach and Ryan are not in attendance.

In compliance with FACA requirements, all BOSC meetings are open to the public and time has been designated on the agenda for public comment. Ms. Kowalski noted that no requests for comment were received prior to the meeting, but she did receive requests for the agenda and to participate by telephone. Time has been set aside on the agenda at 2:00 p.m. for public comment. She asked that comments be limited to 3 minutes each. An ORD contractor, Beverly Campbell from The Scientific Consulting Group (SCG), is present to take notes that capture the presentations and discussions. Following the meeting, she will prepare the meeting minutes, which will be made available to the public on the BOSC Web Site after approval by the Executive Committee and certification by the BOSC Chair.

As required by FACA, a notice of this meeting was published in the *Federal Register*. Ms. Kowalski established an electronic public docket for the meeting on the Federal Docket Management System (FDMS), which can be accessed at http://www.regulations.gov. The number to search for this docket is EPA-HQ-ORD-2009-0652. The *Federal Register* notice and the meeting agenda were available to the public on the docket. As the DFO, Ms. Kowalski ensures that the Executive Committee members receive annual ethics training and complete confidential financial disclosure forms. She asked members to notify her immediately if any potential conflict of interest arises during the meeting deliberations.

She said that Dr. Teichman sends his regards and apologizes for not being able to attend the meeting. As Dr. Sayler mentioned, Dr. Hauchman will be here this afternoon to present the ORD Update. BOSC members should have received their notebooks prior to the meeting. The notebook contains numerous materials including the minutes of the June and August meetings, the draft Clean Air Program Review Report, and the proceedings of the Decision Analysis Workshop and case studies. The binders also contain homework and voucher sheets, both of which should be submitted to Ms. Kowalski before members leave the meeting. She distributed three tables, which she creates for each Executive Committee meeting: a listing of all the activities under the BOSC; a listing of all the Executive Committee member activities, including vetting and workgroup activities; and the work chart table that shows the BOSC workload into 2010.

Because there were requests to participate by telephone, the telephone line will remain open during the meeting. Ms. Kowalski asked those participating by phone to mute their lines except when speaking. She also reminded the BOSC members and other participants to sign in at the registration desk if they had

not done so already, and she mentioned that Denise Hoffman is at the desk to help with any logistical needs.

Next Meeting Date

Dr. Sayler said that the first week of February appears to be the best option for the next Executive Committee meeting. Dr. Giesy indicated that he will be in China in February so he will not be able to attend. Dr. Sayler asked if there are any days that week that are better than others. Dr. Demerjian replied that Thursday and Friday would be better for him. Ms. Kowalski said she would check with Drs. Ryan and Paustenbach as well as the five new members to determine if they are available February 4-5, 2009. She asked the BOSC members to hold those 2 days open on their calendars for now. In response to a question about the possibility of having a central BOSC calendar, Ms. Kowalski stated that there is a calendar of meetings on the BOSC Website (www.epa.gov/osp/bosc). She will enter the date for the next meeting on the Website once it is confirmed. Dr. Sayler mentioned that the May/June Executive Committee meeting is usually held outside the Washington, DC, area. It was held in Duluth, Minnesota, in 2009 and probably will be held in Corvallis, Oregon, in May/June 2010.

AA/ORD Remarks

Mr. Lek Kadeli, Acting Assistant Administrator for ORD

Mr. Kadeli welcomed the BOSC members to the meeting and thanked them for their efforts on behalf of the Agency and ORD. The BOSC recently submitted two reports to ORD—the Science and Technology for Sustainability (STS) Program Review Report and the Water Quality Mid-Cycle Review Report. The Human Health Program Review Report and the NCER Standing Subcommittee Letter Report are in the pipeline and will be transmitted to ORD in the near future.

Mr. Kadeli met with the staff of the National Center for Environmental Research (NCER) yesterday to announce that they will be moving to Potomac Yards where the National Center for Environmental Assessment (NCEA) staff is located. Some NCER staff members are concerned about the commute as well as relocating from Washington, DC, to Virginia.

The BOSC has been busy this past year. Work on the Clean Air Program Review is winding down and that report is being presented at today's meeting. Also at this meeting will be a presentation on the Decision Analysis Workshop. The Computational Toxicology Standing Subcommittee meets in 2 weeks in Research Triangle Park. Next year is shaping up to be another busy year for the BOSC. There will be four or five program review meetings and two standing subcommittees will be active in 2010.

There currently are five vacancies on the BOSC Executive Committee that ORD is trying to fill. Mr. Kadeli expressed his appreciation to the Executive Committee members for submitting the names of candidates who could fill these positions. ORD is in the process of inviting new candidates to serve on the Board and he hopes that the positions will be filled by the February 2010 meeting. He noted that the areas of expertise needed on the BOSC include land, risk management (with an engineering focus), communications (communicating research results), developmental toxicology (to replace Drs. George Daston and Mel Andersen), and program evaluation (to replace Dr. Carol Weiss).

There have been a number of leadership positions filled at EPA. Scott Fulton, who was serving as the Acting Deputy Administrator for EPA, was confirmed by the Senate as EPA's General Counsel on August 7, 2009, and Craig Hooks has been confirmed as the Assistant Administrator for the Office of Administration and Resources Management (OARM). Peter Grevatt, who had been a Senior Advisor to the Office of Solid Waste and Emergency Response (OSWER), was appointed the Director of the Office of Children's Health Protection and Environmental Education. Lisa Heinzerling, who was EPA's Senior Advisor on Climate Change, has been named the Associate Administrator for the Office of Policy,

Innovation and Economics. David McIntosh has been appointed the Associate Administrator for the Office of Congressional and Intergovernmental Relations, and Seth Oster has been named the Associate Administrator for the Office of Public Affairs. Mr. Kadeli said that he had hoped to share the news that Dr. Paul Anastas had been confirmed as the Assistant Administrator for ORD but that has not happened yet. He added that Dr. Anastas is looking forward to stepping into this role.

Three themes emerged from the June 2009 White House retreat that was attended by EPA Administrator Lisa Jackson—recovery, rebranding, and reform. Health care, the economy, energy (which includes climate change), and financial reform were among the priority topics discussed. EPA will focus on future opportunities to work with other federal agencies to address these issues. Representatives from the Office of Children's Health met with Administrator Jackson and it is expected that she will take an active role in children's health issues. ORD will be an important part of that discussion. The FY 2010 budget includes a $5 million increase in funding for children's health research and ORD will focus on enhancing the work of the Children's Centers.

Mr. Kadeli asked if there were any questions. Dr. Philbert asked Mr. Kadeli to repeat the areas of expertise needed for the new BOSC members. Mr. Kadeli reiterated that they were land, risk management (with engineering focus), communications (communicating research results to a broader community), developmental toxicology, and program evaluation. He explained that program evaluation is an important responsibility of science managers. How does ORD ensure that its work is focused on the right areas? Is ORD managing its programs well and are the programs accomplishing what they were intended to accomplish? Mr. Kadeli commented that developing metrics has been difficult. ORD has been trying to develop broad measures that can be used for diverse programs but in dialogue with the Office of Management and Budget (OMB), the National Academies, and others, it is clear that "one size fits all" falls short of what ORD is trying to accomplish with program evaluation.

Dr. Falk mentioned that with the new administration, the Department of Health and Human Services (DHHS) is taking a look at its advisory committees. Is that happening at EPA as well? Mr. Kadeli replied that such an effort is ongoing to determine if there is a need for new advisory committees or opportunities for restructuring existing committees, but it is a low-key effort. ORD has had the opportunity to talk about the BOSC and the role the Board plays in supporting and advising ORD.

Dr. Sayler commented that it often is easier to communicate research programs from the human health perspective rather than the ecological perspective. What effect does this have on the balance between health and ecological research? Will there be any changes in environmental targets in the future? Mr. Kadeli responded that the shift to research on ecological services and the value they provide is critical to increasing the program's relevance. (He noted that "relevance" was not the perfect word to explain what he was trying to convey.) The Agency is looking at significant environmental issues in the Great Lakes and Chesapeake Bay. EPA will take more traditional approaches (e.g., permitting, enforcement) to protect these water bodies, but the new Ecosystem Services Research Program will provide the Agency additional tools to deal with emerging environmental issues. ORD will be briefing Chuck Fox, who is advising the Administrator on the Chesapeake Bay and looking at trading, incentives, and the utilization of land around the Bay. EPA has positioned itself well with the U.S. Department of Agriculture (USDA) and other agencies to make the case that there are complimentary approaches that may be less expensive than traditional methods.

Six months ago, Mr. Kadeli met with a local Congressman in Cincinnati, Ohio. The Congressman was concerned about the significant investments (and tax implications) cities have to make to control combined sewer overflows (CSOs). EPA has an opportunity to identify less expensive options to deal with CSOs. Mr. Kadeli acknowledged that as resources decline there is a natural tendency to focus on issues that impact public health; however, ORD works hard to maintain a reasonable balance between health and ecological research. He added that there is no set percentage of the budget devoted to each area. The Ecosystem Services Research Program has become primarily an intramural research program,

but the staff is forward thinking and should be able to address future problems. Mr. Kadeli commented that Dr. Anastas is attuned to the health-ecological research balance issue and he is very interested in the Science To Achieve Results (STAR) Program. Hopefully, Dr. Anastas will be able to share his thoughts on these issues with the BOSC in the future.

Decision Analysis Workgroup—Implementing Decision Analysis Methods
Dr. Igor Linkov, U.S. Army Corps of Engineers (USACE)

Dr. Linkov stated that there are clear benefits to be gained by advancing the use of formal risk and decision analysis methods. These include: (1) opportunities to explore trade-offs among diverse objectives, (2) the ability to distinguish science and engineering inputs to a decision from values associated with objectives, (3) means for exploring the implications of uncertainty and the value of reducing it, and (4) providing a quantitative framework to implement adaptive management (which was presented by Todd Bridges at the Decision Analysis Workshop).

Based on the summary of the March 2009 Decision Analysis Workshop sponsored by EPA that was compiled by Dr. von Stackelberg, he thought the recommendations from the workshop were scientifically sound. The U.S. Army Engineer Research and Development Center (ERDC) already has implemented many similar recommendations and ERDC's experience could be used to help EPA. Dr. Linkov noted that in applying these approaches EPA will have to confront a number of practical issues such as: (1) underestimating the level of effort required to accomplish effective deliberation through the use of decision analysis, (2) determining who can/should be involved in value/preference elicitation, (3) intolerance for transparency in decision-making, and (4) the misconception that decision analysis is a substitute for an actual decision.

