
MEMORANDUM FOR: Secretary of Energy Ernest J. Moniz
FROM: Secretary of Energy Advisory Board (SEAB)
SUBJECT: SEAB Reflections at End of Term – November 15, 2016

Shortly after your appointment as Secretary in May, 2013, you assembled this Secretary of Energy Advisory Board¹ to carry out studies and provide recommendations to you and the DOE leadership on subjects you deemed important to the missions of the Department. During your tenure, SEAB has produced seventeen reports and letters, with one additional report in process². The success of SEAB should be judged by the impact those reports and letters have had on the Department's subsequent actions and outcomes.

As the end of this administration approaches, SEAB offers this memorandum for four purposes: *First*, to highlight practices you have adopted which we believe have been important to ensure the success of the SEAB advisory process and which we believe should continue; *second*, to summarize some of your initiatives that SEAB believes are especially noteworthy and that, if sustained and expanded, will strengthen DOE's future contributions to the nation's welfare; *third*, to highlight a subset of SEAB's work we believe is most noteworthy; and, *fourth*, to underscore Department initiatives that we believe require continuing significant focus. We hope these reflections will be of value to you and of use to your successor.

- (1) Five of your practices have been important in making SEAB effective and, if continued, will be key to SEAB's future success. These are:
- First and foremost, your direct involvement in SEAB's activities, by setting priorities and being present at every board meeting;
 - A rigorous practice of requiring a DOE response to each SEAB report. This is a best practice for any outside advisory board;
 - Attracting board members with broad expertise. DOE is well served by the breadth of its membership and by a reasonable turnover that introduces new and

¹ Previous and current SEAB members are shown in Appendix 1

² Reports and letters are listed in Appendix 2

diverse points of views. The quality of SEAB Task Force reports has benefited greatly from the participation of outside experts;

- Asking SEAB's advice on the Department's response to external studies and reports; and
- Finally, SEAB benefits enormously from the excellent support of Karen Gibson and members of DOE's Office of Secretarial Boards and Councils.

(2) SEAB wants to underscore some of your initiatives that the board believes have importantly strengthened the Department's effectiveness and efficiency:

- Integration of the Energy and Science offices under a single undersecretary. The DOE has returned to an organizational structure with a single undersecretary responsible for both the science and (applied) energy portfolios. SEAB strongly supports this move and the board has seen evidence of common best practices emerging, e.g., the strategic planning and alignment processes, and more uniform use of the major projects management structure across the combined organization. Continuing the work to align across "lines of business," technology and programmatic suites that span all Department activities from discovery to solution and deployment, will be an important benefit to extract from the single undersecretary structure. There have been initial major successes, e.g., in the solar portfolio and the departmental-wide subsurface science and engineering crosscut. Opportunities exist for similar benefits with efforts on the 21st century grid, nuclear power, and building and industrial efficiency, as well as emerging areas of focus such as CO₂ mitigation and the potential NIH-DOE collaboration. There has also been a welcome increase in cooperation with ARPA-E.
- Implementation of the recommendations of the Augustine – Mies Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise and the Committee to Review the Effectiveness of the National Energy Laboratories (CRENEL.)
- Encouraging new crosscutting technology initiatives among Department offices and national laboratories. Examples include Next Generation High Performance Computing, Environmental Management R&D, and opportunities for new DOE –

NIH collaborations (all subjects of SEAB Task Forces).

- Establishing a new management process for DOE National Laboratories. The creation of the Laboratory Policy Council has been an effective mechanism to establish policy. The Laboratory Operations Board, with responsibilities that complement the Laboratory Policy Council, has been slower to introduce change because of the lack of a confirmed DOE Undersecretary for Management and Performance. SEAB believes that the Office of Science's Laboratory Operations Office with its small career staff should be a model for all Department laboratories.

(3) SEAB highlights a few of its efforts that the board believes are especially significant:

- SEAB has maintained a National Laboratory Task Force throughout the past four years for two purposes: to recommend actions that would improve the outcome and increase the efficiency of the national laboratories, and to advise you on the Department's response to the recommendations of the many external studies that have occurred.

The four central recommendations of the Task Force were:

- Clarify authority and responsibility among the several parties involved in planning and managing laboratory activities – DOE headquarters offices, DOE field and site offices, Management and Operations (M&O) contractor partners, and the lab directors and lab leadership;
- Place greater emphasis on creating value for the private sector, including technology transfer and user facilities;
- Take steps to streamline administrative oversight and approval at the laboratories; and
- Continue to support the Laboratory Directed R&D (LDRD) program.

