

Date to be Added at Time of Signature

The Honorable Stephen L. Johnson
Administrator
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Subject: Science Advisory Board (SAB) Report on the Office of Research and Development's (ORD) Sustainability Research Strategy and the Science and Technology for Sustainability Multiyear Plan

Dear Administrator Johnson:

At the request of the Office of Research and Development (ORD), the SAB recently reviewed ORD's Sustainability Research Strategy (Strategy) and the Science and Technology for Sustainability Multiyear Plan (Plan).

The SAB's Environmental Engineering Committee, augmented with other SAB members for this advisory, strongly endorses the Agency's decision to establish environmental sustainability as the overarching framework through which present and future environmental decisions will be made. The Committee applauds the Agency's determination to move beyond the historical media-specific environmental protection programs to a multifaceted systems regulatory approach that effectively balances environmental, economic and societal interests.

The Strategy identifies and describes a range of compelling sustainability outcomes that will support risk-based environmental protection decisions without compromising society's economic or social development goals. With its emphasis on interdisciplinary approaches to environmental protection, the Strategy provides an effective road map for the transitioning of the Agency's Pollution Prevention and New Technologies (PPNT) program to the new Technology for the Sustainability program. Similarly, the Plan, which describes the Agency's proposed sustainability research and technical activities, describes a clear and unambiguous path that will permit the Agency to achieve both its short term and long term sustainability outcomes.

Although the Committee supports the systems-based approach to environmental decision-making espoused by the sustainability paradigm, it also recognizes that adoption and effective implementation of sustainability principles across the Agency requires the training and deployment of a sustainability-centered workforce. The

1 Committee encourages the Agency to establish creative human resource programs that
2 will help develop and foster the requisite sustainability expertise and skill sets within the
3 Agency's current workforce as well as for effective targeting of uniquely trained
4 employees from outside the Agency.
5

6 To be effective, a sustainability-centered workforce also must be supported by a
7 management structure that values and can facilitate a systems approach for addressing
8 environmental issues. Senior Agency management is encouraged to re-examine the
9 current lines of authority and accountability within the Agency hierarchy in order to
10 identify and remove any structural impediments that could adversely impact the broad
11 inculcation of sustainability principles within the Agency's decision-making processes.
12

13 Finally, because of the Agency's international reputation as scientifically credible
14 steward of environmental protection, the Committee supports the Agency assumption of
15 a more visible and substantive leadership role in promoting and coordinating
16 sustainability-focused research activities across the federal government as well as with
17 private sector partners. Other government agencies (both national and international),
18 commercial industry and a myriad of non-governmental organizations and private
19 citizens have endorsed environmental sustainability as the most appropriate and
20 defensible approach through which sound environmental decisions can be made. The
21 Committee encourages the Agency to strategically utilize its scientific credibility and
22 political capital to accelerate the broad adoption of sustainability principles as the
23 fundamental underpinnings to sound environmental protection decision-making.
24

25 Thank you for the opportunity to provide advice on this important and timely topic
26 now confronting Agency decision-makers. The Committee applauds the Agency's
27 leadership and courage in advancing the sustainability paradigm as a scientifically and
28 economically sound approach for effectively addressing current and emerging
29 environmental issues. The Committee would also like to acknowledge its pleasure in
30 working with a very dedicated, knowledgeable and responsive ORD staff. Please feel
31 free to contact us if you have any questions concerning this review.
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35 Sincerely,
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40 Dr. Granger Morgan, Chair
41 EPA Science Advisory Board
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Dr. Michael J. McFarland, Chair
Environmental Engineering
Committee Augmented for
Sustainability Advisory EPA Science
Advisory Board

NOTICE

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4 **Environmental Engineering Committee Augmented for Sustainability**
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July 25, 2006 DRAFT report of the US EPA Science Advisory Board's Environmental Engineering Committee for Discussion at its August 1 public conference call meeting

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1. Executive Summary

For this activity, the Science Advisory Board augmented the Environmental Engineering Committee with members from the chartered Board and the Environmental Economics Advisory Committee, a standing committee of the Board. In this report, the Environmental Engineering Committee Augmented for Sustainability Advisory (henceforth as the Committee) provides its advice on both the Office of Research and Development (ORD) Sustainability Research Strategy (henceforth the Strategy) and the Science and Technology for Sustainability Multi-year Plan (henceforth the Plan). In developing its advice, the Committee relied upon the documents, briefings by the Agency on a conference call May 17 and at the June 13-15, 2006 meeting in Washington, DC. and public comment.

The Committee was unanimous in its opinion that the Strategy and Plan clearly support the Agency's transition from the historical single media or "stovepipe" approach to environmental protection to a multifaceted systems approach that balances competing environmental, economic and societal interests. The Strategy, which basically describes a research framework for addressing the technical, social and economic complexity of current and emerging environmental protection issues, constitutes a new paradigm that explicitly embraces the application of life-cycle principles in support of risk management decisions. The Strategy emphasizes an integrated methodology to solving environmental issues through explicit recognition of the broader context within which environmental problems occur.

The Committee strongly supports the Agency's decision to adopt environmental sustainability as the overarching framework through which present and future environmental decisions will be made. The Committee applauds the Agency's determination and courage to move beyond the media-specific regulatory model in addressing environmental problems to a fully integrated approach that is cognizant of the economic and social impacts of environmental decision-making. Implementation of environmental protection decisions that also support the economic and social well-being of future generations is of paramount importance to Agency decision-makers and the Strategy clearly establishes the path for achieving that goal.

Similarly, given the expanding technical and social-science based informational needs that are necessary to support sustainability-focused environmental decisions, internal restructuring of the Agency's current programs is required to manage and direct data collection and processing activities. To this end, the Committee acknowledges that the Strategy provides a clear and effective road map for facilitating the Agency's transition from the Pollution Prevention and New Technology (PPNT) program to the Technology for Sustainable Outcomes program.

Of particular importance to achieving broad Agency adoption of the sustainability paradigm is the creation and deployment of a technical workforce effectively trained in the practical application of environmental sustainability concepts and methods. The

1 Committee encourages ORD to work with senior Agency management to establish and
2 reinforce the institutional changes necessary to foster a greater understanding and
3 appreciation for the economic and societal benefits associated with sustainability-
4 centered environmental protection programs.

5
6 Accompanying the Strategy is the Agency's sustainability Plan, which describes the
7 specific research and technical activities proposed by the Agency that will support future
8 sustainability-focused environmental decision-making. The Committee fully endorses
9 the Plan as the blueprint for the Agency to achieve both its short and long term
10 sustainability outcomes. However, the Committee also recognizes that ensuring
11 successful sustainability outcomes is dependent on the Agency's ability to secure and
12 commit sufficient resources to support the development, dissemination and application
13 of new environmental monitoring and assessment technology as well as the design and
14 implementation of suitable sustainability metrics and indicators. The Committee is
15 confident that full implementation of the sustainability Plan will generate vital scientific
16 and technical information that will enable Agency decision-makers to effectively address
17 both present and emerging environmental issues.

18
19 Because of the Agency's international reputation as a scientifically credible steward of
20 environmental protection, the Committee strongly encourages the Agency to assume a
21 more substantive and visible leadership role in developing, disseminating and
22 implementing environmental sustainability principles. Other government agencies (both
23 national and international), commercial industry and a myriad of non-governmental
24 organizations and private citizens have endorsed environmental sustainability as the
25 most appropriate and defensible approach through which sound environmental
26 decisions can be made. Moreover, as global recognition of the economic and societal
27 impacts on environmental decision-making increases, the interdisciplinary approach to
28 solving environmental issues endorsed by the Strategy and Plan elevates the Agency's
29 environmental stewardship profile. The Committee encourages the Agency to
30 strategically utilize its scientific credibility and political capital to accelerate the broad
31 adoption of sustainability principles as the fundamental underpinnings to sound
32 environmental protection decision-making.

33
34 The Agency asked the Committee to address eight multiple part Agency charge
35 questions specifically focused on the Strategy and nine multiple part Agency charge
36 questions that pertained to the Plan. Many of the Committee's responses to these
37 charge questions were overlapping but the salient points and recommendations for
38 each are summarized in the report. Beyond the assigned Agency charge questions,
39 the Committee identified seven additional overarching issues/recommendations that
40 were determined to be of critical importance to the Agency in establishing the
41 sustainability paradigm as the cornerstone of future environmental protection decisions.

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The overarching issues/recommendations are briefly summarized here.

1. The Committee recommends that the Agency better define those terms associated with the sustainability strategy and the measurement of sustainability outcomes.

To minimize the confusion and ambiguity for the targeted audience of both the Strategy and the Plan, the Committee encourages the Agency to define more clearly what is meant by the term sustainability. Both documents would benefit from explicit acknowledgement of the competing definitions of sustainability, thereby providing a context for the Agency's choice among the various definitions of this term and recognition of alternative views of this contested and often nebulous topic.

2. The Committee supports increased integration of sustainability principles through implementation and evaluation on well focused, specific and multi-faceted environmental problems.

The Committee acknowledges that the judicious selection of research projects within the Plan will help to facilitate the diffusion and adoption of the sustainability paradigm both within and outside the Agency. To ensure a successful Agency transition from the traditional media-specific "stove pipe" approach to a more integrated systems approach to environmental protection requires that the sustainability research activities be scientifically compelling and have wide national visibility. Moreover, the sustainability research products should strategically integrate into the Agency's other 16 multi-year plans and provide the technical focus that guides the sustainability research activities conducted by other federal agencies.

ORD should consider development of project portfolio that balances risk, targeted Agency needs and geography. The project portfolio should become the basis for articulating the relationship between projects and products for the annual performance measures (APM) and annual performance goals (APG) described in the Plan.

3. The Committee encourages the Agency to become more creative and strategic in developing its human resources programs with the goal of establishing a critical number of champions of the sustainability approach to environmental protection

Given limited financial and personnel resources, it is essential that the Agency be strategic in the development and deployment of its human capital. The Committee encourages the Agency to acknowledge more explicitly the human resource implications of working on sustainability-related research. In other words, for the Agency to be successful in establishing a new sustainability-centered paradigm for achieving environmental protection requires aligning Agency personnel with the

1 appropriate skill set with an effective management structure. Simply attempting to
2 overlay sustainability principles onto the existing ORD program structure may not yield
3 the desired results.

4
5 If the Agency is to achieve the goals set forth in the Strategy and Plan, it needs to
6 address the mismatch of ORD's current skill set with the skill set desired to implement
7 the Strategy and Plan. How the transformation is achieved is a matter for the Agency to
8 determine. The following Committee comments are only possibilities. The requisite
9 expertise needed to support the sustainability paradigm may be acquired through new
10 hires, redirection of the current workforce accompanied with targeted training programs
11 or through reassignment of personnel from other federal agencies. A sabbatical
12 program to enable current staff to develop new skill sets would allow the Agency to
13 better employ talented individuals whose current work may no longer be supportable.
14 The Agency could consider the use of internal transfers for ORD employees, the
15 Intergovernmental Personnel Act (IPA's) to hire outside experts such as academics,
16 other federal employees and post-doctoral (e.g., AAAS Science Fellows program).

17
18 The Committee observes that the Agency has no in-house experts with a background in
19 decision theory. If the Agency is to pursue the critical social dimensions of sustainability,
20 it needs to employ individuals with backgrounds beyond the physical sciences,
21 engineering and economics. Stronger social science components that go beyond
22 economics are needed. Such fields and tools include anthropology for ethnographic
23 assessments (how individuals, households and communities think, behave and interact
24 with products, technologies and natural systems) and psychology (behavioral
25 economics) among others.

