U.S. DEPARTMENT OF ENERGY | Office of Science

Advanced Scientific Computing Research

Presented to the

Advanced Scientific Computing Advisory Committee

by

Barbara Helland
Associate Director

December 21, 2017

New ASCAC Charge

Department of Energy
Office of Science
Washington, DC 20585

December 7, 2017

Professor Daniel Reed
Chair, Advanced Scientific Computing Research
Advisory Committee
University of Iowa
Iowa City, Iowa

Dear Professor Reed:

I am writing to ask the Advanced Scientific Computing Advisory Committee to produce a report that assess and document the historical accomplishments of the Advanced Scientific Computing Research (ASCR) program and its predecessors over the past four decades. The report, to be produced during the coming year, should highlight outstanding examples of major scientific accomplishments emerging from ASCR's and its predecessor organizations that have shaped the fields of ASCR research. In addition to selected accomplishments, the report should identify the lessons learned from these examples to motivate ASCR investment strategies for the future.

As history has shown, basic research advances have been the bedrock of American innovation and prosperity. These advances often gave rise to new lines of scientific inquiry and led to inventions of new technologies and industries that transformed our society. Breakthrough discoveries emerging from Federal investment can have broader impacts beyond the original field of scope and have made Federal programs, such as ASCR, an essential part of the Nation's science and technology strategy.

The ASCAC 2007 "Opportunities and challenges of Exascale computing," 2012 "DOE Data-intensive Science and Exascale," and the 2013 "Ten Technical Approaches to Address the Challenges of Exascale Computing" reports have identified critical research opportunities for applied mathematics, computer science, computational partnerships and advanced networking during the exascale era. The upcoming ASCAC report on the opportunities and challenges for future high performance computing capabilities should further identify areas for ASCR investments in the "Beyond Moore's Law" era.

By examining past successes, I expect this report to illuminate the guiding strategies and approaches that will be key to ensuring future U.S. leadership, and more generally, U.S. leadership in the full range of disciplines stewarded by ASCR. Even more broadly, such a report will be timely to inform the future investment strategy for the Office of Science as it contributes to fulfillment of the Department of Energy's missions, especially in view of the Federal budget outlook. With these high-level objectives in mind, the report should provide technical details as needed for context but should be primarily concerned with the essence of each story as it relates to the larger progress of science.

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I ask ASCAC to consider the following questions in formulating the study plan:

- What are the major scientific accomplishments that have shaped the ASCR-supported disciplines in the past 40 years? How has ASCR contributed to these advances?
- What impacts have these advances had on the Department's missions in energy, environment, or security?
- What are the key aspects of the ASCR investment strategy that have had the greatest impacts?
- Looking to the future, and building on the ASCAC reports, what research areas and funding strategies to pursue those areas could further strengthen ASCR in serving the DOE's missions?

I would appreciate receiving a written report by December 31, 2018.

Sincerely,

J. Stephen Binkley
Deputy Director for Science Programs
Office of Science

cc: Barbara Helland, SC-21
Christine Chalk, SC-21.2

Key Elements

- **Produce a report that assess and document the historical accomplishments of the Advanced Scientific Computing Research and it predecessors organizations that have shaped the past four decades.**
  - Highlight outstanding examples that have shaped the fields of ASCR research.
  - Identify the lessons learned from these examples to motivate ASCR investment strategies for the future.
- **Consider the following question:**
  - What are the major scientific accomplishments that have shaped the ASCR-supported disciplines in the past 40 years? How has ASCR contributed to these advances?
  - What impacts have these advances had on the Department's missions in energy, environment, or security?
  - What are the key aspects of the ASCR investment strategy that have had the greatest impacts?
  - Looking to the future, and building on the ASCAC reports, what research areas and funding strategies to pursue those areas could further strengthen ASCR in serving the DOE's missions?