The Task Force also highlighted the need to simplify M&O contracts.

These Task Force recommendations aligned closely with the recommendations of the many other studies of DOE laboratories. SEAB stresses in the strongest

possible terms that no additional studies of the governance and management of the DOE laboratories are needed. Rather a large number of recommendations need to be implemented and the results evaluated. The thrust of these recommendations is to shift greater authority and responsibility to the laboratory directors and the laboratory leadership teams.

We are pleased at the progress made at relieving numerous administrative burdens in the labs, through multiple experiments executed through the laboratory directors and the Laboratory Operations Board. We also note the significant contract streamlining being adopted through the work done by both the “evolutionary” and “revolutionary” M&O contract teams.

- The SEAB Exascale Task Force delivered an independent analysis of the rationale for investment in the next generation of high performance computing and determined that a confluence of scientific, technological and national security needs provides a strong case for the benefits of so-called exascale computing. The Task Force found that significant work is needed to bring together highly parallel “conventional” machines with large-scale data-flow architectures to deliver the necessary capability to address the most challenging problems in physics, materials, biology and national security. These problems are increasingly characterized by both large floating-point computations and massive data volumes. The Task Force provided insights and estimates into the \$3B+ investment needed to achieve exascale as well as recommendations on additional early stage discovery efforts needed to prepare for the “beyond exascale” regime.

The report’s summary recommendations were largely adopted and substantially influenced the Department’s 2017 budget submission for its high performance computing efforts. We note that given recent advances in the indigenous capability demonstrated in the Chinese Sunway TaihuLight supercomputer, a sense of urgency must be maintained.

- During your and your predecessor’s term, SEAB produced three separate reports on the environmental effects of hydraulic fracturing, most recently its Report of the Task Force on FracFocus 2.0 of March 28, 2014. These reports identified five

major environmental matters that need attention by regulators and responsible operators: water quality, air quality, community disruption, regional impacts (e.g., pipeline networks) and induced seismicity. The Task Force supported full disclosure of the type and amounts of chemical additives in fracturing fluid, but more importantly it established a framework for assessing the hydraulic fracturing production system.

The Department's response to these reports has articulated progress, ranging from steps to improve information available to the public, actions taken to improve information exchange between States and with the Federal Government, and actions taken on research and development to lessen environmental impact.

- SEAB's Federal Energy Management Task Force was one of the most comprehensive Task Force reports of the last eight years. The report described federal energy management activities in ten different categories and identified opportunities to improve performance. The Task Force raised many critical issues:
 - Reliance on executive branch-wide numeric targets with inadequate consideration of the cost of compliance in different agencies;
 - Wide-scale absence of meters to guide investments in federal energy efficiency, including energy savings performance contracts, and to confirm the value of these investments ex post;
 - Reluctance in some federal energy programs to adopt Randomized Control Trials and other advanced Evaluation, Measurement and Verification (EM&V) techniques to validate programs intended to reduce energy use;
 - The constraint that budget scorekeeping rules place on realizing least-life-cycle-cost contracts for federal buildings, facilities and vehicles;
 - Multiple and often conflicting objectives for federal energy management e.g., least-cost energy services, carbon reductions, energy security, and the demonstration and validation of pre-commercial energy technologies

and energy management practices to the private sector.

These issues indicate confusion of purpose and lack of focus on cost efficiency in some federal energy management programs. SEAB believes further work is justified on federal energy management programs to ensure clarity and prioritization among the goals and establish metering and metrics with which to judge program progress.

We look forward to the Department's response and follow up to this report.

- SEAB's Task Force on Technology Development for Environmental Management highlighted the tremendous costs incurred by the nation in orchestrating the safe cleanup of the environmental legacy of five decades of nuclear weapons development and nuclear energy research. Among its numerous recommendations, it judged that at 0.23% of the overall environmental management budget, the level of investment in research was too low for the magnitude of the task. It recommended increasing investment to around 3% of budget and provided a framework for the Department to consider in placing that investment in a portfolio of incremental, high impact and fundamental research.

The Department has since taken steps in its budget submission to increase the technology development program along the lines recommended in the report.

(4) There are several areas where SEAB has been helpful but there is the opportunity for further contributions by the next SEAB.

