U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE AND TECHNOLOGY
SUBCOMMITTEE ON RESEARCH AND SCIENCE EDUCATION

HEARING CHARTER

The State of Research Infrastructure at U.S. Universities

Tuesday, February 23, 2010
2:00 p.m. – 4:00 p.m.
2318 Rayburn House Office Building

1. Purpose

The purpose of this hearing is to examine the research and research training infrastructure of our universities and colleges, including research facilities, and cyberinfrastructure capabilities, the capacity of the research infrastructure to meet the needs of U.S. scientists and engineers now and in the future, and the appropriate role of the Federal government in sustaining such infrastructure.

2. Witnesses:

- Dr. Leslie Tolbert, Vice President for Research, Graduate Studies and Economic Development, University of Arizona
- Mr. Albert Horvath, Senior Vice President for Finance and Business, Pennsylvania State University
- Dr. John R. Raymond, Vice President for Academic Affairs and Provost, Medical University of South Carolina, and Chair, State of South Carolina EPSCoR Committee
- Dr. Thom Dunning, Director of the National Center for Supercomputing Applications, University of Illinois at Urbana-Champaign

3. Overarching Questions:

- What is the state of the nation's academic research facilities? Are current academic research facilities keeping U.S. scientists and engineers competitive with their international counterparts and are they allowing for cutting edge science? How are universities and colleges maintaining and improving their research facilities? How has the economic climate affected short-term and long-term planning and investments in academic research facilities?

- What is the status of the nation's cyberinfrastructure? Do our research and education networks have the capacity to support computational, storage, data transfer and scientific exchange needs that have become critical to performing innovative research? How are universities and colleges investing in their own

cyberinfrastructure? How are universities partnering with state and local governments as well as the private sector to build regional cyberinfrastructure capabilities?

- What is the appropriate role of the Federal government in supporting the research infrastructure of our universities and colleges? How do Federal agencies such as the National Science Foundation support research infrastructure that benefits the science and engineering enterprise? Given the trade-off between support for research and the support of research facilities should NSF revive their Academic Research Infrastructure Program? What other options, beyond targeted programs, are there for Federal science agencies to support academic research infrastructure?

4. Background

University Research Infrastructure

Since 1988, NSF has conducted a biennial survey on the status of research facilities at academic institutions, nonprofit biomedical research organizations and university hospitals. The survey currently includes data on: the amount of research space, the condition of research facilities, current expenditures and plans for new construction as well as the renovation of research facilities, sources of funds for construction and renovation, and information technology capabilities.

According to the latest NSF survey[1], 77 percent of the respondents rated the condition of their research space as satisfactory or superior with the remainder indicating that their research space needed to be renovated or replaced. The survey also showed that academic institutions spent $6.1 billion on new construction and $2.4 billion on the repair and renovation of research facilities, but deferred $10.2 billion in new construction projects and $3.5 billion in renovation projects. Despite deferred investments, the amount of research space at academic institutions has steadily increased to 192 million square feet in 2007, although the rate of increase has slowed to 3.7 percent, down from its peak of 11 percent between 2001 and 2003.

Academic institutions fund their capital investments through a combination of sources: the Federal government, state and local governments, and institutional funds, which include endowments, private donations, and facilities and administration (F&A) costs recovered from the Federal government. The Federal share of these capital investments is generally about 5 percent, with the state/local governments accounting for 22 percent, and the institutions themselves contributing 72 percent. As just noted, the institutional share does include F&A costs reimbursed by the Federal government as part of Federal contracts and grants, primarily research grants. The reimbursed funds are used for such activities as operation and maintenance of research facilities, library expenses, department administration, including secretaries, academic deans, and grant compliance officers. However, according to a 2000 RAND study[2], the true F&A costs incurred by an

[1] http://www.nsf.gov/statistics/nsf07325/
[2] http://www.rand.org/pubs/monograph_reports/MR1135-1/

institution are higher than the rate for which they are reimbursed and analyses indicate that universities are recouping between 70 to 90 percent of the amount they are actually spending on facilities and administration.

Cyberinfrastructure

Advances in information technology have changed the way research is conducted. In 2005, NSF created the Office of Cyberinfrastructure (OCI) to ensure a comprehensive vision and set of investments in the research, development, acquisition, and operation of cyberinfrastructure across NSF's research directorates. Cyberinfrastructure, which consists of computing systems, data storage systems, data repositories, advanced instruments, and the networks and software that link these systems, has become increasingly important to all science and engineering disciplines. OCI requested a budget of $228 million in FY 2011, a 6.4 percent increase from FY 2010, with the largest investment proposed for the development of petascale computing capabilities.

NSF's recent Science and Engineering Indicators report[3] shows that all institutions of higher education have access to the internet, which was not the case earlier in the decade, but the bandwidth capability or speed of internet connection varied across institution type. The overwhelming majority (83 percent) of institutions with a bandwidth of at least 1 gigabit per second were doctoral degree granting institutions, and all but one institution with a bandwidth greater than 2.4 gigabits per second granted doctoral degrees. Despite the current differences in capabilities, data from NSF indicates that all colleges and universities are investing heavily in the expansion of their networks and are improving wireless campus coverage as well as their external and internal network speeds.

NSF's Academic Research Infrastructure Program

The Academic Research Infrastructure (ARI) program was originally authorized by the Science and Technology Committee in 1988, with funding authorized through 1993. The authorization level grew from $80 million in 1989 to $250 million in 1993. The original ARI program consisted of two components: support for the acquisition or development of major research instrumentation and support for the improvement of research and research training facilities.

