

39th EXECUTIVE COMMITTEE FACE-TO-FACE MEETING SUMMARY

**U.S. Environmental Protection Agency
Key Bridge Marriott
1401 Arlington, Virginia**

September 18-19, 2008

THURSDAY, SEPTEMBER 18, 2008

Welcome and Introductions

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

Dr. Gary Sayler, Chair of the Executive Committee of the Board of Scientific Counselors (BOSC) called the meeting to order at 2:03 p.m. He welcomed everyone to the 39th face-to-face meeting of the BOSC Executive Committee. He noted that the agenda for the meeting was somewhat compressed and he would monitor the schedule closely to stay on time. He welcomed the three new members of the BOSC—Dr. Melvin Andersen, Dennis Paustenbach, and Katherine von Stackelberg—and mentioned that their biosketches had been distributed with the meeting materials. Dr. Sayler noted that Dr. Rogene Henderson was not in attendance and that Dr. Charles Haas would arrive later. Dr. Martin Philbert would be able to attend only on September 19.

Review of May 2008 Meeting Summary

Dr. Sayler asked the BOSC members if there were any comments on the draft summary of the May 6-7, 2008 Executive Committee meeting. Dr. Henderson had one comment on the summary, which she provided to Dr. Sayler prior to the meeting. Dr. Henderson's comment was to replace the words "nitrous oxide" on page 43, line 41 with "nitrogen oxides." Dr. Clifford Duke asked that "National Council on Radiation Protection (NCRP)" on page 26, line 11 be replaced with GCRP. He also requested the following wording change on page 26, line 41: "there is only one extramural STAR grant planned that deals with nonlinear responses." Dr. Sayler indicated that the word "it" should be inserted on page 28, line 14 prior to "was too long to be included." Dr. Duke requested that the wording on page 28, line 43 be changed to "Dr. Duke abstained because he was the Vice Chair of the Subcommittee."

When there were no additional comments, Dr. Sayler called for a motion to approve the May meeting summary with the requested revisions. Dr. Carol Weiss made a motion to approve the summary and Dr. George Daston seconded the motion. The May meeting summary was approved unanimously by the Executive Committee members.

Overview of Agenda

Dr. Sayler indicated that Thursday's agenda included the remarks of the BOSC Designated Federal Officer (DFO); the Office of Research and Development's (ORD) responses to the BOSC Science and Technology for Sustainability (STS) Research Program Review Report, the BOSC Human Health Risk

Assessment Research Program Review Report, and the National Center for Environmental Research (NCER) Letter Report; and an update on the Science Advisory Board (SAB) activities. Friday's agenda included remarks from the Assistant Administrator, ORD, which were presented by Dr. Kevin Teichman, Deputy Assistant Administrator, ORD; presentations and discussions of the Homeland Security Research Program Review Report and Land Research Program Mid-Cycle Review Report; public comment; updates from the Water Quality and STS Mid-Cycle Subcommittees and the Human Health and Endocrine Disrupting Chemicals (EDCs) Subcommittees; updates from the NCER and National Exposure Research Laboratory (NERL) Standing Subcommittees; presentations on the National Academy of Sciences' (NAS) recommendation for assessing investment efficiency, ORD and value of information, and biofuels; and a discussion of future business.

Dr. Sayler announced that Dr. Deborah Swackhamer would be leaving the BOSC in October because she has been appointed the new Chair of EPA's SAB. Ms. Lorelei Kowalski, BOSC DFO, noted that the news brief on Dr. Swackhamer's appointment was included in the meeting materials. Dr. Sayler also mentioned that although this was Dr. Daston's last meeting as a member of the Executive Committee, Dr. Daston will continue to Chair the Computational Toxicology Subcommittee and has agreed to participate on the Subcommittee conducting the upcoming program review of the Human Health Research Program.

Dr. Sayler asked if there were any questions or comments on the agenda; hearing none, he asked Ms. Kowalski to provide her comments as the DFO.

BOSC DFO Remarks

Ms. Lorelei Kowalski, DFO, ORD, EPA

Ms. Kowalski, DFO for the BOSC Executive Committee, welcomed the BOSC members and other participants to the meeting, and she extended a warm welcome to the three new Executive Committee members. She noted that these appointments became official just a few weeks ago. Ms. Kowalski asked that attendees limit their use of acronyms and jargon for the sake of the new members, explaining that she has yet to hold an orientation call to acclimate them to ORD and its terminology.

Ms. Kowalski stated that the BOSC is chartered as a Federal Advisory Committee and subject to Federal Advisory Committee Act (FACA) rules and regulations. As the DFO for the BOSC Executive Committee, she is responsible for ensuring that BOSC activities comply with FACA; thus, this meeting was open to the public and time was designated on the agenda for public comment. She noted that there was one public comment submitted prior to the meeting, and at the designated time on the agenda, she called for public comments. An ORD contractor, Beverly Campbell from SCG, was 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-2008-0648. The *Federal Register* notice and the agenda were available to the public on the docket. As DFO, Ms. Kowalski ensures that the Executive Committee members receive annual ethics training and complete confidential disclosure forms. She asked members to notify her immediately if any potential conflict of interest arises during the meeting. She indicated that fall is the time of year that the members are required to update their confidential disclosure forms and take the online ethics training. The ethics training for all EPA FACA board members now is available on the BOSC Web site. She reported that the disclosure form has been redesigned, shortened, and simplified. In the past members had requested that the disclosure form be a savable, printable file and these changes make that possible, facilitating future updates. The new forms will make it easier for her to retrieve the forms for those

individuals who serve on more than one FACA board from the DFOs of other boards, as long as EPA has the members' permission to share the information.

Ms. Kowalski mentioned that there have been a few problems with the new *GovTrip* travel system. Troy Rutkofske had wanted to attend this meeting, but his schedule did not allow it. It has been decided that BOSC members will not be required to use the electronic voucher system. Mr. Rutkofske will e-mail the forms to the BOSC members; each member must then print and sign the form and return it to Mr. Rutkofske. This should ensure that members receive their payments sooner.

Ms. Kowalski explained that Dr. George Gray, Assistant Administrator (AA) for Research and Development, was unable to attend the meeting because he was at the ORD Executive Council meeting in Research Triangle Park, North Carolina. Dr. Kevin Teichman attended on Friday and provided the AA's remarks.

Each BOSC member should have received a notebook of materials by mail as well as additional materials at the meeting. Ms. Kowalski distributed a table that listed the activities of the BOSC and its subcommittees. She also distributed a table identifying the current BOSC Executive Committee member activities as of September 12. She noted that the new members had been added to this handout. In addition, she distributed a figure depicting the 2008-2009 workload of the BOSC.

Ms. Kowalski reminded the members and other attendees to sign in at the registration desk if they had not done so already. She noted that the telephone line would be open during both days of the meeting. She asked BOSC members to complete their homework sheets and provide her receipts for any expenditures exceeding \$75.

After concluding her remarks, Ms. Kowalski announced that she will be going on a 4-month detail, beginning October 12, to the General Services Administration (GSA) to work with the policy group that oversees all FACA boards across the Federal Government. This will be a great opportunity for her to see what other agencies are doing and learn more about FACA policies. She plans to return to her current position in February; ORD is working to identify the individual who will be taking over her responsibilities while she is out. Ms. Kowalski mentioned that BOSC members can contact Ms. Heather Drumm if they need assistance while she is on detail.

Dr. Paustenbach asked if the BOSC meetings are recorded and transcribed. Ms. Kowalski responded that the contractor prepares a detailed summary rather than a transcript, which is posted on the BOSC Web Site once it is approved by the Executive Committee and certified by the Chair. She noted that the summaries are a good source of information for members who are unable to attend a meeting.

ORD Responses to BOSC Reports

Science and Technology for Sustainability Report

Mr. Alan Hecht, Sustainability Director, ORD, EPA

Mr. Alan Hecht reported that the ORD response to the BOSC program review report on the STS Research Program had not been completed yet, but he expected it to be finished in the next 2 weeks. He thanked Dr. John Giesy, who chaired the Subcommittee that conducted the review, and the other members of the Subcommittee who put a great deal of effort into the report. There were about 60 recommendations in the BOSC's report and ORD is preparing a response to each recommendation. One recommendation was for EPA to make an effort to derive a clear definition of sustainability and a framework for its application to a broad range of human activities. The ORD response will include a table that identifies the recommendations and the specific response, actions to be undertaken by ORD, and a timeline for those actions. To organize its response, ORD examined the underlying issues for each recommendation and then grouped the 60 recommendations under seven strategic issues; for example, 13 recommendations

were grouped under the first issue. Mr. Hecht identified some of these issues: better define, communicate, and coordinate metrics for the program; better program integration in transitioning from the Pollution Prevention Research Program to the STS Research Program; strategically focus the program on a limited number of areas so it can make a bigger impact; improve collaboration with partners; and identify and communicate the program's impacts. The ORD response should be sent to the BOSC within a few weeks.

Mr. Hecht mentioned that there was a major sustainability summit held on September 17. It was organized by Arizona State University and attended by William Ford, Executive Chairman, Ford Motor Company; Rob Walton, Chairman of the Board, Wal-Mart; Michael Crow, President, Arizona State University; Governor Tim Pawlenty (R-Minnesota); U.S. Representative Edward Markey (D-Massachusetts); and U.S. Representative Fred Upton (R-Michigan). The room was packed and it was evident that sustainability is becoming a high priority. Mr. Hecht commented that sustainability works if three things fall into place: (1) the science and technology to support it, (2) the regulatory framework, and (3) businesses see and seize opportunities. If these three converge, there is movement toward sustainability. He noted that businesses are interested in saving money and EPA wants to achieve environmental compliance and environmental improvements. ORD is trying to consolidate efforts to focus on two key areas: biofuels and green buildings. The Agency is meeting with stakeholders to figure out the research needs for the future. He hopes that by the mid-cycle review in March 2009, there will be some evidence of where the program is heading. There has been a great deal of work on biofuels, which was presented in the biofuels briefing on Friday.

Dr. Sayler asked if Dr. Giesy had any comments. Dr. Giesy stated that it was gratifying to review the program. Despite its small size, the STS Program was doing a lot of work. The program is in transition and clearly changing so it will be exciting to see how it has evolved when the BOSC does the mid-cycle review.

Dr. Paustenbach asked about the size of the budget and the number of people in the STS Program. Mr. Hecht replied that there are about 25 people in the National Risk Management Research Laboratory (NRMRL) and NCER, and the budget is approximately \$20 million.

Dr. Daston said that the program appeared to support technology development. Mr. Hecht commented that the program really focuses on the development of tools (e.g., models) for decision makers. Dr. Daston asked if the program had been thinking about developing new data, new approaches, or new models for dealing with new environmental problems such as pollutants from biofuels. Mr. Hecht responded that one emerging area that the program has examined is the pollutants from nanotechnology. Another effort looking at new technologies is the Environmental Technology Verification (ETV) Program. Mr. Hecht mentioned that the ETV Program has struck a deal with the European Union and Japan to use common verification guidelines. A third area is biofuels. The Agency is moving fast on this area and EPA has statutory authority to do assessments to ensure that the entire biofuels supply chain operates sustainably. He noted that co-products are an issue. Although EPA is focusing on environmental impacts, Mr. Hecht said it does have a role in assessing other impacts.

With respect to biofuels sustainability, Dr. Sayler asked if the Agency used the petroleum standard as a comparative model. Mr. Hecht replied in the affirmative, adding that the Agency compares greenhouse gas (GHG) emissions levels with those from petroleum in 1995. He noted that this is less the case when dealing with material flow balance, which is driven by economics. As the price of gas increases, the issues of efficiency and sustainability become more important.

Dr. Swackhamer asked if there were any recommendations in the report that ORD has decided not to address. Mr. Hecht answered that ORD will prepare a response to each recommendation, but there are some recommendations that the Agency does not agree with and some that conflict with regulations. Therefore, ORD will not be acting on every recommendation. Mr. Hecht added that 60 is a large number

of recommendations and there was some redundancy among them. Ms. Kowalski indicated that ORD welcomes all of the BOSC's comments and appreciates the advice provided by the Board.

Human Health Risk Assessment Report

Dr. John Vandenberg, NCEA, ORD, EPA

Dr. John Vandenberg presented ORD's response to the BOSC Human Health Risk Assessment (HHRA) Program Review Report. He thanked Dr. Daston for chairing the Subcommittee and recognized the other six members of the HHRA Subcommittee. The composition of the Subcommittee was good and there was excellent dialogue among the members.

The Subcommittee members participated in premeeting conference calls to discuss the materials received and to review the process for the face-to-face meeting, which was held November 14-16, 2007. The Subcommittee evaluated the program, prepared a report that was submitted to the BOSC Executive Committee, the Executive Committee reviewed and approved the report on March 2008, and the final report was transmitted from the BOSC to ORD in May 2008.

Dr. Vandenberg explained that the HHRA Program is the interface between the scientists and the program offices. The program does risk assessments, modeling to support the risk assessment process, and Provisional Peer Reviewed Toxicity Value (PPRTV) assessments to assist the Superfund office.

The report offered positive feedback on all aspects—relevance, structure, quality, performance, leadership, collaboration, and outcomes—of the program. The research for long-term goal (LTG) 1 received a rating of meets expectations, research for LTG 2 received a rating of exceeds expectations, and research for LTG 3 received a rating of meets expectations. There were 10 specific recommendations included in the report that were categorized into three areas: (1) planning and implementation, (2) customers' needs, and (3) coordination and communication.

The ORD response to the report includes narrative that identifies the specific comments and recommendations as they appear in the report, the response from ORD on each recommendation, action items for each recommendation, and a timeline for the action items. Also included in the report is a table containing the BOSC recommendations, ORD action items, and a timeline.

Recommendation #1 was to assess program needs in order to increase production of Integrated Risk Information System (IRIS) and PPRTV assessments. The program agrees with the need for more assessments and it would like to expand the number of assessments. Unfortunately, there are procedural and resource limitations that make this difficult. A prime limitation is the extensive review requirements for IRIS assessments and the additional demands on staffing and resources to conduct and respond to these reviews. The Agency is trying to speed up the review process but is concerned about maintaining the quality of IRIS, which is the international gold standard. In April, EPA announced an update to the IRIS process for development of new assessments and reassessments. The HHRA Program is implementing the revised process to meet current commitments and is revising the chemical prioritization and selection process to better reflect client office assessment priorities and associated resource requirements. In addition, an IRIS Update Process is being developed that will include an updated literature search and re-evaluation of the qualitative and quantitative determinations in IRIS assessments greater than 10 years old. Application of new analytical methods will be taken into consideration where appropriate as part of the re-evaluation. The IRIS Update Process will process 8-12 chemical at a time to maximize throughput of updated assessments.

Recommendation #2 was to develop a mechanism for retaining IRIS assessments that are more than 10 years old on the Web site. The program has discussed with the program offices and other interested partners the issue of whether to retain IRIS assessments older than 10 years that have not been updated or to remove them from the IRIS database and Web site. The program decided that older assessments will

remain in the IRIS database and Web site and they will be annotated as to the literature screening results until they are updated by the new IRIS Update Process or the traditional IRIS process.

