

TECHVISION21

INSIDE VIEW



2019 END OF YEAR RECAP

2019 saw action on many fronts in science and technology—a final Federal R&D budget, White House activity, important new policies and programs, action to protect U.S. intellectual property, and new appointments to key Administration leadership positions.

This issue of Inside View reports on some of the highlights. TechVision21 anticipates new policy and program developments in 2020, opportunities to shape Federal science and technology initiatives, and opportunities to access R&D funding at key Federal departments and agencies.

TechVision21 is ready to help ensure your voice is heard in Washington, and to help you develop competitive funding proposals.

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Fiscal Year 2020 Federal R&D Budget

Congress was good to R&D in the final FY 2020 appropriations, signed into law by the President on December 20, with an estimated total of \$161.5 billion, nearly \$20 billion over the President's budget request.

Almost all R&D agencies received at least a small increase, and several received double digit increases over FY 2019 funding, including Energy Efficiency and Renewable Energy, and ARPA-E at the Department of Energy (DOE); and Exploration at NASA. Agencies receiving more than a 5 percent boost include: NIH, DOE Office of Science, NASA Aeronautics, and the U.S. Geological Survey.

Department of Energy FY 2020 Appropriations for Clean Energy and Energy Efficiency		
	Millions \$	% Increase Over FY 2019
Vehicle Technologies	396	15.1
Bioenergy Technologies	260	14.8
Hydrogen and Fuel Cells	150	25.0
Solar Energy	280	13.6
Wind Energy	104	13.0
Water Power	148	41.0
Geothermal	110	31.0
Advanced Manufacturing	395	23.4
Building Technologies	285	26.1
ARPA-E	425	16.1



Congress was generous in clean energy and energy efficiency R&D funding. As directed by Congress, expect to see solicitations for proposals in:

- PV cell technologies, including thin-film and cadmium telluride, and grid integration (**\$20 million**).
- Perovskite research, including production methods such as solution processing, roll-to-roll manufacturing, material stability, and tandem manufacturing (**\$20 million**).
- Project development for off-shore wind demonstration projects (**\$10 million**).
- Industry- and university-led projects to validate the performance, reliability, environmental impact, and cost of marine energy technology components, devices, and systems at a variety of scales, and integration into grids (**\$40 million**).

Federal R&D Budget Priorities for 2021

OMB and OSTP issued their annual Memorandum to Heads of Executive Departments and Agencies outlining the Administration's R&D priorities for FY 2021. Semiconductors, artificial intelligence (AI), quantum information science and computing, advanced communications networks and autonomy, advanced manufacturing, energy, biomedicine, and the Bioeconomy are among the priorities.



Action at the White House

PCAST: In October, President Trump issued an Executive Order reestablishing the President's Council of Advisors on Science and Technology.

NSTC JCORE: In May, the National Science and Technology Council established the Joint Committee on Research Environments (JCORE), with four Subcommittees focused on: (1) enhancing research integrity, rigor, reproducibility, and replicability; (2) agency policies and requirements related to Federal grant processes and conflict of interest disclosure; (3) enhancing risk assessment and management, strengthening disclosure requirements, enhancing oversight and vigilance, and developing best practices; and (4) building safe, inclusive, and equitable research environments.

Elevation of AI: In February, President Trump signed an Executive Order establishing the American Artificial Intelligence Initiative, and later issued a refreshed National AI R&D Strategic Plan, with eight strategies focusing on: AI research; human-AI collaboration; ethical, legal, and societal implications of AI; AI safety and security; shared public datasets and environments for AI training and testing; AI standards; AI R&D workforce needs; and public-private partnerships to accelerate advances in AI. (This follows establishment of an NSTC Select Committee on Artificial Intelligence, and AI R&D Interagency Working Group.)

White House Cybersecurity Strategic R&D Plan: In December, the White House issued a Federal Cybersecurity Research and Development Strategic Plan. Priority areas include: AI, quantum information science, trustworthy distributed digital infrastructure, privacy, secure hardware and software, and education and workforce development.

White House Summits: In 2019, the White House convened Summits on: ocean science and technology, America's Bioeconomy, AI in government, building bridges across the science and technology enterprise, and quantum information science (summaries available on OSTP web site).