Dr. Linkov explained that his presentation will cover decision cycles and needs; the ERDC/ Environmental Laboratory (EL) risk and decision science focus area; the suite of tools pursued by ERDC (risk assessment, mental modeling, and decision analysis; EPA Decision Analysis workshop recommendations; and conclusions.

Dr. Linkov emphasized that information gathering and decision-making are two separate cycles, separated in time and space. Citing Sullivan and Dubik's War in the Information Age, he explained that the time to complete the observe-orient-decide-act cycle has been shrinking over the past 200+ years. During the Revolutionary War, observations were made by telescope; it took weeks to orient the troops, months to make a decision, and a season to act on the information. In the war of tomorrow, observations are made in real time, orientation is continuous, decisions are immediate, and it takes less than 1 hour to act on the information. Given that there is virtually little or no time from observation to action, information gathering and decisions can no longer remain separate. Tools are needed to integrate the two cycles into one process.

Dr. Linkov pointed out that, in the cognitive and social domains, it is most difficult to change the behavior of people. It is less difficult to change organizational processes in the information domain, and even easier to change platform/information technologies in the physical domain. The key is to develop tools that work across these different domains.

Mental modeling and decision analysis are in the suite of tools pursued by ERDC. Mental models can be used to assess needs of decision makers and stakeholders. Clear understanding of cognitive drivers can be used to tailor information presentation to decisions and decisions to actions. Risk assessment for emerging materials and threats is a good example of where expert judgment is especially important. Mental modeling and decision analysis tools are needed for risk assessment in situations of high uncertainty and variability.

Multi-criteria decision analysis is a family of tools that allows the structuring of information and translation of it into a decision. Multi-criteria decision analysis refers to a group of tools used to impart structure to the decision-making process. It generally consists of four steps: (1) creating a hierarchy of criteria relevant to the decision at hand, for use in evaluating the decision alternatives; (2) weighting the relative importance of the criteria; (3) scoring how well each alternative performs on each criteria; and (4) combining scores across criteria to produce an aggregate score for each alternative.

The evolving decision-making process integrates different types of information from various sources. These tools allow decision-makers to structure the decision problems based on a set of criteria and metrics, determine the uncertainty of the information, and weight the data based on their quality and relevance to the decision at hand.

ERDC has been using these tools to prioritize alternatives for a number of projects, including:

- ✧ Sediment Management
  - New York/New Jersey Harbor
  - Validation at two Navy sites (funded by the Environmental Security Technology Certification Program)
- ✧ Restoration Planning for Coastal Louisiana and Mississippi
- ✧ Portfolio Approaches for Dams Prioritization
- ✧ Environmental Management at Military Installations Affected by Climate Change
- ✧ Sustainable Infrastructure Development in Afghanistan
- ✧ Energy Security Alternatives at Military Installations.

Referring to the restoration planning for coastal Louisiana and Mississippi project, Dr. Linkov explained that after Hurricane Katrina, USACE's focus began shifting from safety to risk management. No matter how high they rebuilt the levy, there always would be a chance of flooding. They needed to look at other alternatives such as improving housing structure, improving evacuation routes, increasing wetlands, and so on. USACE needed to understand the options and how people value them. The recommendations from this project will be submitted to Congress.

With respect to the Dams Prioritization project, USACE manages hundreds of dams and levees. Normally, those that are in the worst condition would be high priority for repair; but what if the dam/levy is located in an area where there is no population that would be affected if it failed? How does this affect dam prioritization? How are climate change considerations integrated into prioritizing infrastructure investment? USACE is trying to link financial portfolio diversification methods with risk assessment and decision analysis tools to prioritize dam repairs.

Dr. Linkov explained that the Environmental Management at Military Installations Affected by Climate Change project is looking at how USACE can help protect coastal infrastructure in military areas. For the Sustainable Infrastructure Development in Afghanistan project, USACE is trying to understand the culture and assess local infrastructure needs so that what they build will be useful to the Afghanis.

ERDC is using a formal decision analysis process to prioritize its project portfolio. The Department of Homeland Security is considering decision analysis to prioritize chemical/biological threat countermeasures (e.g., develop vaccines, improve sensing at borders, etc.). Decision analysis was used for the Capability Gaps Prioritization in Small Arms Program to show the six different agencies involved that they ultimately did think alike on the issues and would reach similar priorities for bridging capability gaps.

Dr. Linkov provided some examples from the ERDC experience involving judgment and data fusion. The ultimate goal of the Mental Modeling for Flood Risk Management study is to characterize flood risk perception by experts across different organizational elements and disciplines within USACE and assess

how it translates into formulating risk mitigation and response plans. The Expert-Driven Quantitative Structure Activity Relationship (QSAR) for Military Compounds project evaluated the uncertainty and variability in compound properties (e.g., melting point, solubility) as a means of determining whether QSAR tools could provide meaningful results for assessing the physical and biochemical properties of new materials for use in military or civilian applications. The goal of the Defense Threat Reduction Agency (DTRA) Chem/Bio Decision Support in Battlefield project is to provide decision support to those making decisions about these threats on the battlefield. The DHHS Chemical Emergency Communication Portal project involves extracting information and presenting it in a form that it is useful to emergency managers in the field. ERDC is working with the National Library of Medicine on this project.

Mental modeling is a complex web of deeply held beliefs that operate below the conscious level to affect how an individual defines a problem, reacts to issues, learns, and makes decisions. It facilitates communication and coordination in team settings and facilitates learning. Mental modeling helps build effective teams and it involves knowledge about the team's task, individual members' responsibilities, and potential situations the team may encounter. Dr. Linkov presented a diagram that depicted the many influences on USACE flood risk management to illustrate the complexity of mental modeling.

The approach is to link risk assessment, multi-criteria decision analysis, and mental modeling tools. EPA has made a good start with its March workshop, and the Agency can learn from the experiences of ERDC. Dr. Linkov identified the essential decision analysis ingredients in three categories: people, process, and tools. The people include policy decision makers, stakeholders, and scientists/engineers. The process involves defining the problem and generating alternatives; identifying criteria to compare alternatives and gathering value judgments on relative importance of the criteria; screening/eliminating clearly inferior alternatives; determining performance of alternatives for criteria; and ranking/selecting the final alternative(s). The tools include environmental assessment/modeling tools (risk/ecological/environmental assessment and simulation models) and decision analysis tools (group decision-making techniques/decision methodologies and software).

Dr. Linkov closed with a list of references that could be consulted for more information on the projects that he mentioned in his presentation.

Referring to the War in the Information Age timescale, Dr. Duke pointed out that the timescale from observation to action has always been rapid but the generals were not immediately aware of that action. Dr. Linkov commented that in the past decisions were hierarchical but that does not work with terrorists, which operate in flat, flexible organizations.

Referring to the Capability Gaps Prioritization in Small Arms Program example in which the six agencies found that that their values were similar, Dr. Philbert asked what would have happened if they found they had different values after conducting the exercise. Dr. Linkov replied that such a situation could easily happen and the benefit of the exercise would be that the six agencies would understand why their values are different, which would help them in identifying compromises.

Dr. von Stackelberg asked what steps ERDC was taking to institutionalize decision analysis. Is there a training series for staff? Dr. Linkov responded that there is interest in decision analysis but there is no formal effort to institutionalize it across the Center. Dr. von Stackelberg asked if Dr. Linkov's team functioned as a resource for decision analysis within the organization. Dr. Linkov confirmed that his group was functioning as a resource, adding that the staff is working on a strategic plan to formally integrate decision analysis within the next 5 years. More training will be needed at that point.

Dr. Haas liked the presentation and stated that he is supportive of decision analysis approaches. He noted that there always have been other factors between risk assessment and risk management that are considered in reaching decisions. Decision analysis presumably captures these other factors so there is more acceptance of the decision resulting from the analysis. Dr. Linkov mentioned that the USACE

historically has used primarily cost-benefit analysis for selecting alternatives. Congress instructed USACE to find alternative approaches for assessing different options following Hurricane Katrina. He noted that there has been a little resistance among some USACE decision-makers to using a new approach. Dr. Haas pointed out that the hierarchical flowchart had both positive and negative loops. Does the decision-maker get to tweak the levers? Dr. Linkov confirmed that they did and Dr. Haas then suggested that they may need training. Dr. Linkov responded that it is important to bring together the risk managers and risk assessors.

Dr. Sayler thanked Dr. Linkov for his presentation and introduced Dr. Cynthia Stahl from EPA Region III.

Decision Analysis Workgroup—EPA Region III Experience with Decision Making and Policy Making
Dr. Cynthia Stahl, EPA Region III

Dr. Stahl explained that her presentation would cover how EPA Region III is using decision analysis. It has not been institutionalized yet but the Region is moving toward that goal. Many people ask her why they should use decision analytical methodologies. Her reply is that they should be used because they provide context. People always use information within a particular context. The decision question frames the activities. Decision analysis links activities to the Agency's goals and desired outcomes and enables transparent, consistent, stakeholder-inclusive, data-driven decisions. Dr. Stahl emphasized the need to understand the context so that the activities answer the right question(s).

The "work" in decision analysis is in: (1) the upfront decision process, which involves discussion of the decision question and determination of what indicators are relevant and why; (2) the data infrastructure building process, which includes identifying the data available to populate the indicators as well as building infrastructure for better data; and (3) the decision analysis process, which involves determining how the data are related to the decision options.

There are different kinds of decision-making. One type requires ranking/prioritization of something based on decision criteria. The Multi-criteria Integrated Assessment (MIRA) approach works for this type of decision-making. Another type of decision-making requires links to Agency or organizational goals/programs/activities and then prioritization of those programs/activities. Region III has used modified Logic Models as well as the MIRA approach for these types of decisions. Dr. Stahl explained that the Kellogg model was business oriented so Region III staff members modified it for their own use.

Region III has applied the MIRA approach for air ozone nonattainment, air toxics and ozone nonattainment strategies (optimizing the placement and number of air monitors), fine particulate matter (PM) and human health impacts, and optimizing ozone monitoring networks. The MIRA approach also has been used for multimedia issue across all Region III programs/offices for the 2010 Region III budget and program resource allocation. Other applications of the MIRA approach include mountain top mining, agricultural fertilizer practices and the Chesapeake Bay watershed, and EDCs. Dr. Stahl noted that the EDCs project has included endocrinologists, public health experts from EPA and the Centers for Disease Control and Prevention (CDC), academics, and others; therefore, it has been a good platform to align the decision analysis language for both health and ecological experts.