Recommendation #3 was to continue to develop ties with the National Center for Computational Toxicology (NCCT) and provide formal input. The program agrees with the BOSC's recommendation and is continuing to enhance communication and collaboration with NCCT. A number of such activities are underway, including: (1) National Center for Environmental Assessment (NCEA) management and staff involvement in the development of the ORD Strategy for Toxicity Testing for the 21st Century; (2) formation of an NCEA-lead cross-Agency workgroup on the analysis and application of physiologically based pharmacokinetic (PBPK) models for perchlorate that includes principal scientists from NCCT; (3) NCER scientists serving as internal Agency reviewers of the DSSTox database; (4) NCEA consultations with NCCT staff on the exposure communities of practice workgroup; (5) consultation on benchmark dose methods and models development; and (6) cross-participation in program seminars (e.g., NCCT seminar on the virtual fetus).

Recommendation #4 was to capture HHRA responsiveness to national emergencies and difficult to clean-up sites in the overall framework of the program (capture in the annual performance goals [APGs]). The program agrees that these contributions should be accounted for in a meaningful way within the overall framework of the HHRA Program. HHRA staff expertise will continue to be an integral part of such responses. The program recognizes that it is difficult to fully account for or plan the resources needed to respond to such events or requests within an APG. The current annual performance measure (APM)/APG structure of ORD's multi-year plans (MYPs) is that APGs are major outputs that represent significant and timely milestones along a critical path toward the accomplishment of an LTG and that are planned over several years. The program recognizes the implications of providing this support on staffing and reallocations of resources from key projects. NCEA has started to implement procedures to better track these activities and the resources expended internally. Under its Regulatory and Program Support activities, NCEA currently tracks monthly program office and regional requests for assistance and assignment of HHRA staff to cross-Agency regulatory workgroups. This system is being expanded to include emergency responses. The program also is building closer ties with EPA's Office of Emergency and Remedial Response (OERR) to better respond to emergencies. The HHRA MYP will be updated to account for these activities.

Recommendation #5 was to establish goals for increasing the number of IRIS assessments to meet client needs. The program agrees there is a need to establish goals for increasing the number of assessments beyond that of 16 new IRIS and 50 new or revised PPRTV assessments per year; however, there are process and resource limitations that affect productivity. The program is implementing the revised process to meet current commitments and is revising the chemical prioritization and selection process to better reflect client office assessment priorities and associated resource requirements. The program also is developing the new IRIS Update Process to update IRIS assessments 10 years and older. In addition, NCEA is taking steps to increase the program's ability to produce more PPRTV assessment per year and has initiated significant modifications to protocols for the development of draft documents. The program also is enhancing and streamlining the PPRTV process and evaluating PPRTVs for modification for entry into the IRIS process.

Recommendation #6 was to consider well-developed PPRTVs as sources for IRIS assessments. The program has initiated a process for the evaluation of PPRTVs with sufficient data to develop into IRIS assessments. Two PPRTV assessments (vanadium pentoxide and cobalt) are being evaluated and modified for entry into the IRIS review process. PPRTV assessments also are being evaluated for use in the IRIS Update Process.

Recommendation #7 was to take steps to ensure the transparency of decisions made in the process of performing assessments. As part of the new IRIS process, the program has initiated chemical-specific "listening sessions." These sessions have been conducted for carbon tetrachloride, cerium, beryllium, and

tetrachloroethylene IRIS assessments. Protocols and standard operating procedures for the selection, prioritization, and development of IRIS assessments are available on the IRIS Web Site and the program currently is revising the chemical prioritization and selection process to better reflect the client office assessment priorities and resource requirements. All external peer review meetings are announced in the *Federal Register* and are open to the public. The IRIS Update Process includes both public notification and external peer review by a standing external peer review panel. The Agency's new enhanced National Ambient Air Quality Standards (NAAQS) review process includes jointly sponsored expert workshops and consultation with Office of Air and Radiation (OAR) throughout the process.

Recommendation #8 was to consider recruiting senior scientists, especially for the LTG 2 program. The HHRA Program is actively seeking senior scientists and the program recently recruited Dr. Linda Birnbaum from ORD's National Health and Environmental Effects Research Laboratory (NHEERL). The program also is considering the use of ORD Title 42 authority to hire experts.

Recommendation #9 was to make PPRTVs publicly available for use in hazardous waste site risk assessments and to promote their use as appropriate. PPRTVs are available to the states and other partners involved in waste site assessments and they are provided updates on a quarterly basis. PPRTVs also are being made available to program offices within EPA for screening and prioritization of research needs. In addition, they are being modified where appropriate to support the development of IRIS assessments and evaluated for use in the IRIS Update Process.

Recommendation #10 was to consider information on potential public health concerns of various chemicals as the program prioritizes them for IRIS or PPRTV review. Criteria for the selection and prioritization of chemicals for new IRIS assessments and reassessments have been established and are available on the IRIS Web Site. The IRIS process provides opportunities for public comment and for submission of available data. NCEA is meeting with the program offices and regions to provide more explicit information on the IRIS process and setting priorities. The IRIS Update Process includes consultation with EPA programs, regions, and other federal partners in selection and prioritization. PPRTVs are determined in consultation with the Office of Solid Waste and Emergency Response (OSWER) by frequency and extent of contamination at sites.

Dr. Vandenberg closed his presentation with the next steps for the program. ORD is in consultation with the Office of Management and Budget (OMB) about measures and metrics. NCEA will revise the HHRA MYP to reflect the changes in the program processes, APMs, and metrics. Finally, the program will update the BOSC on its progress in addressing the Board's recommendations at the mid-cycle review of the program in fall 2009.

Dr. Sayler asked Dr. Daston if he had any comments on the ORD response. Dr. Daston thanked Dr. Vandenberg for presenting ORD's response. He stated that the Subcommittee was very impressed with the program and the recommendations were made in the spirit of making a good program even better. Dr. Daston thought the ORD response was thoughtful and thorough. With respect to collaborating with NCCT, Dr. Daston thought the program had made substantial progress, and program involvement in the development of the ORD Strategy for Toxicity Testing for the 21st Century is a good example. He noted that LTG 2 received a higher rating because the Subcommittee was very impressed with what has been accomplished in translating the research into practical tools for assessments. He thought the program's effort to streamline the process was an appropriate approach to increase the number of assessments, but another possibility would be to ensure that the work under LTG 2 is used to streamline the program's assessments. Dr. Vandenberg agreed, adding that the individuals working on those tools are involved in assessments so there is a natural interface to ensure that this integration happens. Dr. Daston thought it may not be possible to capture the involvement of program scientists in emergency response in the APMs, but he stressed the importance of tracking and communicating these efforts. This is an unrecognized contribution of the program that will be remembered by the public and the Administrator. Dr. Daston asked why the ORD response did not address directly the recommendation regarding making the PPRTVs

available to the public. Dr. Vandenberg responded that ORD considered the recommendation and discussed it with OSWER. It was decided that the PPRTVs would not be made available to the public. Dr. Daston said that it would be helpful to hear ORD's reasons for this decision. In closing his comments, Dr. Daston stated that EPA may need to rethink its peer review process because the Agency may be going beyond what is necessary to ensure the quality of the assessments.

Dr. Saylor asked Dr. Vandenberg to elaborate on the decision not to make the PPRTVs available to the public. Dr. Vandenberg responded that he was not entirely certain of the rationale for this decision. Dr. Saylor agreed to pose his question to Dr. Teichman on Friday.

Dr. Lambert asked if the program has been able to determine from the clients how IRIS assessments are being used and how they are changing decisions, regulations, etc. Dr. Daston mentioned that there was a series of testimonials from the regional and program offices at the review meeting. OAR is using IRIS information to support regulation under the Clean Air Act (CAA). It was clear that program office staff members value IRIS assessments; the only criticism was that they need more assessments to help them do their jobs. Dr. Lambert asked if the program could ask IRIS users to complete an evaluation when they use IRIS data that influences a decision/outcome. Dr. Stan Barone from NCEA responded that collecting information from more than nine non-federal users is prohibited by OMB. Dr. Daston pointed out that the program commissioned a consultant to interview IRIS stakeholders about how they were using IRIS assessments. Dr. Lambert thought the program should consider asking its clients to notify ORD when IRIS assessments influence a decision. Dr. Barone mentioned that client use of IRIS values is one of the program's outcomes measures.

Dr. Paustenbach asked if the IRIS review process had been affecting productivity. Dr. Vandenberg replied that the old process definitely affected productivity. It takes a certain amount of time to go through the process. In the new process, the program is trying to streamline some of the steps. For example, under the new process, the program will be creating a document on how it responded to peer review comments. The program also is seeking input earlier in the process, before the public comment step.

Dr. Saylor asked if there is any interaction of the HHRA Program with the Homeland Security Research Program. Dr. Vandenberg responded that an HHRA staff member is involved in the development of Provisional Advisory Levels (PALs). He noted that the Homeland Security Research Program focuses on shorter term acute exposures and NCEA focuses on longer term exposures.

NCER Report

Dr. William Sanders, NCER, ORD, EPA

Dr. William Sanders, Director of NCER, presented the ORD response to the BOSC's letter report on NCER. He thanked the Subcommittee for conducting the review and then introduced Alva Daniels (who joined the meeting by telephone), the new senior science advisor at NCER, who was responsible for preparing the ORD response.

Dr. Sanders stated that his presentation would cover the chronological timeline for the review, the charge questions, the BOSC letter report and recommendations, the NCER responses/actions, and acknowledgements.

The BOSC NCER Subcommittee convened in January 2007, and conducted the review from July to December 2007 through a series of teleconferences and a face-to-face meeting. The BOSC's letter report was submitted to ORD in March 2008, and ORD's final response was provided to the BOSC in September 2008.

The charge question for the review was: What steps can NCER take to more effectively engage the external scientific community to better craft a forward-looking portfolio and meet evolving Agency needs? The Subcommittee responded to the charge question by focusing on three issues: (1) flexibility in addressing emerging research issues, (2) effectiveness of communications, and (3) metrics to measure impacts. Dr. Sanders noted that the BOSC's conceptual approach throughout the letter report is to stimulate innovation and discovery. The BOSC made a series of recommendations to help NCER "...create a proactive research agenda that is responsive to input from a wide variety of stakeholders and scientific experts." The report included 16 recommendations in three overarching themes: priority setting, frontiers, and measuring impacts. Throughout its letter report, the BOSC emphasized "qualitative and quantitative metrics that enable the Center and the Agency to identify and set priorities that stimulate innovation and discovery, assess achievement and impact in traditional areas of research, and determine the wider effects on policy and improvements in environmental quality."

Dr. Sanders articulated a three-fold purpose for the actions of NCER's response: (1) achieving the NCER vision: accelerating transformational science, (2) increasing the relevance of NCER's research portfolio by linking investments to stakeholder identified short-term and long-term research issues, and (3) effectively disseminating research results and information to a variety of audiences. Dr. Sanders then provided ORD's response for each of the recommendations. The first six recommendations were grouped under the theme priority setting, Recommendation #7 through #9 under the theme frontiers, and Recommendation #10 through #16 under the theme measure impacts.

Recommendation #1 was to generate a prioritized list of metrics. NCER believes this recommendation should be addressed by ORD's senior science and management leadership. The BOSC could provide input regarding approaches for developing a prioritization methodology for ORD's research portfolio.

Recommendation #2 was to initiate a dialogue with EPA program offices and with outside stakeholders about what information is most needed for their mission. NCER agrees that ORD should establish a standardized approach for initiating and tracking communication and outreach within ORD, and with program offices and regions. The Center participates in ORD's research planning process led by ORD's NPDs, where research needs are identified and discussed with program and regional offices. ORD Research Coordination Teams (RCTs) develop, plan, communicate, and review ORD's research programs. Once the priority areas are identified, NCER works with the RCTs or other designated EPA staff members to write the Requests for Applications (RFAs). NCER is considering establishing a cradle-to-grave RFA approach for initiating and tracking communication and outreach efforts to ensure that partners are involved in the process throughout the life of the grant.

Recommendation #3 was to fund "meta-research" into value-of-information (VOI) theory, software, and training. ORD currently coordinates a cross-Agency workgroup tasked with identifying available tools and research needs associated with "probabilistic risk assessment," a broad topic that includes VOI and other analytical approaches to address scientific uncertainty. NCER is not the lead on this effort but the Center will continue to work with this workgroup in its efforts to engage the Agency in formal methods to incorporate uncertainty in regulatory decision-making.

Recommendation #4 was to increase NCER's efforts on cross-media, multiple-substance, and life-cycle research. NCER has sponsored cross-media research in recent years. The Centers for Children's Environmental Health and Disease Prevention Research have examined the health effects of a wide range of chemicals, including pesticides, metals, and air pollutants. Other RFAs have looked at the nexus between ecological research and economics and the STAR Global Change Research Program recently funded a number of multi-pollutant projects examining the effects of climate change on air quality, including ozone, particulate matter, and mercury. NCER is planning future RFAs that are cross-media and/or examine the effects of exposure to multiple substances; one example is the upcoming RFA on community-based cumulative risk assessment that will look at multiple chemicals in multimedia across

various age groups and geographic locations. NCER also has developed a number of engineering-based projects involving life-cycle analysis. One example is the research on the life-cycle impacts of biofuels.

Recommendation #5 was to balance NCER's extramural research portfolio by funding some social science, cognitive science, and engineering research. NCER has funded social and cognitive sciences research in the past, but those areas of research have been funded by the National Center for Environmental Economics (NCEE) in the Office of Policy, Economics, and Innovation (OPEI) since FY 2008. NCEE has incorporated this body of research into its Economics and Decision Sciences Program and intends to continue funding research in these areas. NCER has and will continue to fund engineering research through the Small Business Innovation Research (SBIR) Program, the Technology for a Sustainable Environment (TSE) Program, and the Drinking Water Program (water infrastructure sustainability).

Recommendation #6 was to consider using an unsolicited grant submission process to encourage the generation of relevant scientific questions that do not match the exact wording of existing RFAs. Historically, NCER has not supported the funding of unsolicited proposals. NCER's mission is to support research grants and fellowships in numerous environmental science and engineering disciplines through a competitive solicitation process and independent peer review. An unsolicited grant submission process would be inconsistent with the overall NCER mission and EPA's policy to promote competition to the maximum extent practicable in the award of assistance agreements. The Agency's Competition Order places restrictions on funding assistance agreements that are not competed. Any assistance award made in excess of \$15,000 must be competed.

Recommendation #7 was to use the "grant summaries" and "state-of-the-science papers" to begin a dialogue about important gaps in decision-relevant information with EPA decision-makers and external scientists. ORD has found that it is much more productive for the program and regional offices to discuss important gaps in decision-relevant information with ORD collectively. NCER has and will continue to engage in these communications. The NCER Director will work with NPDs to host "futures" discussions using not only NCER science summaries, but other relevant science assessments. NCER also will continue to hold sessions at scientific society meetings to discuss key findings and emerging science issues.