IP Protection: After reports last year from the White House and U.S. Trade Representative, and leveraging U.S. tariffs on Chinese products, the Trump Administration made respecting U.S. IP rights a major demand in the latest round of U.S.-China trade negotiations. In December, the United States and China reached an agreement that addresses some concerns about China's infringement of U.S. IP. For the first time in any trade agreement, China agreed to end its long-standing practice of forcing or pressuring foreign companies to transfer their technology to Chinese companies as a condition for obtaining market access or administrative approvals, and China further commits to refrain from directing or supporting outbound investments aimed at acquiring foreign technology pursuant to industrial plans that create distortion.

News Around Federal Departments and Agencies

National Defense Authorization Act for FY 2020: The FY 2020 NDAA includes provisions related to research and technology, including: measures to protect defense R&D from foreign entities and researchers participating in foreign talent programs, directing DOD to establish an ongoing process to update its policies on emerging technologies, establishing quantum information science research centers in each military branch, centralized coordination of hypersonics R&D, a study on DOD research and engineering workforce diversity, developing plans to address deficiencies in infrastructure at DOD labs, grants for apprenticeships to develop skills needed at DOD labs, and opening the Small Business Innovation Research Program to small businesses that are majority-owned by venture capital firms.

Manufacturing USA Institutes: In December, DOD issued a Notice of Intent to launch a competition for its ninth Manufacturing Innovation Institute (MII). The MII will focus on Synthetic Biology, with the goal of fostering a U.S. ecosystem including scale-up manufacturing and downstream processing capabilities, integrated test and evaluation capacity, data for design for manufacturing, workforce development, and a focus on ethics and biosecurity. The MII is to address both defense and commercial applications, maturing the technology from TRL 4 to 7.

Microelectronics: DOD launched MINSAB (Microelectronics Innovation for Next-generation Systems Advancement and Validation)—an \$800 million initiative to advance the design and fabrication of sensor (signal) generation and processing microelectronics technologies. Experimentation will construct prototype systems that demonstrate microelectronics capabilities in DOD-related autonomous, AI, precision navigation and timing, electronic warfare, data processing, spatial/ spectrally agile, and strategic applications. Multiple awards ranging from \$10 million to \$200 million are expected.

Electronics Resurgence Initiative: DARPA stood up the next phase of ERI programs:

- **Photonics in the Package for Extreme Scalability (PIPES)**—embed optical signaling technologies within the package of application-specific integrated circuits and field-programmable gate arrays.
- **Technologies for Mixed-mode Ultra Scaled Integrated Circuits (T-MUSIC)**—advance the underlying technology for RF transistors and circuits in CMOS and SiGe that has been left behind by traditional digital CMOS scaling.
- **Guaranteed Architecture for Physical Security (GAPS)**—reduce system complexity through the development of hardware and software that is open, extendible, and compatible with Size, Weight, and Power (SWaP) constrained environments.
- **Digital RF Battlefield Emulator (DRBE)**—create the world's first large-scale, virtual RF environment for developing, training, and testing advanced radio frequency systems.
- **Real-time Machine Learning (RTML)**—create a processor that can proactively interpret and learn from data in real-time, solve unfamiliar problems using what it has learned, and operate with the energy efficiency of the human brain.
- **Automatic Implementation of Secure Silicon (AISS)**—develop novel design flow for digital integrated circuits that aims to protect advanced chips from known attack strategies.

News Around Federal Departments and Agencies ctd.

Space Development Agency: In March, Acting Secretary of Defense Shanahan established the Space Development Agency, and the FY 2020 National Defense Authorization Act incorporates SDA into the newly established Space Force. SDA is responsible for overall program policy development and execution for next-generation military space capabilities, except those funded in the Military Intelligence Program. Dr. Derek Tournear was named in October as SDA's first permanent director. SDA's 5 year \$11 billion plan is focused on developing and deploying large constellations of satellites for military use.

Crackdown on Foreign Talent Programs: Momentum has been building to address foreign access to U.S. taxpayer-funded R&D, especially through China's talent programs such as the Thousand Talents Plan (TTP). Federal departments and agencies, as well as a November 2019 Report of the Permanent Subcommittee on Investigations, Senate Committee on Homeland Security and Government Affairs (Threats to the U.S. Research Enterprise: China's Talent Recruitment Plans) found numerous cases of concern such as diversion of IP in grant applications or produced in federal research to other countries; peer reviewers sharing confidential information on grant applications with foreign entities; failure by researchers working at federally-funded institutions to disclose substantial resources from foreign governments; TTP members found working at national labs on sensitive research and having security clearances; and failure to disclose affiliation with China's talent recruitment plans to U.S. grant-making agencies. In April 2019 testimony before the Senate Appropriations Committee, NIH Director Francis Collins reported that investigations of NIH-funded foreign scientists were underway at more than 55 U.S. institutions. NIH has identified at least 75 individuals potentially linked to foreign talent recruitment plans who also served as peer reviewers.

