Guide to FY2017 Research Funding at the Department of Energy (DOE)

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Executive Summary and Index

This document provides succinct insights into the various DOE funding opportunities for University research, with special attention to changes anticipated in FY2017. Additional information is available through the USC Mission Agency Program Summary (MAPS) website (see the Resources section).

The mission of the Energy Department is to ensure America's security and prosperity by addressing its energy, environmental and nuclear challenges through transformative science and technology solutions. Basic research is funded through the Office of Science (SC). Applied research is funded through Electricity Delivery and Energy Reliability (EDER), Energy Efficiency and Renewable Energy (EERE), Fossil Energy (FE), Nuclear Energy (NE), ARPA-E, and the National Nuclear Security Administration (NNSA). Innovation Hubs, Clean Energy Manufacturing Innovation Institutes and BioEnergy Centers are large-scale Center opportunities.

Appendix 1: FY2017 DOE Basic Research - New Programs and/or Program Change

The FY 2017 Budget Request for SC is $5.6B, an increase of $222 million or 4.1 percent, relative to the FY 2016 Enacted level. In addition, an authorization proposal for $100M of mandatory funding for University Grants will be transmitted to Congress, for a total FY 2017 Budget of $5.7B; SC would make the funds available through a competitive, merit-based review of proposals solicited from and provided by the university community. But the mechanism of requesting "mandatory" rather than "discretionary" funds is unlikely to get through Congress.

Appendix 2: FY2017 DOE Applied Research - New Programs and/or Program Change

There are projected funds for

Overview

The mission of the Energy Department is to ensure America's security and prosperity by addressing its energy, environmental and nuclear challenges through transformative science and technology solutions. This includes funding for priority areas such as clean energy, research and development to spur innovation, and advanced manufacturing. DOE improves the competitiveness of U.S. industries by research and development on advanced manufacturing processes and advanced industrial materials, enabling companies to cut costs by using less energy while improving product quality. Its efforts span basic research, applied research, development, demonstration and deployment (RDD&D). It also houses the National Nuclear Security Administration (NNSA) that addresses nuclear weapon and Naval reactor issues.

A summary of DOE basic and applied research funding levels at universities for 2013 (most recent data) is shown in Table 1. However, from discussions with DOE program managers, I suspect the applied research amounts in the the source of this data, NSF report 15-324, are not accurate.

Basic Research Programs – Office of Science (SC)

http://science.energy.gov/

The Department of Energy (DOE) is the single largest federal government supporter of basic research in the physical sciences in the United States, providing more than 40% of the total federal funding. In particular, DOE oversees - and is the principal federal funding agency of - the nation's research programs in high-energy physics, nuclear physics, and fusion energy sciences. About 15% of the SC basic research funding went to Universities/Colleges in the 2011-2013 budget years. For those basic research programs more available to University participation, the requested FY2017 funding is listed in Table 2.

The several Office of Science programs include:

- **Advanced Scientific Computing Research** Program (ASCR) (http://science.energy.gov/ascr/)
  Focus: Computational and networking capabilities to analyze, model, simulate, and predict complex phenomena; exoscale computing. See MAPS DOE charts 15-16.
- **Basic Energy Sciences** Program (BES) (http://science.energy.gov/bes/)
  Focus: To understand and ultimately control matter/energy at the electronic, atomic, and molecular levels that are important to new energy technologies. See MAPS DOE charts 17-21.
- **Biological and Environmental Research** Program (BER) (http://science.energy.gov/ber/)
  Focus: Exploring genome-enabled biology; discovering the physical, chemical, and biological drivers of climate change; and seeking the biological, geochem and hydrological molecular determinants of environmental sustainability and stewardship. See MAPS DOE charts 22-24.
- **Fusion Energy Science** Program (FES) (http://science.energy.gov/hep/)
  Focus: understanding of matter at very high temperatures and densities, and to develop the scientific foundations needed for a fusion energy source. See MAPS DOE charts 25-26.
- **High Energy Physics** Program (HEP) (http://science.energy.gov/hep/)
  Focus: discovering the elementary constituents of matter/energy; probing the interactions between them; and exploring the basic nature of space/time. See MAPS DOE charts 27-28.
- **Nuclear Physics** Program (NP) (http://science.energy.gov/np/)
  Focus: To discover and understand nuclear matter and understand how fundamental particles interact to create different types of matter. See MAPS DOE charts 29-30.
- **Workforce Development for Teachers and Scientists** (http://science.energy.gov/wdts/)

Focus: a sustained pipeline of highly trained science, technology, engineering, and mathematics (STEM) individuals for the workforce. See MAPS DOE charts 31-32.