Recommendation #8 was to seek input on possible emerging areas of science from a broader community of stakeholders, not simply from funded scientists. NCER agrees that this is critical and the Center's project officers interact with scientists engaged in cutting-edge research at professional conferences. These efforts could be enhanced further by project officers chairing sessions at professional meetings that would focus specifically on seeking input for new RFAs. NCER also engages the greater community of stakeholders by holding national workshops, issuing RFAs with other agencies, and collaborating with and seeking input from other federal agencies, international organizations, nongovernmental organizations, industrial corporations, and media organizations.

Recommendation #9 was to revitalize the Exploratory Grant mechanism and expand it considerably from its current sole focus on nanotechnology. Prior to 1995, EPA's research grants program was described as entirely exploratory research. NCER's initial exploratory research RFAs were in broad areas such as "chemistry" and "human health." More recently, NCER has tried to focus exploratory RFAs on emerging topics. For the past 3 years, the exploratory program has been devoted almost entirely to nanotechnology research. As nanotechnology moves from being an exploratory effort to its own program, options to reinvigorate the program are being explored by an NCER workgroup. This workgroup may consult with outside advisory groups (e.g., SAB, BOSC) for input on new topics for exploratory research.

Recommendation #10 was to expand the use of bibliometrics to analyze citations to identify audiences and estimate use of research results by other scientists. NCER has the lead for conducting bibliometric analyses of all ORD research programs. NCER agrees that the use of bibliometrics should be expanded

and adapted to stay on the cutting edge of using citation analyses as a metric. Advanced bibliometrics is, however, expensive and resource intensive. Therefore, identification of audiences and determining how citing researchers are using the results can only be considered on a very limited basis using very small subsets of data despite the fact that using small sample sizes can invoke arguments of accuracy and statistical defensibility. NCER will continue to conduct audience analyses on a limited basis to assess whether the results would be statistically relevant. NCER also will analyze a small subset of the citing universe to make a limited determination of how the research results were used. NCER will re-explore the viability of adapting existing COTS text mining software, such as Attensity, to help automate this type of analysis, and experiment with affiliation analysis of co-authors to determine whether that is a relevant indicator of collaboration activities. In addition, NCER is researching the use of additional bibliometric parameters (e.g., H-Index, Scopus-Scimago, Mathew value, publication rates, Google Scholar Page Rank) for inclusion in bibliometric analyses.

Recommendation #11 was to expand the use of datamining tools to connect research with immediate outcomes. NCER has developed a tool that allows batch searching of a program's publications within the EPA dockets and Web Inventory. The output from this tool then is manually culled to identify program office publications and policy or rulemaking documents citing ORD publications.

Recommendation #12 was to develop case studies of how research funded by the Center facilitates change in tangible indicators of environmental performance (results) in addition to how the research is cited, read, and otherwise increases knowledge. NCER has begun internal discussions to develop a template for producing "case-study" and "summary analysis" documents that interpret NCER/ORD research results and present the findings in a user-oriented format for a variety of audiences. Initial target programs include linking ecological assessment indicators research funded through the STAR's Ecological Research Program with ecological condition indicators identified in EPA's 2008 Report on the Environment.

Recommendation #13 was to consider implementation of user/client interviews to collect impact feedback. ORD conducts biennial partner surveys for each of its major research programs. Because NCER's research supports the goals of ORD's research programs, it is included in the research assessed as part of ORD's program-level partner surveys.

Recommendation #14 was to consider the use of expert reviews to assess broad scientific impact and program success. NCER research programs have been the subject of a number of expert panel reviews by the National Research Council and the SAB. In the future, NCER will seek evaluation of its more "independent" program areas (e.g., there are plans to conduct an evaluation of the Fellowships Program in 2009).

Recommendation #15 was to consider implementation of cost-benefit analyses to measure return on investment (ROI). NCER is in the process of completing an ROI analysis of its research portfolio encompassing the past 5 years of grants research activities and its Fellowships programs. The initial analysis will focus on NCER's research activities, but will be expanded to include ORD's intramural research activities and associated productivity levels as well in the future.

Recommendation #16 was to use a broader approach than currently is used to demonstrate the links between NCER research and other approaches beyond rulemaking. NCER might experiment with lengthening the time horizon for the bibliometric analysis and monitor whether NCER funded research has/is resulting in changes in science and engineering. NCER will request information on patents as well as revenues associated with sales, licenses, and other commercialization success from SBIR awardees. NCER also will track investments in SBIR technologies by venture capital, angel investors, and other partners. The Center will expand communicative interactions with the program and regional offices as well as outside stakeholders to gain a better understanding of linkages between their respective missions

and NCER. The Center also hosts regional meetings and workshops that focus on communication of those STAR results that impact the specific region.

Dr. Sanders thanked the Subcommittee members for their efforts in conducting the review and said he was looking forward to working with the Subcommittee again on the next charge question. He noted that NCER has a unique position in ORD. It conducts research across the risk paradigm and shares and collaborates with all the other laboratories and centers. Since he was appointed the NCER Director, Dr. Sanders has been able to hire a Deputy Office Director, a Chief of Staff, an Executive Assistant, a Senior Science Advisor, and a Division Director. This has given him the opportunity to re-shape NCER's organizational culture and establish a new vision.

Dr. Sayler asked Dr. Sanders how it will be possible to revitalize the exploratory research program without additional resources. He added that there are some research programs that currently have no STAR components because of lack of resources. Dr. Sanders replied that he would like to see the exploratory program fund investigators who probably would not get funded through the old system. He is hoping that these investigators have some bright, new ideas that may yield more results for EPA. Dr. Sanders wants to talk to the NPDs about research gaps that could be addressed by these grants. Dr. Sayler asked Dr. Sanders how the BOSC Subcommittee can help the Center. Dr. Sanders replied that he is drafting a charge question for the Subcommittee on accelerating transformational science.

Dr. Andersen said he was surprised at how many positions Dr. Sanders was able to fill once coming to NCER. Why were there so many openings? Dr. Sanders responded that a reorganization had been in the works for 2 years when some senior managers left the Center. When the decision was made to flatten out the organizational structure, five smaller divisions were formed. The organizational change had to be finalized and approved before the positions were filled.

Dr. Andersen asked if specific research needs are communicated to NCER for incorporation into RFAs. Dr. Sanders replied in the affirmative adding that NCER can issue RFAs to address a new area that ORD needs to expand into or to bring on board needed research while the laboratories are gearing up to address an area; for example, ecosystem services research started with NCER. The Center can issue an RFA that looks at how to use computational toxicology data to fund research that will teach the Agency how to use such data.

Dr. Henry Falk noted that Recommendation #3 through #7 identify six or seven new departures. Is that too large of a number to deal with all at once? Dr. Sanders replied that NCER already is dealing with all of these areas so he did not think it was too many. The one exception is social science research, which now is being done by NCEE. Dr. Swackhamer expressed her concern about this change. She thought it was an odd decision given all of the external advice EPA has received about bringing in social scientists to inform other ORD scientists. Is there a formal mechanism to fund socioeconomic research? Dr. Sanders responded that the RFAs to fund this research will come through STAR and NCER will be responsible for the peer review. He hopes to leverage the funding NCEE designates for STAR grants. He also has not abandoned his plans to hire a social scientist, but he has to work within the FTE ceiling. The social scientist could inform the teams working on the various RFAs issued by NCER.

Dr. Swackhamer asked if there was an effort to do bibliometric analyses at a higher level within EPA. Dr. Sanders responded that he was not aware of any efforts outside of ORD. All ORD programs are using bibliometric analysis so it is necessary to explore ways to do more on smaller subsets of publications. Dr. Sanders asked Ms. Daniels if the program offices were doing bibliometric analyses. Ms. Daniels replied that she did not think so.

Dr. Lambert commented that NCER should require each grantee to write a section on the outcomes of his/her research. Dr. Sanders said that NCER is trying to add language to the RFAs to request such information. Workshops are a great venue to discuss outcomes and new research directions. Dr. Lambert

mentioned that quarterly meetings of investigators might be helpful. Dr. Sanders agreed, stating that NCER has been using Webcasting to reduce the costs of such meetings.

Dr. Sayler thanked Dr. Sanders for presenting ORD's response and for answering the BOSC's questions.

SAB Activities

Dr. George Lambert, SAB Liaison to the BOSC

Dr. Lambert explained that he is the liaison to BOSC from EPA's SAB. He mentioned that Dr. Henderson is a member of the SAB and Dr. Swackhamer has been appointed the new SAB Chair. Dr. Weiss asked Dr. Lambert to explain the differences between the charge to the SAB and the charge to the BOSC. Ms. Kowalski responded that both of these boards have mission statements that are posted on the Web. The SAB is coordinated in the Office of the Administrator and it provides reviews of various work products for the entire Agency, including some ORD products (e.g., Sustainability Research Strategy). The BOSC was established in 1996 and its role has evolved since then to a more technical review role. The BOSC focuses solely on ORD programs and products. The SAB does not do the comprehensive program reviews that are undertaken by the BOSC. The SAB reviews the EPA budget; therefore, the BOSC does not focus on the budget. Ms. Kowalski also pointed out that there is a substantial difference in size and resources between the SAB and the BOSC. The SAB has 30 members, numerous standing committees and ad hoc committees, and a support staff of 19; the BOSC has 15 members, only 3 standing subcommittees, and a support staff of 3.5 FTEs.

Dr. Demerjian asked about the Clean Air Science Advisory Committee (CASAC). Dr. Swackhamer replied that the SAB oversees the efforts of many standing boards/committees. CASAC's role is focused on NAAQS. The SAB does not review the products of the CASAC. The Chair of CASAC is a member of the SAB. The SAB provides advice and guidance to the EPA Administrator. It responds to requests for reviews from the Agency and can undertake other projects to provide unsolicited advice to EPA.

Dr. Paustenbach asked about SAB's views on interactions with the BOSC. What does the SAB want the BOSC to provide? Dr. Swackhamer responded that the SAB would like to have more input from the BOSC. In reviewing the budget, the SAB evaluates programmatic content on a very high level; the BOSC evaluates the programs on a much more detailed level. The BOSC program reviews have been very helpful to the SAB. She noted that because the SAB deals with a broader set of questions, the SAB reviews can be useful to the BOSC.

Dr. Sayler agreed that the BOSC reviews can have significant impacts on the programs. For example, the BOSC can recommend that a program change its LTGs, APMs, or APGs. This role is unique to the BOSC, but the SAB can use that information in its reviews.

Dr. Falk noted that the SAB activities list includes several ORD products, including Strategic Directions of EPA's Research and Development Program. Dr. Swackhamer commented that Dr. Granger Morgan, SAB Chair, wanted to add value to the process of determining future directions for EPA research and provide advice that will help the Agency identify those new directions.

Dr. Lambert stated that the SAB will be meeting October 27-28, 2008 in Washington, DC. The first day of the meeting will be a workshop that covers two topics—one on biofuels and one on epigenomics research. The purpose of the workshop is to bring in outside experts to discuss these issues to stimulate SAB thinking about priorities for addressing these critical environmental problems with an integrated approach to interdisciplinary science and research. The speakers' biosketches were included in the meeting materials. Dr. Lambert noted that BOSC members are welcome to attend the meeting. Dr. Sayler commented that the BOSC cannot pay everyone to attend the meeting, but could pay for one member to attend and then provide a report on the meeting to the Executive Committee at the February BOSC meeting. Dr. Duke agreed to attend the meeting and cover the biofuels discussion.

Dr. Lambert mentioned that the budget meeting is usually held in February. Dr. Swackhamer commented that at last year's budget meeting, the SAB met with all eight NPDs, their key staff members, and a few representatives from the program offices. Dr. Teichman has been a key player in these meetings. Dr. Swackhamer noted that the SAB is interested in involving the BOSC in these meetings. She pointed out that the president's budget probably will not be ready until April so there may not be a review of the annual budget in 2009. Dr. Falk thought it would be beneficial to have the BOSC involved in those meetings with SAB. Dr. Sayler agreed, adding that EPA is working on making that happen.

Referring to the FY 2008 Operating Plan for the EPA SAB, Dr. Lambert pointed out a few items that might interest the BOSC, including the Report on the Environment 2007, the Ecological Research Program Strategy and MYP, and the Strategic Directions of EPA's Research and Development Program. The Particulate Matter Research Centers review is scheduled for October 1-2, 2008, in Washington, DC. Dr. Lambert encouraged the BOSC members to inform Dr. Sayler and Ms. Kowalski if they are interested in a particular review activity. Dr. Haas said that he would like to be involved in the Microbial Risk Assessment Guidance Document review planned by FY 2009.

Dr. Lambert mentioned that the FY 2008 Operating Plan for the EPA CASAC was provided in the meeting notebook. Dr. Swackhamer pointed out that the report on the Ecological Research Program Strategy and MYP should be available by October 28. Dr. Sayler noted the review of the Anthrax Technical Assistance Document. He would like to attend that review but will be in China. Dr. Haas said he would be interested in that review. Dr. Swackhamer mentioned that the Homeland Security Advisory Committee is a standing committee of the SAB.

When Dr. Sayler asked for additional comments, Ms. Kowalski reminded the members to review the handout on investment efficiency, which is a topic on Friday's agenda. Dr. Sayler noted that the CD in the notebook contains the reports that were discussed at the meeting today. He reminded the members that the morning session begins at 9:00 a.m. When there were no additional comments, Dr. Sayler adjourned the meeting at 5:05 p.m.

FRIDAY, SEPTEMBER 19, 2008

Opening Remarks

Dr. Gary Sayler, Chair, BOSC Executive Committee

Dr. Sayler called the meeting to order at 9:00 a.m. He asked the members and other attendees to sign in at the registration desk if they had not done so already. He also reminded the members to submit their travel forms to Ms. Kowalski before leaving if possible.

AA/ORD Remarks

Dr. Kevin Teichman, Deputy Assistant Administrator for ORD

Dr. Teichman said he would be providing the AA/ORD remarks for Dr. Gray who could not attend the meeting. Dr. Teichman noted that Dr. Gray had a very busy week testifying at two hearings on Capitol Hill—the Oversight Hearing on EPA's Children's Health Protection Efforts on Tuesday and Science Under Siege: Scientific Integrity at the Environmental Protection Agency on Thursday. Dr. Gray's testimony at these hearings is available on the Web (for the Children's Health Protection Hearing, go to http://epw.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore_id=d58b3b66-b596-488a-bcf3-7667dd7b01ed for the Scientific Integrity Hearing, go to http://energycommerce.house.gov/cmte_mtgs/110-oi-hrg.091808.ScientificIntegrityEPA.TestimonyGray.pdf).

Dr. Teichman attended the awards ceremony in Research Triangle Park yesterday. He was pleased to announce that ORD received more EPA-wide awards than ever before.

