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MEMORANDUM FOR THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES

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SUBJECT: Multi-Agency Research and Development Priorities for the FY 2023 Budget

This moment in American history, as we face unprecedented challenges but also unprecedented opportunities, is a moment for the Federal Government to take action to refresh and reinvigorate our Nation's science and technology enterprise with the aim of harnessing the full power of science and technology on behalf of the American people. Scientific discovery, technological breakthroughs, and innovation are the engines for expanding the frontiers of human knowledge and are vital for responding to the challenges and opportunities of the 21st century.

Federal funding for research and development (R&D) is essential to maximize the benefits of science and technology to tackle the climate crisis and advance health, prosperity, security, environmental quality, equity, and justice for all Americans. Simply supporting R&D is not sufficient; however, Federal agencies should ensure that the R&D results are made widely available to other scientists, to the public to facilitate understanding and decisions, and to innovators and entrepreneurs who can translate them into the businesses and products that will improve all of our lives. And, as we seek to make our supply chains more resilient, R&D investments should create more than just cutting-edge technology; they should also create products that are made in the United States by U.S. workers.

This memorandum outlines the Administration's multi-agency R&D priorities for formulating fiscal year (FY) 2023 Budget submissions to the Office of Management and Budget (OMB). The priorities covered in this memo require continued investments in R&D; science, technology, engineering, and mathematics (STEM) education and engagement; STEM workforce development; technology transfer and commercialization; and research infrastructure, with emphasis on Historically Black Colleges and Universities, other Minority Serving Institutions, and disadvantaged communities who have been historically underserved, marginalized, and adversely affected by persistent poverty and inequality. These priorities should be addressed within the FY 2023 Budget guidance levels provided by OMB.

Agency budget submissions should note when they address the priorities described below. Agencies engaged in complementary activities should consult with each other during the budget planning process to coordinate resources, maximize impact, and avoid unnecessary duplication, and they should include summaries of these discussions in their OMB budget submissions.

Multi-Agency R&D Priorities

In the FY 2023 Budget, agencies should balance priorities to ensure that resources are allocated for agency-specific, mission-driven R&D, including fundamental research, while at the same time focusing resources, where appropriate, on the following multi-agency R&D activities that cannot be addressed solely by a single agency.

Pandemic readiness and prevention. COVID-19 has claimed more than 600,000 lives in America and cost trillions of dollars, demonstrating the devastating effects of pandemics. As the Nation emerges from this historic event, it is more important than ever not to become complacent in ensuring readiness to meet the challenge of the next emerging pandemic. Agencies should continue to build upon previous R&D investments in early warning systems, diagnostics, therapies, and vaccine development and manufacturing to prevent and respond to pandemic and other biological threats, both domestically and globally. Priority areas include: accelerating vaccine design, testing, production, distribution, and administration, with an emphasis on scalable platform modulators; rapidly developed, easy to use, and affordable diagnostic technologies; antiviral therapeutics, including protein inhibitors, neutralizing antibodies, and immune modulators; and data and technology investments to support early warning and real-time monitoring, including genomic sequencing, viral variant tracking, and environmental surveillance. Agencies should leverage these investments across the U.S. Government to strengthen the public health system, with special attention to rural areas, underserved communities, and veterans and military health systems. Agencies should build the data infrastructure, manufacturing and delivery capabilities, and workforce needed to support rapid and scalable public health response—both domestically and globally, and funding the fundamental science and critical technologies needed to fulfill the Administration’s goals in pandemic readiness.

Tackling climate change. The United States and the world face a profound climate crisis with a narrow moment to pursue action to avoid the most catastrophic impacts and to seize the opportunities that tackling climate change presents. This crisis is interconnected with the staggering levels of biodiversity loss occurring across the globe because climate change is exacerbating the impacts that other drivers are having on biodiversity. The President has directed a whole-of-Government approach to reduce climate pollution in every sector of the economy, increase resilience to the impacts of climate change, and protect public health, while creating good-paying jobs that provide a free and fair chance to join a union and collectively bargain. Agencies should identify and prioritize R&D investments that advance understanding of climate change and the development of mitigation and adaptation solutions. Priorities include:

Climate science: Advancing climate science to improve understanding of Earth’s changing climate and changes that pose the greatest risk to society. This includes: facilitating public access to climate-related information that will assist Federal, State, local, and Tribal governments in climate planning and resilience activities, coupled with capacity building and training to increase access to and support the use of data, information, and climate services; research to advance understanding of the societal and economic impacts of climate change (e.g., human and ecosystem health, wildlife and fisheries); improving observational networks to create carbon inventories and baselines; improving modeling capabilities for local-scale, regional climate and related extreme weather events; and disaster attribution science, including in potential tipping points in physical, natural, and human systems.