The Region III Logic Model applications include an offshoot of the 2010 budget case study, which involves development of Branch/Office logic models and linking these models to Divisional and Regional logic models and ultimately to the Agency logic model. Another application of the Region III Logic Model is the automated Microsoft Access interface to input goals and outcomes and link them to activities and individuals. Dr. Stahl reported that this system had not been beta tested yet.

Dr. Stahl used the 2010 Budget Case Study as a more detailed example of Region III's application of decision analysis. The effort involved the prioritization of Region III program focus and resources. The question was: What are Region III's most vulnerable areas geographically and environmentally (implying that these areas need more effort/resources)? About 100 staff and senior managers were involved in the case study. One hundred eighty-seven indicators were used across all Region III program offices and 3,700 Region III HUC 12 watersheds were evaluated.

Senior management commitment to the project was critical. The Regional Administrator and Deputy Regional Administrator supported the effort. The entire analysis, including discussion of the decision question, data collection, and indicator construction, was completed in 6 months (October 2008 – March 2009). Dr. Stahl commented that although it was possible to do this in 6 months, she advised against it. A number of lessons were learned from the 2010 Budget Case Study:

- ✧ It is necessary to develop logic models to link program activities to Regional goals and desired outcomes.
- ✧ EPA does not collect the data it needs to evaluate environmental outcomes/program effectiveness (the Agency currently collects data for reports).
- ✧ EPA needs to hire and/or train more analysts and build in-house expertise in decision analysis. The Agency's reliance on contractors for certain critical work hinders EPA's efficiency and effectiveness.
- ✧ The decision analysis process energizes staff by giving them links to a larger purpose.

Dr. Stahl identified some things to watch out for in applying decision analysis approaches. She warned about the danger of jumping too quickly to technological solutions (e.g., software). There is a tendency to spend very little time thinking through what data should be used in the analysis. Failure to do this can lead to answering the wrong or irrelevant questions, using wrong or not the most appropriate data for the analysis, and lack of transparency. Dr. Stahl emphasized that decision analysis is just a tool; it does not make the decision. Decision-makers still have to make the tough decisions.

It takes the following to implement decision analysis: (1) patience and honesty—lots of "closets" will be opened (data, skills, etc.); (2) focus on the decision questions you want to answer; (3) back away from the technology (buying software without understanding what is does and how it works); (4) think for the long term—build in-house expertise versus relying on contractors); (5) build on your strengths—staff expertise, etc.; and (6) fill in gaps in strengths—through collaboration, partnerships, hiring, training, and/or doing applications.

One of the benefits of committing to a decision analysis approach is a sustainable infrastructure. This includes relevant/useable data systems, analysts who know how to use the data, activities and careers that link to Agency goals/mission, and more efficient communication processes (from staff to senior managers and back). Additional benefits include decision transparency and justification of decisions.

Dr. Stahl's parting message was that the most valuable aspect of decision analysis is the process (the results matter much less than people think they do). The process assures the relevance of Region III's activities by linking them to decision questions and Agency goals. It also leads to gains in internal efficiencies and trans-disciplinary analytical capability. Dr. Stahl explained that decision analysis is an entire field that sits outside disciplines. A different kind of knowledge is required in the decision analysis process. Decision analysis also helps to meet the Administrator's goal to make decision- and policy-making more transparent, stakeholder inclusive, and consistent.

Dr. Sayler thanked Dr. Stahl for her presentation and asked if the BOSC members had any comments or questions.

Dr. Philbert suggested that Dr. Stahl avoid saying that the results do not necessarily matter because it is the role of EPA to protect human health and the environment. He then asked how Region III has integrated extramurally generated data in this analysis. Dr. Stahl replied that most of the data they use for the analysis comes from outside of EPA. Dr. Philbert asked if the Region linked with NCER to solicit the generation of the data through academia. Dr. Stahl responded that the Region has not taken that approach because the extramural process is too slow. The Region needs data in a matter of weeks. The decision probably would be made before the grant was awarded.

Dr. von Stackelberg asked if Dr. Stahl was the only Region III staff member who was trained in decision analysis. She then asked about the process Dr. Stahl used to convert other staff members to support decision analysis. Were there training sessions? Dr. Stahl replied that most staff members would not participate in a training session unless it was related to their work. Much of the conversion of staff members happened during their participation in the process. Dr. Falk asked how the other regions were making decisions. Dr. Stahl answered that the other regions are doing their best but they do not have decision analysis expertise. Region III will have to plant seeds and mentor the other regions until they gain this expertise.

Decision Analysis Workgroup—BOSC Decision Analysis Subcommittee Update
Dr. Katherine von Stackelberg, Harvard School of Public Health

Dr. von Stackelberg reviewed the timeline for the Decision Analysis Subcommittee's efforts. The initial presentation from the Office of Science Policy (OSP), which focused on value of information (VOI), was made to the BOSC in September 2008. A Subcommittee was formed and the members expanded the scope beyond VOI because the kinds of decisions made by ORD range from strategic decisions to proposal prioritization. VOI is difficult to use for evaluation of basic research because the probability of a decision and its impact are unknown. The Subcommittee members thought it would be helpful to bring in some people who were using decision analysis. The National Risk Management Research Laboratory (NRMRL) was considering doing a workshop on decision analysis so the BOSC Subcommittee worked with NRMRL to plan a joint workshop. A 2-day Decision Analysis Workshop was held in March 2009 in Cincinnati, Ohio; the second day of the workshop was focused on the three case studies. Draft recommendations and a draft report were presented to the Executive Committee at this meeting. The recommendations and report will be finalized by late fall 2009. Dr. von Stackelberg stated that the Subcommittee plans to go through the decision analysis process with the case studies to be included in the report.

Dr. von Stackelberg pointed out that decision-making occurs at different levels—organizational, strategic, and annual resource allocation at the laboratory or program level. More structured, transparent approaches to these different levels of decision-making are needed. ORD research is guided by strategic directions, adjusted per annual budget decisions, and applied to inform environmental decisions. There are numerous decision inputs, such as the EPA Strategic Plan, Administration's priorities, stakeholders, and BOSC reviews, as well as feedback and performance evaluation inputs, such as SAB feedback, program and regional office feedback, BOSC program evaluations, and PART reviews. Decision analysis offers a way to assemble this disparate information (e.g., political influences, budget constraints, staff capabilities) to make a better informed decision.

The Multi-Year Plans (MYPs) identify Long-Term Goals, Annual Performance Goals (APGs), and Annual Performance Measures (APMs) for each program. The LTGs identify the timeframe to conduct the work and determine ORD's role and the role of others. The APGs identify the sequence of the work to provide results and integrate research from all sources. The APMs specify who will accomplish the work (in-house laboratory/center or STAR research), and ensure that the work can be done with the

available resources. One of the case studies to be included in the report is the Ecosystem Services Research Program. The Subcommittee has begun to work on that analysis using commercial software (Expert Choice).

Dr. von Stackelberg shared a few observations from the March workshop:

- ✧ The focus of the analysis should be research outcomes versus outputs. The software would link daily activities to larger criteria as determined by LTGs, APGs, and APMs. Publishing may be a great metric for individuals but may not be as useful for organizational goals.

- ✧ Prioritizing research requires a big picture approach. Influence diagrams are useful to visualize how various aspects of the decision are related. It helps describe the linkage between the research and the larger goal.

- ✧ It is necessary to develop decision analysis capabilities and resources in-house to integrate it into the organizational culture.

- ✧ ORD is encouraging inter- and multidisciplinary research, so this is a good opportunity to introduce decision analysis into the process. Decision analysis requires technical analysts as well as decision analysts—those who see the big picture, can deal with details, understand social science, and the process of decision analysis.

- ✧ Risk management training is necessary to get the culture moving in this direction. Decision-makers need training. There have to be mechanisms for the decision analysts to work with the decision-makers.

- ✧ Research prioritization decisions should be based on reducing uncertainty. VOI will help with that evaluation, but decision analysis tools bring that uncertainty to the decision-making. Prioritizing research is just one aspect of the decision analysis. ORD really needs to implement portfolio management—to select the best portfolio of research projects to achieve ORD's goals and desired outcomes.

The draft recommendations from the workshop include the following:

- ✧ Use of decision analysis techniques to support research prioritization within ORD is feasible and recommended.

- ✧ Resist the impulse to rely on one piece of software or an outside vendor or contractor to implement the use of these techniques. Sit down with stakeholders and elicit input and data needed for the evaluation. Identify someone with the skills needed to liaison between the senior managers and those doing the analysis.

- ✧ Develop case studies; begin the process in small ways. The Ecosystem Services Research Program case study involves using a decision analysis process to make resource allocation decisions.

- ✧ Engage staff in the effort; consider internal/external collaboration.

- ✧ Evaluate extramural proposals using the criteria already established.

- ✧ Evaluate ways in which benefits can be defined.

One of the case studies involves the evaluation of research proposals. There is a peer review process in place and there are criteria for evaluating the proposals. Reviewers can evaluate the proposal by each criterion and that information can be entered into an Excel spreadsheet. The expected benefits of the research could be elicited from the proposers or the peer reviewers and added to the matrix. What decisions would be made differently with the information to be generated and what would be the benefits of the different decisions?

Decision analysis tools then could be used to develop the recommendations. Dr. von Stackelberg warned against penalizing innovative research that has high risk but could yield great benefits if it is successful.

Dr. von Stackelberg stated that the Subcommittee has begun working on the three case studies, and a vettable report should be ready by late fall. She then asked if there were any comments or questions.

Dr. Philbert commented that it is important to remember the context in which this effort started—how to help NCER more closely align its funding of research to the Agency's needs. The BOSC members should keep this in mind as this work progresses. Are the existing extramural funding mechanisms appropriate or adequate? Does the BOSC need to think about that? Dr. von Stackelberg responded that the workshop discussions did not address that issue. Dr. Philbert suggested including it as a higher level recommendation in the report—ORD should review funding mechanisms to see if they are appropriate. He recalled Dr. Stahl's statement that Region III did not consult NCER for data because the Center's grants could not respond quickly enough. Perhaps another mechanism, such as a cooperative agreement, is needed to respond to such needs.

