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MEMORANDUM FOR THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES

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SUBJECT: Science and Technology Priorities for the FY 2014 Budget

Scientific discovery, technological breakthroughs, and innovation are the primary engines for expanding the frontiers of human knowledge and are vital for responding to the challenges and opportunities of the 21st century. We look to scientific innovation to promote sustainable economic growth and job creation, improve the health of the population, move toward a clean energy future, address global climate change, manage competing demands on environmental resources, and ensure the security of the Nation.

This memorandum outlines the Administration's multi-agency science and technology priorities for formulating FY 2014 Budget submissions to the Office of Management and Budget (OMB). These priorities require investments from and cooperation among multiple Federal agencies for success. They build on priorities reflected in this Administration's past budgets and documents, such as the President's *Strategy for American Innovation*.

Science and engineering research is a valuable source of new knowledge that has driven important developments in fields ranging from telecommunications to medicine, yielding high economic and social rates of return and creating entirely new industries with highly-skilled, high-wage jobs. In particular, the Nation benefits from government funding for basic and applied research in areas in which the private sector does not have the economic incentive to invest. Because of the crucial government role in supporting research, in general agencies should give priority to funding for research above funding for development activities. Within research portfolios, agencies are encouraged to identify and pursue "Grand Challenges" – ambitious goals that require advances in science, technology and innovation to achieve. Agencies should also support the research tools and infrastructure needed to ensure that U.S. science remains at the leading edge of discovery, but in delineating priorities, any proposals for new major facilities must fit within Federal real property

guidance and be fully justified and balanced against funding for research activities and operations of existing facilities.

Prioritizing key science and technology activities

In a time of constrained resources, agencies should continue to direct resources to high-priority activities and identify potential eliminations or reductions in less-effective, lower-quality, or lower-priority programs. Agencies engaged in complementary activities should consult with each other during the budget planning process so that resources are coordinated to maximize their impact and to avoid inappropriate duplication. They should also avoid duplicating research in areas that already receive funding from the private sector. Agencies should explain in their budget submissions how they are redirecting available resources from lower-priority areas to science and technology activities that address the priorities described below.

Program guidance

In accordance with OMB Circular A-11 and the GPRA Modernization Act of 2010, agencies should describe the targeted outcomes of research and development (R&D) programs using meaningful, measurable, quantitative metrics where possible and describe how they plan to evaluate the success of those programs.

Multi-agency priorities

The Administration recognizes that agency-specific research needed to make progress toward agency missions is important, though this memorandum does not include priorities that fall within the purview of a single agency. In the 2014 Budget, agencies should balance priorities to ensure resources are adequately allocated for agency-specific, mission-driven research while focusing resources, where appropriate, on addressing the following multi-agency research activities that cannot be addressed effectively by a single agency.

Advanced manufacturing

The Administration is committed to revitalizing and transforming America's manufacturing sector. Agencies should give priority to those programs that advance the state of the art in manufacturing, with particular emphasis on government-industry-university partnerships and enabling technologies (such as robotics, materials development, and additive manufacturing) that benefit multiple sectors, as described in the *National Strategic Plan for Advanced Manufacturing*.

Clean energy

The Administration intends for the United States to lead the world in clean-energy technology R&D to help reduce dependence on oil and to help reduce air pollution and greenhouse gas emissions while creating high-wage, highly-skilled, clean-energy jobs and businesses. Agencies should give priority to R&D to advance clean-energy technologies; R&D to address the manufacturing challenges of clean-energy technologies; R&D to advance meteorological and oceanic forecasting to support deployment of clean-energy technologies; and R&D to increase energy efficiency in industry, buildings, and manufacturing.

Global climate change

Within the U.S. Global Change Research Program, agencies should give priority to new activities identified in the recently released 2012 Strategic Plan. Particular emphasis should be given to research that advances understanding of vulnerabilities in human and

biogeophysical systems and their relationships to climate extremes, thresholds, and tipping points. This will require integrated cross-sectoral, biogeophysical, and socioeconomic observations as well as improved simulation and modeling. Specific areas where progress is needed include observations to detect trends in extremes; integration of observation into models; attribution of change to human or natural causes; integrated research on Earth and human systems; simulation and prediction at spatial and temporal scale conducive to decision making; and adaptation responses to changing frequency and intensity of extreme events.

R&D for informed policy-making and management

Agencies, especially those with primary missions other than R&D, should give priority to R&D that strengthens the scientific basis for decision-making, particularly with regard to health, safety, and environmental impacts. This includes efforts to enhance the accessibility and usefulness of data and tools for decision support. Agencies should give priority to R&D that advances the delivery of the following policy goals: ecosystem and landscape-scale management; implementation of the National Ocean Policy and other priority ecosystem and restoration initiatives; sustainable stewardship of critical energy, mineral, air, water, and species resources; implementation of Federal sustainability and adaptation initiatives; and development of sustainable food production systems that minimize the use of inputs such as water, energy, pesticides, and fertilizer and increase the productivity of agriculture while minimizing environmental impacts.

Information Technology Research and Development

Within the interagency Networking and Information Technology Research and Development initiative, agencies should give priority to investments that address the challenges of, and tap the opportunities afforded by, the Big Data revolution – the fast-growing volume of large and complex collections of digital data – to advance agency missions and further scientific discovery and innovation. Within the initiative, agencies should give priority to investment in data analytics and management and to fundamental research in computer science and engineering above funding for the development and procurement of large-scale high-performance computing systems. Agencies should also give priority to research guided by the *Trustworthy Cyberspace: Strategic Plan for Cybersecurity R&D Programs* to develop technologies that can protect our systems against current and future cyber-attacks.

Nanotechnology

Within the interagency National Nanotechnology Initiative, agencies should give priority to implementation of the *2011 Environmental, Health, and Safety (EHS) Research Strategy*, presenting an approach to ensuring the safe, effective, and responsible development and use of nanotechnology; and support for the Nanotechnology Signature Initiatives, which spotlight topical areas that represent key opportunities and can be more rapidly advanced through focused interagency R&D efforts.

Biological Innovation

Agencies should give priority to R&D investments that have the potential to foster biological innovations, in particular enhancing translational sciences and science that supports regulation to accelerate innovation and regulatory decision-making, and enhancing post-secondary and graduate-training programs to ensure that existing programs adequately prepare students for the bioeconomy workforce.

Science, technology, engineering, and mathematics (STEM) education

In keeping with the forthcoming Federal STEM-education strategic plan, agencies should give priority to programs that use evidence to guide program design and implementation and improve measurement of outcomes. Agencies should also enhance coordination with other agencies and focus their funding on those areas of STEM education where the Federal government can have maximum impact. These areas include engaging more citizens in STEM, preparing effective STEM teachers, improving undergraduate STEM success, and better supporting the participation and success in STEM of individuals from historically underrepresented groups.

Innovation and commercialization

Agencies should promote innovation and commercialization from Federal R&D investments, where appropriate, through support for inducement prizes, early-stage technology development, university-industry partnerships, and efforts to better link graduate training with both private and public-sector workforce needs. Such efforts should be aligned with the Administration's Cross-Agency Priority Goal to improve performance across Federal services for entrepreneurs and small businesses.