Innovation in clean-energy technologies and infrastructure: Spurring innovation, commercialization, and deployment of clean energy and climate technologies, including those to lower the cost and decrease emissions in the power, buildings, transportation, industrial, and agricultural sectors; supporting achievement of a 50-52 percent reduction from 2005 levels in economy-wide net greenhouse gas pollution in 2030 and carbon pollution free electricity by 2035. Investments should include R&D, demonstration, and deployment to support the scale-up and transition to operations of emerging clean energy and other emissions mitigation enabling technologies, such as utility-scale energy storage and other zero-carbon grid resilience technologies; carbon capture, utilization and storage; clean hydrogen; advanced nuclear power; rare earth element separations; floating offshore wind; and sustainable biofuels/bioproducts. Agencies should support interdisciplinary research, including research in the humanities and social sciences, to ensure that our climate innovation efforts are connected to and reflective of our broad societal goals and incorporate the views of affected communities and stakeholders, including the views of historically marginalized and overburdened communities. In addition, agency budget submissions should include provisions to prioritize the procurement of promising innovative climate technologies exiting the Federal R&D pipeline to increase their marketability.

Climate adaptation and resilience: Increasing adaptation and resilience, including through integration of physical, natural, and social sciences. In addition, agencies should inform resilience efforts by prioritizing efforts to connect science and decision making through meaningful engagement with climate information users, including through the application of user-friendly climate tools and services, as well as science-based risk communication and citizen and community science programs. A focus within these R&D efforts should be more proactive and accessible engagement mechanisms for disadvantaged communities that are historically underserved, marginalized, and adversely affected by persistent poverty and inequality, in order to co-create resilient solutions that are more just, inclusive, and equitable. These investments should advance economic and environmental justice, equity, and public health through reduced vulnerability to climate impacts.

Nature-based climate solutions for mitigation and adaptation: Pursuing nature-based climate solutions, including protecting and restoring terrestrial, coastal, and ocean ecosystems to provide carbon sequestration and storage and to enhance ecosystem and human community resilience.

Monitoring and measurement: Measuring and monitoring the greenhouse gas emission reduction benefits of climate investments are imperative to continue identifying and implementing effective climate solutions. Agencies should prioritize investments to measure and monitor greenhouse gas pollution reductions, including to assess the causal effectiveness of Federal programs.

Catalyze research and innovation in critical and emerging technologies. Agencies should collaborate to promote world-leading research and innovation boosting American industries and quality American jobs in critical and emerging technologies, including artificial intelligence (AI), quantum information science (QIS), advanced communications technologies, microelectronics, high-performance computing, biotechnology, robotics, and space technologies. Agencies should coordinate to leverage these technologies to ensure the sharing and use of the vast troves of Federal Government datasets to enable large-scale data analysis, and high-fidelity, high-resolution modeling and simulation to address critical challenges in public health, climate science, and disaster resilience. Agencies should actively pursue public-private partnerships, as allowable, that will expedite American leadership in these technologies to grow our inclusive 21st-

century digital economy. Within the area of AI, agencies should prioritize fundamental and translational AI research consistent with the Administration’s priorities for robust, safe, secure, and privacy-preserving machine learning. Within the area of QIS, agencies should prioritize programs to deliberately address the hardest scientific and engineering problems facing the field.