26
27
28 4. The Committee encourages the Agency to enhance the diffusion of sustainability
29 principles and practices within and outside the Agency

30
31 There is a need for ORD to provide leadership both internally to the Agency and
32 externally among other federal agencies. The Agency has an opportunity to coordinate
33 and lead in the definition of environmental sustainability and in the use of related
34 research products which will influence how other federal agencies and organizations
35 move forward with their sustainability programs. The Plan correctly points out that as
36 the value of the ORD sustainability program becomes recognized, other program
37 directors and offices will become more compliant with its attributes, goals, and metrics,
38 and will become active in seeking out collaborative projects.

39
40 To assume a leadership role in promoting the economic and societal benefits of
41 environmental sustainability, the Agency must fundamentally change its approach to
42 environmental protection decision-making. This paradigm shift needs to be away from
43 the current "stove pipe" media-specific regulatory programs and move towards a true
44 systems approach involving personnel from many different areas, including different
45 Agency program offices, Agency regional offices, other federal agencies (e.g.,

1 Department of Defense, Department of Energy, Department of Agriculture, etc.), local
2 environmental groups, private industry and other community stakeholders.

3
4 There are many opportunities for ORD to assume a leadership role, even in the context
5 of limited financial resources. ORD could seek to develop new and greater capacity in
6 sustainability research through a combination of new personnel with training in
7 sustainability research, incentives for existing personnel to explore ways in which their
8 expertise could be incorporated into the sustainability model, pioneering new models of
9 cooperative research within the Agency and with industry, and development of
10 sustainability "incubators" within the Agency (the Committee applauds the Agency's
11 establishment of the Sustainable Environmental Systems group).

12
13
14 5. The Committee strongly supports a greater and more explicit endorsement of the
15 sustainability approach by the Administrator as well as other senior Agency
16 management personnel.

17
18
19 The Committee strongly encourages ORD to assume a more visible leadership role
20 both internally to the Agency and externally among other federal agencies with respect
21 to sustainability and environmental stewardship. To that end, within ORD, the position
22 of National Program Manager for Sustainability with broad authority and resources
23 could provide important sustainability-focused leadership not only within ORD but in the
24 Agency as a whole. The National Program Manager, as well as the leadership of the
25 various programs directed at sustainability should be selected carefully. Explicit support
26 by the Administrator for adoption of the sustainability paradigm as the fundamental
27 framework for defensible environmental protection decision-making is critical. The
28 Committee members concurred that, for the Agency to become an effective leader in
29 the diffusion and implementation of sustainability-based environmental decision-making
30 across the federal government, a full and immediate commitment of support from senior
31 Agency management is necessary.

32
33
34 6. The Committee recommends that the Agency establish more effective and
35 substantive collaborations with other federal agencies as well as the private
36 sector.

37
38 The Committee applauds ORD for their recognition of the need to establish partnerships
39 with sustainability related programs and activities being conducted by organizations
40 outside of the Agency as summarized in Section 5.2 of the Plan. However, the
41 Committee is of the opinion that collaboration and leveraging of resources with outside
42 organizations is such an important item that the Agency should provide explicit
43 descriptions of the scope, goals and objectives of each of these research activities.

44
45 As environmental sustainability relates to achieving a balance between economic
46 growth, social responsibility and environmental protection, the Agency should endeavor

1 to establish substantive collaborative relationships with a broad range of government,
2 private-commercial and local environmental organizations. With much effort and focus
3 being given to the issue of environmental sustainability by numerous groups, the
4 Agency could assume a key role in providing overall leadership and coordination among
5 these different organizations. The Agency is in a unique and strategic position to
6 provide the necessary program structure and research focus to these diverse groups as
7 none presently exists.

8
9
10 7. The Committee believes that the Agency's selection of and priorities for pilot
11 projects and case studies should be the result of a bolder yet balanced approach
12 that clearly illustrates the benefit of adopting sustainability principles (e.g.
13 systems approach).

14
15 Recognizing that the current budget climate might encourage ORD to be conservative in
16 its selection of sustainability projects to support, the Panel nevertheless urges the
17 Agency to adopt a more creative approach and to think "outside the box" in identifying
18 those research activities that may yield valuable information regarding the potential
19 benefits and limitations associated with the application of the environmental
20 sustainability paradigm. For example, given the importance of water resources and
21 water resource development, especially in the western US, the Agency has the
22 opportunity to apply sustainability principles in examining the options for reuse/recycle
23 of grey waters or collection and reuse of rain water. Similar opportunities exist within
24 ORD and other Agency program offices and the willingness to undertake such studies
25 would help to elevate the Agency's visibility and reputation as a global leader in
26 sustainability-centered environmental protection.

27
28 The responses to the Sustainability Research Strategy Charge Questions
29 are briefly summarized here.

30
31
32 S1. Does the SAB agree with the central premise of the Strategy that sustainability is
33 all about decision making and that ORD research support should aim to inform
34 and allow decision makers at all levels of government and in the private sector to
35 choose courses of action that will lead to achieving sustainable outcomes?

36
37 The Sustainability Strategy document is a careful and thoughtful effort to capture the
38 opportunity to implement an important paradigm shift across much of the agency's
39 jurisdiction and, along with other Federal partners and stakeholders, the national
40 landscape. The Agency is to be commended for its work here.

41
42 The document will serve as an important companion document to the Plan as the
43 sustainability paradigm is adopted internal to the Agency. It will also be important as the
44 Agency works externally with other Federal agencies and stakeholders across the
45 national landscape.

1 However, the Committee does not explicitly agree with the central premise that
2 sustainability is "all about decision making" and "aiming to inform." Rather, four
3 additional, expansive views are offered:

- 4
5 1. Some core research about sustainability science is needed.
- 6
7 2. The public and public stakeholders are clearly part of the cultural aspect of
8 responding to and implementing sustainability at the local level.
- 9
10 3. The definition of sustainability may benefit from additional interpretation.
11 The research portfolio would be more compelling if ORD were willing to be more
12 explicit about the interdependence of the three pillars of sustainability
13 (environment, social aspects and the economy).
- 14
15 4. ORD needs to be thinking about a life-cycle approach to change, that
16 goes beyond just generating information and getting it to decision makers and
17 includes behavioral change and outcome measurement over time.

18
19
20 S2. Does the strategy make a compelling case for ORD and EPA that Sustainability
21 Research is a priority for ORD?

22
23 The Committee agreed with the case made in the Strategy that a systems view is
24 needed in order to address environmental problems and that a sustainability framework
25 encompasses a systems approach.

26
27 S3. Does the strategy focus on priority national issues and identify the right research
28 questions?

29
30 The Strategy is cross-media. The areas and questions outlined are quite
31 comprehensive, and expand upon the initial themes. Nevertheless the Committee is
32 concerned that insufficient attention is devoted to certain issues (such as climate
33 change research), the interface of social science and economics research with
34 chemical/biological research, and the difficulty of developing a meaningful suite of
35 sustainability. Nevertheless, the country needs to begin this journey and should have
36 done it much sooner

37
38 S4. Does the strategy identify the right implementing steps to address research
39 questions and achieve sustainable outcomes (Advance technology, develop tools
40 and approaches, advance systems research and disseminate and apply results.)

41
42 As implementation progresses, the specificity of the Strategy decreases and as does
43 ORD's control over the outcomes. The latter will lead to measurement problems. The
44 Strategy should acknowledge increasing resource demands tied to coordination with
45 multiple entities. Neither the Strategy nor the Plan specify how the Agency will identify
46 and pursue future research opportunities, what resources will be used, or how success

1 might be evaluated. Finally, it is not clear what happens to pollution prevention.
2 Prevention has been an important part of EPA message for over 15 years and one
3 which resonates with the public, NGO community, and certainly some parts of industry.
4

5 S5. Does the strategy adequately and correctly connect to policy and/or decision-
6 makers inside and outside EPA for achieving desired sustainability outcomes?
7

8 Policy and decision-making are two different, but related, aspects of the problem
9 Decision-making depends on the way policy is implemented, and requires that
10 appropriate incentives (i.e. policy tools) be implemented. The Strategy focuses on
11 activities, offices, and regions within EPA, and coordination among these entities.
12 There is very limited discussion of connections to and collaborations with decision-
13 makers and organizations outside of EPA. The strategy does connect to EPA decision-
14 makers by arguing that environmental sustainability research is important and
15 appropriate for ORD, as well as by seeking to negotiate with other EPA program
16 managers and decision-makers about the content and future of sustainability research
17 at EPA.
18

19
20 S6. Does the strategy enable ORD to prioritize its research investments? Does the
21 strategy define an appropriate role for EPA relative to other funding agencies?
22 Does it sufficiently encourage other Federal agencies and organizations to relate
23 their sustainability efforts to EPA's so as to promote co-funding and/or
24 collaboration where appropriate?
25

26 The strategy document clearly states that it is up to the individual multi-year plans and
27 to the National Program Directors to identify their priority sustainability research areas
28 and presents criteria for setting priorities that are consistent with those in the
29 sustainability strategy document. Moreover, the strategy document emphasizes that
30 each individual multi-year plan should develop a balanced research portfolio with a
31 good mix of short-term and long-term projects, known and emerging issues, projects
32 that are traditionally central to EPA's mission
33

34 However, the Committee had mixed reactions to this agenda and criteria for setting
35 priorities. Following general discussion within the Committee, and recognizing that
36 ORD wants to establish its presence in the area of sustainability, but that the budget
37 available for this purpose is very limited, the Committee recommends a two-pronged
38 approach that (i) pursues core research on sustainability and sustainability metrics, and
39 (ii) establishes a small number of demonstration projects that would give ORD high
40 visibility in the sustainability arena
41

42 S7. Does the Strategy outline an adequate roadmap for ORD to implement this
43 program (P2 transition to Sustainable Technology, coordination among NPD and
44 across existing multi-year plans, leveraging interagency cooperation, and
45 defining emerging research areas?)
46

1 The Strategy lists specific projects and programs with a sustainability emphasis or focus
2 in other agencies. It also identifies other federal agencies with overlapping interests for
3 each of the six broad research themes, as well as international partners. Despite these
4 lists, however, and EPA's acute awareness of other nations' focus and recent advances
5 on sustainability matters, the discussion and the information offered is too cursory to
6 allow the Committee to judge whether these other agencies will feel encouraged to
7 establish partnerships with EPA and promote co-funding and collaborations.
8

9 S8. Does the SAB believe that sustainability research is a sufficiently strong concept
10 for integrating and coordinating across ORD research programs?
11

12 Upper management and a critical core of Agency scientists should take sustainability
13 very seriously and sustainability research can play an important role in integrating and
14 coordinating across ORD research programs. However, the exigencies of Agency
15 mandates, resource constraints, and the "ownership" of key topics by other agencies,
16 makes it unlikely that the full portfolio of ORD research programs can be integrated in
17 this manner
18

19
20 The responses to the Multi-Year Plan Charge Questions are briefly summarized here.
21

22 P1. Does the organization of the new Sustainability Technology PLAN provide a clear
23 logical framework for implementing an element of the overall Sustainability
24 Strategy? Does the PLAN follow appropriately from the Sustainability Research
25 Strategy? Are the research issues identified in the PLAN consistent with the
26 research questions identified within the Sustainability Research Strategy?
27

28 The Plan provides a clear logical framework for implementing an element of the overall
29 Strategy. Within the context of limited resources, the Plan identifies a set of issues that are
30 consistent with the Sustainability Research Strategy and current ORD capabilities.
31 The criteria for project selection should be reviewed to ensure that they focus research on
32 projects that will contribute more effectively to the Strategy.
33

34 The Committee is largely satisfied with the content of the Plan through chapter 4. The
35 Committee did engage in extensive discussion about chapter 5, which presents the
36 specifics of the planned research program. The Committee's comments are included
37 later in this document.
38

39 P2. For each major research track addressed within the Plan (e.g., Decision Support
40 Tools, Education, Technologies, Systems, and Metrics/Indicators), do the Annual
41 Performance Goals (APGs) and Annual Performance Measures (APMs)
42 represent a logical progression of activities and intended outcomes? Does the
43 Plan identify the specific issues motivating the research program?
44

1 Within each major research goal related to metrics, tools and technologies , the
2 respective annual program goals and measures represent a logical progression of
3 activities and intended outcomes.