Dr. Demerjian stated that there is a clear process for deciding what STAR projects will be funded. He was not certain that a decision analysis process would offer a clear picture for funding grants. Dr. Linkov commented that the STAR review process needs to be improved. USACE uses metrics and a decision software package. The reviewers rate each criterion numerically and enter that information into the system. This approach would be easier, faster, and more consistent than the approach currently used by NCER. Dr. von Stackelberg added that the reviewers for STAR grants are asked to evaluate the proposals using criteria but there is no evidence of how they reached the final decision. Dr. Sayler expressed some concern that such an approach would favor mission research over exploratory research that may yield greater benefits if it is successful.

Dr. Giesy stated that he is a member of SAB's Committee on Science Integration for Decision Making, which is undertaking a new study at the request of the EPA Administrator to evaluate the extent to which scientific assessment practices are integrated into EPA's environmental decision-making processes. The study will build upon the findings of the previous SAB and National Research Council (NRC) studies, and recommend actions that EPA could take to improve the integration of scientific assessments for decision making. Dr. Giesy thought the information presented at today's BOSC meeting would be helpful to that Committee. He also mentioned that he served on the Scientific and Technologic Achievement Awards (STAA) review committee. That committee reviewed nominations for award and used a complicated scoring/rating system to make recommendations. In his opinion, this was a difficult process. Dr. Giesy also shared his experience when serving on the Toxic Substances Control Commission in Michigan. The industry representatives did not trust the state representatives and vice versa; the public did not trust either group. A decision process was used and the answer they arrived at was ridiculous so most said they would not participate in such a process again. The issues and problems really have not changed so what is new and unique here and will it actually help ORD make better decisions? He suggested that the answers to those questions be included in the workshop report.

Dr. von Stackelberg said that she was not sure that there was anything new. It is more of a logical evolution in pulling together disparate information so that it can be reviewed at a glance. It provides a way to structure all the information to consider in decision-making. Decision analysis assembles the various pieces of information that would have been considered independently. It allows the decision

maker to see trade-offs explicitly and evaluate them for making decisions. Dr. Sayler asked if the case studies would make this evident. Dr. von Stackelberg replied that she thought they would make this clear. Dr. Sayler agreed that the BOSC should be trying to communicate something new. Dr. Giesy pointed out that it may be new to EPA. He thought the report should explain why the Agency should implement something different. Dr. Demerjian commented that the biggest limitation usually is the lack of data needed to make the choices that need to be made; for example, data on the number of lives that have been saved from managing particulate matter and ozone. If "lives saved" is used as the criterion for prioritization then many research areas would be neglected. Dr. Sayler responded that the NRC report indicated that outcomes, such as lives saved, are poor ways to evaluate research because it depends on implementation and the efforts of so many others. Dr. Philbert pointed out that priorities change over time; the system has to allow ORD to go back and quickly evaluate where the program is and identify mid-course adjustments rather than just a one-time, static review. Dr. Demerjian expressed his concern about using decision analysis to decide which areas the grants will address—that could be contentious. Dr. Linkov commented that if numerical scores are assigned to proposals, the data can be sliced in many different ways. ORD could look at the high risk projects, those that deal with quality of life issues, etc. Numerical scores would help ORD make the selections.

Dr. Sayler pointed out that congressional mandates could change the decisions. He cautioned the Subcommittee about using the term "outcomes" in the report because it might be misinterpreted. This word has a specific meaning for ORD and the Office of Management and Budget (OMB).

Dr. von Stackelberg responded that the outcomes versus outputs point was an observation from workshop participants. There were no recommendations on outcomes from the workshop. Dr. Sayler commented that the Subcommittee should ensure that the results of the research are outputs rather than outcomes. He cautioned against letting outcomes become the driver for the research programs. Dr. Haas stated that it could be argued that the advancement of knowledge is the outcome and the outputs are papers, reports, and presentations. The focus of the report should be how EPA decides to allocate resources to various areas. Dr. von Stackelberg mentioned that the Subcommittee's work will focus only on ORD. Dr. Giesy stated that the work of the Committee on Science Integration for Decision Making will be Agency wide. Dr. Philbert noted that there should be different outcomes at different levels—the outcome of a grant should be different than the outcome of ORD's intramural research. There will be different outcomes at different levels but they need to be integrated at a bigger scale. Dr. Sayler asked how knowledge changed. Dr. Philbert replied that EPA needs scientific information to make decisions to protect human health and the environment. It may not be the most fascinating information but it is information the Agency needs.

Dr. Haas stated that EPA understands data gaps in a 5-year time horizon but the Agency cannot predict those 10-15 years out. There is value in science knowledge as a hedge against future problems. Fundamental research is an important part of EPA's portfolio. Dr. Sayler reiterated Dr. Linkov's earlier suggestion that alternatives be included in the report. Dr. von Stackelberg said she thought that was implicit because every decision involves a trade off of alternatives. Dr. Linkov responded that alternatives may be even more important for Agency-wide decision analysis.

Dr. Sayler asked Dr. Stahl if she had anything to add. Dr. Stahl said she agreed that outcomes are different at every level and it can be quite difficult to see the connection. Dr. Philbert agreed but noted that the connections are critical. The decision analysis approach allows those involved to agree to disagree and find an alternative solution. Dr. Stahl mentioned that Region III has used back casting in certain instances. The staff figures out what they want and then works backwards to see what it would take to get there. These experiences have been very informative. Dr. Sayler thought that the issue of how to value something could be a proverbial swamp. Dr. Linkov responded that everyone has different values but an organization has to have common values. At Superfund sites, for example, the parties involved have different values but they work together to find an acceptable solution even though it is difficult to reach consensus. He noted that there is research ongoing to help understand values. Dr. Sayler

asked if there is a comparative assessment in mental modeling. Dr. Linkov replied in the affirmative, adding that it is necessary to look at what each group thinks. In some cases, experts can predict what will be important to the public but they are not always right.

Dr. Sayler asked if there were any additional questions or comments. When there were none, he stated that the report from the Subcommittee should be available for review at the February 2010 Executive Committee meeting. Drs. Haas, Philbert, and Duke volunteered to vet the report. Dr. von Stackelberg asked the Executive Committee members to send her their comments on the draft recommendations and report. Dr. Sayler thanked the presenters and the Executive Committee members for their comments.

Subcommittee Updates—Program Review Subcommittees

Drinking Water Program Review
Dr. Chuck Haas, Drexel University, Subcommittee Chair

Dr. Haas reported that Troy Rutkofske is the DFO for the Drinking Water Program Review. The Subcommittee is being formed, and the face-to-face meeting probably will be held in late March/early April 2010 in Cincinnati, Ohio. Mr. Rutkofske added that the Subcommittee will have 8 to 10 members, including two members who participated in the previous review. The final member selections will be made in the next few weeks.

Subcommittee Updates—Standing Subcommittees

NCER Subcommittee
Dr. Martin Philbert, University of Michigan, Subcommittee Chair

Dr. Philbert reported that he revised the letter report as requested at the last meeting; the recommendations have been moved to the front of the report. Ms. Kowalski sent the revised letter report to the vettors to verify that the changes had been made before the report is submitted to ORD.

NERL Subcommittee
Dr. Ken Demerjian, State University of New York, Subcommittee Chair

Dr. Demerjian stated that there have been no new activities since the last Executive Committee meeting. There may be a conference call in 2010 but there currently are no plans for a face-to-face meeting.

Computational Toxicology Subcommittee
Ms. Lorelei Kowalski, EPA/ORD, DFO

Ms. Kowalski reported that five new members, including Dr. Dennis Paustenbach, have been added to the Subcommittee. Their areas of expertise include systems biology, computational biology, high throughput screening, and developmental toxicology. A public conference call will be held on September 25, 2009, to discuss the Subcommittee's charge and to bring the members up to speed for the face-to-face meeting, which is scheduled for September 29-30, 2009 in Research Triangle Park, North Carolina. The Subcommittee will be addressing six charge questions. She noted that this is an important meeting for the National Center for Computational Toxicology (NCCT) because it has been in operation for 5 years, which was its initial tenure. Dr. George Daston is still the Subcommittee Chair but his term on the Subcommittee will end after this meeting; therefore, ORD is searching for a new Chair. Ms. Kowalski stated that the Subcommittee meets every 18 months or so. Following its September meeting, the Subcommittee will prepare a letter report that will be vetted at the February 2010 Executive Committee meeting.

Dr. Giesy asked if the new Subcommittee Chair had to be an Executive Committee member. Ms. Kowalski replied that the Chair did not have to be on the Executive Committee; she added that Dr. Paustenbach has volunteered to serve as a member and possibly the Subcommittee Chair.

Dr. Sayler asked if there were any questions regarding the reports for these Subcommittees and there were none. He then asked the BOSC members to return from lunch before 12:45 p.m. so that Dr. Demerjian could make his flight.

Subcommittee Draft Report: Clean Air Program Review Draft Report Presentation
Dr. Ken Demerjian, State University of New York, Subcommittee Chair

Dr. Demerjian identified the members of the BOSC Subcommittee on Clean Air Research. He chaired the Subcommittee and there were 10 additional members. This was a bit larger than initially expected but it was necessary to cover all of the areas of expertise. He mentioned that Heather Drumm served as the Subcommittee DFO and she did an excellent job of keeping the Subcommittee on track.

There were four conference calls—May 21, May 29, July 27, and August 28, 2009—and one face-to-face meeting, which was held June 8-10, 2009, in Research Triangle Park, North Carolina. Prior to the first conference call, Dr. Demerjian had two calls with the National Program Director (NPD) to outline the depth and breadth of the charge questions to be addressed by the Subcommittee. The first Subcommittee conference call covered various administrative issues and provided some background for the review.

The Clean Air Research Program has two LTGs:

- ✧ LTG 1: Advance air pollution sciences to reduce uncertainty in standard setting and air quality management decisions. This LTG supports two research themes: (a) developing National Ambient Air Quality Standards (NAAQS) and other air quality regulations, and (b) implementing air quality regulations.

- ✧ LTG 2: Air pollution research will reduce uncertainties in linking health and environmental outcomes to sources of air pollutants to improve the effectiveness of air quality management strategies.

Dr. Demerjian explained that in LTG 2, the program is going beyond the pollutant-by-pollutant approach. He mentioned the multi-pollutant enterprise concept, which was the subject of a 2005 National Academy of Sciences report. The Clean Air Program is trying to look at pollutants in totality and ORD will propose approaches for doing this.

The charge to the Subcommittee was two-fold: (1) a program assessment that included charge questions to help evaluate program design and demonstrated leadership, science quality, relevance, and demonstrated outcomes; and (2) a summary assessment that included a rating of program performance by LTG.

