COMMITTEE ON
SCIENCE, SPACE, & TECHNOLOGY
REPUBLICANS
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Legislative Framework:
Securing American Leadership in Science and Technology Act

A strategy to ensure American competitiveness

The U.S. is facing two fundamental challenges to our competitiveness and growth as a nation:

First, foreign countries, especially China, are threatening to outpace us in the science and technology that has paid dividends to our country's economy and national security for decades.

Second, we must respond to a changing climate and develop next-generation technologies to understand it, address it, and mitigate it.

The Securing American Leadership in Science and Technology Act creates a long-term strategy for investment in basic research and infrastructure to protect the economic and national security of the United States.

The U.S. Must Preserve Our Global Leadership in Science and Technology

- The United States has the most dynamic private sector in the world, with entrepreneurs, investors, big companies, and capital markets all eager to license technologies and launch start-ups. Those ventures, however, are often driven by technologies that come from basic research funded by the federal government.
- The "Made in China 2025" initiative is a bold plan by the Chinese Communist Party, which outlines its intent to surpass the U.S. and become the global leader in areas like quantum, artificial intelligence and biotechnology.
- China's communist leadership is also pushing a strategy of promoting foreign acquisitions, forced technology transfer agreements, and, in many cases, commercial cyber espionage to gain cutting-edge technologies and know-how.
- China has likely surpassed the U.S. in total R&D spending. China increased public R&D by 56 percent between 2011 and 2016, but U.S. investment in the same period fell by 12 percent in absolute terms. U.S. investment in basic civilian research has stagnated, which is a recipe for decline, economically and strategically.
- China is also doing more to expand their Science, Technology, Engineering, and Math (STEM) workforce pipeline. According to the most recent estimates, the U.S. awarded nearly 800,000 science and engineering bachelor's degrees in 2016, while 1.7 million equivalent degrees were awarded in China.

The U.S. Must Innovate to Adapt to a Changing Climate

- Global industrial activity is contributing to climate change and we must adapt and respond to this so Americans continue to thrive.
- Our challenge is to address climate change without drastically raising energy prices and devastating our economy. We do that by incentivizing American innovation so we can produce and export clean and affordable technology, ensuring the U.S. remains the global leader in energy.
- We also need to know more about the real-world, Main St. effects of a changing climate so we can mitigate storm damage, grow our economy, and provide certainty for businesses that depend on accurate forecasts.
- It is vital we accelerate our investments in basic research and the tools and facilities needed to support that research to meet these two generational challenges.

Our Solutions

- **Create a National S&T Strategy.** Directs a more strategic whole-of-government planning process to establish national priorities with better coordination between agencies and a large focus on securing research from China.
- **Prioritize Investment in Federal Basic Research.** Authorizes a doubling of basic research funding over the next 10 years at the Department of Energy, the National Science Foundation, the National Institute of Standards and Technology, and the National Oceanic and Atmospheric Administration.
- **Invest in American Research Facilities.** Authorizes the infrastructure needed to maintain world-class research facilities.
- **Develop a STEM Workforce.** Supports an increase in key programs to grow the American pipeline of STEM-capable workers, including cybersecurity and other areas of national need.
- **Reform Regulation.** Improves the effectiveness of Federal R&D investments through technology transfer reform and promotes better collaboration between the federal government and private industry.

Legislative Outline

Title I – National Science and Technology Strategy – Office of Science and Technology Policy (OSTP)

Given the importance of the U.S. R&D enterprise, it is critical that we approach it strategically and holistically. By developing a cross-cutting strategy for Science & Technology, as is already done for national defense, homeland security, and energy, the U.S. can address emerging challenges and set priorities.

- Requires a National Science and Technology Strategy every 4 years.
- Authorizes a quadrennial review for U.S. Science and Technology.

Title II – Research Integrity

Foreign adversaries, particularly the Chinese Communist Party (CCP), are seeking to outpace the U.S. in technological development whether through investment, acquisitions, or outright theft. Research theft has been compounded by foreign talent acquisition efforts like the Thousand Talents Program, which pays U.S. researchers to share their work with the Chinese Communist Party. In addition to compromising and stealing U.S. taxpayer-funded research, efforts like this harm the open exchange of information that is crucial to scientific cooperation. The U.S. needs more comprehensive policies to protect our intellectual property.

- Prohibits federal agency personnel from participating in foreign talent recruitment programs.
- Establishes computing enclaves to ensure the security of federally funded research conducted at universities.
- Directs the National Institute of Standards and Technology (NIST) to develop cybersecurity standards and guidance specifically tailored to research institutes and universities.
- Requires the Comptroller General to conduct a study on how federal funds were dispersed to foreign entities.

Title III – Supply Chain and Critical Minerals Security

Critical minerals, with applications including healthcare, defense systems, and renewable energy technology, are essential to our modern way of life. China has dominated the critical minerals market for years, controlling the vast majority of the global supply. Currently, 14 of the 35 critical minerals identified by the USGS are imported to the U.S. at a rate of 100%. Ensuring a stable supply of critical minerals for electric car batteries, smartphones, healthcare equipment, and a range of other technologies and products, begins with encouraging responsible critical minerals development, production, and innovation here at home.