4
5 However, the long-term goals themselves should be re-ordered. A more logical
6 progression is

- 7
- 8 1. Develop the appropriate metrics
- 9 2. Develop any decision support tools required for analysis (keep this systems
10 based if possible and linked to metrics).
- 11 3. Investigate technological options to reach the goal and try to get the technologies
12 in place (SBIR grants, performance incentives...).
- 13

14 Realizing the constraints and wanting to have the biggest impact for the resources
15 invested, the Agency might consider picking one or two key demonstration projects,
16 focused on a real and current sustainability issue where the approach can include all
17 the aspects of metrics development, development and application of decision support
18 tools, and technology development and demonstration. The actual projects identified
19 should have a major impact for the municipality, region, or even industry that is the
20 focus of the project, with the information gained easily transferred to other entities so
21 the value can be realized over and over.

22
23
24 P3. Does the Plan lay out a balanced program addressing both short-term and
25 longer-term research that meets current needs while positioning the Agency to
26 respond to emerging issues?

27
28 If the focus of this question is "what is the best balance between short and long term
29 research products (output) to ensure the success of the program, then it might be useful
30 to weight the balance to 60% short term research projects that develop useful products
31 in the next year or two; and 40% long term (i.e. research projects that develop useful
32 products within five years) so that early successes are ensured.

33
34 In addition, the long term research needs to flow from the short term time frame.

35
36
37 P4. Do the long-term goals address the high-priority science, engineering, and
38 technology needs of users that will help the Agency meet its strategic goals
39 relating to sustainability? Do the long-term goals clearly relate to the research
40 tracks within the Plan framework? Do they provide a picture of what the program
41 is trying to achieve? Will the proposed research activities lead to progress
42 towards these goals? Are the goals appropriately linked to long-term
43 environmental outcomes?

44
45 Addressing the longer term outputs and outcomes of the program is important because
46 ORD research has historically been focused on shorter term needs. The Plan explains

1 clearly the linkages of the annual performance goals to the long-term goals and the
2 long-term goals to the Strategy; however, it is not clear that these long-term goals will
3 significantly advance sustainable approaches to management and address specific
4 sustainability. The weakest part of the Plan is the link between the long-term goals and
5 long-term environmental outcomes. The outcomes, while measurable, are not really
6 challenging and focused on achieving goals through the application of sustainability
7 principles. A weak link here leaves the Plan vulnerable to retreating to a focus on end-
8 of-pipe treatment.

9
10 While the development of new, more sustainable technologies is usually best left to the
11 private sector, the Agency has a critical role to play in certifying and evaluating data and
12 making it available to the sustainability community and performing research on ways to
13 incentivize companies to invest in and adopt new technologies.

14
15 The Plan alludes but does not explicitly develop the Agency's role in conducting "regular
16 and continuous assessments of environmental trends". If indeed the Agency assumes
17 this role, and makes such assessments available in a non-politicized way, then it will be
18 performing a valuable service that can enable decision makers at all levels to respond
19 to emerging issues as well as ongoing ones.

20
21 P5. Are the research products supportive of the strategic target as set forth in the
22 Agency's Strategic Plan under Objective 5.4?

23
24 Objective 5.4 of the Agency's Plan focuses on enhancing society's capacity for
25 sustainability through science and research. The long-term goals support this strategic
26 target, by establishing sustainability metrics, creating decision-support tools, and
27 developing and applying cutting-edge technologies to solve environmental problems.
28 However it is not clear who will be leading proposed efforts, how funding will be
29 prioritized, or how the research products will be defined. Given the lack of detail, it is
30 difficult to assess the nature of the products or their significance. With the small budget
31 projected it is not likely that products will have a large impact on enhancing the science
32 or decision-support of sustainability.

33
34 P6. Does the scope of work proposed within the Plan complement research being
35 supported by other programs inside and outside EPA?

36
37 The Committee found that the scope of work appeared to complement research inside
38 the Agency and perhaps outside the Agency. More extensive investigation and
39 documentation of external research related to the Plan is urged.

40
41 P7. Are there other potential emerging research areas that the Plan should consider?

42
43 The long-term goals are sufficiently broad to cover most emerging issues, however, it is
44 not clear how the Agency will identify, prioritize, and respond to emerging issues on an
45 on-going basis. The plan should reflect this since it has both resource and coordination
46 implications

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P8. Is the level of resources specified by the Plan sufficient to address the research issues that it identifies, allowing ORD to achieve the intended outcomes of the research program? Is the Plan's relative allocation of those resources among the research tracks of the sustainability research program appropriate, based on a consideration of scientific and programmatic needs?

The level of support specified for the Plan is less than one one-thousandth of the Agency's overall budget and no more than 1% of the S&T budget. In the Committee's opinion a commitment of \$60-75 million is needed to have a serious impact on internal research priorities and managerial buy-in, and begin to meet the needs of the program. The level of support allocated suggests to the Committee that the Agency has not grasped the potential significance of the injection of sustainability-based themes into its research programs. In the Committee's opinion, the area of sustainability should become ORD's main thrust, with allocation and resources focused here rather than on the historical compliance-focused legacy issues.

P9. Does the Plan appropriately address findings and recommendations in evaluations of the program and its components?

ORD is clearly interested in working with other parts of the Agency and organizations outside of the Agency. However, the descriptions of how such collaborations will be developed and implemented need to be strengthened in the Plan

Overall, the Plan is too vague when it describes proposed results and outcomes that pertain to sustainability. Planned efforts to quantitatively describe those planned results and outcomes need to be expanded in light of future external assessments of the sustainability program.

This Committee review and the upcoming BOSC review should address the concerns delineated in the PART evaluation about timely review. Regarding the integration of the elements of the P2NT (now sustainability) research program, the Plan provides evidence of substantial efforts at coordination and integration. The Committee's evaluation of those effects is described in the responses to other Plan charge questions.

2. Responses to Charge Questions Relating to the Strategy

S1 Does the SAB agree with the central premise of the Strategy that sustainability is all about decision making and that ORD research support should aim to inform and allow decision makers at all levels of government and in the private sector to choose courses of action that will lead to achieving sustainable outcomes?
(Eighmy, July 6)

The Sustainability Strategy document is a careful and thoughtful effort to capture the opportunity to implement an important paradigm shift across much of the agency's jurisdiction and, along with other Federal partners and stakeholders, the national landscape. The Agency is to be commended for its work here.

The document will serve as an important companion document to the Plan as the sustainability paradigm is adopted internal to the Agency. It will also be important as the Agency works externally with other Federal agencies and stakeholders across the national landscape.

Many of the comments offered here reflect initial thoughts by the Committee that eventually resulted in the seven overarching comments being developed during the Committee meeting (presented in section 4 of this report). Consequently, these comments in response to S1 may be elaborative in nature.

In response to this specific question, the Committee does not explicitly agree with the central premise that sustainability is "all about decision making" and "aiming to inform." Rather, four additional, expansive views are offered:

First, some core research about sustainability science is needed. By defining sustainability as "all about decision making," the strategy mixes together scientific questions with assumptions about likely policy directions. These assumptions may not stand the test of time. More importantly, these assumptions weaken and limit the scientific aspects of the strategy, and focus the research too much on near term applications rather than developing a more robust scientific understanding of all aspects of sustainability. Development of decision support tools implies a foundation of knowledge about sustainability. In some areas there is this foundation: for example, the benefits of energy efficiency are widely acknowledged. But by shying away from research at understanding sustainability science and by not clarifying which areas are appropriate for decision support at this time, the strategy may not fully support sustainable outcomes. ORD research support should not just aim to inform to help decision makers, but that the work should also provide some sort of prioritization so that major issues are identified and addressed first and deliver maximum value back to stakeholders in terms of a balance to economic, social and environmental improvements (the three pillars of sustainability).

1 It would be useful for the Strategy document to distinguish two functions: understanding
2 sustainability, and implementing sustainability. The strength of ORD research has
3 traditionally been on understanding environmental impacts; this strength needs to be
4 continued with the main effort of ORD research being the understanding of
5 sustainability. Implementing sustainability will be primarily a policy decision. After policy
6 decisions are made, ORD research could then appropriately focus on applied research
7 to implement the policies. For instance, ORD's efforts is to "develop a set of appropriate
8 metrics to gauge society's progress towards sustainability" (ES-page 14) should in part
9 be based on metrics already available (e.g., energy efficiency) and allow greater focus
10 on current and future policy and regulations. With such existing metrics, then society
11 can get on with the task of developing technologies and approaches to achieve these
12 goals.

13
14 Second, the public and public stakeholders are clearly part of the cultural aspect of
15 responding to and implementing sustainability at the local level.

16
17 Sustainable decision-making will take place at many levels and across both the public
18 and private sectors, from individuals to neighborhoods, municipalities and regions,
19 countries and continents, NGOs and private firms, and consumers and producers. Any
20 plan to inform and support decision-making on such a scale is a very large undertaking,
21 involving research on material and energy flows, but also the generation and flow of
22 information, the economics of incentives, the dynamic role of humankind's perception of
23 self to the environment, and expectations for present and future payback. As such,
24 integration of social factors into the science that ORD has traditionally employed is an
25 essential element of the sustainability paradigm. Typically and historically, change such
26 as this is accompanied by major legislative actions and policy that responds to public
27 perception of need. The sustainability paradigm is of such a nature: a radical departure
28 from past ways of perceiving humankind's relationship to the environment.

29
30 People make decisions all the time and choose courses of action without having these
31 translate into any real change. An important premise in sustainability is informed
32 decision making for change agents (e.g., government) and for the practitioners (e.g., the
33 public). In general, the difficult component of decision-making is having the needed
34 information. In this regard it is very important that the Strategy document focus on
35 decision-making and identify "information driven" processes. The reason this matters is
36 that sustainability is only going to work if information is coupled with incentives (or
37 disincentives) that can drive behavioral change (and prevent backsliding to the old
38 unsustainable behaviors). The Strategy document fails to mention the public and any
39 stakeholders other than local, state and federal government and the regulated entities
40 (i.e., private industry). The public should be apprised of, and might well be interested in
41 learning about, for example, technological advances funded by ORD, even if the nature
42 of these technologies is such that they would be adopted in private industry. In addition,
43 the metrics and indicators developed under the auspices of ORD research program
44 would serve the interests of the public at large, not just those of government officials
45 and decision makers.