- The request for a study for a DOE RD&D program on negative emissions and CO₂ utilization technologies that have the potential to reduce CO₂ emission at the gigatonne (GT) scale occurred too late to mount a complete Task Force effort. Preliminary work has identified a significant interrelated set of R&D questions that deserves the DOE presenting a plan to pursue these research opportunities.
- The Quadrennial Energy Review (QER) and second Quadrennial Technology Review, executed under DOE's leadership, involved a complex interagency process, which made it difficult to engage SEAB in a way that captured the full potential of independent expertise that SEAB could have provided.

- SEAB has assisted the Deputy Secretary in the difficult task of addressing the agency's evolving mission of Energy Emergency Preparedness. This topic must remain a priority.
- In the future SEAB member experience can make a significant contribution to the Department's laudable efforts to address enterprise risk management.

(5) Finally, we mention some initiatives that we believe are especially important for your successor to continue:

- The necessary process of integration of National Nuclear Security Administration (NNSA) into the DOE. To accomplish this, it is key that the next Secretary and Deputy Secretary form a team having deep knowledge of national security and nuclear weapons and deep knowledge and experience in energy and environmental affairs.
- SEAB's National Lab Task Force identified actions to improve M&O contract operations, reduce administrative burdens, improve technology transfer processes and ensure that the value of LDRD is recognized and the program preserved. This focus should continue.
- SEAB believes it is more important than ever that DOE attract and retain, and ensure the highest morale of, the men and women who perform the work in our national laboratories. Efforts to provide clear, continual communications on strategic alignment and stability; career and educational growth opportunities; interactions with the academic and private sector; and reductions in often overwhelming administrative and bureaucratic burdens are crucial to attract and retain the nation's highest scientific workforce. These issues are especially important at laboratories managed by the NNSA with its national security mission and complicated and unique customer base.

SEAB recommends strongly that an assessment of morale at the national labs be made in 2017 and action plans created and executed where opportunities exist.

- You charged the new Office of Energy Policy and Systems Analysis (EPSA) to lead the Quadrennial Energy Review. EPSA has had considerable success in the interagency energy and environmental policy process and the QER has been

well received by Congress. A SEAB Task Force during your predecessor's tenure (of which you were a member) recommended creation of EPSA in order to increase the role of systems analysis in the planning and budgeting of the multi-year technology activities of the program offices. The full advantage of such a systems analysis (and associated modeling and simulation) has yet to be felt.

- The recommendations of the 2010 Blue Ribbon Commission on America's Nuclear Future, chaired by Lee Hamilton and Brent Scowcroft, on how better to manage nuclear waste has received widespread support and the endorsement of Congress and the administration. Nevertheless, few of its recommendations have been enacted and implemented. A strengthened nuclear waste management program as described by the Commission will enhance the prospects for expanded nuclear power.
- The next administration will need to decide if it wishes to launch the type of initiative described by the Future of Nuclear Energy Task Force. The country needs to adopt an initiative of this scope if it is to have the option of nuclear power at scale thirty years from now.
- In light of the Fixing America's Surface Transportation (FAST) Act and in the face of new and evolving natural and manmade threats to energy infrastructure, it is important to continue to make progress on improving the Department's energy emergency preparedness.

SEAB thanks you for your outstanding service as Secretary of Energy and closes with the admonition we are sure you share: "so much to do, so little time."

For the Secretary of Energy Advisory Board

A handwritten signature in black ink that reads "John Deutch". The signature is written in a cursive, flowing style.