The consensus view of the Subcommittee members was overall very positive. The Clean Air Research Program has been responsive to the 2005 program review and 2007 mid-cycle review BOSC recommendations, and the level and quality of the science remains outstanding. The program is making progress in: (1) developing a multi-pollutant research program, (2) identifying source-to-health outcomes linkages, and (3) developing approaches for accountability assessment. The research underway is extremely relevant to the program's stakeholder and client base.

The overview summary presentations on the thematic areas were outstanding. The "road map" developed by the program to help the Subcommittee members connect the materials to the charge questions was very

useful. The poster presentations at the face-to-face meeting were excellent, and the overall presentations and leadership by senior management in the review process were exceptional.

The Subcommittee's summary assessment rating for LTG 1 was Exceeds Expectations. The program exceeds expectations in delivering ambient measurements, source emission inventories, and air quality models and analyses to address LTG 1. The program demonstrated national leadership, including work on biogenic emissions and the emerging research on climate change air-quality interactions. Research on health implications of PM exposure has made rapid progress and the quality of this work clearly has been exceptional. The near-singular focus on PM is partly justified in light of the public health burden and significant regulatory decisions, but does imply that the Clean Air Research Program science has been relatively less effective in establishing NAAQS for other criteria pollutants or informing air quality management decisions related to air toxics. Additional direct emphasis on the health implications of low-level exposure (i.e., below the current NAAQS) would be valuable, particularly in controlled exposure multi-pollutant environments, where possible. In the future, issues may arise that will require more research efforts from the Clean Air Research Program in regard to the other criteria pollutants.

The recommendations for LTG 1 follow:

1. The Community Multiscale Air Quality (CMAQ) model and other air quality models should continue to be a high priority for sequential refinement and development with a focus not only on the size and mass of PM, but also on the components of PM, including the characterization of the chemistry and physics of organic aerosols (both primary and secondary aerosols), and the further characterization of anthropogenic and biogenic precursor emissions.

2. The combined use of modeling tools such as CMAQ and inverse-CMAQ modeling, and ambient and satellite measurements to improve estimates of ammonia and elemental carbon emissions should be applied to other pollutants/sources and other areas to demonstrate their wider applicability.

3. ORD is encouraged to leverage its selection of emerging monitoring technologies and methods by selecting the ones that have the greatest potential for widespread use among state and local air quality monitoring agencies.

4. The potential health effects of coarse particles in urban and rural environments should be examined.

The Subcommittee assigned an overall summary assessment rating of Exceeds Expectations for LTG 2. The Clean Air Research Program has been responsive to advice from the SAB, and NRC advice to consider air quality management will be based more on regulating sources of pollutant mixtures rather than regulating individual pollutants. The research program for LTG 2 is exceptional both in the quality of its science and the speed with which it has been accomplished. ORD has launched a multi-pollutant research program and initiated a specific source-to-health outcome study with an emphasis on "near roadway exposures." These multi-pollutant themes are relatively new and it is too early to determine their overall impact on reducing uncertainty in air quality health outcomes. A significant challenge in moving from a framework of managing individual pollutants, one pollutant at a time, to a multi-pollutant approach is reconciliation between the complex multi-pollutant mixture and the pollutant-specific NAAQS. The progress in developing these areas has certainly exceeded expectations. Assessing the health and environmental improvements due to past regulatory actions, sometimes referred to as "accountability," has been evolving with major efforts underway in collaboration with the Health Effects Institute (HEI). Accountability studies to address the impact of regulatory actions on health outcomes remain illusive, but increased interest in the area should stimulate research approaches and improve data resources. ORD's contributions and performance in this area have exceeded expectations.

The recommendations for LTG 2 follow:

1. The Clean Air Research Program should continue to pursue a multi-pollutant approach for both air quality management and research, but formally define the aspects of "multi-pollutant" that are of highest priority and will be pursued in the near term and long term.

2. The program should consider developing a research framework to explore multi-pollutant exposures as they relate to the co-pollutant complex of PM components, ozone, NO_2, and air toxics and the potential positive and negative effects that may result from combinations of these pollutants on health outcomes.

3. More basic research on pollutant mixture exposure needs to be performed to support the design of multi-pollutant-based emission regulations and ambient standards. Because it is apparent that it will not be realistic to set air quality standards for pollutant mixtures or components of $PM_{2.5}$ in the near term, examining the health effect correlations from one or more source categories is a reasonable approach.

4. The program should continue to survey clients and stakeholders on perceptions of and satisfaction with ORD's role in the source-to-health outcomes process.

The general recommendations for the overall program include:

1. ORD should develop a working definition for the term "multi-pollutant approach" as it pertains to the program's LTGs and the expectations of its various stakeholders.

2. ORD should strengthen the Federal Reference Method (FRM)/Federal Equivalent Method (FEM) methods development by ascertaining the state of the measurement science for each NAAQS pollutant ahead of the review cycle, and subsequently initiate intramural or extramural research programs to develop and improve methods as needed.

3. ORD should revise the procedures for designation of an approved instrument method, which will accommodate and provide incentives for the development and introduction of new measurement technologies for air quality monitoring.

4. The planning and resource allocation for the Clean Air Research Program to address research priorities reflecting stakeholder needs is developed through negotiation between the NPD and participating ORD laboratories/centers, which retain budgetary authority. ORD should review the rationale for this management decision and consider a more balanced approach for resource management under the direction of the program.

5. ORD should further evaluate the judicious use of satellite data with existing ground-based measurements before embarking on more extended use of satellite data.

6. ORD should coordinate ammonia and PM emission studies with current industry-funded research on concentrated animal feeding operations (CAFO) sources at various universities.

Clean Air Program Review Draft Report Discussion

Dr. Sayler thanked Dr. Demerjian for presenting the Clean Air Program Review Report and then asked the vettors—Drs. Falk and von Stackelberg—to provide their comments. He mentioned that Dr. Ryan also vetted this report and provided his comments to Drs. Sayler and Demerjian prior to the meeting.

Dr. Falk thought it was a good report—it was well written, easy to follow, and the points were clear. He noted that because the program received a rating of Exceeds Expectations, the comments that are less than laudable really stand out. He noted that in the Executive Summary on page 5 and again on page 18 of the report, there is mention of the program being level funded since 1997. Dr. Falk noted that this represents a steep decline in program resources given inflation. It is not clear if the program exceeded expectations because it was able to achieve its goals despite this significant budget decline. He suggested including some discussion of what has been lost as a result of that budget decline.

Referring to page 3, line 19, Dr. Falk noted the words "One overriding concern is that ORD (and, for that matter, the scientific and regulatory communities) has not yet clearly and formally…." He thought this was rather strong language for a program that received a rating of Exceeds Expectations. Perhaps this sentence could be reworded; he added that the report would benefit from additional detail here. Where the report mentions the need for methods development, it would be helpful to suggest the methods development might be most helpful in advancing the program. With regard to the recommendation concerning resource allocation for the program, Dr. Falk did not think this concern was limited to the Clean Air Research Program and suggested that it be flagged for a broader dialogue beyond this program. He added, however, that he had not seen this come up in other program reviews. Dr. Sayler agreed that this concern was not unique to the Clean Air Research Program.

Dr. von Stackelberg stated that it was a good report. She noticed a few items that she would like to mention. On page 4, line 14 are the words "…stakeholders at the regional level seemed less cognizant of how best to interact with the Clean Air Research Program and how to get their needs met." She did not understand the sentence and asked for clarification. Dr. Demerjian replied that some of the stakeholders who attended the face-to-face review meeting mentioned a mentoring program within ORD that did not work well because it was difficult to get the buy-in of the scientists. He said that it was difficult to balance some of these comments in the report and he is open to any suggestions from the BOSC members. Referring to page 4, lines 30-32, Dr. von Stackelberg thought that the sentence "The BOSC encourages ORD to either strengthen its in-house methods development program or solicit extramural assistance in this area" read like a recommendation. Should this statement be in bold font and listed as a recommendation?

Dr. von Stackelberg thought that the sentence on page 6, line 2, "Ultimately, however, more resources and a higher priority for some areas would have to be instituted to satisfy stakeholders' needs" required further explanation. It leaves the reader wondering about the stakeholders' needs that are not being met. Dr. Demerjian responded that the state representatives were concerned about some needs not being met in areas of monitoring methods development, non-PM exposures and health effects, NAAQS setting, the identification of monitoring techniques for diesel emissions, estimation of emissions from various sources including ammonia, and indoor air issues. Dr. Demerjian acknowledged that the Clean Air Research Program has lost some of the people who had expertise in these areas and has not replaced them. Another issue is the lack of focus on ozone research. The mid-cycle review recommended that ORD rethink the decision to eliminate ozone research; ORD responded that ozone is addressed in the multi-pollutant research. Some of the Subcommittee members were satisfied with that response but others were not. Dr. Demerjian noted that in the 1970s, there was research on every one of the criteria air pollutants but that is no longer the case because of the declining budget.

Referring to the first recommendation on page 9 ("The BOSC recommends that the judicious use of satellite data…"), Dr. von Stackelberg stated that there appears to be a disconnect between this recommendation and the paragraph preceding it, which has nothing to do with satellite data.
Dr. Demerjian replied that there is some verbiage in the main report that could be added on page 6 to solve this problem.

Dr. Demerjian said he had reviewed Dr. Ryan's comments and will address them in the revised report. Dr. Sayler noted that Dr. Ryan was complimentary of the report. He confirmed that there was nothing in

Dr. Ryan's comments that would require Dr. Demerjian to ask the Subcommittee members to rethink any of the recommendations.

Dr. Sayler asked if the Subcommittee had a charge question that focused on efficiency. Dr. Demerjian replied that ORD did include something about effectiveness and efficiency in achieving LTGs and APGs; there is a short discussion on this in the report. He thought it was adequate to satisfy ORD's needs.

Dr. Sayler noted that the report was structured in line with the new report structure that recently was proposed by the BOSC. Dr. Demerjian confirmed that it was, adding that he had to rework the draft report to conform to the new format. He regretted that he did not instruct the Subcommittee members to follow this format from the outset. On the second Subcommittee conference call, Dr. Demerjian reviewed the charge and assigned certain areas to each Subcommittee member. He thought it was helpful to identify their responsibilities prior to the face-to-face meeting. He mentioned that it was very difficult to get the Subcommittee members to focus on the report after the first draft was developed. Most of them seemed to misunderstand the level of effort required as a Subcommittee member and their busy schedules made it difficult to devote the time needed to complete the report. Dr. Demerjian urged future Subcommittee Chairs to inform the Subcommittee members that their work is not concluded until the report is complete and accepted by the Executive Committee.