46

1 Third, the definition of sustainability may benefit from additional interpretation. The
2 research portfolio would be more compelling if ORD were willing to be more explicit
3 about the interdependence of the three pillars of sustainability (environment, social
4 aspects and the economy). Right now, economic growth and population change appear
5 to be treated as exogenous variables that determine the pressure imposed on the
6 environment. The ORD strategy seems confined to the environmental pillar and seems
7 to have a rather sectorized view of sustainability. What if ORD ventured to do research
8 on, for example, the feedback between social aspects and environmental performance?
9 Can environmental performance goals be thwarted by, say, lack of social
10 cohesiveness? What are the environmental policy tools that work best under these
11 circumstances?

12
13 Finally, ORD needs to be thinking about a life-cycle approach to change, that goes
14 beyond just generating information and getting it to decision makers and includes
15 behavioral change and outcome measurement over time. Decision support tools, no
16 matter how elegant, are a necessary, but insufficient, condition to achieve sustainable
17 outcomes.

18
19 **S2 Does the strategy make a compelling case for ORD and EPA that**
20 **Sustainability Research is a priority for ORD?** (Lifset, June 8 text used)

21
22
23 The Committee agreed with the case made in the Strategy that a systems view is
24 needed in order to address environmental problems and that a sustainability framework
25 encompasses a systems approach. Other points of agreement included concern that
26 the category of "decision maker" was construed rather narrowly. Committee members
27 argued that the long-standing problem of "silos"—division of environmental problems
28 into individual media and/or pollutants—was not sufficiently addressed as a core source
29 of the problems facing environmental policy and the agency. Other objections
30 concerned the constraints on ORD and the agency that made some of the judgments
31 about the adequacy of the Strategy difficult.

32
33 **S3 Does the strategy focus on priority national issues and identify the right**
34 **research questions?** (Theis, June 8 text used)

35
36 The Strategy organizes its priority research questions according to the six critical
37 research themes in Chapter 4 (Natural Resource Protection, Non-renewable Resource
38 Conservation, Long Term Chemical and Biological Impacts, Human Built Systems and
39 Land Use, Economics and Human Behavior, and Information and Decision Making).
40 These themes, and the questions that are derived from them, have both a generic (i.e.
41 nothing to distinguish EPA's role), and EPA-specific focus which, in general,
42 emphasizes issues related to human interactions with the environment. To its credit, the
43 Agency has tried to derive a strategy that is cross-media, media-specificity having been
44 a problem in that past in formulating a truly comprehensive environmental strategy. The
45 areas and questions outlined are quite comprehensive, and expand upon the initial
46 themes, however the Committee is concerned that insufficient attention is devoted to

1 major issues such as climate change research, and the interface of social science and
2 economics research with chemical/biological research. The Committee is also
3 concerned that the difficulty of developing a meaningful suite of sustainability metrics is
4 underestimated inasmuch as the Interagency Sustainable Development Indicators
5 group never got very far on this topic.
6

7 The Committee is concerned about the diffuse and broad focus of the Strategy, and
8 some members have clearly struggled with the issue of how the Strategy, once
9 implemented, will do things differently? Nevertheless, the country needs to begin this
10 journey and should have done it much sooner. The US is far behind Europe and much
11 of the rest of the world related to the sustainability paradigm, indeed the Committee
12 recommends that the Agency critically examine the practices of the EU countries,
13 Japan, and others as a means of deriving a research program that avoids past pitfalls,
14 builds upon what has already been done, while developing a distinctive model for
15 sustainability research that is patterned after the sustainability paradigm, i.e.
16 collaborative, forward-focused, inclusive, adaptive, and integrative.
17

18 There may be value in focusing the critical questions in the Strategy so that specific
19 outcomes can be generated with the meager resources allocated. For example LTG 3
20 (Develop and Demonstrate Innovative Technologies), may yield results that the
21 regulated community recognizes as useful, hence it may be possible to secure industry
22 support. Should HR1215 (Green Chemistry Bill) be passed there would be increased
23 funding and momentum for areas such as Green Design, Design for the Environment
24 (DFE), and so forth. In this instance questions such as "How could ORD, help create a
25 low-risk, micro emissions, closed-loop society?" "What pilot projects could prove that
26 such a goal is possible and help free up more interest and funding?
27
28

29 **S4 Does the strategy identify the right implanting steps to address**
30 **research questions and achieve sustainable outcomes (advance**
31 **technology, develop tools and approaches, advance systems**
32 **research, and disseminate and apply results)? (Rejeski, June 18)**
33

34 The strategy refers to four implementing steps: (1) transition the current pollution
35 prevention and new technology research program into a Science and Technology for
36 Sustainability Research Program, (2) coordinate with 16 other multi-year plans, (3)
37 collaborate and partner with EPA Program and Regional Offices and other government
38 organizations, and (4) identify and pursue future research opportunities.
39

40 As one proceeds from implementing step 1 to 3 a number of things occur:
41

- 42 1. There is less and less specificity of how this will work in the strategy.
- 43 2. ORD has less and less direct control of the outcomes and this will lead to
44 measurement problems.
- 45 3. There will be increasing resource demands tied to coordination with multiple
46 entities (important given limited resources).

1
2 Step 4 (identify and pursue future research opportunities) appears in various forms
3 throughout the strategy but neither the strategy nor the multiyear plan specify how this
4 will be done, what resources will be used, or how success might be evaluated.

5
6 Finally, it is not clear what happens to pollution prevention (step 1). Though always
7 under-resourced, prevention has been an important part of EPA message for over 15
8 years and one which resonates with the public, NGO community, and certainly some
9 parts of industry. The plan should make clear how the S&T for Sustainability Research
10 Program views the concept of "prevention."

11
12
13 **S5 Does the strategy adequately and correctly connect to policy**
14 **and/or decision-makers inside and outside the EPA for achieving**
15 **desired sustainability outcomes?** (Dzombak, June 27)
16

17
18 Policy and decision-making are two different, but related, aspects of the problem. US
19 environmental policy is, and will most likely remain, risk-based. Whether this is
20 inconsistent with "sustainability-based" policy remains to be seen, as the outcomes of
21 research on sustainability become apparent.
22

23 Decision-making depends on policy, or more precisely the way policy is implemented,
24 and requires that appropriate incentives (i.e. policy tools) be implemented. It can relate
25 to long or short term courses of action, the longer the term the greater the uncertainty in
26 the outcome. This is why it is important to view sustainability metrics and standards as
27 evolving—a moving target—as we do research.
28

29 The Strategy focuses on activities, offices, and regions within EPA, and coordination
30 among these entities. There is very limited discussion of connections to and
31 collaborations with decision-makers and organizations outside of EPA. The strategy
32 does connect to EPA decision-makers by arguing that environmental sustainability
33 research is important and appropriate for ORD, as well as by seeking to negotiate with
34 other EPA program managers and decision-makers about the content and future of
35 sustainability research at EPA.
36

37 The Strategy does not propose any significant connections to federal policy and/or
38 decision-makers outside EPA. External collaborations and partnerships are discussed
39 in a summary manner on pages 70-73. Ongoing programs and relationships are noted,
40 with some specific examples given. There is more discussion of connections with other
41 Federal agencies than with regulated bodies (industry), communities, and consumers.
42 Although the Strategy refers on page 63 to the need for balance between research that
43 supports decision making within EPA and by other government organizations and
44 industry, it neglects there to mention the role of consumers or non-governmental, non-
45 regulated parties that may be involved in policy recommendations or decisions, be they
46 individual life-style decisions or those that affect local or regional communities. There is

1 little in the strategy about partnering with academic research or even how EPA might
2 better leverage information and research generated by the regulated parties
3 themselves.

4
5 The general nature of the discussion of external connections is consistent with the tone
6 of the rest of the strategy, which examines six broad themes of environmental
7 sustainability in a general manner. It is not clear, however, how much of an impact the
8 collaborations and partnerships will actually have in advancing sustainable approaches
9 to management and protection of the environment. There is no discussion of
10 connections with specific kinds of decision-makers or policies linked with specific
11 sustainability challenges. Certainly, specific connections within public and private
12 sectors will evolve as the program develops, but the strategy recognizes that this effort
13 must be (and will be enhanced by) connections with other efforts in EPA and outside
14 EPA.

15
16 ORD is clearly interested in connecting to policy and decision makers within and outside
17 of Agency in the Strategy and Plan. However, as formulated the Strategy does not
18 require the identification of specific kinds of decision-makers and policies. Weakness in
19 this respect probably reflects resource constraints rather than failure of intention and
20 foresight. If the strategy was built around specific sustainability challenges, which it is
21 not, then the need for identifying decision-makers and policies would be more apparent.

22
23 The Strategy should do more to prepare to discuss research results with policy makers.
24 After ORD clarifies and strengthens its research strategy, it should develop an active
25 program to connect to policy makers and decision makers. In this regard, the strategy
26 could be more explicit in its goal of trying to change behavior through the development
27 of metrics and tools that might move all parties towards decisions that create
28 environmental sustainability – that recognize something beyond straight measures of
29 economic productivity. It's almost too subtle in that regard. At the same time, it is critical
30 that the strategy acknowledge that we will always be making decisions in the absence
31 of complete information; development of approaches to decision making that address
32 uncertainty are essential.

33
34 The Strategy could also do more to move us away from a waste-centered view of
35 environmental protection. The Strategy appears to view "sustainability" as following
36 logically, temporally, and philosophically from the current emphasis on waste
37 management as a means to healthy environments. It may be more useful to view things
38 the other way around, regardless of how policy has historically been implemented. The
39 problem with seeing sustainability as derived from a waste-centered view is that it then
40 becomes very difficult to refocus our (EPA managers and scientists, the government in
41 general, and the citizenry) environmental frame of reference. This inevitably leads to
42 inadequate organizational structures, poor prioritization, and seeking answers to the
43 wrong questions. Interestingly, this has been recognized in the Agency's Strategic Plan
44 under Goal 3 (Land Preservation) in which it is stated "Our ultimate goal is to move the
45 Nation from a waste-oriented to a life-cycle management way of thinking about
46 materials".

1
2
3 ORD has an opportunity to provide leadership both internal to the Agency and external
4 among the federal agency family and other organizations. This can be accomplished by
5 coordination and leadership in the definition of environmental sustainability and in the
6 use of related research products which will influence how other federal agencies and
7 organizations move forward with their sustainability programs.

8
9 The scope of environmental sustainability research efforts outside EPA is vast and the
10 ORD has only skimmed the surface. To take one example, there is no mention of the
11 scholarly literature on environmental sustainability. There are several key
12 academic/scientific journals devoted to this topic and, of course, many more that touch
13 on it. A more deliberate effort at ongoing literature review is warranted in this respect -
14 to exploit what has been created by others, to stay abreast of developments in the field
15 and to identify vehicles (e.g., journals) through which ORD research should be
16 disseminated.

17
18 **S6 (a) Does the strategy enable ORD to prioritize its research investments?**
19 **(b) Does the strategy define an appropriate role for EPA relative to other**
20 **funding agencies? Does it sufficiently encourage other Federal agencies**
21 **and organizations to relate their sustainability efforts to EPA's so as to**
22 **promote co-funding and/or collaboration where appropriate?**

23 (Alberini, June 22)

24
25
26 **S6(a): Does the strategy enable ORD to prioritize its research investments?**

27
28 The strategy document identifies five objectives for ORD research (understanding of
29 systems, development of decision-support tools, development of technologies,
30 collaborative approaches to decision-making, development of metrics and indicators)
31 and six broad research areas ("themes"—namely renewable resource systems, non-
32 renewable resource systems, long-term term chemical and biological impacts, human-
33 built systems and land use, economics and human behavior, information and decision-
34 making).