Innovation for equity. The President has implemented a whole-of-Government equity agenda. Federal agencies should prioritize R&D investments in programs with strong potential to advance equity for all, including people of color and others who have been historically disadvantaged, marginalized, and adversely affected by persistent poverty and inequality. As part of this focus, agencies should consider programs and initiatives, including community-level capacity building and training that expand equitable inclusion in Federal science and technology programs and the use of scientific and technological innovation to advance equitable outcomes. For example, open science and other participatory modes of research, such as community-based datahubs that give citizens access to information and data, as well as community-engaged research that respectfully provides opportunities for the participation in science and technology of those historically excluded from the scientific enterprise. Public participation in science is critical for the health of the nation and leads to more innovative research of all kinds, including research that addresses the needs of diverse communities. One particularly important area of investment innovation is research for health equity. America remains plagued by wide health disparities, due in no small part to social determinants of health, and underscored by racial inequities, such as access to care and disparate medical treatment. Investments in science and technology, including implementing high-quality virtual healthcare through telehealth solutions, provide opportunities to move us toward health equity. But barriers to widespread use and adoption of such technologies remain. Relevant agencies should develop data infrastructure that facilitates identification of inequities across sectors at scale, especially in underserved rural and urban communities, including through data linkage across Federal agencies, creation of interoperable data systems, and efforts to make data more available to the public, while preserving privacy and upholding ethical principles. This includes a focus on the underutilized, inaccessible, or missing data needed to measure and promote equity. Finally, agencies should also take steps to improve diversity and equity in the research workforce.

National security and economic resilience. Agencies’ plans and budgets should support the research, development, and application of technologies that protect American security and strengthen our economic resilience. Investments in security should prioritize the reduction of catastrophic biological, nuclear, and cyber risks, including investments in technologies supporting: biosecurity and biosafety; nuclear nonproliferation, arms control and treaty verification, measures that lower the risk of nuclear accidents and miscalculation, and measures that enhance strategic stability; and new capabilities for defending critical infrastructure and sensitive networks against cyberattacks and supply chain attacks, including improved authentication mechanisms, zero-trust architectures, and better intrusion detection capabilities. Investments in economic resilience should emphasize technologies that ensure safe, clean, and reliable access to critical products, materials and minerals, including new manufacturing and biomanufacturing processes that can cost-effectively produce key goods on demand.

Other R&D Program Guidance

Science is a tool that should be available to every American. More inclusive engagement in science benefits the American people, the environment, and the economy. The American public must be both knowledgeable about and involved in science research and its products, thereby fostering trust. To build a trustworthy and engaged U.S. science and technology (S&T) enterprise, agencies should prioritize making Federally funded R&D: open to the public in a findable, accessible, interoperable, and reusable way; more rigorous, reproducible, and transparent; safe and secure; grounded in assessment of ethical, legal, and societal implications; and free from improper political interference—all while minimizing administrative burden. In addition, cultivating a

research environment composed of people from diverse backgrounds will bring the U.S. S&T enterprise closer to each community.

Moreover, Federally funded R&D can be an important pillar of rebuilding U.S.-based supply chains, seeding the market with cutting-edge new technologies and providing a comparative advantage for our companies and workers. For decades, though, many new products have been invented and innovated in the United States, but ultimately manufactured at scale elsewhere. The Biden-Harris Administration is committed to ensuring that the practice of “invent it here; make it there” is replaced with “invent it here; make it here.” Federally funded R&D investments should therefore promote domestic manufacturing, job creation, and economic prosperity in the United States, including in communities historically underserved, marginalized, and adversely affected by persistent poverty and inequality.

STEM Education and Engagement Guidance

The engagement and motivation of our country’s students in STEM, the instructional and institutional environments for STEM learning, and the training and talent development for our future STEM workforce are considerations that Federal agencies should make when formulating their FY 2023 budgets. Agencies should develop measurable strategies to promote diversity, inclusion, equity, and accessibility across all R&D focus areas, while building supportive STEM education and engagement ecosystems; this goal would be accomplished by identifying and showcasing Models of Equitable STEM Excellence – a new initiative to highlight successful large-scale practices to improve diversity, inclusion, equity, and accessibility in STEM while reducing barriers for STEM learners and workers. Specifically, agencies should consider new opportunities such as increasing the participation of families in STEM outreach and engagement, especially those underserved and underrepresented in STEM, and expanding training and hiring opportunities for STEM learners. These efforts could include informal learners, interested members of the general public, and smaller institutions that might need to combine infrastructure support with STEM R&D funding to be effective. Investments should enhance the instructional, organizational, and institutional environments for STEM learning, including at Federal and Federally funded institutions, as well as in formal and informal learning communities, such as nonprofit STEM programs.