- Establishes a National Supply Chain Database to help government and industry minimize disruptions to the U.S. supply of critical minerals.
- Creates basic research grants to advance critical minerals mining strategies and technologies to as to make better use of existing domestic resources and identify alternative materials.
- Establishes a research, development, and demonstration program to accelerate improvements in energy-efficient recyclable plastics, next-generation plastics, and composites recycling and upcycling.
- Creates an interagency Critical Minerals Subcommittee at the National Science and Technology Council to coordinate efforts across the government to secure our critical minerals supply.
- Paves the way for broad adoption of autonomous freight trucking by establishing a Heavy Freight Autonomous Trucking Research Initiative at the Department of Transportation.
- Encourages the development of unmanned aerial vehicle (UAV) technologies.

Title IV - Department of Energy

The Department of Energy ensures America's security and prosperity by addressing its energy, environmental, and nuclear challenges through transformative science and technology solutions. DOE sponsors basic research at more than 300 institutions across the country, including universities, national laboratories, nonprofits, and private sector institutions. This legislation advances research on cutting-edge science and supercomputing, improves infrastructure to give researchers and industry access to best-in-class facilities, and prioritizes clean energy technologies.

- Basic Energy Science
    - Creates a program for basic energy science (BES), including materials sciences and engineering, chemical sciences, physical biosciences, and geosciences, and authorizes funding for construction of key BES user facilities and upgrades.
    - Authorizes funding for research and development programs in artificial photosynthesis, multivalent systems, and electrochemistry modeling.
    - Establishes a program for computational materials and chemistry sciences including a materials research database.
- Computing Power
    - Prioritizes beyond-exascale computing initiatives and energy-efficient computing architectures and algorithms.
    - Creates a research and development program in artificial intelligence, data analytics, and computational research.
    - Improves advanced scientific computing research by authorizing upgrades to the Energy Sciences Network (ESnet).
    - Authorizes funding for a Computational Science Graduate Fellowship
- Quantum Information Science
    - Establishes a program to accelerate innovation in quantum network infrastructure.
    - Facilitates access to quantum computing hardware and quantum computing clouds.
- High Energy Physics
    - Authorizes full funding for the construction of key high-energy physics user facilities and upgrades, as well as a program to research the fundamental constituents of matter, energy, and the nature of space and time.
    - Authorizes the construction of the Long-Baseline Neutrino Facility (LBNF) to enable fundamental research of neutrinos and their properties.
- Biological and Environmental Research
    - Authorizes Bioenergy Research Centers and a program for the development, construction, operation, and maintenance of biological and environmental research user facilities.
    - Extends authorization of appropriations for the Low-Dose Radiation Research Program and creates a \low-dose radiation and space radiation research program.
    - Establishes a coastal zone research initiative to prioritize efforts to analyze the diverse physical processes that interact in coastal zones.
    - Enables collaboration with NOAA to use DOE's advanced computing capabilities to conduct climate and atmospheric science modeling and research.
    - Establishes an emerging infectious disease research program.
- Fusion Energy
    - Establishes a fusion energy high-performance computing program.

- Establishes a brightest light research initiative to enable the development of laser technologies necessary for discovery science
- Authorizes the construction of key fusion energy experiments and instruments.
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- Nuclear Physics
  - Creates a program to explore all forms of nuclear matter, including the production of isotopes needed for research purposes.
  - Authorizes the construction of key nuclear physics user facilities.
- Science Laboratories Infrastructure Program
  - Prioritizes mid-scale instrumentation activities at the DOE national labs.
- ARPA-E
  - Extends authorization of appropriations for the Advanced Research Projects Agency – Energy (ARPA-E), supplying the program with sustained growth over 10 years.
- Advanced Energy Programs
  - Establishes Regional Energy Innovation Centers.
  - Extends authorization of appropriations for the versatile neutron source.
  - Creates an initiative on carbon sequestration research and development.
  - Extends authorization of appropriations for the Frontier Observatory for Research in Geothermal Energy (FORGE).
  - Authorizes the Energy Storage Grand Challenge.
  - Improves resilience and security of critical integrated grid infrastructures including the authorization of a Critical Infrastructure Research and Construction.

Title V – National Institute of Standards and Technologies

NIST's mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology. Almost every federal agency and U.S. industry sector uses the standards, measurements, and certification services that NIST labs provide. NIST also engages in international standards development, which can determine how technology & products are measured and evaluated. This has consequences for international trade and for the competitiveness of American industry. Lately, China has been far more successful than the U.S. in influencing global standards. This legislation improves NIST facilities and addresses the need for U.S. leadership in international standards development.

- Doubles funding for basic research over 10 years.
- Supports new research facilities and addresses maintenance backlog to improve existing facilities.
- Expands ongoing cybersecurity research and directs research into practical solutions to cybersecurity challenges.