Dr. Sayler asked about the table of contents. He thought it would include a section on recommendations so that the reader could find them easily. He also mentioned that the BOSC decided to present the recommendations in a table to make them easy for ORD to find and address. Dr. Demerjian said that he did not think there were enough recommendations in the report to warrant a table. Dr. Sayler responded that he thought there was an adequate number of recommendations so he asked Dr. Demerjian to insert a table of recommendations. Dr. Demerjian agreed to do that; he also wanted to wordsmith some of the recommendations.

Referring to the problem of getting the Subcommittee members to complete the report after the meeting, Dr. Philbert asked if there was any way to link their payment to completion of the task. Dr. Demerjian noted that the amount the Subcommittee members are being paid is just a fraction of what they make so linking payment to report completion would offer little leverage. Dr. Philbert suggested informing them of the time commitment and timeline when they agree to serve on the Subcommittee. Ms. Kowalski commented that EPA emphasizes the amount of time required as well as the schedule at the beginning of the member recruitment process. She estimates the time required based on the number of teleconferences, the face-to-face meeting, and the homework sheets submitted by Subcommittee members. She indicated that feedback from the Executive Committee members on these estimates would be welcome.
Dr. Philbert thought Subcommittee members should be told that there will be several rounds of revisions and then review of a final report. Ms. Kowalski replied that the DFOs currently do that informally but perhaps it should be done more formally. Dr. Sayler commented that the longer it takes to complete a report the more difficult it becomes to keep the Subcommittee members engaged.

Dr. Haas said that he liked the roadmap that was prepared by the program for the review. Should that be included as part of the standard review process? Dr. Demerjian noted that it was very helpful. Dr. Haas then asked about the term multi-pollutants. It sounds as if the pollutants are coming from a common source. Is that the case? Dr. Demerjian replied that the term includes pollutants coming from common sources as well as other sources.

Dr. Duke mentioned that there was a summary of the bibliometric analysis in the report. There have been differing opinions about bibliometrics in past reports. Dr. Demerjian responded that Dr. Rogene Henderson was responsible for summarizing the bibliometric analysis results and the Subcommittee used it primarily as an indication of the quality of the science. They did not focus too heavily on the numbers. The Subcommittee members were satisfied with Dr. Henderson's review of the analysis and assessment of quality. This was one task of the team that was assigned to address quality. Dr. Demerjian commented

that each team included a client (e.g., state representative), academician, and at least one additional person. There were three to five members on each team. More team members were assigned if there was a large amount of material to review for that area.

Dr. Giesy indicated that he also like the roadmap and thought it would be a good idea to request those for future program reviews. He noted, however, that the use of the BOSC logo on the top of the document made it look as if it was a BOSC document. He recommended removing the logo from the roadmap for the Clean Air Research Program in the final report.

Dr. Demerjian indicated that he would revise the report to address the comments of the vettors and other BOSC members. He also would prepare a table of recommendations. Dr. Sayler then called for a motion to approve the Clean Air Program Review Report. Dr. Falk moved to accept the report and Dr. Duke seconded the motion. The report was approved unanimously by the BOSC Executive Committee with the changes that had been discussed. Dr. Demerjian asked the vettors and others who had comments to send them to both him and Ms. Kowalski via e-mail. Ms. Kowalski agreed to send Dr. Demerjian the contractor's notes from the meeting as well.

Future Discussion/Future Business
Dr. Gary Sayler, University of Tennessee, BOSC Executive Committee Chair

Dr. Sayler brought up an issue that was discussed on the August conference call—whether Subcommittee members who are not on the Executive Committee should participate in reviewing the mid-cycle progress reports submitted by the programs. He reminded the BOSC members that they had agreed that mid-cycle reviews would be replaced by progress reports. He added that ORD or the BOSC could request a mid-cycle review should either party believe that one was warranted based on significant changes in the program or the progress report submitted by the program. He explained that the Executive Committee members who did not serve on the review subcommittee are not as familiar with the program and would have less insight when reviewing the progress reports. Should one or two members of the review subcommittee be invited to participate in a conference call to review and discuss the progress report?

Dr. Falk asked for some clarification. Dr. Sayler answered that in lieu of the mid-cycle review, the BOSC is proposing that ORD submit a progress report that describes how the program has responded to the recommendations from the last BOSC program review. The progress report would be submitted approximately 2 years after the program review. The Executive Committee will review those progress reports and determine if the program should make any mid-course corrections or if a mid-cycle review is warranted. Because the Executive Committee members who did not serve on the review subcommittee are less familiar with the program, should one or two members of the subcommittee be included in the review of the progress report?

Dr. Philbert said he is in favor of inviting all of the subcommittee members to participate in reviewing the progress report given that it will be conducted by conference call. Dr. Sayler asked if anyone opposed Dr. Philbert's suggestion. Dr. Falk commented that the inclusion of so many additional people in the conference call will require more time for discussion to allow each reviewer to share his/her thoughts. Dr. Sayler responded that the Chair would have to limit the discussion time and ask reviewers to keep their comments concise. The Chair also could request written comments if the discussion time is too limited for all of the reviewers to share their comments. Dr. Falk said it would be awkward to invite the subcommittee members to review the progress report and not give them time to comment. They may want to engage in more discussion and the Executive Committee should allow time for that so that the BOSC is better informed. Dr. Philbert suggested that the subcommittee members should pose questions and offer insights that may elude the Executive Committee members who were not involved in the program review. He did not think the program should be required to respond to the response.
Ms. Kowalski noted that there are a few programs that are nearing their mid-cycle point. Dr. Sayler asked

if there was consensus on inviting the entire subcommittee to participate in mid-cycle progress report conference calls. The members were in agreement with this approach.

Dr. Sayler mentioned that Dr. Giesy had provided a list of suggestions for improving the review process, which were discussed on the August conference call. Are there any other issues to add to that list? When there were no additional items, Dr. Sayler mentioned that Ms. Kowalski and others at EPA are using this input to improve the review process.

Dr. Demerjian pointed out that the subcommittee members are basically volunteers so there is little that the Executive Committee can do to motivate them. Dr. Sayler commented that it helps to keep the process as efficient as possible—the shorter the better.

Public Comment
Dr. Gary Sayler, University of Tennessee, BOSC Executive Committee Chair

At 2:00 p.m., Dr. Sayler called for public comments. When no one offered a comment, Dr. Sayler stated that he had received one comment via e-mail. Basically, the individual did not think that federal agencies were collaborating with one another. Dr. Sayler did not read the comment because of the wording was rather extreme.

Dr. Falk mentioned that the National Institute of Environmental Health Sciences (NIEHS) has a number of advisory boards. Should the BOSC consider including an NIEHS liaison. Has that ever been suggested? Dr. Sayler replied that no such suggestion had been made but the BOSC has invited other agencies to make presentations. He added that the SAB may be serving that role because its focus is Agency wide.

Dr. Falk suggested inviting representatives from NIEHS and CDC to address the BOSC periodically. Collaboration with other agencies/organizations is included in the program reviews so it might be helpful to hear from these agencies once each year to learn more about collaborative efforts. Dr. Sayler said he would add that to the suggestions for future discussions.

ORD Update
Dr. Fred Hauchman, EPA/ORD, Director of the Office of Science Policy (OSP)

Dr. Hauchman explained that he was sitting in for Dr. Kevin Teichman who just got back from a trip to Vietnam where he has been assisting with dioxin issues.

The role of ORD science in supporting regulatory programs on regulatory issues is important. He met with OSP's regulatory support coordinators who coordinate ORD's input for regulatory programs. This is an exceptionally vital function of ORD scientists. Dr. Hauchman sat in on briefings of Administrator Jackson and has observed the tremendous reliance on ORD to make sure that the science is right. More often than not, the Administrator will turn to ORD to see if the science supports the proposed option. This puts pressure on ORD, but ORD's scientists get to weigh in on the issues and it is a very valuable service to the Agency. Dr. Hauchman stated that ORD interacts with the regional offices and has been highly successful in addressing many regional technical and scientific needs through a combination of technical assistance and targeted research activities. ORD has some programs that provide funding for targeted research in each of the regions. The needs of the regions, however, exceed ORD's ability to meet them all.

Dr. Hauchman said that his presentation would cover some highlights of what has been happening in ORD, updates from the NPDs, some information about ORD's transformation, and a few slides on the FY 2010 budget.

Toxicity Testing

ORD is responding to the National Academies report "Toxicity Testing in the 21st Century." This report focused on the future of toxicity testing and its implications for toxicology. NCEA has been looking at the report and is in the process of developing a framework document on the next generation of risk assessment with a focus on how to manage new information. Dr. Hauchman mentioned that the European Union's REACH program will produce a considerable amount of toxicity data that EPA will want to use. The BOSC will certainly hear more about this in the future.

NPDs Update

Mr. Jeff Morris, the NPD for Nanotechnology Research, did a briefing for the Office of Prevention, Pesticides and Toxic Substances (OPPTS) on nanosilver. Dr. Rick Linthurst, the NPD for Ecosystem Services Research, has been busy helping to organize a partnership meeting to enhance coordination of ecosystem partnerships. That meeting will be held October 1-2, 2009. Dr. Alan Hecht, NPD for Science and Technology for Sustainability Research, held a meeting in early September to better coordinate biofuels research. Mr. Randy Wentsel , NPD for Land Research, met with Region V to discuss the allocation of resources to address contaminated sediments. Dr. Audrey Levine, NPD for Drinking Water Research, and Dr. Chuck Noss, NPD for Water Quality Research, just released the latest versions of their MYPs for review by the Science Council. Dr. Hauchman mentioned that there have been some questions about how ORD's transformation will affect future MYPs. As ORD moves toward addressing problems of broad national significance, it is unclear how this will affect the NPDs and the MYPs. Dr. Levine is working with ORD scientists, the Office of Water (OW), the Water Research Foundation, and other groups on a strategic framework for partnerships among these groups to conduct research related to water distribution systems. Dr. Noss has been busy working with OW on the recreational water program. At a workshop held several years ago, ORD and OW identified research needs and much of that research will be completed in 2010. EPA will use the information from these studies in the development of water quality criteria. The Human Health Risk Assessment Program has a number of Integrated Risk Information System (IRIS) assessments forthcoming. The BOSC was briefed on the IRIS process at a previous meeting; basically, a new process has been implemented to shorten the time for an assessment from 4 years to 2 years.

The NPDs will be meeting with the SAB in early November 2009 to talk about the strategic directions for their programs. Administrator Jackson has been invited to attend that meeting.