Dr. Teichman welcomed the three new BOSC members and noted that this was the last meeting for Drs. Daston, Henderson, and Swackhamer. He thanked these members for their service to ORD and the strong contribution they have made to the BOSC. Although he is leaving the Executive Committee, Dr. Daston will continue to serve as the Chair of the Computational Toxicology Subcommittee. Both Drs. Swackhamer and Henderson also will continue to serve EPA in an advisory capacity. Dr. Swackhamer has been appointed the new Chair of the SAB, and Dr. Henderson will continue to serve as a member of CASAC. Dr. Jonathan Samet will replace Dr. Henderson as the Chair of CASAC.

Dr. Fred Hauchman, who will be making a presentation on ORD and value of information later today, has been selected as the new Director of the Office of Science Policy (OSP).

Since the last Executive Committee meeting, the BOSC submitted three reports to ORD—the NERL Letter Report (June 2008), the Computational Toxicology Letter Report (September 2008), and the Global Change Mid-Cycle Review Report (September 2008). ORD will prepare responses to these reports and present them to the BOSC at the February meeting. Yesterday, the BOSC was presented with ORD's responses to the HHRA Program Review Report and the NCER Letter Report. The response to the STS Program Review Report will be finalized in 2 weeks.

In May, Dr. Gray distributed the final principles for ORD staff. He carries a copy of these principles in his wallet, which is a testament to his commitment to the principles.

The seventh EPA Science Forum was held May 20-22, 2008, in Washington, DC. This forum focused on innovative technologies as the key to environmental and economic progress. In conjunction with the Science Forum, the winners of the Science and Technological Achievement Awards were honored with a reception on Capitol Hill and the 2008 Report on the Environment (ROE) was released. Dr. Swackhamer chaired the SAB committee that reviewed the report.

ORD has been active internationally since the May meeting. Dr. Teichman accompanied Dr. Gray to China to discuss plans for science and technology collaboration. They met with China's newly formed Ministry of Environmental Protection and discussed numerous topics including water protection, technology innovation, communities research, and the People, Prosperity, and the Planet (P3) Program. (P3 provides grants to innovative undergraduate teams around the country to conduct research and develop designs for scientific, technical, and policy solutions to sustainability challenges.) Dr. Teichman reported that China is interested in creating a P3 Program, possibly in conjunction with EPA ORD.

Dr. Teichman recently visited Vietnam to work on the issue of Agent Orange contamination in that country. There is dioxin contamination associated with former Air Force bases, and ORD is talking with the Vietnamese about how to clean up those sites. There are two task forces involved with this effort—one, which is led by EPA, focuses on environmental issues, and the other, which is led by the Centers for Disease Control and Prevention (CDC), focuses on health issues. The health task force is working on developing a birth defects registry and improving prenatal care and early childhood surveillance in Vietnam. These efforts were mentioned at a press conference yesterday, during which the Ambassador announced that this is the most positive interaction between the United States and Vietnam on the Agent Orange topic in years.

The FY 2009 President's budget is on the Hill but it is very unlikely that a budget will be approved before April. The government probably will be operating on a continuing resolution to allow the new administration to revise the budget in accordance with its new priorities.

In response to many concerns, the Headquarters Library as well as those in EPA Regions 5, 6, and 7 will reopen September 30, 2008.

ORD has initiated a senior leadership development program to mentor candidates to be high-performing senior officials to ensure that ORD will have well-qualified future leaders.

Dr. Teichman was pleased to announce that EPA was one of three government agencies that received a green rating on the President's Management Agenda scorecard. Dr. Teichman noted that the BOSC deserves credit for boosting the Agency's effective management of research. Also contributing to this scorecard rating is ORD's administrative efficiency project, which consolidates personnel, travel, and other administrative support activities in an effort to trim administrative costs and maximize the dollars available for science. He noted that Phillip Juengst from ORD's Office of Resources Management and Administration (ORMA) will be discussing the NAS recommendations for assessing investment efficiency later today. Mr. Juengst is working to ensure that the performance metrics for ORD programs are measurable. Dr. Hauchman will give a presentation on value of information concepts and how they could be used to improve ORD's prioritization of research efforts to achieve environmental results.

Dr. Sayler asked if there were any questions for Dr. Teichman. Dr. Paustenbach asked Dr. Teichman to identify the four big challenges facing ORD in 2009. How can the BOSC help ORD address these challenges?

Dr. Teichman responded that the buying power of ORD's budget has gone down because of inflation and increased costs. This problem must be addressed, and it is the reason that ORD undertook the administrative efficiency project to ensure that resources are being used as effectively as possible. ORD also must ensure that it is working on the right science. Some efforts should be sunseting as ORD takes on new topics. Two challenges include biofuels and their environmental impacts and climate change. ORD must be cognizant of the work being done by other agencies and industry and focus its research on what ORD is best capable of doing. EPA is the only agency with scientific expertise that covers source to outcome. The Agency must use this expertise to ensure that ORD is doing the right science and doing it right. ORD must find ways to do its work better; there is more accountability than in the past.

Dr. Paustenbach asked if the BOSC is provided a pie chart that shows how the ORD budget is allocated among programs. In the individual program reviews, the BOSC is looking only at one slice of the pie. It might be helpful to look at that slice in context of the entire budget. Dr. Teichman commented that the SAB takes on the task of looking at the allocation of ORD's budget. He makes a presentation to the SAB that describes the changes in the ORD budget from the previous year. The BOSC may become more involved in this process in the future.

Dr. Paustenbach expressed concern about the claims that the morale of EPA scientists is very low because they have experienced budget reductions and have been unable to speak their minds. Does ORD ensure the kind of "academic freedom" that is needed to make the researchers successful? Dr. Sayler commented that the program reviews allow the BOSC members an opportunity to see the scientists' morale and enthusiasm first hand. His experience has been that the ORD scientists are very enthusiastic and committed to their research. He has not seen evidence that morale is low within ORD. Dr. Paustenbach said he was impressed with the two BOSC reviews in which he participated. Has anything changed in the last 2 years to impact the morale? Dr. Sayler replied that he has observed that ORD staff members are very committed to the mission of the Agency and their overall satisfaction does not appear to have changed in the past 2 years. Dr. Teichman added that ORD scientists are free to publish their opinions as long as the publication includes a disclaimer that these are the opinions of the scientist and not the Agency. This approach ensures academic freedom within the Agency. Dr. Teichman noted that sometimes scientists need to be reminded that science is not the only factor that drives a policy decision. ORD scientists are excited about telling the BOSC about their research because they believe they are making a difference that is improving public health and the environment. Dr. Falk suggested that it would be helpful for the BOSC to receive information on ORD's budget allocation even if the Board is not asked to comment on it. Dr. Teichman agreed to provide the presentation that he gave to the SAB to the BOSC members. (Ms. Kowalski sent the presentation to the BOSC members on October 10, 2008.)

Dr. Demerjian asked if ORD considers the impact of earmarks on its budget. Both presidential candidates are saying they will eliminate earmarks. Will this have a positive or negative effect on ORD's budget? Dr. Teichman responded that earmarks typically result in an increase in the ORD budget; however, because there usually is a general reduction in the president's budget, ORD often experiences a net decrease. ORD tries to allocate its resources to address the research that best meets its mission; earmark offsets often require ORD to readjust these allocations.

Dr. Teichman wanted to address some of the questions that were posed during the meeting yesterday. One of the questions concerned the use of bibliometric analyses across the Agency. The first bibliometric analyses were conducted by NCER in an effort to determine the value of the extramural research funded by the Center. Now, ORD is doing these analyses on both intramural and extramural research publications. Therefore, ORD has turned to ORMA to coordinate this effort and to standardize it across ORD. Within ORD, bibliometrics is an important measure of performance, but it is not the only measure.

With respect to PPRTVs, EPA has not made these assessments available to the public in the past. The reviews of these assessments are not as rigorous as for the IRIS assessments, and the applicability of PPRTVs tends to be narrower. PPRTVs are intended for Superfund applications, and the Agency is concerned that they will be used for other purposes and a sloppy individual user could use the PPRTV assessments for the wrong purpose. Nevertheless, because ORD values the BOSC's advice, this recommendation will be reconsidered by ORD and OSWER.

Dr. Swackhamer asked Dr. Teichman to comment on the role differences between the SAB and the BOSC. She also asked him for his view of the NCER reorganization. Dr. Teichman said that he did not review the NCER reorganization but he believes that the Center is taking steps to rearrange itself to maximize NCER's scientific contribution while minimizing administrative costs. With regard to the differences between the SAB and the BOSC, the SAB helps EPA do the right science and the BOSC helps ORD do the science right. Dr. Teichman thinks there should be more collaboration between the two boards. More BOSC input on the budget discussion is needed, and the BOSC can help the SAB understand how the science is being done.

Dr. Lambert asked about the timeline for the budget discussion. Dr. Teichman replied that the discussion usually takes place in January but with the administration change, there will be a delay in putting forth the president's budget. Therefore, he was not certain when the SAB would be reviewing the annual budget. He did, however, want to get SAB input on the future budget directions. This could take place in December if that fits in with the SAB's schedule.

Homeland Security Research Program Review Report

Dr. Gary Saylor, Chair of the Homeland Security Research Subcommittee

Dr. Saylor explained that the National Homeland Security Research Center (NHSRC) was created as a virtual center following the terrorist attacks of September 11, 2001. It became a permanent Center in 2004, and this was the first BOSC review of the program. The nine-member Subcommittee included risk assessment, military, systems analysis, water resources, environmental engineering, and chemistry experts. The Subcommittee divided into two groups of four members each, and each workgroup was assigned the responsibility for addressing the charge questions with respect to one of the two program's LTGs. Because the workgroups contained less than one-half of the Subcommittee members, the workgroup members could meet to discuss the charge questions without being subject to the requirements of FACA. Dr. Saylor mentioned that Greg Susanke served as the DFO for the Subcommittee.

The charge questions for the review focused on relevance, structure, quality, leadership, communication, performance, and efficiency. The questions were evaluated by the LTG workgroups and were collectively discussed as responses of the entire Subcommittee. Both LTG research programs are

structured around the thematic areas of protection, detection, containment, and remediation. The LTG workgroups performed a detailed analysis of the thematic research, evaluated strengths, weaknesses, and gaps and formulated recommendations. The Subcommittee reached consensus on the qualitative ranking of “meets expectations” for each LTG and the program as a whole. The Subcommittee did not have enough information to adequately assess program performance and efficiency.

The two LTGs of the Homeland Security Research Program (HSRP) are:

- ✧ LTG 1: The Office of Water (OW), water utilities, and other clients use homeland security research products and expertise to improve protection from and the capability to respond to terrorist attacks on the nation’s water and wastewater infrastructure. (Water Security)
- ✧ LTG 2: OSWER and other clients use homeland security research and program products and expertise to improve capability to respond to terrorist attacks affecting buildings and the outdoor environment. (Building and Outdoor Environments)

The research program developed an event chronology (see table below) that summarizes the comparative role and responsibility of both LTGs in responding to an event.

Event Chronology	EPA responsibility for providing guidance methods and tools	
Protect Against Attack	LTG 1	NA
Monitor, Detect, and Confirm CBR	LTG 1	LTG 2*
Minimize Public Exposure	LTG 1	LTG 2
Characterize the Nature and Extent of Contamination	LTG 1	LTG 2
Assess Human Health Risk and Establish Cleanup Goals	LTG 1	LTG 2
Cleanup	LTG 1	LTG 2

* A responsibility shared with other agencies.

The Subcommittee was very impressed by the spirit and enthusiasm of the EPA staff and managers. The HSRP is a focused but complex research program that is well structured. It is a young program with relatively little output to the scientific literature. The general quality of the research is good and some outputs such as standardized analytical methods (SAM) have great utility and can be harmonized across the states and regions. Scientific and research leadership is evident and for a relatively young program suggests great promise for future contribution. The research program is meeting client needs but it is not yet clear that outcomes are manifest. Efforts to interface with the end user community and the public are excellent but continued improvements to meet end user needs are needed and anticipated. The Subcommittee found it difficult, at this point, to truly evaluate efficiency particularly for investments in modeling new products versus historical products. To address next generation needs and requirements, further consideration needs to be given to a longer-term research program, which may include STAR activity and outside research collaborations. There is an apparent need for operational input throughout the life cycle of the research projects. Generally, the program has been responsive to previous NAS and SAB review recommendations, with some exceptions. The timeliness of some products reaching end users may be problematic.

Dr. Sayler summarized the Subcommittee’s findings for the two LTGs:

Relevance

- ✧ LTG 1
 - It is consistent with the EPA Strategic Plan and the Homeland Security MYP.
 - The program is responsive to EPA program office and regional homeland security research needs.

- The program could improve collaboration with outside stakeholders, small-medium enterprises, and advisory boards.
- Due to the inherent number and variability of the parameters in the Threat Ensemble Vulnerability Assessment (TEVA), investment in sensitivity analysis research is needed in order to quantify the accuracy of model prediction before release.

✧ LTG 2

- Objectives and scope as defined in the MYP are consistent and clear.
- Program focus is generally responsive, but there are some areas where improvement is needed.
- More communication and interaction with end users would be useful to ensure relevance and accelerate implementation for stakeholder needs.
- It is too early in the research program to assess public benefits, but it appears to be on track.
- The overall program is in line with U.S. homeland security needs.

Structure

✧ LTG 1

- The program design has clearly identified priorities.
- LTG 1 does contribute to the logical framework.
- Periodic reassessment within the framework of a systems approach is both appropriate and timely.
- Dual use applications are evident.

✧ LTG 2

- The science used to achieve the LTG is appropriate in most areas of the research.
- The researchers need to be encouraged to constantly evaluate scientific literature for new methods.
- A systems approach in conjunction with a risk analysis/threat assessment could be considered in determining research objectives.
- Efforts need to be considered for supplying existing or interim technologies that could be given to the end users sooner even if they are just the 50 percent solution.
- All of the LTG 2 plans appear to benefit multiple needs.

Quality

✧ LTG 1

- Reporting products appear to meet expectations.
- The program is generating good research projects.
- There is room for improvement in the peer review and evaluation process.

✧ LTG 2

- Work is conscientiously performed, researchers are enthusiastic, and a good QA/QC program appears to be in operation.
- Research appears well thought out and there is good attention to detail.

Scientific Leadership

✧ LTG 1

- The program clearly exercises a leadership role in the field of water security.
- Many EPA staff members are actively engaged and have leadership roles in interagency programs.
- EPA could expand its leadership role in providing guidance for the planning, design, and implementation of new, more sustainable and resilient water and wastewater systems for the 21st century.

✧ LTG 2

- Researchers are strongly involved in federal research collaborations.
- Researchers are very active on many committees and working groups and provide positive value.
- There is a need to be more proactive in setting national level priorities.

Coordination and Communication

✧ LTG 1

- Scientists and managers are effectively engaged in program management.
- Program is actively engaged with clients, stakeholders, and end users.
- There is a continuing need to improve external communications.

✧ LTG 2

- Many of the researchers are involved in excellent collaborations.
- Researchers are using, leveraging, and supplementing ongoing efforts and expertise at other agencies.
- University interactions appear to be limited.