35
36 Examples of more specific, but still sufficiently broad, research questions are offered for
37 each of the six research themes. In this document, ORD elected to present criteria that
38 could be used to set priorities, rather than trying to identify research priorities
39 directly. Specifically, these criteria are (i) "high impact;" (ii) "true to EPA's research
40 capabilities;" (iii) "true to EPA's role" and mission; (iv) "leverage:" higher priorities on
41 research that ultimately leads to sustainability on a large scale, with EPA partnering in
42 initial research or through transfer and diffusion of knowledge, methodologies, and
43 approaches; and (v) systems context.

44
45 The strategy document clearly states that it is up to the individual multi-year plans and
46 to the National Program Directors to identify their priority sustainability research areas.

1 (Indeed, the Plan document presents criteria for setting priorities—grouped into primary
2 and secondary criteria—that are consistent with those in the sustainability strategy
3 document.)
4

5 Moreover, the strategy document emphasizes that each individual multi-year plan
6 should develop a balanced research portfolio with a good mix of short-term and long-
7 term projects, known and emerging issues, projects that are traditionally central to
8 EPA's mission (e.g., water) and projects that are at the boundary of EPA's responsibility
9 but still important for sustainability (e.g., agriculture and the health of aquatic systems),
10 research that supports decision-making within EPA (programs and regional offices) and
11 research that supports decision-making in the industry and in other local, state and
12 federal organizations.
13

14 The Committee had mixed reactions to this agenda and criteria for setting priorities.
15 One member felt that they were adequate. The research portfolio composition was
16 judged to be appropriate for ORD, but care must be taken to avoid 'sectoral' research
17 questions and research priorities and to encourage research questions and priorities
18 that truly speak to sustainability and its cross-cutting issues.
19

20 Another member pointed out that such a general and flexible strategy may be a
21 strength, in the sense that it provides ORD with much latitude in setting priorities, and at
22 the same time a weakness: Legal, political and budgetary constraints may prevent the
23 Agency from pursuing such a broad agenda and from having a real impact on many of
24 the selected sustainability issues. An alternative approach, this member suggested,
25 might be one where ORD focuses on high-priority sustainability issues where
26 sustainable technical, financial and management approaches are needed, and where
27 EPA has "a long history and credibility" and is in a position to make an impact.
28

29 Following general discussion within the Committee, and on recognizing that ORD wants
30 to establish its presence in the area of sustainability, but that the budget available for
31 this purpose is very limited, it would seem appropriate to recommend a two-pronged
32 approach that (i) pursues core research on sustainability and sustainability metrics, and
33 (ii) establishes a small number of demonstration projects that would give ORD high
34 visibility in the sustainability arena. It is important that these demonstration projects
35 move away from waste/end-of-pipe approaches to take a broader, system-based
36 perspective. Examples of such projects might include an assessment of (i) biofuels
37 policies and options, which are topical and encompass a broad range of issues and
38 potential impacts on emissions of greenhouse gases, agriculture, dependence on
39 imports of fossil fuels, etc. and may imply a variety of economic incentives; (ii) a study of
40 the hypoxic environment in the Gulf of Mexico, which is the result of upstream
41 agricultural practices and water management, or the Chesapeake Bay, and (iii)
42 wastewater practices and infrastructure needs in regions and cities with projected fast
43 population growth.
44

45 Finally, one member was very critical of the ORD research strategy. Among other
46 things, he noted the potential for conflict when dealing with industry (which the Agency

1 traditionally “regulates”), and pronounced himself skeptical that the EPA regions might
2 be in a position to play a functional role in the transition to the sustainability paradigm,
3 given their non-achievement record and their “necessary emphasis on responding to
4 short term problems.”

5
6 Even more important, this member feels that the Agency does not have a clear notion of
7 how to recognize research that is, or might be, truly sustainable. For example, the
8 document touts the “Green Chemistry and Engineering” programs, but fails to propose
9 the use of quantitative LCA metrics to assess their true impacts. Likewise, much of the
10 emphasis on technologies research (“e.g. bio-based products, nanotechnology, non-
11 solvent based processes, and various material substitutions, to name a few”) appears to
12 grounded on the assumption that such technologies must be better, without properly
13 testing such assumption or proposing a proper assessment, and/or a poor
14 understanding of commercial uses and end-of-life options (e.g. ionic liquids).

15
16 **S6(b): Does the strategy define an appropriate role for EPA relative to other**
17 **funding agencies? Does it sufficiently encourage other Federal agencies and**
18 **organizations to relate their sustainability efforts to EPA’s so as to promote co-**
19 **funding and/or collaboration where appropriate?**

20
21 The Strategy lists specific projects and programs with a sustainability emphasis or
22 focus in other agencies. It also identifies other federal agencies with overlapping
23 interests for each of the six broad research themes, as well as international partners.
24 Despite these lists, however, and EPA’s acute awareness of other nations’ focus and
25 recent advances on sustainability matters, the discussion and the information offered on
26 page 71-73 is too cursory to allow us to judge whether these other agencies will feel
27 encouraged to establish partnerships with EPA and promote co-funding and
28 collaborations.

29
30
31 **S7 Does the Strategy outline an adequate roadmap for ORD to implement**
32 **this program (P2 transition to Sustainable Technology, coordination among NPD**
33 **and across existing multi-year plans, leveraging interagency cooperation, and**
34 **defining emerging research areas?) (Thomas, June 20)**

35
36 The roadmap for implementation of the program is described in Chapter 6, pp. 61-75,
37 especially beginning on page 64, and includes four implementing steps: (1) transition
38 the current pollution prevention and new technologies research program into a Science
39 and Technology for Sustainability Research Program; (2) coordinate with other multi-
40 year plans; (3) coordinate and partner with EPA Program and Regional Offices and
41 other government organizations, communities, nonprofit organizations, universities, and
42 industry; and (4) identify and pursue future research opportunities.

1 The Committee supports ORDs roadmap for implementation of the Sustainability
2 Research Strategy. Coordination with other multi-year plans is essential to the success
3 of the Sustainability Research Strategy. The implementation of the Sustainability
4 Research Strategy through a number of multi-year plans will begin to provide the
5 agency with a distributed core of sustainability research in ORD. Coordination with EPA
6 program and regional offices and other government organizations will provide additional
7 needed capacity to carry out the research program.

8
9 Implementation of the STRATEGY is highly challenging because it relies on cooperation
10 throughout ORD and EPA. The STRATEGY is an important step for ORD and for the
11 agency, and the Committee supports ORD's initiative. Explicit management support of
12 the Sustainability Research Strategy would be important to ensuring successful
13 implementation.

14
15
16 **S8 Does the SAB believe that sustainability research is a sufficiently strong**
17 **concept for integrating and coordinating across ORD research**
18 **programs? (Aneja, July 7)**
19

20 In the face of exponential economic and population growth, in addition to the threats of
21 an imminent oil crisis, global warming, and ozone depletion, it is clear that novel actions
22 must be taken in order to ensure the continued prosperity and progress of our
23 generation and those of the future. New methods must be developed to balance the
24 needs of present and future populations with the very real limits of our natural
25 resources. Attempting to remedy ecological damage by "stovepipe" policies represents
26 an incomplete understanding of pollution and the environment. Thus, we are now
27 presented with a multitude of environmental challenges in developing new models,
28 methods, and technologies to deal with pollution and environmental protection in a
29 holistic, systems-based manner. The philosophy of sustainability has the capacity to
30 provide the answers to these challenges when applied to relevant scientific, social, and
31 economic fields.

32
33 Sustainability impacts and is impacted by variety of disciplines, and thus a
34 multidisciplinary and multimedia approach to managing our environment is required
35 Building on the definition taken from the well-known Brundtland Report, the ORD draft
36 document defines sustainability as "meeting basic environmental, economic, and social
37 needs now and in the future without undermining the natural systems upon which life
38 depends." Thus sustainability is conceptualized as a dynamic process, an open-ended
39 challenge, in which scientists, economists, and lawmakers work together to solve
40 present problems and anticipate future issues.

1 More precisely, the Strategy identifies "Six Themes of Environmental Sustainability,"
2 that will underpin the Agency's approach to sustainability. They are: natural resource
3 protection, non-renewable resource conservation, long-term chemical and biological
4 impacts, human-built systems and land use, economics and human behavior, and
5 information and decision-making. These themes reflect the concept upon which the
6 Strategy is predicated – that "the nation is most capable of achieving sustainable
7 environmental outcomes by investigating resources . . . in a systems-based context and
8 incorporating the influences off economy and human behavior where appropriate."
9

10 The report of the 2005 National Academies of Sciences cited in the ORD draft
11 document identified eight priority sustainability areas in need of government support,
12 including green chemistry and engineering, energy intensity of clean processing, and
13 separation sciences, among others. These fields all represent the frontier of
14 environmentally conscious sciences, as well as representing specific research areas in
15 which the ORD has a vested interest, and an accordingly strong presence.
16

17 In addition to intramural research programs, the Strategy proposes ORD involvement
18 and collaboration with government programs at the federal and state level, and also with
19 industrial programs. Thus sustainability effectively helps to coordinate and integrate a
20 broad range of ORD research programs. However two main issues are not emphasized
21

22 (1) increasing food (both crop and animal) production and its
23 consequences to the environment; and
24

25 (2) multimedia nature of a sustainable strategy.
26

27 The EPA is the Federal agency most concerned with research designed to protect and
28 utilize the natural resources of the environment. It is therefore appropriate for the
29 Agency to fund research programs that will serve its mission, and, where possible,
30 assist the missions of other agencies. The Strategy will create opportunities for co-
31 funding/coordination between the EPA and other Federal agencies in science,
32 engineering, economic and social fields, as sustainability comes to the forefront of
33 research programs in many different disciplines.
34

35 Sustainability research can play a role in integrating and coordinating across ORD
36 research programs, but that the exigencies of Agency mandates and to a lesser extent
37 resource constraints and the "ownership" of key topics by other agencies, means that
38 the portfolio of ORD research programs is not likely to be completely conducive to
39 integration in this manner. However, sustainable development must be taken seriously
40 by the entirety of upper management at the agency, and a critical core of Agency
41 scientists.
42

1
2 **3. Responses to Charge Questions Relating to the Plan**
3

4 **P1 Does the organization of the new Sustainability Technology Plan provide a**
5 **clear logical framework for implementing an element of the overall**
6 **Sustainability Strategy?**
7 **Does the Plan follow appropriately from the Sustainability Research Strategy?**
8 **Are the research issues identified in the PLAN consistent with the research**
9 **questions identified within the Sustainability Research Strategy?**
10 (Thomas, June 20)
11

12 Yes. The Committee agrees that the organization of the new Sustainability Technology PLAN
13 provides a clear logical framework for implementing an element of the overall Sustainability
14 Strategy. The Committee recognizes that financial and personnel resources are limited for this
15 program. Within this context, the Plan identifies a set of issues that are consistent with the
16 Sustainability Research Strategy and current ORD capabilities.
17

18 The criteria for project selection should be reviewed to ensure that they effectively focus
19 research on projects that will contribute more effectively to the Sustainability Research
20 Strategy.
21