- **Scientific User Facilities** (http://science.energy.gov/user-facilities/)
  Focus: state-of-the-art facilities shared with the science community worldwide.

Single Investigator Efforts - Generic Broad Agency Announcement

The Office of Science annually releases a *Continuation of Solicitation for the Office of Science Financial Assistance Program* for all Office of Science programs (http://science.doe.gov/grants/foas/open/). Discussion with the appropriate DOE program manager is recommended to ascertain their interest in your ideas and the availability of funds. One can find information on current Office of Science awards to Universities; this information can be useful for understanding a program manager's interests.

Guidance on proposal preparation and submission can be found at: http://science.doe.gov/grants/guide.asp. There are no submission deadlines, however, it is recommended that a full application be sent between June 1st and November 30th. Three to four years is the usual grant duration. Matching funds are usually not required for basic research. The Office of Science requires the submission of all financial assistance applications through Grants.gov.

DOE will perform an initial review to determine that (1) the applicant is eligible for the award; (2) the information required by the Federal Opportunity Announcement (FOA) has been submitted; (3) all mandatory requirements are satisfied; and (4) the proposed project is responsive to the objectives of the funding opportunity announcement. Those accepted will be subjected to scientific merit review (peer review) and will be evaluated against the following evaluation criteria, which are listed in descending order of importance:

1. Scientific and/or Technical Merit of the Project;
2. Appropriateness of the Proposed Method or Approach;
3. Competency of Applicant's Personnel and Adequacy of Proposed Resources; and
4. Reasonableness and Appropriateness of the Proposed Budget.

The evaluation process will include program policy factors such as the relevance of the proposed research to the terms of the FOA and the agencies' programmatic needs.

Early Career

http://science.energy.gov/early-career/

The Office of Science (SC) supports an Early Career Research Program in projects of interest to SC; a typical award is $750K over 5 years. The Principal Investigator must be an untenured Assistant Professor or Associate Professor on tenure track at a U.S. academic institution as of the deadline for the application. No more than ten years can have passed between the year the PI's Ph.D. was awarded and the year of the deadline for the application. No citizenship requirement. Preapplications are required. For more information, see MAPS DOE chart 13; a list of prior Early Career awardees/topics is available from the DC office.

Energy Frontier Research Centers (EFRC)

(http://science.energy.gov/bes/efrc/)

These integrated, multi-investigator Centers conduct fundamental research focusing on one or more of several "grand challenges" and use-inspired "basic research needs" identified in major strategic planning efforts. The Centers integrate the talents and expertise of leading scientists to accelerate research toward meeting our critical energy challenges. Funded at ~$3M/yr for five

years. For more information, see MAPS DOE chart 14.

Bioenergy Centers

http://genomicscience.energy.gov/centers/

To focus the most advanced biotechnology-based resources on the biological challenges of biofuel production, DOE established three Bioenergy Research Centers (BRCs - BioEnergy Science, Great Lakes Bioenergy Research, and Joint BioEnergy Institute) in September 2007 and renewed them in 2012. Each center is pursuing the basic research underlying a range of high-risk, high-return biological solutions for bioenergy applications. They are funded by the Office of Science at ~$25M/yr each. For more information, see MAPS DOE chart 24.

Innovation Hubs

http://energy.gov/hubs

Major multidisciplinary, multi-investigator, and multi-institutional integrated research centers, the Hubs are modeled after the centralized scientific management characteristics of the Manhattan Project. There are currently five funded Hubs (at ~$25M/yr each), two by Office of Science - Fuels from Sunlight, and Energy Storage.

