ISSUE BRIEF

Rebuilding the Nation's Research Infrastructure:
Restoring Jobs and the U.S. Competitive Advantage

America's infrastructure is aging and needs revitalization. As with our highways, bridges, tunnels and airports, America's research infrastructure – most of which was built more than 50 years ago –desperately needs upgrading. The mid- and large-scale research facilities, dedicated laboratory buildings and advanced scientific instruments, located at national laboratories, universities and research institutions across the country, are as fundamental to our economy and security as roads, bridges and railways.

The Administration has an ambitious plan – potentially a $1 trillion investment – to modernize our infrastructure. Including research infrastructure in this initiative will more fully energize the economy, increase our competitiveness, enhance our national security, and improve the quality of life for all our citizens.

America's research infrastructure is as fundamental to our economy as roads, bridges and tunnels.

Americans rely on our country's research infrastructure – the national labs, university research facilities and state-of-the-art instrumentation spread across the country – for the breakthroughs and discoveries that improve our everyday lives, advance our economic growth, and help defend our country. U.S. research infrastructure is also the essential scaffolding that directly supports more than 17 million U.S. jobs.[1]

Starting with the Manhattan Project in 1942, the U.S. government began developing a scientific research infrastructure through investments at national laboratories, universities and federal research facilities. Within three decades, the U.S. established a scientific ecosystem, integrating diverse and cutting-edge research facilities, unrivaled by any other nation.

But the nation has failed to maintain that infrastructure. The disrepair of key elements of our research infrastructure is now jeopardizing our nation's competitiveness and the jobs that go with it. While our counterparts in Europe and Asia aggressively invest in modern facilities, attracting the best researchers from around the world, U.S. laboratories and university research facilities that were once considered world-class are becoming dangerously obsolete. The U.S. must upgrade its own research infrastructure to compete globally and be a sought-after partner in leveraged international collaborations.

Today, U.S. scientists and engineers increasingly need to travel abroad to use the best technology and scientific equipment because we no longer have state-of-the-art facilities. By doing so, the U.S. loses opportunities to make key discoveries and to train the next generation of U.S. researchers, trends that detrimentally impact our domestic economy and national security.

This course can be reversed. The national labs, universities and federal science agencies have the plans; the technology is available; and construction is ready to begin. An Infrastructure Initiative provides the opportunity to revitalize the nation's research infrastructure – restoring jobs and the U.S. competitive advantage.

Investing Only in What We Need

We must ensure that taxpayer dollars marked for infrastructure are spent on the necessary projects. Two principles can guide the investment:

- *Public Value*: any infrastructure project must provide a broadly shared benefit
- *Essential*: any infrastructure project must be central to the mission of the sponsoring agency and fit within its envelope of activities and operations

[1] Bureau of Labor Statistics, "Beyond the Numbers," May 2016.

Opportunities

Investing in our research infrastructure would immediately spur our economy, creating jobs across the construction and manufacturing sectors. Such investments would also enable new discoveries and innovations with associated economic benefits, paying dividends for decades to come. There are *Essential* opportunities that provide *Public Value* across the U.S. scientific enterprise:

- **National Science Foundation (NSF):** Existing NSF programs support updating and improving large facilities, state-of-the-art instrumentation and research facilities – or provide funding for new projects having reached NSF's Conceptual Design Stage – at institutions of higher education and other non-profit research organizations. Such projects could be drawn from the Major Research Instrumentation, the Major Research Equipment and Facilities Construction, and the Academic Research Infrastructure programs. In addition, a process to fund "mid-scale" projects – from $20 million to $100 million – could be instituted.

- **Department of Energy (DOE):** Existing DOE programs support upgrading and repairing its national laboratories and user facilities or provide funding for new projects that DOE has identified as "mission critical" (CD-0). These activities include Office of Science major scientific user facility upgrades; new construction projects such as light sources, neutron sources, advanced particle detector systems and large-scale computing facilities; and projects within the Science Laboratories Infrastructure Program – currently operating with a $2 billion backlog – which supports general-purpose construction projects and provides funding to maintain, repair and upgrade infrastructure at the national labs. Other changes to statute or regulation could leverage private investment through alternative financing mechanisms making it easier and less costly to utilize existing resources on smaller scale projects (<$20 million).

- **National Institute of Standards and Technology (NIST):** The Construction Research Facilities account supports the renovation and maintenance of current buildings and laboratories. According to assessments of NIST facilities, there are approximately $350 million of backlogged laboratory upgrades, including repairs to energy and water systems and mechanical-electrical systems as well as structural repairs.

- **National Aeronautics and Space Administration (NASA):** Existing NASA programs support upgrading and repairing facilities located at NASA centers across the country – or funding new projects that have been approved for formulation – critical to the agency's scientific, aeronautics and exploration missions. The Construction of Facilities and Center Management & Operations programs provide the primary support for repair or upgrade projects on shared infrastructure. The science, aeronautics and human exploration mission directorates support and launch new, cutting-edge research projects. Much of NASA's aging infrastructure dates back to the Apollo program, with an estimated $2.4 billion backlog in deferred maintenance and upgrades.

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