

Should the U.S. National Labs be Reinvented for the Exascale Era?

Written by: The Exascale Report Staff, July 2013

A recent report from a nonpartisan working group has presented a well articulated argument for the reinvention of the U.S. National Labs so they can effectively deal with the challenges of the upcoming exascale and zettascale decades.

The working group consists of <u>The Information</u> <u>Technology and Innovation Foundation</u>, <u>The</u> <u>Center for American Progress</u>, and <u>The Heritage</u> <u>Foundation</u>.

The Exascale Report recently reported on the daunting challenges facing the new Secretary of Energy, Ernest Moniz. Many in the HPC community hope he will establish a strong leadership position for DOE. There is deep-rooted concern throughout the community as the nation's National Lab researchers and scientists watch the U.S. position of global technology leader give way to Chinese ingenuity, determination, and overwhelming technology research and development budgets.

The new report titled, "<u>Reimagining the National</u> <u>Labs in the 21st Century Innovation Economy</u>," gets to the heart of both infrastructure and policy issues that contribute to the declining effectiveness of the labs, which are the cornerstone of U.S. technology research and development.

The following, taken from the report, does an excellent job of summarizing the scope of this challenge:

[While the pace of innovation and the complexity of national challenges have accelerated, the labs have not kept stride. Although private-sector innovation will remain the cornerstone of economic growth, lab scientists and engineers do important work that can be of significant future use to private enterprise. Examples include commercial global positioning system, or GPS, applications and genetics analysis. The problem is that the labs' tether to the market is weak, often by design. Though the mission of the labs must not be to subsidize private-sector research, efficient means for transferring scientific discovery into the market should exist. But the labs' bureaucracy remains largely unchanged and does not reflect the nimble characteristics of today's innovation-driven economy. Inefficiencies, duplicative regulations, and top-down research micromanagement are having a stifling effect on innovation. Furthermore, institutional biases against transferring market-relevant technology out of the labs and into the private sector reduce incentives for technology transfer.]

[The federal government must reform the labs from their 20th century atomic-energy roots to create 21st century engines of innovation.]

The authors, Matthew Stepp, Sean Pool, Nicolas Loris, and Jack Spencer, summarize their analysis and recommendations into three major categories:

- 1. Transforming Lab Management from DOE Micromanagement to Contractor Accountability
- 2. Unifying Lab Stewardship, Funding, and Management Stovepipes with Innovation Goals
- 3. Moving Technology to Market with Better Incentives and More Flexibility

Innovation goals, better incentives, more flexibility. Who can argue with that?



The national lab system is the nucleus of the U.S. HPC ecosystem. Consisting of 17 lab facilities and more than \$18 billion in public research funding in fiscal year 2011, the labs primarily serve three different focus areas: Energy, science, and of course weapons.

As pointed out in our June 2013 article, "From Capitol Hill to Silicon Valley to the Great Wall of China - Exascale Crusaders Prepare for Battle," the relationship between the labs and DOE headquarters has been strained in several ways, one of which is DOE micromanagement that has stifled innovation and effectiveness. One anonymous source described key lab researchers as "puppets dancing under the control of a dozen marionettes."

Another point in the report is perhaps the key factor behind the U.S.'s inability to compete adequately in the exascale race. The current restrictive funding model requires each program to essentially research and acquire its own technology portfolio. There is more competition than collaboration among the various programs.

Most grants are issued with short-term objectives, requiring extensive reporting and frequent jumping-through-hoops, a major barrier to progress.

Again, we quote directly from the report: "Because each institutional and research category is tasked with funding its own portfolio of technologies, the labs become locked into prearranged research pathways that may not be the cheapest, most direct, or most effective way to solve problems. Program managers focus on short-term research objectives tied to their appropriated grants at the expense of pursuing more promising but longer-term avenues of research. This results in two immediate impacts: (1) the labs are not well equipped to engage in long-term planning to strategically support promising areas of research unless they lie within existing atomized technology categories, and (2) the labs must spend increasingly more time and overhead bidding on and managing small contracts and grants, which takes resources away from supporting promising research."

Exascale, and eventually zettascale, require longterm, dedicated research. Success will depend on collaboration among the labs' researchers, shared experiences and results, along with the dedication of individual researchers and scientists who will stay focused on such a research agenda over many years. Our current approach is failing because there is no long term vision – or commitment.

The U.S. National Labs may indeed be in for a major overhaul. The HPC community will be watching Secretary Moniz to see what changes he has in mind for reigniting U.S. technology leadership.

We urge our readers to download and read this document.

http://www.americanprogress.org/issues/green/r eport/2013/06/20/67454/turning-the-pagereimagining-the-national-labs-in-the-21stcentury-innovation-economy/

The future of U.S. competitiveness depends on HPC leadership, and the U.S. needs the National Labs to get the country back on top.

The U.S. National Lab ecosystem has an abundance of superstars. Let's give them a chance to shine. Give the labs the freedom, flexibility and incentive they deserve. We will all win.

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