High End Computing

http://www.nersc.gov/

The National Energy Research Scientific Computing Center (NERSC) serves researchers at DOE laboratories, universities, industrial laboratories and other Federal agencies. The ASCR Leadership Computing Challenge (ALCC) program allocates up to 30% of the computational resources at NERSC and the Leadership Computing Facilities at Argonne and Oak Ridge for special situations of interest to the Department with an emphasis on high-risk, high-payoff simulations in areas directly related to the Department's energy mission. Allocations of computer time and archival storage at NERSC are awarded to research groups based on a review of submitted proposals. (http://science.energy.gov/ascr/facilities/alcc/)

The Innovative and Novel Computational Impact on Theory and Experiment (INCITE) program invites proposals for large-scale, computationally intensive, research projects to run at America's premier leadership computing facility (LCF) centers. The INCITE program awards sizeable allocations (typically, millions of processor-hours per project) on some of the world's most powerful supercomputers to address grand challenges in science and engineering. (http://www.doeleadershipcomputing.org/)

Resources for Basic and Applied Research

Office of Science solicitations:
http://science.doe.gov/grants/

BES reports:
http://science.energy.gov/bes/community-resources/reports/

Search engine for current SC awards:
https://pamspublic.science.energy.gov/WebPAMSExternal/interface/awards/AwardSearchExternal.aspx

Email alerts for the EERE Advanced Manufacturing Office
http://energy.gov/eere/amo/subscribe

Mission Agency Program Summaries (MAPS)
The DC Office of Research Advancement has created the Federal Mission Agency Program Summaries website to:

1. connect PIs with appropriate funding agency programs/program officers
2. assist in development of white papers/charts/elevator speeches

The website (http://web-app.usc.edu/web/ra_maps) can be accessed using one's USC NetID and Password.

MAPS will have the following resources:

1. *Search Tab* for a searchable database of programs/program officers
   One can do keyword searches to locate many of the associated mission agency (DHS, DOD, DOE, DOT, ED, EPA, NASA, NIST, NOAA and USDA) programs and program officers.
2. *Mission Agency Tab* (DHS, DHHS, DOD, DOE, DOJ, DOT, ED, EPA, INTEL, NASA, NIST, NOAA, and USDA)
   Guide to Agency Funding for FYXX
   Agency Research Program Charts
   Agency Planning Documents
   Chart numbers in the "Guides to Funding" reference the Agency Research Program Chart file.
3. *Presentation Tab* for charts from recent USC Center of Excellence in Research workshops
4. *Proposal Tab* for reports / guides on writing proposals
5. *Email Alerts Tab* for URLs at which one can arrange for automatic solicitation updates
6. *Grantee Tab* for URLs at which one can find previous agency/program officer awardees
7. *Visiting DC Tab* for information about DC Office services

Chart numbers in the text above reference the Agency Research Program Chart file in MAPS.

Assistance in Locating Funding and Preparing Proposals

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Table 1: 2013 / 2014 DOE funding ($M) for Basic and Applied Research at Universities and Colleges

	2013		2014	
	Basic	**Applied**	**Basic**	**Applied**
Total for DOE	3851	3482	4102	3579
Total at Universities	**663**	**143**	**647**	**164**
Physical Sciences	**410**	**78**	**416**	**74**
Astronomy	0	0		
Chemistry	79	7		
Physics	331	69		
Other	0	2		
Environmental Sciences	**37**	**6**	**40**	**6**
Atmospheric	32	0		
Geological	0	0		
Oceanology	0	0		
Other	5	6		
Mathematics and Computer	**24**	**0.9**	**6**	**0.3**
Computer Sciences	12	0.9		
Mathematics	12	0		
Other	0	0		
Engineering	**33**	**39**	**28**	**46**
Aeronautical	0	0		
Astronautical	0.1	0		
Chemical	0	9		
Civil	0	0.3		
Electrical	0.8	7		
Mechanical	0	6		
Metal/Materials	32	12		
Other	0	4		
Life Sciences	**105**	**17**	**93**	**17**
Agriculture	0.2	16		
Biological	105	0		
Environmental	0	0		
Medical	0	0		
Other	0	0.4		
Psychological	**0**	**0**	**0**	**0**
Social Sciences	**0**	**3**	**0**	**0**
Other Sciences	**52**	**0**	**64**	**21**

From NSF "Federal Funds for Research and Development: FY2013-2015" NSF 15-324, July 2015

Basic	2013	Tables 30, 77 and 80-86
Applied Research	2013	Tables 44, 88 and 91-97
Basic	2014	Table 31 and 78
Applied Research	2014	Table 45 and 89

