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CONGRESSIONAL OVERVIEW

CHIPS+Science Act
CHIPS+Science is the long-awaited competitiveness and innovation package

- Bipartisan support and signed into law
- Slimmed down version of two larger competitiveness packages:
  - U.S. Innovation and Competition Act (USICA), passed by the Senate in June 2021 (also formerly Endless Frontier)
  - Creating Opportunities for Manufacturing, Preeminence in Technology and Economic Strength Act (COMPETES), passed by the House in February 2022
- **Division A**: $54 billion **appropriated** for semiconductor R&D, manufacturing, tax incentives, and workforce development
- **Division B**: $102 billion **authorized** for major research initiatives
  - Authorizes R&D program at:
    - National Science Foundation (NSF)
    - Department of Energy (DOE)
    - National Institute of Standards and Technology (NIST)
    - National Aeronautics and Space Administration (NASA)
  - Creates a new bioeconomy research and development national initiatives
  - Establishes Regional Technology Hubs
  - Many broadening participation/STEM Education policy provisions
  - Research Security
Division A

- Funds the authorized CHIPS Act, passed in the FY 2021 NDAA
- Goal: Domestic semiconductor production
  - Protect and extend U.S. semiconductor technology leadership
  - Ensure a secured supply of chips for critical sectors
  - "Re-shore/on-shore" semiconductor production from foreign sources
- Promote long term economic viability for semiconductor:
  - Research and Development (R&D)
  - Manufacturing
  - Supply chain
  - Workforce (NSF)

Most of the new funding in the CHIPS Act is for industry and job creation activities
Appropriated funding includes:

- **CHIPS for America Fund**: $50 billion over 5 years
  - Department of Commerce
  - $39 billion for subsidies & incentives to industry (bulk - $19 billion - in FY 22)
    - expands the eligibility for incentives to downstream materials and equipment suppliers
  - $11 billion for workforce development & R&D
    - National Semiconductor Technology Center (NSTC)
      - $2 billion in 2022; shared budget with programs below for FY 23-26
    - National Advanced Manufacturing and Packaging Program (NIST)
      - $2.5 billion in 2022; shared budget with these programs for FY 23-26
  - Other R&D (including new semiconductor manufacturing institute through Manufacturing USA)
    - $500 million in 2022; shared budget with these programs for FY 23-26

- **CHIPS for America's Defense Fund**
  - Department of Defense & Intelligence Community R&D, testing, workforce development, and other activities - consortia
  - $2 billion ($400 million/year for 5 years)

- **CHIPS for America International Technology Security and Innovation Fund**
  - $500 million ($100 million/year for 5 years)
  - Coordinate common international supply chain security and consistency in the global semiconductor industry

- **CHIPS for America Workforce & Education Fund** (for NSF) -- $200 million

- **Public Wireless Supply Chain Innovation Fund** (aka O-RAN/5G+) -- $1.5 billion (up front)

*In most cases, the CHIPS opportunities require a consortia of industry, national labs, and research universities.*
National Semiconductor Technology Center (Sec. 9906c)

- Department of Commerce (DOC) funding and activities prioritize NSTC
- $2 billion in initial funding for FY 2023, plus funding through FY 2027
- Mission: R&D activities requiring “manufacturing, design and packaging research”
  - Prototyping at technology readiness levels (TRL) 3-8
  - Planning elements:
    - Design infrastructure
    - Fabrication and prototyping needs
    - Advanced packaging, assembly, and test needs
    - Investment fund/incubator
    - Workforce development
- Oversight provided by the NIST CHIPS Program Office
- Expected to be funded through a cooperative agreement
  - New or existing non-profit organization or consortium
  - Open competition
- Technical Advisory Committee will advise on long-term strategy, priorities, and collaborations
National Institute of Standards and Technology (NIST) (Sec. 9906f)

• $150 million ($30 million a year) for the creation of a new Manufacturing USA Institute