22 The Committee is largely satisfied with the content of the Plan through chapter 4. These parts
23 of the Plan discuss the shift to sustainability, the foundation of a sustainability program,
24 creation of a framework for the Plan, and prioritization of the Plan research. The Committee did
25 engage in extensive discussion about chapter 5, which presents the specifics of the planned
26 research program. The Committee has a number of comments on the specifics of the planned
27 research program. These comments are included later in this document.
28
29
30

31 **P2 For each major research theme addressed within the PLAN (e.g.,**
32 **Sustainability Metrics, Decision Support Tools, and Technologies), do**
33 **the Annual Performance Goals (APGs) and Annual Performance**
34 **Measures (APMs) represent a logical progression of activities and**
35 **intended outcomes? Does the PLAN identify the specific issues**
36 **motivating the research program? (Confirmed by Smith July 7)**
37

38 The answer to the first question is Yes and No.
39

40 Yes, as within each major research goal related to metrics (LTG 1), tools (LTG 2) and
41 technologies (LTG 3), the respective APGs and the APMs do represent a logical
42 progression of activities and intended outcomes. While one could debate the choice of
43 LTGs and related APGs and APMs, for those cited there is a logical progression of
44 events for intended outcomes.
45

1 No, if one looks at the progression of the three major LTGs. Here the plan appears to
2 be putting the cart before the horse with metrics not be selected till 2008-2011, yet the
3 technology development focus is well ahead of the metrics. Here, a more logical
4 progression within the context of a overall focused project is :

- 5
- 6 1. Develop the appropriate metrics
- 7
- 8 2. Develop any decision support tools required for analysis (keep this systems
9 based if possible and linked to metrics).
- 10
- 11 3. Investigate technological options to reach the goal and try to get the technologies
12 in place (SBIR grants, performance incentives...).
- 13

14 Again, the goal is to link metrics, with decision support, with technological innovation
15 within one project that can be completed with available resources. Right now this
16 doesn't happen as there is no clear progression among the the 3 LTGs given
17

18 **Does the Plan identify the specific issues motivating the research program?**

19

20 While there does appear to be a logical progression of activities and intended outcomes
21 presented within each LTG, it is difficult to determine what is the real motivating driver
22 and goals for the research program proposed. While the overall strategy is good in
23 wanting to address sustainable outcome measures (see Table 1.1) related to energy,
24 air, water, materials, land and ecosystems, there is no real clear linkage between the
25 research program and how these outcomes will be achieved. Furthermore, the
26 probability of achieving the intended outcomes is low due to resource (appropriate
27 personnel and funding) constraints. Realizing such constraints and wanting to have the
28 biggest impact for the resources invested, one recommendation is to pick one or two
29 key demonstration projects, focused on a real and current sustainability issue where the
30 approach can include all the aspects of metrics development, development and
31 application of decision support tools, and technology development and demonstration.
32 The actual projects identified should have a major impact for the municipality, region, or
33 even industry that is the focus of the project, with the information gained easily
34 transferred to other entities so the value can be realized over and over.

35

36

37 **P3 Does the PLAN lay out a balanced program addressing both short-term**

38 **and longer-term research that meets current needs while positioning the Agency**

39 **to respond to emerging issues? (Aneja, July 7)**

40

41 The Science and Technology for Sustainability Multi-Year Plan (Plan) builds upon the
42 framework of the Pollution Prevention and New Technologies (P2NT) Research
43 Program, created in 2000. Under the P2NT program, much progress has been made in
44 a variety of fields pertaining to sustainability, such as the development of Environmental
45 Impact Assessment Models, the Small Business Innovation Research Program, and the
46 Technology for a Sustainable Environment programs.

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The P2NT program was reviewed by the Federal Government's Office of Management and Budget, and several recommendations were made to improve the program, including "becoming more focused on the need of Agency client offices, fostering more collaboration with other researchers (academic, industrial, and government), and developing an ability to measure and track program results over time." Thus, the Plan benefits from being created with these recommendations in mind, focusing on coordinating interdisciplinary programs, setting long- and short-term goals, and measuring the program's performance in an effective way.

The Plan establishes three long-term goals (LTGs), with the overall vision of "providing support to regional and national sustainability polices and initiatives." First, the plan seeks to identify and create scientifically-based sustainability metrics, which will allow scientists a clearer picture of what a healthy, sustainable ecological system looks like. Next, the PLAN calls for the development of decision-support tools that promotes environmental stewardship and sustainable management practices. Thirdly, the PLAN calls for the development, application, and demonstration of innovative technologies that solve environmental problems and provide sustainable outcomes.

These three long-term goals are general enough to allow much flexibility in their execution, but specific enough to establish criteria for the measurement of the performance of the Plan. In addition, the related research program also has several performance measures which rely upon feedback from the Agency's clients, which include individuals, communities, government, and companies.

Furthermore, the ORD has established criteria by which research endeavors may be prioritized. The primary criteria are: resource availability, relevance to the Agency's Mission and Addressing Program Office Needs, and Staying True to ORD's Research Capabilities. This raises a significant question, in that the draft document reports that the resources allocated to the existing P2NT research program are modest, and are expected to decline. With this in mind, are the long-term goals of the Plan attainable? Will new research programs fail to be funded, although there may be potential for a highly positive environmental impact? Is the Plan itself a sustainable program? This question is of utmost importance, as all goals and plans are predicated upon adequate resources, especially finances.

The Plan calls for responding to emerging issues, but lays out no strategy for identifying these issues or organizing a coherent response. ORD needs to be specific about how it will track emerging issues, prioritize them, and decide how best to address them. This function will be important in terms of also identifying future partners within the government, in industry, and in academia. The resource demands for issue tracking are not extensive, but someone must be responsible over time for this to work. It is also important to track widely looking for changes in production technologies, social behaviors, and economic drivers that may result in new opportunities to achieve sustainable outcomes.

1 Given the discussion over the last day and a half, the focus of this question might
2 actually become "what is the best balance between short and long term research
3 products (output) to ensure the success of the program.
4

5 If this is a more helpful interpretation around the topic of balance, then it might be useful
6 to weight the balance to 60% short term research projects that develop useful products
7 in the next year or two; and 40% long term (i.e. research projects that develop useful
8 products within five years) so that early successes are ensured.
9

10 In addition, the long term research needs to flow from the short term time frame.
11
12

13 **P4 Do the long-term goals address the high-priority science, engineering,**
14 **and technology needs of users that will help the Agency meet its**
15 **strategic goals relating to sustainability? Do the long-term goals clearly**
16 **relate to the research tracks within the multi-year plan framework? Do**
17 **they provide a picture of what the program is trying to achieve? Will the**
18 **proposed research activities lead to progress toward these goals? Are**
19 **the goals appropriately linked to long-term environmental outcomes?**

20 (Confirmed by Theis, July 17)
21

22 **(a) Do the long-term goals address the high-priority science, engineering, and**
23 **technology needs of users that will help the Agency meet its strategic goals**
24 **relating to sustainability?**
25

26 This set of charge questions requests commentary from the SAB on the long term
27 efficacy of the proposed sustainability research program. Addressing the longer term
28 outputs and outcomes of the program is important because ORD research has
29 historically been focused on shorter term needs, often driven by political imperatives
30 rather than science-based prioritization. In many ways, the characterization of a
31 research program that is focused on sustainable outcomes in terms of "long term" goals
32 that have a perspective of five years is inconsistent, but such is the reality of
33 government performance practice.
34

35 Chapter 3 of the PLAN explains clearly the linkage of the LTGs to the Sustainability
36 Research Strategy, which examines six broad themes of environmental sustainability. It
37 is not clear, however, how much of an impact the general LTGs will actually have in
38 advancing sustainable approaches to management and addressing specific
39 sustainability challenges. The LTGs address high-priority science, engineering, and
40 technology needs mostly indirectly. Moreover, specific sustainability challenges involve
41 more than just science, engineering, and technology research needs (i.e., the need to
42 integrate economics, social sciences, architecture, and planning).
43

44 The Committee is dubious of the involvement of the Agency in developing new, more
45 sustainable technologies (APG 3.2). In the majority of cases, such development is best
46 left to the private sector, in particular producers and users who have need of less

1 polluting technologies. However, this does not mean that the Agency has no role to
2 play. Indeed there are critical needs for interfacing through the P2 program, certifying
3 and evaluating data and making it available to the sustainability community (consistent
4 with proprietary requirements), verifying the technologies, ensuring that consistent
5 metrics are used by all stakeholders (including various Agency offices and programs),
6 and especially performing research on ways to incentivize companies to invest in and
7 adopt new technologies.

8
9 **(b) Do the long-term goals clearly relate to the research tracks within the multi-**
10 **year plan framework? Do they provide a picture of what the program is trying to**
11 **achieve?**

12
13 In Chapter 5 of the Plan, the planned research described via the APGs is consistent
14 with the LTGs under which the APGs are listed. The inclusion of particular APGs can
15 be debated, and other possible APGs could be suggested. The proposed research
16 activities represented by the APGs will clearly lead to progress, but the likely impact of
17 this progress in helping to address specific long term sustainability challenges is not
18 clear.

19
20 One clear role that the Agency can play to which the Plan alludes but does not explicitly
21 develop is that of conducting "regular and continuous assessments of environmental
22 trends". If indeed the Agency assumes this role, and makes such assessments
23 available in a non-politicized way, then it will be performing a valuable service that can
24 enable decision makers at all levels to respond to emerging issues as well as ongoing
25 ones.

26
27 **(c) Will the proposed research activities lead to progress toward these goals?**
28

29 The document has specific deliverables but it is not clear where the research questions
30 are developed and prioritized. There is little in the Plan about cooperative research with
31 universities and industry. In the latter case, there needs to be a shift in Agency policy to
32 move from one of regulation to one more focused on demonstrating the business case
33 for sustainability. In this regard, having regulations in place to drive certain sustainability
34 initiatives, once identified, can help but should be done judiciously.

35
36 The Committee notes that Plan LTG 1 focuses on the development of metrics for
37 assessing environmental systems, but the Agency fails to follow this same approach for
38 prioritizing its research. Without such an approach the sustainability research portfolio
39 may not reach its maximum long term value.

40
41 **(d) Are the goals appropriately linked to long-term environmental outcomes?**
42

43 This area is perhaps the weakest part of the Plan. The outcomes, while measurable, are
44 not really challenging and focused on achieving goals through the application of
45 sustainability principles (such as dematerialization, material substitution, development of
46 alternative energy sources, process modification, fostering of innovative technologies,

1 organizational change, supply-chain management, and total cost accounting, to name a
2 few). Without this aspect, the plan runs the risk of retreating to a focus on end-of-pipe
3 treatment.