Title 42 Positions

Dr. Hauchman mentioned that ORD is proceeding with its efforts to identify highly qualified candidates for several key division director positions under the Title 42 authority. These new positions would be in addition to the five or six Title 42 positions that have been filled already in ORD. A number of excellent candidates have been identified.

Dr. Haas mentioned that a National Academy of Sciences committee is conducting an evaluation of the use of the use of the Title 42 hiring authority in ORD. Will that have any impact on these new positions in ORD? Dr. Hauchman responded that ORD is moving forward with the recruitment process while the NAS conducts its study.

ORD Transformation

There has been a lot of activity on the ORD transformation in the past few months. ORD has been working to flesh out a definition of Integrated Multidisciplinary (IMD) Research and to identify problems of broad national significance. Several task forces, which included individuals from outside ORD, have been formed to work on these issues. There was a large workshop held in Charlotte, North Carolina, to

solicit input from ORD staff and managers. The outcomes of that workshop will be discussed at the ORD Executive Council meeting to be held in Cincinnati, Ohio.

ORD Budget

The ORD budget was $547.6 million in FY 2008 and $562.7 million in FY 2009. The ORD budget in the FY 2010 President's budget is $587.2 million. Although there has been a slight increase in resources each year since FY 2008, the salaries of ORD employees increase each year so some of the budget increase is used to cover those rising expenses. Referring to a table comparing the FY 2010 President's Budget Request to the FY 2009 enacted budget by program/project, Dr. Hauchman stated that the budgets for 11 of 13 programs/projects increased, and only 2 decreased (i.e., Homeland Security and Congressional Earmarks).

Dr. Hauchman identified four major new investments for FY 2010:

- ✧ Water Quality–Green Infrastructure (+$3 million)—will assess, develop, and compile scientifically rigorous tools and/or models that will be used by OW, states, and municipalities to more confidently select and apply green infrastructure options.

- ✧ Human Health Risk Assessment–IRIS (+$5 million, 10 FTEs)—will increase the number of completed critical hazard assessments in IRIS by developing and applying computational approaches that incorporate new high throughput toxicity testing data into risk assessment.

- ✧ Computational Toxicology (+$5 million)—will enable EPA to profile the biological activity of up to 200 additional chemicals, including some nanomaterials and pharmaceuticals.

- ✧ Sustainability–Biofuels (+$5 million)—will conduct research to aid decision makers in better understanding the risks and trade-offs associated with biofuel use and production.

Dr. Hauchman provided a status update on the FY 2010 appropriations. The Bill marked up by the House Subcommittee on June 10, 2009, included $10.68 billion for EPA, which is an $84 million increase over the FY 2010 Request. The House Full Committee passed its Bill on June 18, 2009. The House Floor passed the House Bill on June 26, 2009. That Bill included $849.6 million in the Science & Technology account, which is a $7.3 million increase over the FY 2010 Request. The impacts to ORD include an additional $5 million for human health research related to the Children's Health Centers ($2 million) and on the effects of environmental chemicals and toxins on children ($3 million). The Senate Subcommittee marked up its Bill on June 25, 2009. The Senate Full Committee passed its Bill on June 25, 2009. The Senate Committee mark for ORD differs from the House mark by only $5 million—the Senate report does not provide an additional $5 million in Human Health and Eco as provided by the House. ORD's total budget is approximately $592.6 million, which includes ORD's request level plus $5.4 million in resources to fund high-priority research by EPA partners on water quality and availability issues.

Dr. Hauchman said that he expected there would be a continuing resolution but he hoped that ORD would have a budget soon. Dr. Sayler asked about the $849.6 million in the House budget. That number exceeds ORD's budget so what else does it include? Dr. Hauchman replied that he did not know what was included in that budget number. He would have to follow-up on that to get more information. Dr. Philbert asked what was delaying the passage of the Appropriations Bill, and Dr. Hauchman replied that he did not know.

Program Review Process: Status of ORD Review
Mr. Lawrence Martin, EPA/ORD

Mr. Martin explained that he works in OSP, which is the staff office for the BOSC, manages activities for the ORD Science Council, and leads the strategic planning for ORD. He was asked to prepare an internal assessment of the BOSC evaluations of ORD research programs for ORD management. As part of this assessment, he was to identify areas for improvement, provide suggestions for best practices, and suggest a more systematic approach for conducting the BOSC reviews. Mr. Martin was to look at the value of the charge questions in context of the recommendations received from the BOSC and how ORD responded to those recommendations. He also was asked to develop a set of variables that affect the outcomes of the BOSC reviews. The assessment encompassed the charge questions, the information provided to the BOSC for the reviews, the meeting agendas/schedules, and meeting management. He is examining correlations between the charge questions and the recommendations. The final step of the review is to interview the NPDs, discuss the findings, and solicit their input on what worked for their reviews. Mr. Martin said he expects to complete the review by the end of October 2009. He asked if there were any questions.

Dr. Sayler asked if there were any preliminary findings that he could share with the BOSC. Mr. Martin replied that he would prefer to wait until the review has been completed before sharing any of the findings. Ms. Kowalski commented that some common themes have arisen in the review and ORD is working on identifying best practices and ways to improve the efficiency of the review process. The charge questions will be revised to narrow the focus of future reviews.

Dr. Sayler asked if similar reviews are occurring for other FACAs at EPA. Ms. Kowalski responded that she was sure such reviews take place but she did not have any examples to share. She added that it is good management practice to review the process at this point because all of the programs have undergone one or more BOSC reviews. She would like to implement improvements to the process before the next cycle of reviews begins.

Update on ORD Performance Activities for BOSC Program Reviews
Ms. Mya Sjogren, EPA/ORD

Ms. Sjogren stated that she works in ORD's Office of Resources Management and Administration (ORMA). For the past several months, she has been looking at the performance measures currently used by ORD. She reviewed some of the relevant activities that might be of interest to the BOSC.

She mentioned that EPA is co-sponsoring an upcoming Science of Science Policy (OSTP) workshop—"Best Practices in Research Prioritization, Management, & Evaluation Workshop," which will be held October 28-29, 2009 in Washington, DC. The workshop will include practitioners from several R&D agencies who will discuss the good/best practices their agencies apply in regard to R&D prioritization, management, and evaluation. EPA will be highlighting the BOSC review process at that workshop.

EPA sponsored a National Academies study on measuring efficiency for R&D programs. The 2008 report of this study found that expert review panels offer the most effective mechanism for evaluating investment efficiency of R&D programs. ORD has been working with the BOSC to implement this recommendation.

ORD relies on a suite of performance metrics, including the BOSC reviews, partner surveys, decision document analysis, bibliometric analysis, and APMs. The BOSC reviews ORD's programs based on the quality, relevance, and scientific impact of the research. The partner surveys provide stakeholder feedback on the utility of ORD research. The decision document analysis assesses the extent to which partners use ORD research in policy and regulatory decisions. The bibliometric analysis quantifies the

impact and influence of ORD publications in the broader scientific community. APMs track the on-time completion of outputs.

Other efforts include the development of Laboratory/Center/Office (LCO)/ORD Scorecards that are maintained and developed by each LCO. Scorecards assess performance in the following categories: (1) customers—impact on decisions and science, (2) financial—increase resources for core mission, (3) internal—improve management of operations, and (4) learning/growth—improve staff effectiveness.

Ms. Sjogren indicated that ORD is assessing two of these measures: bibliometric analysis and partner surveys. ORD currently uses *highly cited* and *high impact* measures. She has found that these bibliometric measures are not widely used by the ORD program managers. One BOSC review report stated that "…bibliometric analysis is difficult to interpret and understand, especially with the commingling of intra- and extramural publications; this analysis should be modified and improved or discontinued." ORD is looking at some other measures such as co-author analysis and co-location analysis to provide information on how ORD is partnering and leveraging resources. These measures are being tested in a pilot analysis for the Drinking Water Research Program.

Since 2008, ORD has launched six partner surveys and received consistent feedback from its stakeholders on ORD's performance. The NPDs indicate that surveys are not particularly useful. In the Human Health Research Program report, the BOSC recommended that ORD should develop a better partner survey. The report indicated, "the partner survey should be improved so that it is informative or should be abandoned." ORD has decided to abandon the partner survey and further investigate tools for providing stakeholder feedback on the utility of ORD research.

Referring to a table she had distributed, Ms. Sjogren explained that the table shows the drivers behind the five different methods ORD uses for evaluating research. It also identifies ORD's intent to revise the method as well as efforts being taken to improve it. Also in the table are considerations and challenges, and the criteria addressed by the method.

The BOSC reviews are driven internally and ORD is considering minor enhancements to the process. ORD is examining the frequency of the reviews, materials needed, timing of meetings, and other items. The BOSC is an excellent tool for evaluating the quality of ORD research programs.

Partner surveys were developed in response to the Program Assessment Rating Tool (PART) reviews but they are not a formal PART measure. ORD is re-examining the utility of these surveys and has decided to abandon the current approach to surveys. Other customer evaluation methods are being examined. ORD plans to focus on responding to consistent partner feedback before continuing to survey its stakeholders. Partner surveys provided information for assessing the program's relevance.

Decision document analysis (DDA) is driven by the PART reviews. ORD plans to enhance this effort. A more extensive DDA was conducted for the EDCs Research Program and it yielded some interesting information for assessing the program's relevance. The challenge is that these analyses are costly and labor intensive. The cost for the expanded DDA for the EDCs Program was about $32K so ORD is trying to determine if the information is worth the cost or if there are ways to reduce the cost of these analyses.

The bibliometric analysis is driven by PART and ORD is re-examining the use of *highly cited* and *high impact* measures. The Drinking Water Research Program is piloting other types of bibliometric measures (e.g., co-author analysis, co-location analysis). The challenge for these analyses is that standardization and automation is needed in generating the bibliography, which currently is labor intensive. The bibliometric analyses provide information for evaluating the quality, productivity, and outreach of the program.

APMs are driven by the Government Performance Results Act (GPRA). ORD is working to revise these measures. An internal pilot to improve these measures is being conducted for the Homeland Security Research Program. The challenge is that ORD needs to have a strategic plan, annual measures, and performance plans to comply with GPRA. Implementation of a new process will have significant impacts on the laboratories and centers. The APMs are used to assess the productivity of a program.

Dr. Sayler thanked Mr. Martin and Ms. Sjogren for their presentations and asked if the Executive Committee members had any comments or questions.