Performance and Efficiency

✧ LTG 1

- At this point, it is difficult to judge the effectiveness of the limited number of products that have been produced thus far.

✧ LTG 2

- More detailed information is needed from a broader set of end users and decision-makers (e.g., survey).
- Interactions with regional offices and other government agencies are judged to be strong.

The general recommendations in the report are:

1. The NHSRC should consider opportunities for a more expansive extramural contribution to its research program with a significant STAR component, perhaps supported jointly by the Department of Homeland Security (DHS) and EPA, if not in direct collaboration with NCER.
2. The NHSRC should explore the use of an acquisition life cycle model for individual research program elements, perhaps aligned along the Department of Defense's (Category 3), National Institute of Standards and Technology (NIST), or National Aeronautics and Space Administration (NASA) approaches, to provide a significant enhancement to the overall program.
3. The NHSRC should clarify the role and responsibilities of the NPD for the Center and more broadly across ORD.

4. Although the NAS recommendation for additional research in behavioral science seems to have been initially addressed at a preliminary level, more work in this area should be considered.
5. The NHSRC should more formally establish a program to develop and periodically evaluate the priorities for evaluating research goals and also for determining product delivery within research programs. A mechanism to gauge the degree to which these priorities are heard and addressed in research activities is encouraged as part of this recommendation.
6. The NHSRC should develop a specific goal to include development of well-defined digital “clearinghouses” of technical information that are easy to search and cover each of the major topics (prevention, detection, mitigation, etc.).

The Water Security (LTG 1) recommendations of the Subcommittee include:

1. Prior to implementation of the Real-Time Monitoring Systems (RTMS) and TEVA to any more systems, a detailed sensitivity analysis of these technologies to determine the variance of the resulting decisions should be performed.
2. A review of the Blast Vulnerability Assessment (BVA) Tool’s value should be undertaken, and the process used to conduct this review and analytically quantify the merits of further investment should be made transparent as a model for project life cycle determinations.
3. A clearer presentation of milestones for the PALs development sub-goal for water systems is desirable and the NHSRC should undertake an analysis of what needs to be accomplished for a more timely release of useful information derived from this research (also relevant to LTG 2).
4. The Center should examine the CARVER (Criticality, Accessibility, Recoverability, Vulnerability, Effect and Recognizability) methodology as a means of generating Probability of Attack (**Pa**) to improve RAM-W (Risk Assessment Methodology for Water Utilities) assessment methodology.
5. The NHSRC should take a more systems approach when evaluating key research objectives to ensure that the correct questions are being addressed in the context of real risk assessment and management.
6. Greater explanation is needed in the MYP of the current priority of NHSRC research efforts and how these priorities may change over the duration of the plan and realized budget.
7. A comprehensive model verification process should be established to evaluate the predictive capabilities of the advanced TEVA model and other models such MS-EPANET need to be quantified and documented, and the sensitivity of TEVA to predict the potential occurrence of an attack on the system needs to be evaluated in terms of the exact time and duration of a potential contaminant insertion.
8. A rapid assessment process needs to be put in place as the timeline from detection to public notification is slower than the contamination event progress; thus, effort should be placed on assessment methodologies following detection.
9. During a mass contamination event, prioritization of the cleanup process will likely be required and a cost benefit analysis methodology along with a database as a decision-making support tool should be developed to assist water systems in this prioritization.

The Building and Outdoor Environment (LTG 2) recommendations of the Subcommittee include:

1. The NHSRC should better understand and evaluate time limitations in research requests of EPA program office and regional homeland security research needs and address these limitations with appropriate level of implementation recognizing that in some instances an implemented 50 percent solution is better than no implementation of a 100 percent solution.
2. Customer support surveys should be broadened to include On Scene Coordinators, the National Decontamination team, and other state and local responders and to include follow-up assessment, recommendation, disposition, and end user response.
3. The NHSRC should take a more active role in identifying field-ready technology and initiate and evaluative board process to allow for civilian/public testing. Included in this recommendation is the need for draft information material and preliminary tools to be made early on so that procedures and directions for actions relating to chemical, biological, and radiological (CBR) events are more quickly available to clients and response community (also relevant to LTG 1).
4. Threat assessment evaluation similar to that employed in LTG 1 should be used to insure that realistic source terms for key threat agents are identified and used to effectively set research objectives and priorities.
5. The NHSRC should focus its efforts in evaluating existing commercially available real-time or near real-time detection systems and/or making some modifications to enhance specific needs, rather than the development of new sensors and analytical equipment, which is best left to the commercial sector (also relevant to LTG 1)
6. Development of PALs for additional media beyond water and air are recommended to assist consequence management. Additionally, it is recommended to pursue advances in microbial risk assessment and to do this in partnership with CDC.
7. Additional research in technical mitigation and remediation measures appears to be lacking and it is recommended that some consideration be given to possible new efforts that can be pursued in these areas particularly as they relate to environmental setting and media.
8. An examination and report on the environmental settings and media that are likely to be impacted by various threat scenarios and the basic research needed to address fate, residence, persistence, and alternative disinfection and decontamination practices is recommended.

Dr. Sayler mentioned that the Subcommittee also identified a number of subordinate needs for the two LTGs.

Dr. Andersen asked about the size of the program. Dr. Sayler responded that the program had about 50 FTEs and \$70 million. Jonathan Herrmann is the NHSRC Director and Dr. Greg Sayles is the NPD for the program. Dr. Barry Ryan asked about the percentage of the program's products that are classified and could not be published in the literature. Dr. Sayler responded that some of the products are classified but much of the research has dual use and would add value to the scientific literature.

Dr. Sayler asked the two vettors for the report, Drs. Daston and Falk, to provide their comments.

Dr. Daston stated that the report includes clear recommendations and provides a qualitative rating for the program. He thought the first general recommendation about adding a STAR component to the program was too narrow. He was not sure that academic research would be the most efficient means of addressing

LTGs 1 and 2. It may be more appropriate to collaborate with other government agencies and other countries (e.g., Canada, Japan, and European Union).

Dr. Daston said it was not clear to him why this program should be responsible for risk communication and behavioral science research. Why should the NHSRC develop risk communication expertise when other offices in the Agency have this expertise. Referring to page 6, Dr. Daston did not think cyber infrastructure was within the purview of these two LTGs. Even though NAS noted the absence of research on the protection of cyber infrastructure, it does not appear within the mandate of the NHSRC.

Dr. Daston noted that there were numerous acronyms used in the report and it would benefit from a list of acronyms. He also commented that if it is not possible for the program to publish its research results because of secrecy reasons, NHSRC should find another metric. A survey of clients may be a much better measure for this program. Dr. Daston had some additional editorial comments that he agreed to send to Dr. Saylor.

Dr. Saylor asked Dr. Daston if he would be satisfied if the first general recommendation was revised to include broader participation of the outside scientific community and not just STAR. Dr. Daston said that change would address his concern. With respect to the behavioral scientist, Dr. Saylor stated that he was not sure why the program needed to develop its own expertise in this area, but he will try to better explain the need in the report. Dr. Weiss commented that behavioral scientists could contribute a great deal to the program. There is an entire field of sociology devoted to disaster research and community response investigating how people deal with each other in a crisis and the likelihood of panic. This is a well developed field of study. Dr. Lambert noted that the SAB and NAS have been highlighting the need for more behavioral scientists, social scientists, and economists at EPA.

Dr. Saylor thought the report should note that the issue of cyber infrastructure protection is still not being addressed. Dr. Daston responded that cyber infrastructure security probably is being addressed by other programs. Systems protection is a broader issue and is not specific to the software being employed. Dr. Saylor thought it would be best to leave that comment in the report and allow ORD to respond to it.

Dr. Falk agreed with Dr. Daston's comments. The report provides a good overview of the program. He thought that more justification could be provided for some of the recommendations. Although the recommendations seem logical, there is little backup provided for the reader. He also thought it might be helpful to define what was meant by behavioral science. In addition, he suggested replacing the words "more completely circumscribes" with "better defines" in the following sentence: "...ORD Homeland Security Research Multi-Year Plan (May 2008) that more completely circumscribes the LTGs."

Dr. Falk suggested that it might be helpful for the BOSC to integrate recommendations across the many review reports prepared by the BOSC. A number of the recommendations affect other ORD programs because to implement them, ORD may have to move resources from one program to another. Dr. Falk also asked if the recommendations under the section "Supporting EPA's Laboratory Network" (pp. 22-23), such as developing a shipping/transportation process for samples, are appropriate for the program. Are these research functions? Dr. Saylor replied that ORD has the responsibility to distribute information for the Environmental Response Laboratory Network (ERLN). Dr. Falk agreed that this is a critical function but questioned whether it should be a function of ORD. Noting the recommendation on page 34 about working in partnership with CDC on advances in microbial risk assessment, he indicated that there is significant interest at CDC in this topic and CDC would be interested in pursuing this with EPA. Dr. Falk thought radiation contamination exposures (mentioned on page 36) was an important issue that could be emphasized more in the report. Dr. Saylor asked if Dr. Falk thought it was diminished because it was a subordinate recommendation. Dr. Falk replied that it would be easy to miss the suggestion given the length and detail in the report. He thought it should be highlighted in the report.

Dr. Swackhamer said that, if she was the NPD, she would have difficulty figuring out what to focus on in the report. Only one bold item is listed as a recommendation, so how are the NPD and Center Director going to identify the recommendations? She thought it might be helpful to number the recommendations. Dr. Saylor responded that the Subcommittee resisted numbering the recommendations because some of them are not the responsibility of the program. Some of the recommendations are very specific and others more general; some require a response and others do not. Mr. Susanke said he thought the major recommendations had been pulled from the body of the report and placed in the summary section. Also they were in bold font in the report, making it rather easy for the NPD and Center Director to identify them. Dr. Swackhamer noted that on page 20 the report indicates that the BVA tool should be assessed but that text is not in bold and it is included in the list of the recommendations in the summary. She had a hard time tracking the report with the oral presentation. She thought the presentation was better organized than the report. Dr. Saylor said he was surprised that the recommendations were not clear.

Ms. Kowalski commented that it would be helpful to ORD to have primary and subordinate recommendations because it emphasizes the primary recommendations. ORD will respond to all of the recommendations, but it helps when there is some prioritization.

Dr. Swackhamer said there are some typographical errors in the report; Dr. Saylor replied that many of those errors had been caught in the last round of edits, which was completed after the report was distributed to the BOSC members.

Dr. Paustenbach thought the report was thorough but he suggested it would be better if the reports had a common format. He also suggested including some basic information about the program such as the number of staff, the budget, and the percentage of the ORD budget allocated to the program. In addition, he proposed including another section that presented a benchmark analysis of what other groups were doing in this research area. It would be helpful to know that the program has looked at what others are doing to ensure that ORD's work is not duplicative.

Dr. Saylor answered that the BOSC Subcommittee looks at that as part of the review process. The review examines the collaboration of the program with others working in that research area. He agreed that a standard format would be helpful and the BOSC is working toward that goal. He noted that the Science in Action factsheet, which has been added to the materials provided to the BOSC for these reviews, provides the basic information on the program that Dr. Paustenbach is seeking. Dr. Paustenbach said he would be willing to work with another BOSC member who has more experience with these reviews to develop a standard format for the reports. Dr. Demerjian pointed out that the Science in Action factsheet is not part of the report and the factsheet does not include budget information. It might be helpful to include the factsheet in the report. Dr. Saylor said he thought the report included a summary on the program to help inform the reader. Dr. Demerjian responded that he did not see information on resources and Dr. Saylor confirmed that resources were not addressed in the report.

Dr. Demerjian asked if the Subcommittee members got the impression that this was just a repackaging of programs to meet homeland security needs. Dr. Saylor replied that there was a little of that but there was more new research.

Dr. Andersen commented that it was difficult to determine the audience of the report. There is a set of general recommendations and some more specific recommendations but there was no prioritization of the recommendations. Dr. Saylor confirmed that the Subcommittee did not attempt to prioritize the recommendations other than identify major recommendations and subordinate recommendations. Dr. Andersen thought it might be helpful to include that statement in the report.

Given that there were no real objections to the report and its recommendations, Dr. Saylor called for a motion to approve the report. Dr. Daston moved to approve the report with the suggested changes and

Dr. Demerjian seconded the motion. The report was approved by the BOSC members with one abstention. Dr. Haas abstained from voting on the report.

Land Research Program Mid-Cycle Review Report

Dr. Charlie Menzie, Chair of the Land Research Mid-Cycle Subcommittee

Dr. Charlie Menzie, Chair of the Land Research Mid-Cycle Subcommittee, stated that the Land Research Program was restructured prior to the 2005 BOSC program review. The program undertakes a variety of research initiatives, including research on Superfund site remediation, sediments, leaking underground storage tanks, oil spills, nanotechnology, and vapor intrusion issues. The Subcommittee included six members, five of whom served on the Subcommittee that conducted the 2005 program review. The program review was conducted in December 2005 by a nine-member Subcommittee. The report from that review was submitted to ORD in July 2006. ORD responded to the report in October 2006. Since the program review, ORD further defined the scope of the program's LTGs and implemented research activities. ORD requested a mid-cycle review to assess the program's activities and plans in light of changes in research priorities. The mid-cycle review process included two conference calls to discuss the review materials provided to the Subcommittee and a public meeting held on May 8, 2008. The mid-cycle report was completed in July 2007.

The Land MYP is organized around two LTGs:

- ✧ LTG 1: Clients request and apply ORD research products and services needed for mitigation, management, and long-term stewardship of contaminated sites. LTG 1 research supports remediation activities of OSWER and the regions.
- ✧ LTG 2: Clients request and apply ORD research products and services needed to manage material streams, conserve resources, and appropriately manage waste. LTG 2 supports the prevention research needs of the Office of Solid Waste (OSW).

The first charge question was: How responsive has the Land Research Program been to the recommendations from the 2005 BOSC program review? Dr. Menzie stated that the Subcommittee developed a table that tracks the 2005 program review recommendations and the program's responsiveness to those recommendations. The Subcommittee concluded that the Land Research Program has been very responsive to the 2005 BOSC program review recommendations. In reaching this conclusion, the Subcommittee considered how the program responded to each element of the 2005 review.

The second charge question was: How clear is the rationale for the revised Land Research MYP completed in July 2007, and are the revisions consistent with the advice given by the BOSC? The Subcommittee concluded that the revised Land MYP provided a clear rationale and that the revisions were consistent with the BOSC advice and recommendations. The Subcommittee noted that LTG 2 likely will need to be revised over time.

The third charge question was: How can LTG 2 be more effectively restructured to reflect materials management research, as well as the growth in nanomaterials research? The Subcommittee suggested that LTG 2 could be rephrased in one of two ways:

- ✧ Clients request and apply ORD research products and services needed to manage and address existing and emerging material streams and associated wastes.
- ✧ Provide clients with requested ORD research products and services needed to manage and address existing and emerging material streams and associated wastes.

With respect to this charge question, the Subcommittee had discussions about resource conservation, which is being phased out of the program, and whether nanomaterials should have its own LTG. The Subcommittee decided that nanomaterials should not be elevated to an LTG but should be kept within the broader emerging material category.