4
5 **P5 Are the research products supportive of the strategic target as set**
6 **forth in the Agency's Strategic Plan under Objective 5.4?** (Unable to
7 locate Mitsch's revisions, used June 8 text)
8

9 Objective 5.4 of the Agency's Plan focuses on enhancing society's capacity for sustainability
10 through science and research. More specifically, it states that the Agency will "(C)onduct
11 leading edge, sound scientific research on pollution prevention, new technology development,
12 socioeconomic, sustainable systems and decision tool. By 2011, the products of this research
13 will be independently recognized as providing critical and key evidence in informing Agency
14 policies and decisions and solving problems for the Agency and its partners and stakeholders."
15

16 The LTGs set forth in the Plan certainly support this strategic target, by establishing
17 sustainability metrics, creating decision-support tools, and developing and applying cutting-
18 edge technologies to solve environmental problems. However it is not clear who will be leading
19 proposed efforts, how funding will be prioritized, or how the research products will be defined.
20 In section 4.2, a series of research questions is provided that are directed at the LTG's. Each
21 of these questions are important and complex and in Chapter 5 the planned research program
22 presents APG's are presented that address these questions. Very little detail is provided to
23 understand specifically what the research products will be within Plan and therefore it is
24 difficult to assess the nature of the products or their significance. With the small budget
25 projected it is not likely that products will have a large impact on enhancing the science or
26 decision-support of sustainability.
27
28

29 **P6 Does the scope of work proposed within the Plan complement research**
30 **being supported by other programs inside and outside EPA?**
31 (Lifset, text confirmed)
32

33 The Committee found that the scope of work appeared to complement research inside
34 the Agency and perhaps outside the Agency. More extensive investigation and
35 documentation of external research related to the Plan is urged.
36
37

38 **P7 Are there other potential emerging research areas that the Plan**
39 **should consider?** (Rejeski, June 18)
40

41 Yes, but.....
42

43 The LTGs are sufficiently broad to cover most emerging issues, however, it is not clear
44 how the Agency will identify, prioritize, and respond to emerging issues on an on-going
45 basis. The plan should reflect this since it has both resource and coordination
46 implications (for instance, coordination with the 16 other MYPs). What criteria will be

1 used to define "emerging" issues, how will they be teed up, and what type of criteria
2 could be used to evaluate "success" in terms of addressing an emerging sustainable
3 development challenge (versus an existing one)?
4

5 What should the balance be between existing and emerging? (This ties to the broader
6 issue of how to allocate resources using a portfolio-of-initiatives approach) This issue of
7 how many resources ORD should focus on future issues has come up in other SAB
8 studies (for instance, Over the Horizon) and has yet to be resolved.
9

10 Identifying emerging issues will also affect the ability of ORD to identify collaborators
11 and partners as well as leverage points.
12

13 Finally, who has already done this? There are other studies on emerging issues,
14 domestically or globally. Have these been considered by ORD?
15
16

17 **P8 Is the level of resources specified by the Plan sufficient to address the**
18 **research issues that it identifies, allowing ORD to achieve the intended**
19 **outcomes of the research program? Is the Plan's relative allocation of**
20 **those resources among the research tracks of the sustainability research**
21 **program appropriate, based on a consideration of scientific and**
22 **programmatic needs? (Confirmed by Theis, July 17)**
23

24 The level of support specified for the Plan is \$2.7 million external and 36.5 internal full-
25 time equivalents (FTEs). Assuming the 36.5 FTEs translate into something on the order
26 of \$4 million, this suggests that the Agency is allocating about \$6.7 million to
27 sustainability research (with the hope that it will increase by 10-20% in the near future).
28 Even in times of declining budgets, EPA is still a \$7.3 billion agency, meaning that the
29 sustainability initiative is less than one one-thousandth of the Agency's budget. Even if
30 the comparison is made only against the S&T budget, the fraction approaches no more
31 than 1%. No other multi-year plan is allocated such a miniscule resource base. The
32 Committee is perplexed by such modest levels for a program that promises to re-focus
33 the way the Agency does research and re-evaluate the basis for the risk-based
34 paradigm. Given the enthusiastic and expansive goals and metrics for this program, and
35 assurances of "traction" of the sustainability theme within the Agency, the Committee is,
36 frankly, disappointed that the Agency is unwilling to initiate this program at a more
37 substantial level. The Plan correctly points out that as the value of the sustainability
38 program becomes recognized, other program directors and offices will become more
39 compliant with its attributes, goals, and metrics, and will presumably become active in
40 seeking out collaborative projects. Even so, in the Committee's opinion this initial
41 allocation, even if grown in the short term by 20%, falls far short of that needed to
42 elevate the sustainability paradigm to a level where it is visible within the Agency, the
43 Federal government, and the Nation. In the Committee's opinion a commitment of \$60-
44 75 million is needed to have a serious impact on internal research priorities and
45 managerial buy-in, and begin to meet the needs of the program.
46

1 The level of support allocated suggests to the Committee that the Agency has not
2 grasped the potential significance of the injection of sustainability-based themes into its
3 research programs. For example, the priorities for future research activities (section 5.4
4 of the Plan) would result in further narrowing ORD sustainability research into the areas
5 of its existing expertise. Instead, the Agency could seek to develop new and greater
6 capacity in sustainability research through a combination of new personnel with training
7 in sustainability research (directed hires), incentives for existing personnel to explore
8 ways in which their expertise could be incorporated into the sustainability model (such
9 as focused sabbaticals for Agency scientists), and pioneering new models of
10 cooperative research (such as partnering with industry and other agencies), and
11 sustainability "incubates" within the Agency (the Committee notes with praise the
12 existence of such new expertise and experimental research programs such as the
13 Sustainable Environmental Systems group). In the Committee's opinion, the area of
14 sustainability should become ORD's main thrust, with allocation and resources focused
15 here rather than on the historical compliance-focused legacy issues.

16
17 **P9 Does the PLAN appropriately address findings and recommendations in**
18 **evaluations of the program and its components?** (Rood, July 11)
19

20 Discussions between ORD officials and members of the SAB Committee revealed that
21 this question pertains to the responsiveness of ORD to the feedback from the Program
22 Assessment Rating Tool (PART) Review of USEPA's Pollution Prevention and New
23 Technologies Research Program (P2NT). Therefore this question was revised as
24 follows:
25

26 Does the Plan provide a clear description of how results from the
27 proposed research plan will be assessed and justified in light of the feedback
28 from the Program Assessment Rating Tool (PART) Review of the Pollution
29 Prevention and New Technology Research (P2NT) Program?
30

31 In addressing the PART Review of the P2NT Program, the Plan briefly expresses
32 concerns about: 1) becoming more focused on the need of Agency client offices, 2)
33 fostering more collaboration with other researchers, and 3) developing an ability to
34 measure and track program results over time. Discussions during the SAB review also
35 indicated that concerns had emerged during the PART review related to the lack of a
36 timely review and failure to integrate all parts of the P2NT program.
37

38 ORD's responses in the Plan to P2NT's PART review was not sufficient for the
39 Committee to provide a comprehensive response to the revised question #9, and more
40 detailed information about issues pertaining to the PART review should be included in
41 the Plan
42

43 The Plan and feedback from ORD during the June 13-15 meeting indicates ORD is
44 interested in working with other components of the Agency (e.g. regional and state EPA
45 offices) and other external governmental agencies. However, how ORD will accomplish
46 such goal with anticipated outcomes should be described in more detail. In particular,

July 25, 2006 DRAFT report of the US EPA Science Advisory Board's Environmental Engineering Committee for Discussion at its August 1 public conference call meeting

1 ORD needs to carefully describe how they will work with other governmental
2 organizations, and achieve measurable outcomes that will be helpful for future
3 assessments of the sustainability program.

4
5 There is also information in the Plan and was discussed during the SAB meeting that
6 demonstrates strong interest by ORD in improving collaborative efforts with other
7 researchers who are internal and external to USEPA. Once again, the descriptions of
8 how such collaborations will be developed and implemented need to be strengthened in
9 the Plan. The issue of developing methods to measure and track program results is
10 briefly described as part of LTG1 in terms of identifying and creating scientifically based
11 sustainability metrics. Such effort to develop those techniques to measure and track
12 program results needs to be described in much more detail. Overall, the Plan is too
13 vague when it describes proposed results and outcomes that pertain to sustainability.
14 Planned efforts to quantitatively describe those planned results and outcomes need to
15 be expanded in light of future external assessments of the sustainability program.

16
17 This Committee review and the upcoming BOSC review should address the concerns
18 delineated in the PART evaluation about timely review. Regarding the integration of the
19 elements of the P2NT (now sustainability) research program, the Plan provides
20 evidence of substantial efforts at coordination and integration. The Committee's
21 evaluation of those effects is described in the responses to other Plan charge questions.

4. Additional Advice

1. The Committee recommends that the Agency better define those terms associated with the sustainability strategy and the measurement of sustainability outcomes. (Lifset, June 15 text)

The STRATEGY and the PLAN need to define sustainability more clearly and overtly. In this regard, the documents would benefit from explicit acknowledgement of competing definitions of sustainability—thereby providing both context for the Agency's choice among the various definitions and recognition of alternative views of this contested and often vague topic. Similarly, the Agency should acknowledge the emphasis in its approach on environmental sustainability. (There should also be greater care taken to avoid conflating sustainability and sustainable development.) Clarity about these definitions will help readers better grasp choices made by the Agency and help them locate their own understanding of sustainability relative to the Agency's deliberations.

In addition, some discussion of the attributes of sustainability (already implicit in the draft documents)—e.g., systems approach, integrative science—making clear where possible if the attributes are unique, necessary or sufficient markers of sustainability, will help the Agency avoid problems where the programs, PLAN and other constituencies that it hopes to enlist in sustainability research, deem their existing activities as falling under this rubric without appropriate expansion, amendment or enhancement.

2. Increased Internal and External Integration Using Multifaceted Projects (Eighmy, July 7)

The Committee feels that the careful selection of multifaceted research projects within the PLAN is helpful to the adoption of the sustainability paradigm both within and outside the agency. EPA has a prominent leadership mandate in the sustainability arena and its research projects and their products are important for adoption of the paradigm. The projects should have visibility and be nationally compelling. The research products should strategically integrate into the other 16 multi-year plans across the Agency and allow the Agency to guide other Federal agency research on sustainability.

A portfolio of projects should be considered that has balance with respect to factors such as risk, early winners, and geography. The portfolio might include regional projects, projects conducted with CRADAs with industry, projects conducted jointly with other agencies, or projects conducted in cooperation with programs overseas. The Agency has conducted many prior compelling studies and efforts that may be amenable to analysis and produce excellent sustainability science, so some retrospective analysis may be helpful. A portion of the portfolio may be considered high risk with anticipated high rewards. An internal skunk works might be considered as it can be strategic and allow certain higher risks projects to be conducted, particularly in emerging areas, to

1 advance important sustainability science products. The portfolio should become the
2 basis for articulating projects and products for the APMs and APGs in the MYP.

3
4 Criteria for assembling the portfolio should be developed that includes parameters such
5 as balance, risk, and targeted product needs for internal and external adoption. These
6 criteria should be more detailed than the primary and secondary criteria presently
7 offered. Criteria for high risk projects may differ. The depiction of a clear linkage
8 between criteria, project, product, and APMs and APGs in the PLAN would be helpful.

9
10 **3. The Committee encourages the Agency to become more creative and**
11 **strategic in developing its human resources programs with the goal of**
12 **establishing a critical number of champions of the sustainability**
13 **approach to environmental protection** (Koshland, June 15 text used)

14
15 In an era of constrained resources, it is essential that the agency be strategic in the
16 development and deployment of its human capital. It needs to address more explicitly
17 the human resource implications of working on sustainable development. This involves
18 combining the right talent with the right management structures, as well as addressing
19 the issue of where the people are located in the EPA hierarchy. Just integrating
20 sustainable development and outcomes into the existing ORD structures and programs
21 may not be the best approach.