• Research topics identified include virtualization and automation of maintenance of semiconductor machinery, development of new advanced test, assembly and packaging capabilities, and development of educational skills training curricula for the talent pipeline.
  • Common institute features:
    • Industry-led consortia
    • public-private partnerships
    • Required 1:1 cost match (2:1 is typical)
    • TRL 4-7 research funding
    • Collaboration of industry, universities, and government
      • Technology development
      • Workforce development

Credit: NIST
DOD’s Microelectronics Commons

- Goals:
  - Create “Lab-to-Fab” testing/prototyping hubs to mature microelectronics technologies
  - Provide broad access to these prototyping hubs, potentially through augmented academic facilities (i.e. a local semiconductor company or a Federally Funded Research and Development Center)
  - Facilitate microelectronics education and training of students at local colleges and universities, and provide a potential pipeline for an engineering workforce to bolster the local semiconductor economy
- Open competition, will be run by a non-profit that will then identify hubs across nation
- National network expected to be created:
  - 10 Hub nodes
    - Funding Already existing facilities able be able to produce 200 mm wafers for microelectronic production
    - May be developed from existing facilities already in the U.S.
    - DOD would pay to augment staff or invest in new equipment
  - Two Core nodes
    - Capable of producing larger 300 mm wafers
    - Make the transition to commercial production
- Informed by DOD’s previous RFI for the regional hubs
OTHER CHIPS+ PROVISIONS

CHIPS+ funding continued

CHIPS for America International Technology Security Fund ($500 million)
- Funding for international information and communications technology security
- International semiconductor supply chain activities, including secure and trusted telecommunications and other emerging technologies

CHIPS for America Workforce and Education Fund ($200 million)
- Funding for activities at NSF to strengthen the nation’s semiconductor workforce:
  - National Network for Microelectronics Education – regional partnerships on workforce pathways
  - Innovative approaches and learning experiences
  - Graduate Traineeships
  - Faculty capacity building
  - Industry partnerships
  - Addressing the skilled technical workforce
OTHER CHIPS+ PROVISIONS

CHIPS+ funding continued

Public Wireless Supply Chain Innovation Fund ($1.5 billion)
- Funding for DOC's National Telecommunications and Information Administration (NTIA) to develop innovative wireless technologies
- Deploy Open Radio Access Network (Open RAN) network equipment to promote open architecture, software-based wireless technologies, and funding innovative, catalytic mobile broadband technologies

Additional provisions in the CHIPS for America Act of 2022 include:
- A 25 percent investment tax credit (ITC) for investments and incentives in semiconductor manufacturing
- Expanding the scope of the Government Accountability Office (GAO) report required in the FY 2021 NDAA to evaluate steps the federal government can take to avoid future semiconductor and workforce shortages
- Encouraging increased participation of economically disadvantaged individuals in the semiconductor workforce
- Prohibiting the use of federal incentive funds for new semiconductor manufacturing efforts in countries that present a national security threat, including China
DIVISION B

Research and Innovation Authorization
Authorizes $81 billion for NSF over five years, growing annual authorized NSF funding to $19 billion in FY 2027

- Not accounting for TIP, NSF would grow 84% over FY 2021 funding and EDU specifically would grow 170% to $1.89 billion
- Specific programs authorized for growth: mid-scale research infrastructure, Noyce, graduate fellowships and traineeships, Cybercorps

Creates set-aside of overall NSF funding for EPSCoR eligible institutions “to the maximum extent possible”

- Grows from 15.5% in FY 2023 to 20% in FY 2029
- Separate set aside for scholarships, fellowships, and traineeships – grows from 16% in FY 2023 to 20% in FY 2025
- NSF can review EPSCoR eligibility criteria in five years
- Other institutional capacity building programs authorized for emerging research institutions
Authorizes the new Directorate for Technology, Innovation, and Partnerships