The fourth charge question was: Please rate the progress made by the Land Research Program in moving the program forward in response to the BOSC review of 2005. The Subcommittee rated the program's progress as "exceeds expectations." Dr. Menzie stated that the Subcommittee recognized that efforts were made to extend the life of certain aspects of the program and leverage through collaborative efforts with the National Institutes of Health (NIH), the Department of Defense's (DOD) Strategic Environmental Research and Development Program (SERDP) and Environmental Security Technology Certification Program (ESTCP), and private and non-governmental organizations. Given the limitations on resources, the Subcommittee recommends that the program emphasize collaborative efforts within the United States and internationally.

Public Comment

Dr. Gary Saylor, Chair of the BOSC Executive Committee

At 11:15 a.m., Dr. Saylor called for public comments. He read the written comment that was submitted prior to the meeting. The individual was displeased with the lack of attention paid by the current administration to the environment and contamination issues and global earth concerns. Dr. Saylor stated that the BOSC understands such concerns with regard to protecting the environment and public health; however, the BOSC will not be responding to the comment because it does not relate to the work of the Board. Dr. Saylor asked if there were any additional comments. No comments were offered so the public comment period was concluded and the discussion of the Land Research Program Mid-Cycle Report resumed.

Land Research Program Mid-Cycle Review Report (Continued)

Dr. Charlie Menzie, Chair of the Land Research Mid-Cycle Subcommittee

In closing his presentation, Dr. Menzie thanked Ms. Heather Drumm, the DFO for the Subcommittee, and her staff for their guidance and support. He also thanked the ORD staff members for all their efforts to support this review.

Dr. Saylor asked Dr. Duke, who served as a vector for the report, to provide his comments.

Dr. Duke thought the report was well written and concise. The table presentation was straightforward and easy to follow. It could be a good model for future mid-cycle review reports. He thought the titles of the two tables were confusing, however; he had a difficult time figuring out the distinction between the two tables. Dr. Menzie said he will take a look at that and try to clarify the table titles. Dr. Duke suggested including the current wording of LTG 2 in the report because the wording of this LTG is the topic of one of the charge questions. With respect to the Subcommittee's two suggestions for the rewording of LTG 2, Dr. Duke noted that one is within the control of the program and the other depends on the actions of others (i.e., "clients request and apply ORD research products..." versus "provide clients with requested ORD research products..."). He stressed the importance of setting goals that are within the control of the program. Dr. Menzie responded that the Subcommittee had an interesting discussion about the phrasing of the goals; most members thought the original phrasing of the goals was awkward.

Referring to the first bullet on page 5, Dr. Duke noted that the issues with the activities and changes that were made by the program were not discussed in the report. Dr. Menzie replied that this comment was specific to the sediments part of the program and the need to complete deliverables faster than has been done. Dr. Duke suggested softening that language or clarifying what was meant so that the reader understands the issues.

Dr. Menzie asked about the next steps. Ms. Kowalski stated that the Subcommittee Chair will be asked to address the comments and revise the report as needed. The vettors will review the revised report to verify that the BOSC's comments have been addressed; then, the report will be finalized and submitted to ORD.

Dr. Ryan, who also served as a vettor for the report, said it was well written and concise. He too liked the table format and recommended it for future mid-cycle reports. He was not certain what was meant by the recommendation to pursue international collaboration (see page 1, line 32). The wording on page 2, lines 17-18, refers to limited resources but then encourages the program to collaborate within the United States and internationally. This needs to be clarified in the report. Perhaps reword it to state: "Within the limitations of resources, the Subcommittee recommends that emphasis be given to collaborative efforts within the United States and internationally." Dr. Menzie answered that the NPD has been relatively effective in pursuing collaborations. There was good progress in collaborating with DOD's SERDP and ESTCP. The Subcommittee thought there may be some similar international opportunities.

Dr. Ryan pointed out that on page 2, lines 11-12 the report states "...the Subcommittee thought that the program meets or exceeds expectations." This sounds like the Subcommittee was not in agreement on the rating. Dr. Menzie replied that the Subcommittee members initially were weighing both ratings and finally decided on exceeds expectations. He will remove the words "meets or" from that sentence.

Dr. Ryan noted a split infinitive on page 3, line 15. The words "progressed to further define" should be changed to "progressed to define further." He also suggested deleting the definitions of the four rating adjectives on pages 3 and 4 and refer the reader to the definitions provided in Appendix A. Dr. Menzie agreed to make that change. Agreeing with Dr. Duke's comment about the first bullet on page 5, Dr. Ryan stated that the phrase "however, there are some issues with some of the activities and changes that have been made" needs to be clarified. Dr. Ryan had some concerns with the program's responses identified in the tables. In two or three cases, the BOSC posed a specific question and the program answered a different question. He thought that some needed clarification. Dr. Ryan liked the inclusion of nanomaterials within the broader category of emerging materials.

When there were no additional comments on the report, Dr. Sayler called for a motion to approve the report with the requested changes. Dr. Duke moved that the report be approved with the changes and Dr. Weiss seconded the motion. The report was unanimously approved by the BOSC.

Investment Efficiency

Report of Workgroup on Investment Efficiency

Dr. Carol Weiss, Chair of the Workgroup on Investment Efficiency

Dr. Weiss stated that at the end of the last Executive Committee meeting, she agreed to chair a workgroup on investment efficiency. The other workgroup members are Drs. Demerjian, Haas, and Henderson. At the May meeting, the BOSC heard a presentation by Dr. Gilbert Omenn on the NAS report entitled, "Evaluating Research Efficiency in the U.S. Environmental Protection Agency." A copy of the summary chapter of the NAS report was provided in the May meeting notebook. OMB and EPA had disagreed about the efficiency measurement in OMB's Program Assessment Rating Tool (PART). OMB stressed that efficiency measures should deal with outcomes rather than outputs, and that they should be quantitative measures as much as possible so that agencies would be able to assess progress from year to year. EPA found these strictures difficult when applying them to research programs.

The NAS panel concluded that the concept of efficiency when applied to research consists of two components. One is "process efficiency," which has to do with how well research is managed. It deals with cost effectiveness and efficiencies in terms of such things as number of grant applications processed per dollar of funding or whether construction of a laboratory proceeds on time and within budget. The

NAS report states that process efficiency should be a “minimum component of research evaluation.” The second and more important component is “investment efficiency.” This concept deals with whether an agency is doing the right research and doing it well. The NAS report states that the way to assess investment efficiency is through peer review. Dr. Weiss noted that ensuring that ORD is doing the right research and doing it well is the goal of the BOSC’s program reviews.

The workgroup agreed with NAS that quantitative indicators are inappropriate for investment efficiency, which also can be called “research portfolio management.” The workgroup also agreed that investment efficiency cannot be judged on the basis of long-term outcomes. Too many other actors have to get involved in order to turn research findings, methods, or tools into action to ascribe all the successes, partial successes, or failures to the research. Research, however relevant, brilliant, and timely, cannot by itself bring about progress in clean water or human health.

The workgroup identified several phases in the process of investment efficiency:

- ✧ Defining needs for research.
- ✧ Soliciting research proposals from the field.
- ✧ Allocating funds for research that meets defined needs and fits the long-term strategic plan.
- ✧ Reviewing research plans (proposals).
- ✧ Implementing a process for quality control of internal and external research.
- ✧ Establishing relationships between ORD researchers and external researchers.
- ✧ Continuing research programs, including opportunity for STAR researchers to continue a promising line of research after their initial study has ended.

The workgroup reviewed the procedures and processes used in other federal agencies with large research investments, such as the Office of Naval Research, DHS, NIH, and the National Science Foundation (NSF). The workgroup asked ORD to provide more information about some of these practices and procedures so that the workgroup can assess how it and the BOSC can help support ORD’s efforts to assess investment efficiency in ways that satisfy both OMB demands and internal management review. The workgroup thinks that PART measures regarding investment efficiency will be grounded in peer reviews like those performed by the BOSC. Specifically, the BOSC is requesting information on:

- ✧ The processes by which ORD defines problems and needs for research.
- ✧ The specificity or generality of ORD solicitations to the research field.
- ✧ The processes of peer review and (where instituted) review of applicability of proposed research to defined needs and the long-term strategic plan.
- ✧ The nature of the relationship between external researchers and ORD staff (extent of monitoring, autonomy of researcher, or involvement of ORD staff during the conduct of the research).
- ✧ The history of cooperative agreements at EPA.
- ✧ The continuity of research (opportunity for STAR researchers to continue a promising line of research).
- ✧ The processes for disseminating research findings.

NAS Recommendation For Assessing Investment Efficiency

Mr. Phillip Juengst, ORMA, ORD, EPA

Mr. Phillip Juengst stated that EPA has had numerous conversations with OMB about the topic of investment efficiency. The primary focus of these conversations has been on the efficiency question to be included in the BOSC reviews. How wide and deep should this question be cast into the BOSC reviews? He distributed a draft of revised charge questions for BOSC reviews. Specifically, an efficiency question has been added under the Program Performance section: “How efficiently has the program invested and managed resources to achieve the LTGs?” ORD is seeking the BOSC’s feedback on adding this question to the reviews.

Mr. Juengst explained that he organized an interagency workshop in late spring to discuss the NAS report. He also participated in a task group of the Office of Science and Technology Policy (OSTP) that is working on a roadmap for decisions on investment in science. There will be a workshop in December to talk about tools, methods, and models used to inform science investment. There is ongoing discussion on how to apply these to ORD.

Dr. Daston said he had no concerns about including the efficiency question in the reviews, but unless the BOSC or ORD develops some equations or metrics by which to measure efficiency, the answer to the question will be generic and probably not that useful to OMB or ORD. OMB is concerned about budgets, so it assigns a dollar value to investments and tries to translate EPA's response in dollar units. It is very difficult for the BOSC to evaluate quantitative outputs in a credible way. ORD's success depends on how ORD products are applied within and outside EPA. Outcomes happen at different times—perhaps 10 years after the research investment. Is that efficient? The BOSC probably cannot answer that question. This has to be defined in a way that the BOSC can provide more than a generalized, useless answer. He expressed some concern that a focus on efficiency may jeopardize the anticipatory research conducted by ORD.

Dr. Sayler stated that the Homeland Security Research Subcommittee tried to deal with this efficiency question in the program review. The Subcommittee members thought they could examine how decisions on investments were made with a life cycle approach. Once the goals were achieved, ORD should disinvest in certain efforts. The Subcommittee wanted to look at how the NPD and Center Director were using their funding to stimulate new activities but the lack of decision-making transparency made it impossible to tie outputs to outcomes. That is why the Subcommittee commented on transparency and the use of life cycle analysis for projects.

Mr. Juengst commented that Dr. Omenn recommended looking at how the program is making broad resource allocation decisions and how those are changing over time. He added that ORD currently is using several quantitative metrics—grants processing time, technical support center response time, and cost savings in administrative overhead. The new question for the BOSC reviews is seeking qualitative input. Dr. Sayler replied that the BOSC is willing to accept the charge to provide qualitative responses to the efficiency question, but a greater level of transparency is needed for the BOSC to determine how allocation decisions are made and changed. Dr. Weiss said that this is an extremely difficult issue. Decision-making is a very opaque process that is not orderly or linear. The process takes place over an extended period of time, usually narrowing decisions to a limited number of possibilities and then reaching a decision. This is a demanding exercise but she believes the BOSC can try to answer the question.

Dr. Teichman agreed that this is a difficult question to answer. Many factors go into these decisions—the priority of the need being addressed by the research, the funding available, and the capabilities of the staff. He appreciated the efforts of the BOSC and said that if the workgroup needs more time to work on this issue then more time will be allotted. Dr. Weiss pointed out that the new administration may change the reporting requirements. She added that the workgroup will be happy to continue to work on this issue if it will improve the BOSC's reports.

Dr. Demerjian said he has difficulty understanding the process by which the research strategy is crafted. How does ORD determine what will be done intramurally and what will be done extramurally? It is important for ORD to focus on its core scientific capabilities to support the LTGs. How does all of this come together? He understands how LTGs are developed but thought that if the workgroup members understood how research project decisions are made, they might be able to identify some measures. Efforts are needed to minimize uncertainties in key areas that have impacts on outcomes and perhaps economics as well. For example, it may be possible to save money by reducing uncertainty (i.e., less uncertainty could result in less stringent controls).

Dr. Giesy said that this question is very difficult to answer and he did not have much confidence that the BOSC response to the question would be of much help to ORD. Dr. Philbert echoed Dr. Giesy's comment, adding that he was concerned that this question will detract from the core mission of the BOSC reviews. He acknowledged that there is a national focus on efficiency, but he did not think it should be applied to science and research. More important than efficiency is the issue of nimbleness. How nimble is the organization in addressing emerging issues? The answer to this question is far more useful.

Dr. Sayler stated that there is some role for qualitative assessment of decision making. For example, he makes decisions about allocating funding to faculty members. He could give \$40K to one faculty member who will produce a product or he could give \$100K to an even better scientist who may not get a product completed. Dr. Sayler said that the BOSC cannot predict long-term outcomes but it may be able to predict intermediate outcomes.

Dr. Falk emphasized that the issue is impact. What was really accomplished? He saw Dr. Sayler's example as a management issue. Timeliness is a real issue and it is used in the definition of the rating objectives.

Dr. Andersen commented that he had been on both ends of these reviews and the keys are expectations and accountability. ORD is investing in people to get something back from them. The people need to know what is expected of them. He can see the accountability aspect in the bibliometric analyses but he did not think they were the best measure of efficiency. As Dr. Philbert mentioned, nimbleness is a better measure. Is the organization able to change? How does the organization prepare to deal with change? How does the program prepare staff for change?

Dr. Lambert mentioned that the SAB has had discussions on strategic and institutional planning to try to get a better understanding of the decision-making process. Dr. Swackhamer asked about the next steps on this issue. Dr. Sayler responded that the workgroup will continue to work with Mr. Juengst and Dr. Teichman to define what the BOSC needs to make a qualitative assessment of efficiency for the program reviews.

Immediately following the lunch break, Dr. Teichman expanded on his earlier response to Dr. Paustenbach's question about ORD's four big challenges. Dr. Teichman stated that ORD is unique in that it combines health and ecology in one organization and looks across the entire risk paradigm. The BOSC could help ensure that ORD's research is multidisciplinary and integrated as much as possible. In addition, there is constant competition between short-term and long-term research. The program offices have short-term needs and ORD is constantly trying to balance meeting those customer needs while continuing to pursue long-term and anticipatory research. ORD needs to improve on communicating research results. ORD publishes journal articles, but most decision-makers do not read the technical literature. ORD is trying to communicate research results to decision-makers using Web sites and other tools. ORD could use the BOSC's advice on how best to communicate results to decision-makers.