22
23 If it is to achieve the goals of the Strategy and the Plan, there is a need to fill talent
24 gaps. The agency needs to acquire the requisite expertise through new hires, or
25 through redirection of the workforce through transformation of existing skill sets or
26 efforts of current staff, and through partnering and leveraging other programs in ORD or
27 the agency as a whole. A sabbatical program to enable current staff to retool would
28 allow the agency to better employ talented individuals whose current work is no longer
29 supported. EPA should consider the use of internal transfers for EPA employees, the
30 Intergovernmental Personnel Act (IPA's) to bring in academics, details for people from
31 other agencies and fellowships for post-docs such as AAAS Science Fellows. It might
32 be worth bringing in someone from another country that has worked on developing and
33 implementing a national sustainability plan. This approach could allow another 6-10
34 individuals with needed skills and talents to be added to the existing 35 FTEs as well as
35 better positioning the current 35 FTEs.

36
37 There are several areas identified for development. There are no in-house experts with
38 a background in decision theory. If the agency is to pursue the critical social dimensions
39 of sustainability, even if its focus is limited to environmental sustainability, it needs to
40 hire individuals with backgrounds beyond the physical sciences, engineering and
41 economics. Stronger social science components that go beyond economics are needed.
42 Such fields and tools include anthropology for ethnographic assessments (how
43 individuals, households and communities think, behave and interact with products,
44 technologies and natural systems) and psychology (behavioral economics) among
45 others.

1
2 If it is to be a knowledge agency as well as a regulatory one, it needs to devote some
3 resources to analyses and syntheses of the outcomes of both intra-mural and extra-
4 mural research as well as of the efforts world-wide in this area. There is still more
5 thinking that is needed around sustainable development and EPA's role as well as the
6 need to catalyze additional people and resources. A part of this overhauled team should
7 be isolated in a skunkworks-type program (maybe 5-8 people) to do out of the box
8 strategic thinking on this topic for at least a year without being saddled with
9 management responsibilities.

10
11
12
13 **4. The Committee encourages the Agency to enhance the diffusion of**
14 **sustainability concepts and practices within and outside the Agency (related to**
15 **strategic human resource development, careful project selection and linkage with**
16 **other multi-year plans, consideration of sustainability components for internal**
17 **and external research projects, and securing and exploiting senior management**
18 **buy-in).** (Dzombak, June 27)

19
20 There is a need for, and EPA should provide, leadership both internal to the Agency and
21 external among the federal agency family and other organizations. The EPA has an
22 opportunity to coordinate and lead in the definition of environmental sustainability and in
23 the use of related research products which will influence how other federal agencies
24 and organizations move forward with their sustainability programs. The PLAN correctly
25 points out that as the value of the EPA ORD sustainability program becomes
26 recognized, other program directors and offices will become more compliant with its
27 attributes, goals, and metrics, and will become active in seeking out collaborative
28 projects.

29
30 To achieve leadership by EPA in promotion of environmental sustainability, there needs
31 to be a paradigm shift at EPA. The shift needs to be away from the current silos related
32 to air, water, solid waste, etc and more towards a true systems approach involving
33 personnel from many different areas, including different offices within EPA, the EPA
34 regions, other government agencies such as DOD and DOE, community stakeholders
35 (i.e., general public), and industry.

36
37 There are many opportunities for EPA ORD to step up to a leadership role, even in the
38 context of very limited resources. ORD could seek to develop new and greater capacity
39 in sustainability research through a combination of new personnel with training in
40 sustainability research, incentives for existing personnel to explore ways in which their
41 expertise could be incorporated into the sustainability model, pioneering new models of
42 cooperative research within the Agency and with industry, and development of
43 sustainability "incubators" within the Agency (the Committee notes with praise the
44 existence of such new expertise and experimental research programs such as the
45 Sustainable Environmental Systems group).

1 Establishment of internal incubators and think-tank

2 The development and diffusion of sustainability metrics, tools, and technologies can be
3 accelerated via the creation of in-house incubators and an in-house think-tank to
4 consider deeply how to infuse environmental sustainability approaches and thinking.
5 The think-tank, a group of perhaps 5-8 people, could develop the messages that can
6 catalyze additional people and resources. Such a program could become very
7 attractive since there are not many places in government now where out-of-the-box
8 thinking on this topic can take place. These people should be kept out of the "weeds"
9 and the "in-box" and be able to think strategically about the topic for at least one year.
10 The think-tank group, and incubator groups on particular sustainability topics, need to
11 be systems thinkers with diverse backgrounds to focus and be agents of change within
12 EPA.

13
14 Careful project selection and linkage with other multi-year plans

15 Internal and external interest in ORD sustainability research will be driven at least
16 partially by successes (or failures) of early projects. The Science and Technology for
17 Sustainability PLAN should have some definitely achievable APGs and APMs for
18 prioritized themes that will quickly deliver research product "winners."

19
20 The research products should clearly tie into the other 16 multi-year plans. This way,
21 results of the EPA ORD program in sustainability will be immediately relevant to the
22 larger EPA, and will encourage more EPA groups to adopt the sustainability paradigm.

23
24 Consideration of sustainability components in internal and external research

25 The ORD should require the applicants for both extramural and internal research
26 support to state how their proposed research impacts, affects, or enhances
27 environmental sustainability. Similar to the "broader impacts" component required in all
28 NSF proposals, a statement about "sustainability relevance" could be a required section
29 in all proposals received by the Agency.

30
31 To encourage a systems approach in EPA research, care should be taken to encourage
32 systems thinking in proposals and to have an extramural review process that rewards
33 not only good reductionist science (traditional science by most accounts) but broad
34 systems science that investigates many variables in one or a few systems.

35
36 **5. The Committee strongly supports a greater and more explicit endorsement of**
37 **the sustainability approach by the Agency Administrator as well as other senior**
38 **Agency management personnel. (Koshland, June 15 text used)**

39
40 EPA needs to demonstrate leadership both internal to itself and external among the
41 federal agency family with respect to sustainability and environmental stewardship. To
42 that end, within ORD, the position of National Program Manager for Sustainability needs
43 to be created. Such a position should be expected to lead not only in ORD but in the
44 agency as a whole. Management of the overall team if developed as outlined in 3 above
45 will require skill and care. The National Program Manager, as well as leadership of the
46 various programs directed at sustainability should be chosen carefully. Explicit support

1 from the Administrator of this effort, and of this position is critical. It is also important that
2 the agency recognize that the opportunity for leadership across the federal agencies is
3 now, and that a commitment from the highest levels will be transformative.
4

5 **6. The Committee recommends that the Agency establish more effective and**
6 **substantive collaborations with other federal agencies as well as the private**
7 **sector.** (June 15 p.m. version confirmed by Smith)
8
9

10 The Committee recommends that the Agency establish more effective and substantive
11 collaborations with other federal agencies as well as the private sector.
12

13 The agency and the ORD should be applauded for their recognizing the need to
14 establish partnerships with sustainability related programs and activities being carried
15 out by others as summarized in Section 5.2 of the PLAN. However, the committee feels
16 that this is such an important item that more specific plans and goals in this regard
17 should be clearly identified related to the specific environmental sustainability projects to
18 be performed.
19

20 As environmental sustainability relates to achieving a balance among the three areas of
21 economic growth and viability, social responsibility and environmental protection,
22 organizations associated with all three aspects need to be engaged. With much effort
23 and focus being give to the issue of environmental sustainability by numerous groups
24 ranging from governmental organizations, the private sector and academia, EPA could
25 move into the key role of providing overall leadership and coordination among these
26 different organizations by providing structure and focus to these diverse groups as none
27 presently exists. To be successful, all three of these different focus areas need to be
28 addressed equally.
29

30 By doing so, will help EPA achieve their goals with limited resources by leveraging with
31 work already done and to be done by the many other organizations addressing
32 environmental sustainability; they do not need to reinvent the wheel but can quickly
33 come up the learning curve resulting in improved effectiveness of the varied
34 organizations by providing coordinating leadership. By being able to bring the different
35 groups and organizations to the table will also serve to provide x-training among the
36 diverse disciplines. In this regard, the committee feels that many of the answers to
37 achieving true environmental sustainability already exist among the different and
38 diverse groups just need to get all the different players to the table and great things can
39 happen.
40

41 In moving down this road, the first thing that should be done is to do a thorough bench-
42 marking exercise of all the different organizations dealing with environmental
43 sustainability, both within the US and internationally as well as covering all the different
44 stakeholder groups. This will serve to help bring the agency personnel quickly up the
45 learning curve as well as even help to identify some key focus areas that EPA could
46 begin participating in directly, as well as even help to provide some prioritization to

1 some key project areas to begin focusing on. As a first step, ORD could just determine
2 what is happening within other agencies of the EPA and determine some opportunities
3 in terms of seeing how a coordinating role could help move their respective agendas
4 along. Once done, then the effort could be expanded to other governmental
5 organizations, academia and the private sector.
6

7 In conclusion, actively engaging many of the other organizations focused on
8 environmental sustainability can be the first step in EPA becoming the body that first
9 brings the different groups to the table, and then provide the glue that holds them
10 together to achieve true sustainability. Presently, the committee sees a huge void in
11 terms of this coordination being provided at present. This could also be the first step for
12 all the other programs within EPA to be focused and coordinated under an overall
13 environmental sustainability paradigm.
14

15 **7. The Committee believes that the Agency's selection and prioritization of pilot**
16 **projects and case studies should be the result of a bolder yet balanced approach**
17 **that clearly illustrates the benefit of adopting sustainability principles (e.g.**
18 **systems approach).** (Alberini, June 20)
19

20 We realize that the current political and budget climate might encourage ORD to be
21 cautious in its choice of technologies to explore, projects to fund and participate in, and
22 aspects of sustainability to study within a project. Yet, the Committee feels that if ORD
23 and the Agency at large wish to become a presence in the sustainability arena, they
24 should be encouraged to think creatively and "outside the box."
25

26 For example, given the importance of water resources and water resource
27 development, especially in the West, why not explore options for reuse/recycle of grey
28 waters, or collection and reuse of rain water, even if they are not envisioned within the
29 current regulatory framework and current practice?
30

31 Likewise, the portfolio of projects to fund or directly participate in might also include,
32 along with obvious "winners", projects that examine unusual aspects of sustainability or
33 innovative policy options and their relation to sustainability. The willingness to undertake
34 such studies and to have a diversified portfolio would, in the Committee's opinion,
35 enhance the agency's already good reputation, and would not detract from it.
36

37 The same might apply when selecting which aspects of sustainability to examine in
38 depth within a given project. Consider, for example, biofuels and biofuels policy options.
39 In addition to studying the implications of biofuels use on greenhouse gas emissions,
40 the impacts of biofuel crops on agriculture and the environmental consequences of
41 biofuel crop practices, it might be interesting to examine how such environmental
42 consequences are linked to social aspects of biofuel use and production, even though
43 the latter might be seen as belonging to the social—rather than environmental proper—
44 pillar of sustainability. Similar considerations might apply to a project that studies
45 hypoxia in the Gulf of Mexico, including implications for upstream agricultural practice
46 and wastewater treatment, impacts on communities, economic activities and

1 ecosystems at risk. ORD could serve as a coordinator for such a project. Another type
2 of project where ORD would be an excellent leader and coordinator might be one
3 focused on wastewater treatment, a real problem in communities with undersized
4 capacity and high projected growth in population.

5
6 We believe that the latter two points bode well for ORD's goal to have a well-balanced
7 research portfolio with projects that are central to EPA's mission (e.g., watershed
8 protection), projects that reside at the boundaries (e.g., agriculture and the health of
9 aquatic ecosystems), and a mix of current and emerging issues. To pursue them, ORD
10 might consider partnerships with other agencies and/or international organizations, and
11 hiring personnel with the appropriate background, as discussed in overarching theme
12 #3.