- $16 billion total authorized – grows to $4 billion annually by FY 2027, 1011% from FY 2021 funding
- Balance of House and Senate visions and in line with NSF planning – focus on key technologies and social, national, and geostrategic challenges
  - **ten key technology areas**: artificial intelligence (AI) and machine learning; high performance computing; quantum information science and technology; robotics and advanced manufacturing; disaster prevention and mitigation; advanced communications and immersive technology; biotechnology and synthetic biology; data management and cybersecurity; advanced energy and efficiency technologies; and advanced materials science
  - **five critical social, national, and geostrategic challenges**: national security; manufacturing and industrial productivity; workforce development and skills gaps; climate change and environmental sustainability; and inequitable access to education, opportunity, and other services
- List to be reviewed and updated annually by TIP, NSB, and in consultation with other agencies
- Several authorized **activities**: Regional Innovation Engines, translation accelerators, test beds, capacity building activities, entrepreneurial fellowships, scholarships and fellowships, research and development, and scaling STEM innovation centers
STEM EDUCATION/BROADENING PARTICIPATION

Several New K-12 Focused Education Programs Authorized
• Centers for Transformative Education Research and Translation on scaling STEM innovation within TIP
• National Academies Study on improving K-12 education and barriers to implementation of promising innovations
• National STEM Teacher Corps Pilot Program authorized at $60M to recognize teachers and elevate their work and best practices in STEM
• $140 million authorized for research on rural STEM Education, establishes the Rural STEM Collaborative pilot program, and National Academies study

Undergraduate and Graduate Education
• Encourages research on better alignment between undergraduate education and workforce needs and supports industry partnerships
• Updates to ATE and encourages research on STEM innovations at community colleges and career and technical institutions
• Requires graduate mentoring plans in proposals (currently required for postdocs)
• Study on effects of different funding mechanisms for graduate student support
• Authorization to establish AI Scholarships for Service program modeled after Cybercorps and research and data collection on the cyber workforce
• Skilled Technical Workforce portfolio review

Broadening Participation
• $40 million authorized for a new ADVANCE style program to help institutions recruit, retain, advance underrepresented minority faculty
• Creates a Chief Diversity Officer role
• Policies for caregivers, expansion of data collection, policy review to address barriers, sexual harassment reporting and interagency working group
• Large authorizations for MSI capacity building, support for early career researchers, and undergraduate broadening participation
Authorizes $68 billion over five years for DOE research and infrastructure

**First comprehensive authorization for the Office of Science**
- 18 new research initiatives in climate, energy, emerging technologies, and mid-scale instrumentation
- Accelerate construction of science facilities and modernize DOE national lab infrastructure
- Expand STEM education and workforce development programs
- Grow EPSCoR: 10% of total research funding and target of $75 million for the EPSCoR program

**New microelectronics R&D program, including 4 new large-scale centers**

**Expands opportunities for advanced nuclear R&D and upgrade or build new university nuclear research infrastructure**

**Greater focus on technology transfer activities, including new Regional Clean Energy Innovation Centers and a DOE Foundation**
• **WIRELESS**: Create a new $5 million *R&D program for broadband and rural and/or underserved rural communities* and authorize the creation of the National Advanced Spectrum and Communications Test Network (NASCTN).

• **Early Career Research and Support**: *CHIPS*+ authorizes $250 million for NSF to establish a new 2-year pilot program which would support awards to early career researchers to initiate an independently led research program.

• **Ocean Acidification Research and Innovation**: The *CHIPS*+ legislation supports the establishment of working group with participation from DOE, NIST, USDA, EPA.

• **Blockchain Specialist**: *CHIPS*+ directs OSTP to *create or appoint a cryptocurrency and blockchain advisory specialist*

• **National Science and Technology Strategy**: *CHIPS*+ requires the Director of OSTP to submit to Congress a four-year national science and technology (S&T) strategy.

• **Science and Security**: Expand research security protocols and compliance requirements for NSF, DOE, NIST and other research agencies.

• **Bioeconomy**: Creates a National Engineering Biology Research and Development Initiative through the Office of Science and Technology Policy (OSTP)

• **NIST**: Authorizes $10 billion for NIST R&D programs including a focus on MEP, Manufacturing USA, workforce, and supply chain resilience

• **Regional Technology Hubs**: Authorizes $10 billion for 20 new regional technology hubs to be administered by the Department of Commerce

• **NASA**: Authorizes several NASA missions with a focus on Moon to Mars