Mid-Cycle Review Subcommittees

Water Quality Mid-Cycle Review

Dr. Gary Sayler, Member of Water Quality Mid-Cycle Review Subcommittee

Dr. Sayler reported that Dr. Herb Windom, former member of the BOSC Executive Committee, is the Chair of the Water Quality Mid-Cycle Subcommittee. The Subcommittee held a conference call on September 4, during which writing assignments were made. The face-to-face review meeting will be held on Tuesday, September 23, 2008, in Washington, DC. The report will be provided to the Executive Committee for review at the February meeting.

Science and Technology for Sustainability Mid-Cycle Review

Dr. John Giesy, Chair of the STS Mid-Cycle Review Subcommittee

Dr. Giesy stated that he has been working with Ms. Claudia Walters, DFO for the STS Mid-Cycle Subcommittee, to form the Subcommittee. Five individuals have been selected from a list of candidates and EPA is working on the paperwork to complete the process. The Subcommittee includes engineering, land use, biofuels, green buildings, and economics expertise. The charge questions are in good shape. The first Subcommittee conference call will be held in January 2009, and the face-to-face review meeting will be held in March.

Program Review Subcommittees

Human Health Research Program Review

Dr. Henry Falk, Vice Chair of the Human Health Research Subcommittee

Dr. Falk reported that Ms. Heather Drumm is the DFO for the Subcommittee and the nine-member Subcommittee has been formed. In addition to Dr. Falk, it includes the following eight members: Dr. James Klaunig (Chair), Dr. Paul Blanc, Dr. George Daston, Dr. David Hoel, Dr. Donald Mattison, Dr. Edo Pellizzari, Dr. Christopher Portier, and Dr. Joel Schwartz. Dr. Falk was very pleased with the mix of expertise on the Subcommittee. The first conference call will be held on October 10, 2008, to discuss the charge to the Subcommittee. The second call is scheduled for December 1 to discuss the LTGs, the roles of the Subcommittee members, and the writing assignments. The face-to-face meeting will be held January 13-15, 2009, in Research Triangle Park, North Carolina.

EDCs Research Program Review

Dr. Gary Saylor, Chair of the BOSC Executive Committee

Dr. Saylor stated that Dr. Swackhamer was to chair this Subcommittee, but her increased responsibilities as the SAB Chair preclude her from continuing as a BOSC member. Dr. Glen Van Der Kraak, who served on the subcommittee that conducted the mid-cycle review, has agreed to chair the EDCs Research Subcommittee. Megan Grogard is the DFO for this Subcommittee and she is working with Dr. Van Der Kraak to identify the Subcommittee members. The face-to-face review meeting will be held in February 2009. Dr. Saylor asked if any of the Executive Committee members had an interest in serving on this Subcommittee. Dr. Andersen volunteered to serve on the Subcommittee.

Standing Subcommittees

NCER Subcommittee

Dr. Martin Philbert, Chair of the NCER Subcommittee

Dr. Philbert stated that the BOSC received a briefing on ORD's response from the NCER Director yesterday. Dr. Philbert was not certain how many of the 16 recommendations will be adopted by NCER. A new charge question for the Subcommittee has been developed. Some of the Subcommittee members will be cycling off and some new members will be added to provide the expertise needed to address the new question. Susan Peterson is the DFO for the Subcommittee and she is helping to identify the new members.

NERL Subcommittee

Dr. Ken Demerjian, Chair of the NERL Subcommittee

Dr. Demerjian said that the report on the exposure framework was submitted to ORD in June 2008. ORD is working on a response to the report. He anticipates that there will be a Subcommittee conference call with the NERL Director in the next 3 to 6 months. He hopes to have feedback from ORD on the letter report prior to that call.

Upcoming Program and Mid-Cycle Reviews

Dr. Gary Saylor, Chair of the BOSC Executive Committee

Dr. Saylor mentioned that there are two additional program reviews to be conducted in 2009—the Air Research Program and the Drinking Water Research Program. In addition, there is the mid-cycle review for the Safe Pesticides/Safe Products (SP2) Research Program. He asked if any of the Executive Committee members were interested in chairing these Subcommittees. Dr. Haas agreed to be the Chair or Vice Chair of the Drinking Water Subcommittee. Dr. Demerjian agreed to serve as the Chair of the Air Subcommittee. Dr. Ryan, who served as Vice Chair of the Subcommittee that conducted the SP2 program review, volunteered to serve as the Chair of the SP2 Mid-Cycle Subcommittee.

Dr. Saylor mentioned that the February Executive Committee meeting will be held in Washington, DC. The May meeting will be held at the EPA laboratory in Duluth, Minnesota. That meeting probably will be held the last week of May.

ORD and Value of Information

Dr. Fred Hauchman, OSP, ORD, EPA

Dr. Fred Hauchman, Director of OSP, said that he began his career at EPA doing risk assessments on air pollutants in the Office of Air Quality Planning and Standards. He then joined ORD and became immersed in research planning. The Agency would be well served if ORD could implement a process to prioritize research transparently in an outcomes-based format. There have been several attempts to look at the value of research needs in terms of outcomes.

Dr. Hauchman's presentation included some background information, a description of the current practice for prioritizing research, the elements of a value of information (VOI) approach, and some conclusions. As an introduction, Dr. Hauchman presented two quotes concerning VOI—one from the Presidential/Congressional Commission on Risk Assessment and Management and one from the March 2008 BOSC letter report to NCER. The first quote encouraged risk managers to experiment with VOI tools to make decisions for which the uncertainties are complex. The second quote urged NCER to consider using tools to align its research toward information that has the most potential value in decision-making and to fund work that would improve tools to gauge that value.

VOI is a form of decision analysis that evaluates the benefits of information for reducing uncertainty in a decision-making context. It is a complex blend of economics (utility theory) with Bayesian statistics (informed priors). It forces thoughtful articulation and valuation of outcomes and it uses time- and information-intensive quantitative decision trees. There are decision points (nodes) for each possible outcome, probabilities for each node, and analysis of the benefits for each node.

To illustrate that VOI can be complicated, Dr. Hauchman presented the equation for calculating the expected value of sample information (EVSE). Calculating EVSE requires a preposterior analysis, which implies making a decision before the collection of information and receiving knowledge of the sample outcome. Bayesian updating of the probability of s for all possible sample information, t , begins with the computing of the posterior probability of s given observation t

$$p(s/t) = \frac{f(s)g(t/s)}{h(t)}$$

where $g(t/s)$ represents the likelihood function of observing t given a state of the world s , and $h(t)$ gives the predictive density of t

$$h(t) = \int_{s \in S} f(s)g(t/s)ds$$

Actual applications of VOI in environmental decision-making have been limited and there have been even fewer applications in prioritizing research. The major constraints include the complexity of current approaches, intensive data requirements, extensive time required, and general lack of familiarity with VOI.

Identification of research needs at EPA is part of a formal planning process in ORD that has many participants. The NPDs lead the process in consultation with the ORD Laboratory and Center Directors, program office and regional staff, principal investigators, the academic community, stakeholders, and others. The prioritization process involves developing goals (“outcomes”) and research activities (“outputs”) to address needs across the risk paradigm (LTGs, APGs, and APMs). The current process uses a qualitative prioritization approach that considers a variety of criteria, including: regulatory importance and timing (program office, regional, congressional priorities), potential for reducing uncertainties, opportunity for leveraging resources, and ORD capabilities, capacities, and resources.

ORD might consider VOI as well as other decision tools in the context of research planning and budgeting as a means to promote:

- ✧ Comprehensive, outcome-based prioritization within and across research topics, and potentially across research programs.
- ✧ Transparency of process.
- ✧ Responsiveness to the OMB R&D Investment Criteria (relevance, quality, and performance).
- ✧ Record of decision process and preparation of congressional justification for budget.

The central question is: Can a VOI-based approach to prioritizing research be developed that is systematic, objective, comprehensive, transparent, documentable, inclusive, and not too complex?

Dr. Hauchman then presented a hypothetical VOI approach for prioritization of research to stimulate a dialogue on this topic. It involves an explicit consideration of each research activity in terms of: (1) outcome-oriented goals (“Measurement Criteria”) and (2) type of research activity across the risk paradigm (“Alternatives for Investment of Resources”). The approach would be semi-quantitative, with considerable judgment needed to identify and evaluate research “Alternatives” in the context of weighted “Measurement Criteria.” The approach also could consider other parameters such as estimated cost and duration of the research and tractability of the research problem. The approach may be applied within and across research topics/programs.

Using contaminants in drinking water as an example, Dr. Hauchman went through three steps. Step 1 was to identify outcome-oriented goals (Measurement Criteria):

- ✧ Likelihood of research leading directly to a decision that can reduce the contaminant in drinking water (thereby reducing human exposure).
- ✧ Degree to which the decision can reduce human exposures below levels of concern, specifically for at-risk subpopulations.
- ✧ Likelihood of research leading to a decision that can reduce costs (e.g., associated with corrective action or health care).

- ✧ Likelihood of research leading directly to a decision that can be easily implemented.
- ✧ Cost of implementing the decision or action.

Step 2 was to identify research activities (Alternatives for Investment of Resources):

- ✧ Methods development for monitoring and research.
- ✧ Environmental sampling, monitoring, and characterization.
- ✧ Identification and characterization of sources.
- ✧ Study of fate and transport.
- ✧ Study of human exposure.
- ✧ Study of human health effects.
- ✧ Development of treatment approaches.
- ✧ Design of pollution prevention approaches.

Step 3 was to develop a matrix to compare Measurement Criteria with Alternatives.

	MEASUREMENT CRITERIA				
	Reduce levels in drinking water	Reduce human exposures	Reduce costs of health care	Impact ease of implementation	Reduce cost of implementation
Criteria Weighting	x/2	x	x	x	x/4
ALTERNATIVES					
A. Methods development					
B. Environmental sampling, monitoring, and characterization					
C. Identification and characterization of sources					
D. Study of fate and transport					
E. Study of human exposure					
F. Study of human health effects					
G. Development of treatment approaches					
H. Design pollution prevention approaches					

Dr. Hauchman explained that the Measurement Criteria “Reduce levels in drinking water” would receive half the weight of the Measurement Criteria “Reduce human exposures.”

Dr. Hauchman presented the following conclusions. VOI methods published to date are generally too complex and time-intensive to be applied broadly in ORD for prioritizing research. Modified VOI approaches (VOI-lite?) that are less complex and time-intensive than these methods, yet are more comprehensive and explicitly outcome-oriented than current ORD processes, may be feasible. Pilot studies could be used to first evaluate the feasibility of applying a modified VOI process to prioritizing research within a particular topic. Approaches for prioritizing across broader scales of research (topics/programs) also could be explored.

In closing, Dr. Hauchman acknowledged the efforts of Christian Daughton and Lawrence Martin in helping him put together this presentation.

Dr. Swackhamer commented that it is exciting to see that EPA is looking to the future and trying to employ new tools to make better decisions. She expressed her concern about the weighting factors because they are subjective and that removes the transparency. Are you planning to sum the scores in the matrix? Dr. Hauchman replied that the idea is to assign a score to the Measurement Criteria and then sum the scores for the various Alternatives. Dr. Swackhamer supported the idea of developing the technique but cautioned against weighting the criteria. Dr. Hauchman agreed that the weighting is an issue, but it forces ORD to discuss and document it.

Dr. Philbert liked the presentation, stating that it directly addresses one of the recommendations in the report to NCER. It would be good for NCER to test this model. NCER can make some small investments with researchers who are knowledgeable about VOI to develop VOI-lite, test it, and then teach ORD how to use it. Dr. Lambert asked how the tool would be validated. Dr. Hauchman responded that he did not know how to validate it. A process would be needed to validate it, especially given the subjectivity of the criteria weighting. Dr. Andersen said that he had done something similar to this with the methylene chloride risk assessment at Wright Patterson Air Force Base. It was a very valuable exercise. He added that it might be helpful to ask the question: If you get the information you are seeking, how will it help the outcome?

Dr. Haas applauded this effort and thought it could be extended to include resource constraints. Dr. Daston said that there has been a push to use this approach for the European Union's REACH program. He agreed that it is difficult to assign weights to the criteria. The level of uncertainty is huge and the subjectivity associated with weighting is daunting. He recommended that ORD start small on a discrete problem for which a lot of the uncertainty can be eliminated. Dr. Swackhamer argued that these matrix approaches actually are better for addressing big rather than small problems. There are ways to get around the weighting issue. The approach is semi-quantitative and it allows comparison of totally different things. She pointed out that the prioritization informs the decision-making but it is not the only input used to make a decision. The value of this tool is in looking at the big picture.

Dr. Giesy commended EPA for looking at this approach. He liked the idea of codifying the process. He cautioned about producing a number because it will become the subject of arguments. The process is the key and not the resulting number.

Dr. Sayler asked if the BOSC would like to be engaged in this effort. Should there be a workgroup to focus on this? Dr. von Stackelberg said she would be interested in leading a workgroup on this topic. Dr. Philbert agreed to be a member of the workgroup. Dr. Swackhamer commented that this effort may dovetail nicely with work that the SAB will undertake in the next year; perhaps the SAB and the BOSC could work together on this topic.

Dr. Sayler noted that this approach could help with the quantitative efficiency measure. Dr. Philbert suggested that EPA work with other agencies that also are interested in this approach.

ORD Briefing on Biofuels

Mr. Alan Hecht, Sustainability Director, ORD, EPA

Mr. Hecht provided some background on EPA's involvement in biofuels. He stated that in November 2006, the National Advisory Council on Environmental Policy and Technology (NACEPT) established an Energy Working Group and in February 2007, NACEPT recommended that EPA develop an EPA Biofuels Strategy. In January 2007, in response to comments from the BOSC and SAB, ORD redefined the STS Program to focus on sustainable biofuel production. In September 2007, the EPA Administrator directed ORD to work with OAR, Region 7, and the EPA Agricultural Counselor to coordinate preparation of the EPA Biofuels Strategy. In December 2007, the Energy Independence and Security Act (EISA) of 2007 added mandates for EPA regarding biofuels. In January 2008, EPA advanced sustainable biofuels production (in the National Biofuels Action Plan) and development of sustainable biofuel criteria

and indicators, and established seven workgroups. In March 2008, the Biomass Research & Development (R&D) Board revised the National Biofuels Action Plan to focus on sustainable biofuel production and created seven workgroups. In June 2008, EPA completed the EPA Biofuels Strategy and in August 2008, ORD initiated 14 biofuels projects under the STS Research Program. In September 2008, the Biomass R&D Board released the National Biofuels Action Plan, and EPA released the Draft EPA Biofuels Strategy to NACEPT and the Farm, Ranch, and Rural Communities Committee (FRRCC) for review. Today, the draft strategy was released to the SAB for review.

The biofuel system was used as the framework for the National Biofuels Action Plan and the EPA Biofuels Strategy. This system goes from feedstock production to feedstock logistics, to biofuels production to biofuels distribution to biofuels end use.