- Prioritizes critical research for the industries of the future, including quantum information science, cybersecurity, artificial intelligence and data science, the internet of things, engineering biology, and materials research.
- Prioritizes engagement in international standards development.
- Establishes a nonprofit National Institute of Standards and Technology Foundation.
- Expands the Manufacturing Extension Partnership (MEP) to include outreach ang engagement with local high schools, especially those in rural areas.

Title VI – National Oceanic and Atmospheric Administration (NOAA)

The work done by the National Oceanic and Atmospheric Administration supports economic vitality and affects more than one-third of our GDP. Within NOAA, the National Weather Service provides weather, water, and climate data, forecasts, and warnings. Improving NSF forecasts not only helps people, businesses, and farmers plan for productive days, but also enhances our ability to protect property and save lives in severe weather events.

- Doubles funding for basic research over 10 years.
- Improves technology transfer.
- Authorizes National Mesonet Program to better integrate data into forecast models and meet the NWS goal of 30-minute warning time for severe weather.
- Creates severe weather extramural research testbeds to improve weather forecasting and modeling.
- Creates a program to accelerate research into a next-generation phased array radar system to replace the current system and improve the accuracy of severe weather forecasts, while cutting operating costs.
- Establishes a fellowship program to support STEM graduate students in meteorology, atmospheric science, space weather, and climatology within NOAA.
- Updates commercial data reporting requirements.
- Requires a report on internet bandwidth issues at the National Center for Environmental Prediction, including any issues experienced by the National Weather Service.
- Requires a study on the feasibility of transferring Marine Protection Services to the Department of the Interior.

Title VII – National Science Foundation (NSF)

NSF supports all fields of fundamental science and engineering, except for medical sciences. NSF-funded research at universities and academic facilities keeps the U.S. at the leading edge of discovery in areas from astronomy to biology, to computer science. This legislation supports basic research, promotes scientific integrity, and prioritizes the security of U.S. intellectual property.

- Doubles funding for basic research over 10 years.
- Directs an external review of NSF's research directorate structure for improving support for cross-disciplinary research.

- Supports research security through the established of an Office of Research Security and Policy within the Office of the NSF Director, the development of a new policy for plans to manage security and ethical implications of research, and the authorization of secure computing enclaves.
- Supports reproducibility in science through the development of new tools and creation of data repositories.
- Encourages public-private partnerships to enhance economic competitiveness and security.
- Offers a Sense of Congress that EPSCoR investments into State research and education capacities are in the Federal interest and should be sustained, and updates the program to include rural communities providing STEM education and workforce development.

Title VIII- STEM Workforce for the 21st Century

The global economy is changing. To remain competitive in this evolving market, the U.S. needs a workforce skilled in science, technology, engineering, and math (STEM). Knowledge and technology-intensive industries make up one-third of global GDP. STEM careers are growing faster than any other sector and employers are struggling to fill open jobs. Over the next decade, the STEM shortage is anticipated to reach one million professionals, according to the Bureau of Labor Statistics. This legislation improves U.S. competitiveness by improving the STEM workforce pipeline.

- Supports the Advanced Technical Education program to grow a skilled technical workforce.
- Promotes growing NSF Graduate Research Fellowships to over 2,500 students annually with new fellowships in areas of national need over the next 10 years.
- Promotes the Noyce Teacher Scholarship Program, reaching the goal of doubling science teachers funded per year.
- Encourages informal STEM learning by supporting student participation in nonprofit competitions, out-of-school activities., and field experiences related to STEM subjects.
- Creates grants for research on programming that engages students in grades pre-kindergarten through 8, including underrepresented and rural students in STEM in order to prepare students to pursue degrees or careers in STEM.
- Awards grants to institutions of higher education to establish traineeship programs for graduate students who pursue artificial intelligence-related research.
- Requires the development of a cybersecurity workforce program that facilitates collaboration between undergraduate and graduate students, researchers at the National Laboratories and the private sector.
- Broadens participation for Presidential Awards for Excellence in Mathematics and Science Teaching.

Title IX – Technology Transfer and Innovation

Securely and efficiently sharing federal research with public and private organizations facilitates the commercialization of new technologies.

- Updates federal technology transfer law (Stevenson-Wydler Act) to improve federal return on investment, including updates to copyright protections and royalty payments for federal employees and improvements to the CRADA authority to support collaborations between federal laboratories and the private sector.
- Authorizes federal lab support of emerging technologies and industries of the future.

- Updates reporting and metrics requirements to improve data on intellectual property (IP) resulting from Federal laboratory R&D.
- Allows agencies to set aside a portion of Small Business Technology Transfer funds to create "proof of concept" grant programs and other innovative technology transfer programs to address the “valley of death.”
- Authorizes DOE lab signature authority to remove red tape and improve industry access to the national labs and the establishment of public-private partnerships.
- Establishes a nonprofit Energy Foundation to channel private sector investments to commercialize innovative energy technologies.