Dr. Giesy asked about the content of the DDA report. Ms. Sjogren answered that the DDA report identifies decision documents, such as regulations, policies, guidance, etc., that cite the program's publications. The purpose is to identify the use of ORD's publications in rulemaking/regulations, policy, and decision-making by EPA and other federal agencies, state and local governments, international governments/organizations, academia, associations, and others. Ms. Sjogren added that these analyses are labor intensive because the searches are conducted manually.

Dr. Haas asked if ORD had consulted the decision science academic community about the best tools to do this type of analysis. Ms. Sjogren responded that ORD had not done that yet but could follow-up on that suggestion. Dr. Philbert asked about the differences between the DDA and the bibliometric analysis. Ms. Sjogren stated that the bibliometric analysis focuses on percentages of program publications that are highly cited and published in high impact journals; the DDA focuses on the use of ORD publications in rulemaking/regulations, policy-making, and decision-making. In response to a question regarding whether any type of clearance was required to do these analyses, Dr. Chris Saint responded that some decisions are not documented well in the literature and such information is not published in sources that are picked up by PubMed. Dr. Philbert encouraged ORD to automate the process as much as possible. Ms. Sjogren stated that the National Science Foundation (NSF) has offered to collaborate with EPA on a Request for Applications (RFA) focused on a better way to do these analyses.

Dr. Philbert commented that the current method employed for doing these DDAs does not appear to be the most efficient. He and Dr. Haas would like to work with ORD to think about informatics in a more structured fashion. They could work with the contractor and information technology academics to come up with a more integrated, efficient strategy. Dr. Sayler asked Dr. Philbert to send him an e-mail about this offer to assist ORD and he will submit it to Dr. Teichman for consideration. Drs. Philbert and Haas agreed to prepare a brief description of the task and send it to Dr. Sayler.

EPA Science Advisory Board (SAB) Activities

Dr. Gary Sayler, University of Tennessee, BOSC Executive Committee Chair

Three handouts containing the FY 2009 Operating Plan for the EPA SAB, the FY 2009 Operating Plan for the EPA Clean Air Scientific Advisory Committee (CASAC), and the FY 2009 Operating Plan for the EPA Advisory Council on the Clean Air Compliance Analysis were distributed to the BOSC members. Dr. Sayler stated that these tables are the same ones that were distributed at the June 2009 Executive Committee meeting. He noted that the BOSC is invited to participate in any of these activities that interest the Board. BOSC members who would like to participate should contact him so that he can get ORD's approval to pay for the travel expenses. The only condition is that the BOSC member would be asked to report on the activity to the Executive Committee.

Dr. Sayler noted the "Influence Analysis of Uncertainty in Air Pollution Benefits Analysis" activity to be conducted in early 2010 by the Advisory Council on the Clean Air Compliance Analysis. He also mentioned that CASAC has many activities planned for 2010, and a number of these activities intersect with the BOSC program reviews. Several ORD-related activities will be undertaken by the SAB this fall and early 2010. Dr. Sayler said that he is involved in the SAB's drinking water activities and he will report on those efforts to the BOSC.

Dr. Sayler asked Dr. Giesy if he had any comments. Dr. Giesy said that it would be very helpful to get input from Dr. von Stackelberg on decision analysis for the SAB Committee on Science Integration for Decision Making. The SAB committee can learn from what the BOSC Subcommittee has done. It would be great if Dr. von Stackelberg could brief the SAB committee before the members begin interviewing EPA staff members about how they use science. Dr. Sayler said he would offer such a briefing to Dr. Vanessa Vu. Dr. von Stackelberg said she would be glad to brief the SAB committee. Dr. Sayler indicated that he also would bring up the possibility of Dr. Giesy serving as the SAB liaison to the BOSC when he meets with Dr. Teichman.

Future Business
Dr. Gary Sayler, University of Tennessee, BOSC Executive Committee Chair

Referring to the 2009-2010 Workload of the BOSC chart prepared by Ms. Kowalski, Dr. Sayler said that the BOSC will be conducting reviews of the Drinking Water Research Program, Global Change Research Program, Ecosystem Services Research Program, Land Research Program, and Water Quality Research Program in 2010. Dr. Falk has agreed to serve as the Vice Chair for the Global Change Research Program Subcommittee. Ms. Kowalski reported that no DFO has been selected for that Subcommittee yet so there has been no activity on identifying and selecting Subcommittee members.

Dr. Sayler stated that Drs. Duke and Falk agreed to vet the final changes to the NCER Letter Report. He asked them to send him their comments and copy both Ms. Kowalski and Dr. Philbert. Dr. Sayler hoped to finalize that report soon and submit it to ORD. Referring to one of the tables prepared by Ms. Kowalski, Dr. Sayler pointed out that the assignments of the individual BOSC members are listed in the table. He encouraged members to review that table so that they are aware of their responsibilities. He noted that Dr. Haas has agreed to serve as the Chair for the Drinking Water Program Review.

Dr. Sayler noted that it may be necessary to schedule an Executive Committee conference call for late November/early December 2009.

Dr. Giesy said this would be his last BOSC meeting because he will be in China in February and will miss his final meeting. Because he was listed as a vettor for the Comp Tox Letter Report he asked when that report will be available for review. Ms. Kowalski replied that it should be ready before the February meeting. Dr. Giesy said he could review it and send his comments prior to the meeting given that he will not be in attendance.

Dr. Giesy said that he had served on many different boards and the BOSC is definitely one of the best. He added that it had been a pleasure and honor to serve on the BOSC. It is a classy board and does valuable work. He said he learned a great deal from Ms. Kowalski and he thanked her for her support. Everyone at EPA with whom he has worked while on the BOSC has been top quality. Dr. Sayler agreed stating that the enthusiasm of the ORD staff has been amazing. He added that Dr. Giesy has been a very valuable Board member and he hopes that Dr. Giesy will be able to serve as the SAB liaison to the BOSC.

Dr. Sayler then thanked everyone for their participation and adjourned the meeting at 3:41 p.m.

Action Items

- ✧ Dr. von Stackelberg asked the Executive Committee members to send her their comments on the draft recommendations and Decision Analysis Subcommittee Report.

- ✧ Drs. Haas, Philbert, and Duke will serve as vettors for the Decision Analysis Subcommittee report.

- ✧ Dr. Demerjian will revise the Clean Air Research Program Review Report to address the comments of the vettors and other BOSC members. He also will prepare a table of recommendations for the report.

- ✧ Drs. Falk and von Stackelberg and others who had comments on the Clean Air Research Program Review Report to send them to both him and Ms. Kowalski via e-mail.

- ✧ Ms. Kowalski will send the contractor's notes on the Clean Air Research Program Review Report to Dr. Demerjian as soon as they are available.

- ✧ Drs. Philbert and Haas offered to work with ORD to think about informatics in a more structured fashion and to develop a more integrated, efficient strategy. Drs. Philbert and Haas agreed to send Dr. Sayler a brief description of the task to assist ORD.

- ✧ Dr. Sayler will submit this offer to work with ORD on developing a more integrated, efficient strategy for informatics to Dr. Teichman for consideration.

- ✧ Drs. Duke and Falk will vet the final changes to the NCER Letter Report and send their comments to Dr. Sayler, Ms. Kowalski, and Dr. Philbert. Once all of the final changes have been verified, Dr. Sayler will prepare the transmission letter and submit the report to ORD.

PARTICIPANTS LIST

All materials that were transmitted during and for this meeting are in the public meeting binder in the BOSC central files in Washington, DC.

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B·O·S·C

BOARD OF SCIENTIFIC COUNSELORS

42nd EXECUTIVE COMMITTEE FACE-TO-FACE MEETING
AGENDA
Tuesday, September 15, 2009

The Washington Plaza Hotel
10 Thomas Circle, NW
Washington, DC 20005
Tel: 202-842-1300

7:30 a.m. – 8:00 a.m.	Registration	
8:00 a.m. – 8:15 a.m.	Welcome and Introductions - Review of June Meeting Minutes - Review of August Meeting Minutes - Overview of Agenda	Dr. Gary S. Sayler, Chair, Executive Committee
8:15 a.m. – 8:30 a.m.	BOSC DFO Remarks - Administrative Issues	Ms. Lorelei Kowalski, Office of Research & Development (ORD)
8:30 a.m. – 9:00 a.m.	AA/ORD Remarks	Mr. Lek Kadeli, Acting Assistant Administrator for ORD
9:00 a.m. – 10:00 a.m.	Decision Analysis Workgroup - Implementing Decision Analysis Methods	Dr. Igor Linkov, U.S. Army Corps of Engineers; Dr. Cynthia Stahl, EPA Region III
10:00 a.m. – 10:15 a.m.	Break	
10:15 a.m. – 11:30 a.m.	Decision Analysis Workgroup (Cont.) - Workgroup draft product	Dr. Trina Von Stackelberg, Executive Committee
11:30 a.m. – 11:45 a.m.	Subcommittee Updates: <u>Program Review Subcommittees:</u> - Drinking Water Program Review	Dr. Chuck Haas, Subcommittee Chair
	<u>Standing Subcommittees:</u> - National Center for Environmental Research (NCER) - National Exposure Research Lab (NERL) - Computational Toxicology	Dr. Martin Philbert, Subcommittee Chair Dr. Ken Demerjian, Subcommittee Chair Dr. Dennis Paustenbach, Executive Committee
11:45 a.m. – 12:45 p.m.	Lunch	

12:45 p.m. – 2:00 p.m.	Subcommittee Draft Report: (1) Clean Air Program Review Draft Report Presentation - Discussion	Dr. Ken Demerjian, Subcommittee Chair Vettors: Dr. Trina von Stackelberg/ Dr. Henry Falk, Executive Committee
2:00 p.m. – 2:15 p.m.	Public Comment	
2:15 p.m. – 2:45 p.m.	ORD Update	Dr. Kevin Teichman, Deputy Assistant Administrator for Science for ORD
2:45 p.m. – 3:30 p.m.	Program Review Process: - Status of ORD Review - Update on ORD Performance Activities for BOSC Program Reviews	Mr. Lawrence Martin, ORD Ms. Mya Sjogren, ORD
3:30 p.m. – 3:45 p.m.	Break	
3:45 pm. – 4:15 p.m.	EPA Science Advisory Board (SAB) Activities	Dr. George Lambert, SAB Liaison to the BOSC
4:15 p.m. – 4:45 p.m.	Future Discussion/Future Business - EC Meetings in 2010 - Future Work	Dr. Gary Sayler, Chair, Executive Committee
4:45 p.m.	Adjourn	