John Deutch, Chair

Appendix 1

Secretary of Energy Advisory Board Members

Secretary of Energy Advisory Board (SEAB) Members 2013 – 2017

Current Members

- **John Deutch (Chair)** - Institute Professor, MIT and Former Under Secretary of Energy
- **Arun Majumdar (Vice Chair)** - Jay Precourt Professor and Co-Director, Precourt Institute for Energy, Stanford University; Former ARPA-E Director & Acting Undersecretary of Energy
- **Carol Browner** - Senior Counselor, Albright Stonebridge Group and Distinguished Senior Fellow, Center for American Progress, and Former Administrator Environmental Protection Administration
- **Rafael Bras** - Provost and Executive Vice President for Academic Affairs, Georgia Institute of Technology
- **Michael Greenstone** - Milton Friedman Professor of Economics and Director of the Energy Policy Institute, University of Chicago
- **Paula T. Hammond (joined SEAB December 2015)** - David H. Koch Professor in Engineering and Head of the Department of Chemical Engineering, MIT
- **Shirley Ann Jackson** - President, Rensselaer Polytechnic Institute and Former Chair U.S. Nuclear Regulatory Commission
- **Steven Koonin** - Director, Center for Urban Science and Progress, New York University and Former Under Secretary for Science
- **J. Michael McQuade** - Senior Vice President, Science and Technology, United Technologies Corporation
- **Richard Meserve** - President Emeritus, Carnegie Institution for Science and Former Chair, U.S. Nuclear Regulatory Commission
- **Richard Mies** - Former Commander US Strategic Command
- **Dan Reicher** - Executive Director of the Steyer-Taylor Center for Energy Policy and Finance and Professor of the Practice of Law, Stanford University and Former Assistant Secretary for Energy, Efficiency and Renewable Energy
- **Carmichael Roberts** - General Partner, North Bridge Venture Partners
- **Gary Samore (joined SEAB December 2015)** - Executive Director for Research, Belfer Center for Science and International Affairs, Harvard University
- **Martha Schlicher** - Vice President, Medicines Team Lead, Specialty Generics, Mallinckrodt Pharmaceutical and former Vice-President, Sustainability and Stakeholder Engagement, Monsanto Agricultural Company
- **Ram Shenoy** - Chief Technology Officer of the RBR Group and former Chief Technology Officer, ConocoPhillips
- **Linda Stuntz** - Founding Partner, Stuntz, Davis & Staffier, P.C. and Former Deputy Secretary of Energy
- **Ellen Tauscher** - Former Under Secretary of State and former Member of Congress

- **Harold Varmus** - Lewis Thomas University Professor & Senior Advisor to the Dean and Provost, Weil Cornell Medical College and Former Director, National Cancer Institute and National Institutes of Health.

Former members

- **Persis Drell** – Professor and Dean of Engineering, Stanford University and Director Emerita, SLAC National Accelerator Laboratory
- **Frances Beinecke** - Former President, Natural Resources Defense Council
- **Albert Carnesale** - Chancellor Emeritus and Professor, University of California, Los Angeles
- **Deborah Jin** - Physicist, National Institute of Standards and Technology and Professor Adjoint for Physics, University of Colorado, Boulder
- **Paul Joskow** - President, Alfred P. Sloan Foundation and Professor Emeritus, MIT
- **Cherry Murray** - John A. and Elizabeth S. Armstrong Professor of Engineering and Applied Sciences; Professor of Physics, Harvard University
- **Daniel Yergin** - Vice Chairman, IHS and Founder of IHS Cambridge Energy Research Associates

Appendix 2

Secretary of Energy Advisory Board Work Product
2013 – 2016

Report of the Task Force on FracFocus 2.0	3/28/2014
Report of the Hubs+ Task Force	3/28/2014
Report of the Task Force on Next Generation High Performance Computing	8/18/2014
Report of the Task Force on Technology Development for Environmental Management	12/3/2014
Report of the Task Force on Nuclear Nonproliferation	3/31/2015
Interim Report of the Task Force on National Laboratories	6/17/2015
Report of the Task Force on Methane Hydrates	1/26/16
Report of the Task Force on Federal Energy Management	9/13/16
Report of the Task Force on The Future of Nuclear Power	9/15/16
Report of the Task Force on Biomedical Sciences	9/22/16
Report of the Task Force on CO ₂ Utilization	TBD
Letter Endorsing the Office of Science Working Group to Study Modifications to Laboratory M&O Contracts for Single-Program Laboratories	12/9/2014
Letter to OMB on DOE Graduate Research and Trainee Fellowship Programs	6/12/2015
Letter on the interim report of the <i>Commission to Review the Effectiveness of the National Energy Laboratories</i>	6/17/2015
Letter on <i>Aligning the Governance Structure of the NNSA Laboratories to Meet 21st Century National Security Challenges</i> (Augustine – Mies)	6/17/2015
Letter on the Office of Science Working Group to Study Modifications to Laboratory M&O Contracts for Single-Program Laboratories; and A Suggestion Related to the University of Minnesota Math Institute	6/19/2015
Letter on Low-level Radiation Exposure Research	6/23/2015
Letter on the final report of the <i>Commission to Review the Effectiveness of the National Energy Laboratories</i>	1/26/2016