Federal agencies are beginning to crack down. Letters of concern and request for vigilance from NIH and OSTP have been sent to thousands of universities and the research community. DOE, NSF, and DOD have instituted new restrictions and disclosure requirements on employees and/or grant recipients and contractors to address this threat.





New Appointments

OSTP: The Senate confirmed Dr. Kelvin Droegemeier as Director of the White House Office of Science and Technology Policy. He was Vice President for Research and Regents' Professor of Meteorology at the University of Oklahoma. He led NSF's Science and Technology Center for Analysis and Prediction of Storms, and served as Deputy Director of the NSF Engineering Research Center for Collaborative Adaptive Sensing of the Atmosphere. He also served on the National Science Board and as its Vice Chair. Public-private partnerships to move research into the marketplace is among his priorities.

National Science Foundation: In December, President Trump announced the nomination of Dr. Sethuraman "Panch" Panchanathan as the next director of the National Science Foundation. Panchanathan is Chief Research and Innovation Officer, and Executive Vice President of Knowledge Enterprise at Arizona State University. He has an orientation toward competitiveness, leading-edge technologies and future industries, R&D's role in driving economic development, and public-private partnerships.

Department of Energy: The Senate confirmed Dan Brouillette as the new Secretary of Energy. He had served as Deputy Secretary of Energy. Prior to coming to DOE, he was the Senior Vice President and head of public policy for USAA, a provider of financial services to the military community. Before joining USAA, he was a Vice President of Ford Motor Company. He also served as chief of staff to the House Energy and Commerce Committee and was Assistant Secretary of Energy for Congressional and Intergovernmental Affairs in the George W. Bush Administration.

Also, the Senate confirmed Daniel Simmons as Director of the Office of Energy Efficiency and Renewable Energy who, prior to coming to DOE, was Vice President for Policy at the Institute for Energy Research. The Senate confirmed Paul Dabber as Under Secretary for Science and Lane Genatowski as director of ARPA-E, both drawn from the energy sector finance community.



Remembering Dr. Mary Lowe Good

Members of the science and technology community are mourning the loss of one of their most respected and beloved colleagues, Dr. Mary Lowe Good, who passed away on November 20th at the age of 88 at her home in Little Rock, Arkansas. She leaves behind a legacy and remarkable career of leadership roles in science and technology that spanned national government, industry, and academia over 46 years.



She served in science and technology leadership and advisory positions in the Administrations of four U.S. presidents—Jimmy Carter, Ronald Reagan, George H.W. Bush, and Bill Clinton. This includes service on the President's Council of Advisors on Science and Technology and as Under Secretary of Commerce for Technology in the Clinton Administration, where she led the groundbreaking Partnership for a New Generation of Vehicles, a public-private sector initiative to develop a 3X fuel efficient vehicle. Dr. Good served on the National Science Board from 1980-1991, and served as the Board's chair from 1988-1991. In industry, she began her career at Universal Oil Products in Chicago, and then moved to AlliedSignal, Inc. as senior vice president for technology. At Allied Signal, she became the only woman in the country to lead a major industrial research center.

In academia, she began her career at Louisiana State University and, later, became part of the founding faculty of LSUNO (now the University of New Orleans), becoming the second faculty member to receive the distinction of Boyd Professor. She served as dean of the School of Engineering. In recent years, Dr. Good served as Founding Dean of the Donaghey College of Engineering and Information Technology (EIT) at the University of Arkansas-Little Rock. EIT grew significantly under Dr. Good's leadership. She completed her doctoral degree in inorganic chemistry at the University of Arkansas at age 24.

In other leadership positions, she was elected in 2001 as President of the 143,000-member American Association for the Advancement of Science (AAAS), and was the first woman ever elected to the board of the American Chemical Society, where she also served as the society's president.

Throughout her career, her leadership and achievements in science and technology were recognized with 27 high honors and awards. Among them, in 2004, she received the National Science Foundation's highest honor, the Vannevar Bush Award, and the esteemed Priestly Medal, the highest honor conferred by the American Chemical Society. She was the first female winner of the AAAS's prestigious Philip Hogue Abelson prize for outstanding achievements in education, R&D management, and public service. Dr. Good received 21 honorary degrees, was voted one of the **"Top 100 Women of Arkansas"** by Arkansas Business, and was inducted into the **Arkansas Women's Hall of Fame in 2015**.