Several existing EPA regulations are applicable to biofuels. The CAA regulates emissions from managing feedstock, ethanol, and biodiesel production; power sources; pumps; and vehicle end use. Under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), EPA evaluates the toxicity of pesticides and fungicides and whether they contaminate co-products resulting in potential food chain and ecological exposures and establishes biological tolerances. The National Environmental Policy Act (NEPA) requires an environmental impact assessment if federal funds are involved. Under the Resource Conservation and Recovery Act (RCRA), EPA determines whether discarded materials are hazardous waste and regulates fugitive emissions from pipelines and tanks, as well as underground storage tank leak detection and prevention. The Emergency Planning and Community Right-to-Know Act (EPCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) regulate emergency response to discharge of biofuels. Under the Toxic Substances Control Act (TSCA), EPA requires premanufacturing notification (PMN) and reviews new chemical fuels and new genetically engineered microbes used to produce biofuels or products. Under the Safe Drinking Water Act (SDWA), EPA regulates underground injection control permits; under the Clean Water Act (CWA), EPA regulates National Pollutant Discharge Elimination System (NPDES) permits, total maximum daily loads (TMDLs), water quality standards, and non-point source control.

The EPA Biofuels Strategy includes six sections: Purpose, Environmental Benefits and Impacts, Role of EPA, International Impacts, Research Gaps and Challenges, and Action Items. The core goal of the EPA Biofuels Strategy is to promote actions to enhance sustainable practices and outcomes in all parts of the biofuel supply chain, thus fulfilling the Agency's mission and mandates to protect human health and the environment. The aim of the EPA Biofuels Strategy is to position EPA to strategically:

- ✧ Address biofuel issues in an integrated cross-media manner.
- ✧ Ensure that EPA environmental strategic goals are met.
- ✧ Advance the biofuels industry in a sustainable manner.
- ✧ Respond to public and industry concerns.
- ✧ Meet national biofuel goals.
- ✧ Identify new research and technical opportunities and promote solutions to address environmental and health impacts.

Section 204 of EISA requires the EPA Administrator, in consultation with the Secretary of Agriculture and the Secretary of Energy, to assess and report to Congress every 3 years on the impacts to date and likely future impacts of the requirements of section 211(o) of the CAA on the following:

- ✧ Environmental issues, including air quality, effects on hypoxia, pesticides, sediment, nutrient, and pathogen levels in waters, acreage and function of waters, and soil environmental quality.
- ✧ Resource conservation issues, including soil conservation, water availability, and ecosystem health and biodiversity, including impacts on forests, grasslands, and wetlands.

- ✧ The growth and use of cultivated invasive or noxious plants and their impacts on the environment and agriculture.

In advance of preparing the report to Congress, the Administrator may seek the views of the NAS or another appropriate independent research institute. Mr. Hecht pointed out that GHG emissions effects were not mentioned in the act but noted that they are an issue. Given the Renewable Fuel Standard (RFS) requirements, it is projected that the United States will produce 15 billion gallons of corn ethanol by 2012. There is international concern over the increased use of U.S. corn for ethanol production. Today nearly all ethanol is made from corn grain. In the future, cellulosic biomass will be the primary source for fuel ethanol. Sources of cellulosic biomass include agricultural residues, forestry residues, terrestrial and aquatic crops and trees grown for energy purposes, and selected municipal, agricultural, and industrial wastes.

The focus of the Biomass R&D Board has been the development of the National Biofuels Action Plan to achieve national goals. Seven critical areas have been identified by the Board: (1) feedstock production (U.S. Department of Agriculture [USDA] and Department of Energy [DOE]); (2) feedstock logistics; (3) conversion science and technology (NSF); (4) distribution infrastructure (Department of Transportation [DOT]); (5) fuel blending (DOE, EPA); (6) environment, health, and safety (EPA); and (7) sustainability (EPA, DOE, USDA, OSTP). Mr. Hecht identified two cross-cutting themes: (1) sustainability as a key element of the National Biofuels Action Plan, and (2) the central role of R&D to provide technology advances.

The criteria for sustainable biofuel production are categories of factors, capacities, or processes that are used to evaluate the environmental, economic, or social performance of a topic. The indicators for sustainable biofuel production are measureable outcomes of a criteria; a means for measuring or describing various aspects of the criteria. The benchmarks (metrics) for sustainable biofuel production are quantitative values or qualitative statements representing current industry practice. Mr. Hecht commented that there are probably 100 different indicators to choose from but the workgroup is trying to converge on 14 to 16 criteria measures for which indicators will be developed.

Mr. Hecht mentioned some specific ORD actions related to biofuels. ORD's STS Research Program is supporting 14 new biofuel projects (the National Risk Management Research Laboratory [NRMRL]). ORD's Ecological Research Program launched the Future Midwestern Landscapes Study, which is examining the projected changes in landscapes and ecosystem services in the Midwest. Given its immediate influence, biofuel production will be studied as the primary driver of landscape change. The STS Research Program is leading the interagency development of sustainable biofuel criteria and indicators. In addition, the STS Research Program leads the Environment, Health, and Safety Workgroup of the Biomass R&D Board. ORD, in conjunction with OAR, Region 7, and the Agricultural Counselor, is leading discussions of the framework for the EPA report to congress. The STS Research Program also is working with the University of Tennessee-Oak Ridge on a China-United States bioenergy workshop.

Mr. Hecht identified the three LTGs of the draft STS MYP: (1) LTG 1—Decision-makers adopt ORD-identified and developed metrics to quantitatively assess environmental systems for sustainability, (2) LTG 2—Decision-makers adopt ORD-developed decision support tools and methodologies to promote environmental stewardship and sustainable environmental practices, and (3) LTG 3—Decision-makers adopt innovative technologies developed or verified by ORD to solve environmental problems, contributing to sustainable outcomes. The outcome is that the research is used to support decisions, policies, and initiatives that promote environmental stewardship and sustainable environmental practices.

Mr. Hecht closed his presentation with a timetable for the future. In September 2008, the National Biofuels Action Plan was released and the Draft EPA Biofuels Strategy was released to NACEPT, FRRCC, and SAB. In October 2008, RFS 2 requires substantial increases in the use of renewable fuels, including renewable fuels with significantly lower life cycle GHG emissions (proposed rulemaking—life

cycle GHG emissions, pollutants, land use changes). Also in October 2008 will be the China-U.S. Workshop on Biofuels, the SAB workshop on future issues, and the DOE-USDA Sustainability Research Workshop. In November 2008, NACEPT will review the EPA Biofuels Strategy, and EPA will finalize the strategy and launch the EPA biofuels Web site. A workshop on criteria and indicators will be held in December 2008, and ORD will define its Biofuels Research Strategy. The new team will be briefed from December 2008 to February 2009, and the STS mid-cycle review will be conducted by the BOSC in March 2009.

Dr. Duke commented that the Ecological Society of America held a conference on the ecological dimensions of biofuels in March 2008. He was very impressed with what EPA has accomplished so quickly. Dr. Duke will be leading a session entitled "Biomass, Biofuels and Biodiversity: Biodiversity and Carbon Sequestration" at the National Council for Science and the Environment's conference in December. He also mentioned the SAB workshop in October, which includes a session on biofuels.

Dr. Swackhamer said that she too was impressed with what EPA has accomplished so quickly. EPA is definitely staying ahead of the curve on this issue. Mr. Hecht replied that there is a high level of enthusiasm for this effort within the Agency.

Dr. Sayler asked Mr. Hecht what the BOSC could do to help the program. Mr. Hecht responded that the BOSC will be looking at this effort in the STS mid-cycle review coming up in March 2009. He mentioned that ORD wants to sponsor a major workshop on life cycle methodology. He pointed out that the biofuels program impacts a number of ORD research programs, including the STS, Ecological, and Global Change Research Programs. Dr. Giesy commented that the biofuels program could become the *raison d'être* of the STS Research Program. Dr. Demerjian asked if anyone was looking at feedstocks and exhaust composition from biodiesel. Mr. Hecht responded that EPA is looking at GHG emissions from different feedstocks. The Agency also is looking at compatibility of different feedstocks, fuel blending, and water supply. Dr. Swackhamer pointed out that water quantity issues are not the purview of EPA. Mr. Hecht agreed, explaining that EPA is focusing on water supply as part of the entire supply chain, rather than water quantity.

Future Discussion/Future Business

Dr. Gary Sayler, Chair, BOSC Executive Committee

Dr. Sayler said that it may be necessary to hold an Executive Committee conference call in November to discuss the investment efficiency issue. He will work with Dr. Weiss to develop a strawman for the call and Ms. Kowalski (or Ms. Drumm) will schedule and make the arrangements for the call.

Dr. Sayler asked if there were any volunteers to vet the Water Quality Mid-Cycle Review Report (ready in February 2009) and the STS Mid-Cycle Review Report (probably ready in May 2009). Drs. van Stackelberg and Paustenbach agreed to serve as vetters for the Water Quality Mid-Cycle Review Report. Drs. Philbert and Ryan volunteered to serve as vetters for the STS Mid-Cycle Review Report.

Dr. Teichman said that he had clocks to present to Drs. Daston and Henderson to thank them for their years of service on the BOSC. They were vital members of the Board and provided excellent advice to help improve ORD programs. He also will send one to Dr. Swackhamer to thank her for her superb work in support of the BOSC.

Dr. Sayler reminded the BOSC members that the next Executive Committee had been scheduled for February 9-10, 2009 in Washington, DC. He reminded the members to notify him and Ms. Kowalski if they are interested in any of the SAB activities. Dr. Sayler then will send a letter to the SAB Chair asking that the BOSC be included in the activity. When there was no additional business to discuss, Dr. Sayler adjourned the meeting at 3:15 p.m.

Action Items

- ✧ BOSC members will notify Dr. Sayler and Ms. Kowalski if they are interested in participating in any of the SAB activities. Dr. Sayler then will send a letter to the SAB Chair asking to include the BOSC in the activity.
- ✧ Dr. Hass indicated that he is interested in participating in the SAB review of the Anthrax Technical Assistance Document.
- ✧ Dr. Teichman will provide his presentation on the ORD budget that was presented to the SAB to the BOSC members.
- ✧ Dr. Daston will provide his comments on the Homeland Security Research Program Review Report to Dr. Sayler.
- ✧ Dr. Sayler will revise the Homeland Security Research Program Review Report and submit it to Ms. Kowalski.
- ✧ Drs. Duke and Ryan will send their comments on the Land Mid-Cycle Review Report to Dr. Menzie and Ms. Kowalski.
- ✧ Dr. Menzie will revise the Land Mid-Cycle Review Report and submit it to Ms. Kowalski.
- ✧ Dr. Paustenbach volunteered to work with another BOSC member who has more experience with program reviews to develop a standard format for the reports.
- ✧ Dr. Andersen agreed to serve on the EDCs Subcommittee.
- ✧ Dr. Haas agreed to be the Chair or Vice Chair of the Drinking Water Subcommittee.
- ✧ Dr. Demerjian agreed to serve as the Chair of the Air Subcommittee.
- ✧ Dr. Ryan, who served as Vice Chair of the Subcommittee that conducted the SP2 program review, volunteered to serve as the Chair of the SP2 Mid-Cycle Subcommittee.
- ✧ Dr. von Stackelberg volunteered to lead a workgroup on the topic of value of information (VOI).
- ✧ Dr. Philbert agreed to serve as a member of the VOI workgroup.
- ✧ Dr. Sayler will work with Dr. Weiss to develop a strawman on investment efficiency by November 2008.
- ✧ Ms. Kowalski (or Ms. Drumm) will schedule an Executive Committee conference call in November 2008 to discuss the investment efficiency strawman developed by Drs. Sayler and Weiss.
- ✧ Drs. von Stackelberg and Paustenbach agreed to serve as vettors for the Water Quality Mid-Cycle Review Report.
- ✧ Drs. Philbert and Ryan agreed to serve as vettors for the STS Mid-Cycle Review Report.

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**39th EXECUTIVE COMMITTEE FACE-TO-FACE MEETING
AGENDA**

September 18-19, 2008

Key Bridge Marriott

1401 Lee Highway

Arlington, VA 22209

Tel: (703) 524-6400

Thursday, September 18, 2008

2:00 p.m. - 2:15 p.m.	Welcome and Introductions - Review of May Meeting Minutes - Overview of Agenda	Dr. Gary S. Sayler, Chair, Executive Committee
2:15 p.m. - 2:30 p.m.	BOSC DFO Remarks - Administrative Issues	Ms. Lori Kowalski, Office of Research & Development (ORD)
2:30 p.m. - 4:45 p.m.	ORD Responses to BOSC Reports: - Science and Technology for Sustainability - Human Health Risk Assessment - National Center for Environmental	Mr. Alan Hecht, ORD Dr. John Vandenberg, ORD Dr. William Sanders, ORD Research (NCER)
4:45 p.m. - 5:15 p.m.	SAB Activities	Dr. George Lambert, SAB Liaison to the BOSC
5:15 p.m.	Adjourn	

Friday, September 19, 2008

8:45 a.m. - 9:00 a.m.	Registration	
9:00 a.m. - 9:30 a.m.	AA/ORD Remarks	Dr. Kevin Teichman, Deputy Assistant Administrator for ORD
9:30 a.m. - 11:15 a.m.	Subcommittee Draft Reports: (1) Homeland Security Draft Report Presentation - Discussion (2) Land Mid-Cycle Draft Report Presentation - Discussion	Dr. Gary Sayler, Subcommittee Chair Executive Committee Dr. Charlie Menzie, Subcommittee Chair Executive Committee

Agenda for September 18-19, 2008 Executive Committee Meeting

11:15 a.m. – 11:30 a.m.	Public Comment	
11:30 a.m. – 12:30 p.m.	Lunch	
12:30 p.m. – 1:30 p.m.	Subcommittee Updates:	
	<u>Mid-Cycle Review Subcommittees:</u>	
	- Water Quality Mid-Cycle	Dr. Gary Sayler, Subcommittee Vice-Chair
	- Science and Technology for Sustainability (STS) Mid-Cycle	Dr. John Giesy, Subcommittee Chair
	<u>Program Review Subcommittees:</u>	
	- Human Health Program Review	Dr. Henry Falk, Subcommittee Vice-Chair
	- Endocrine Disrupting Chemicals (EDC) Program Review	Dr. Gary Sayler, Chair Executive Committee
	<u>Standing Subcommittees:</u>	
	- National Center for Environmental Research (NCER)	Dr. Martin Philbert, Subcommittee Chair
	- National Exposure Research Lab (NERL)	Dr. Ken Demerjian, Subcommittee Chair
1:30 p.m. – 2:00 p.m.	NAS Recommendation for Assessing Investment Efficiency	Mr. Phillip Juengst, ORD
2:00 p.m. – 2:30 p.m.	ORD and Value of Information	Dr. Fred Hauchman, ORD
2:30 p.m. – 3:00 p.m.	ORD Briefing on Biofuels	Mr. Alan Hecht, ORD
3:00 p.m. – 3:30 p.m.	Future Discussion/Future Business	Dr. Gary Sayler, Chair, Executive Committee
	- Workgroup Update	
	- EC Meetings in 2009	
	- Mid-Cycle Reviews in 2009	
	- Future Work	
3:30 p.m.	Adjourn	