ARI was included in appropriations bills from 1990 until 1996. It was initially funded at $20 million, and rose steadily to $100 million with an anomalous peak of $250 million in 1995. Beginning in 1997, NSF continued the instrumentation part of ARI only, and renamed it the Major Research Instrumentation (MRI) Program. The funding level for MRI in 1997 was $50 million, half the level the full ARI program received the year before. Today, it receives approximately $100 million annually with a FY 2011 budget request of $90 million. MRI also received $300 million in the Recovery Act, which helped NSF fill in much of the backlog in demand from universities.

The long defunct facilities portion of the old ARI program received $200 million in the Recovery Act. NSF stood up a revised version of the program, the Academic Research

[3] http://www.nsf.gov/statistics/seind10/

Infrastructure Program: Recovery and Reinvestment (ARI-R²), that does not require cost sharing and goes beyond physical research facilities, allowing for the modernization of virtual research space. Last August, NSF received 495 applications for funding under the ARI-R^2 program, proposing a total of $1.2 billion in renovations. NSF plans to award 125 grants between February and September in three size categories: $250,000 - $2 million, $2 million - $5 million, and $5 million - $10 million. According to NSF, the vast majority of awards will fall into the $250,000 to $2 million range. Additionally, nearly half of the awards (46 percent) will go to doctoral degree granting institutions, with the remaining going to a variety of master's degree granting institutions, undergraduate institutions, minority serving institutions and non-profit research organizations. The overall success rate of 25 percent is similar to the Foundation-wide success rate for its competitive awards.

NSF Support for Research Infrastructure Broadly

In addition to supporting cutting edge science through research grants, NSF invests in the infrastructure that enables such research. Approximately 24 percent ($1.8 billion) of NSF's FY 2011 budget is devoted to research infrastructure. These infrastructure investments are generally large, multi-user facilities, distributed instrumentation networks, or large pieces of equipment such as telescopes, research vessels, or accelerators that benefit an entire scientific discipline and could not be achieved without significant Federal support. For example, the Ocean Observatories Initiative, currently under construction with funding from the Major Research Equipment and Facilities (MREFC) account, will create a network of sensors for the continuous and real-time measurement of the physical, chemical, geological and biological variables of the ocean and seafloor.

In addition to these targeted large-scale investments, NSF also supports the development of university research infrastructure through the Experimental Program to Stimulate Competitive Research (EPSCoR) program. EPSCoR was created in 1978 to build research capacity in States with few research intensive universities; in order to be eligible a state must receive less than 0.75 percent of the total NSF funding awarded in the previous 3-year period. The intent of the program is to improve a state's competitiveness for R&D funding primarily by supporting sustainable research infrastructure improvements across the states' academic institutions. NSF has requested $154 million for the program in FY 2011, a 5 percent increase from FY 2010. The success of NSF's EPSCoR program in the 1980s resulted in the creation of six other EPSCoR-like programs within DOE, DOD, NIH, NASA, EPA, and USDA. In FY 2008, these programs invested a total of $419 million across the approximately 25 EPSCoR-eligible states.

5. Questions for Witnesses

Dr. Leslie Tolbert

1. How does the University of Arizona plan for its research infrastructure needs, including its research facilities? What is the current state the University of Arizona's research infrastructure and its plans for the next 5-10 years? How is the

University of Arizona partnering with state and local governments as well as the private sector to improve the region's research infrastructure and capabilities?

2. What federal funds currently support the University of Arizona's research infrastructure, including research facilities? Please include a description of all sources of funding for your research facilities, including indirect costs reimbursed from federal research grants. What are your unmet research infrastructure needs? Would you support funding for the Academic Research Infrastructure Program if it meant decreasing NSF's research budget by an equivalent amount? Are there other options beyond targeted programs for Federal science agencies to support the research infrastructure of our universities?

Mr. Albert Horvath

1. Please describe how research infrastructure is financed at Pennsylvania State University, including the financing of research facilities, cyberinfrastructure and other investments in the university's research capabilities? What federal funds currently support Penn State's research infrastructure, including research facilities? Please include a description of all sources of funding for your research facilities, including indirect costs reimbursed from federal research grants. What are your unmet research infrastructure needs?

2. How is Penn State partnering with state and local governments as well as the private sector to improve the region's research infrastructure and capabilities?

3. Would you support funding for the Academic Research Infrastructure Program if it meant decreasing NSF's research budget by an equivalent amount? Are there other options beyond targeted programs for Federal science agencies to support the research infrastructure of our universities?

Dr. John R. Raymond

1. Please describe the current National Science Foundation EPSCoR grant awarded to South Carolina. What role have EPSCoR funds played in facilitating partnerships with state and local governments as well as the private sector to improve the region's research infrastructure and capabilities? How have EPSCoR funds been leveraged across institutions to improve the region's cyberinfrastructure capabilities? Specifically, how have EPSCoR funds been used by the Medical University of South Carolina?

2. Please describe the state of Medical University of South Carolina's research infrastructure, including its research facilities. What are your unmet research infrastructure needs?

3. Do you have any specific recommendations on how to improve the EPSCoR program? Are there other options beyond targeted programs for Federal science agencies to support the research infrastructure of our universities?

Dr. Thom Dunning

1. Please describe the state of the University of Illinois's cyberinfrastructure, including the Blue Waters project. How is the University of Illinois partnering with state and local governments as well as the private sector to build regional cyberinfrastructure capabilities?

2. In your opinion, as the lead of one of 6 task forces established by NSF's Advisory Committee for Cyberinfrastructure to address long-term cyberinfrastructure issues, what is the state of the Nation's cyberinfrastructure? Do our research and education networks have the capacity to support computational, storage, data transfer and other scientific exchange needed to perform innovative research? Are we appropriately prioritizing our investments in cyberinfrastructure? What, if any, critical investments or opportunities are we missing?