Table 2: DOE Basic Research Budget Pertinent to USC

Progr	Division	Budget Line	FY15	FY16	FY17		
			Actual ($M)	Enacted ($M)	PBR ($M)		Program Manager
Basic Energy Sciences Program							
	Materials Sciences and Engineering Research Division						
		Condensed Matter and Materials Physics	121	118	134		
			Experimental Condensed Matter Physics				Dr. Michael Pechan
			Theoretical Condensed Matter Physics				Dr. James Davenport
			Mechanical Behavior and Radiation Effects				Dr. John Vetrano
			Physical Behavior of Materials				Dr. Refik Kortan
		Scattering and Instrumentation Sciences	68	62	70		
			Neutron and Xray Scattering				Dr. Thiyaga Thiyagarajan
			Neutron and Xray Scattering				Dr. Lane Wilson
			Electron and Scanning Probe Microscopies				Dr. Jane Zhu
		Materials Discovery Design and Synthesis	71	70	77		
			Synthesis and Processing Science				Dr. Bonnie Gersten
			Materials Chemistry and Biomolecular Materials				Dr. Michael Sennett
			Materials Chemistry and Biomolecular Materials				Dr. Michael Markowitz
		Computational / Materials Sciences	8	12	12		
		Energy Frontier Research Centers	51	56	56		
		Energy Innovation Hub - Batteries and Energy Storage	24	24	24		
	Chemical Sci, Geosci, and Energy Biosci Research Divison						
		Fundamental Interactions	73	75	79		
			Atomic, Molecular, and Optical Science				Dr. Tom Setterstein
			Chemical Physics Research - Gas Phase				Dr. Wade Sisk
			Condensed Phase and Interfacial Molecular				Dr. Gregory Fiechtner
			Computational and Theoretical Chemistry				Dr. Mark Pederson
		Photochemistry and Biochemistry	74	64	71		
			Solar Photochemistry				Dr. Mark Spitler
			Photosynthetic Systems				Dr. Stephen Herbert
			Physical Biosciences				Dr. Robert Stack
		Chemical Transformations	91	92	106		
			Catalysis Science				Dr. Raul Miranda
			Separations and Analysis				Dr. Larry Rahn
			Heavy Element Chemistry				Dr. Phillip Wilk
			Geosciences Research				Dr. Larry Rahn
			Computational Chemical Sciences	0	0	14	
		Energy Frontier Research Centers	49	54	87		
		Energy Innovation Hub - Fuels from Sunlight	15	15	15		
	Scientific User Facilities		889	967	964		Dr. James Murphy
Progr	Division	Budget Line	FY15	FY16	FY17		
			Actual ($M)	Enacted ($M)	PBR ($M)		Program Manager
Advanced Scientific Computation Research Program (~25% to Universities)							
	Math, Computational, and Computer Sciences Research						
			Applied Mathematics	49	49	39	Dr. Alexandra Landsberg
			Computer Science	55	57	39	Dr. Sonia Sachs
			Computational Partnerships (SciDAC)	44	48	46	Dr. Steven Lee
			Next Generation Networking for Science	19	19	19	Dr. Thomas Ndousse-Fetter
	High Performance Computing and Networking Facilities						Dr. Barb Helland
			Research and Evaluation Prototypes	53	121	18	

Table 2: DOE Basic Research Budget Pertinent to USC (continued)

Progr	Division	Budget Line	FY15	FY16	FY17		
			Actual ($M)	**Enacted ($M)**	**PBR ($M)**		**Program Manager**
Biological and Environmental Research Program (~35% to Universities)							
	Biological Systems Science Division						
		Genomic Science					
		Foundational Genomics	73	76	104		Dr. Joseph Graber
		Genomics Analysis and Validation	10	9	9		Dr. Joseph Graber
		Metabolic Synthesis and Conversion	16	16	16		Dr. Joseph Graber
		Computational Biosciences	16	16	16		vacant
		Bioenergy Research Centers	75	75	90		Dr. Kent Peters
		Mesoscale to Molecules	10	10	11		Dr. Prem Srivastava
		Radiological Sciences	5	2	0		Dr. Todd Anderson
		Facilities and Infrastructure	84	80	80		
	Climate and Environmental Sciences Division						
		Atmospheric System Research	26	26	26		Dr. Sally McFarlane
		Environmental System Science					
		Terrestrial Ecosystem Science	44	40	40		Dr. Mike Kuperberg
		Subsurface Biogeochemical	24	23	23		Dr. David Lesmes
		Climate and Earth System Modeling					
		Climate Model Development and Validation	0	15	10		Dr. Ashley Williamson
		Regional and Global Climate Modeling	26	30	30		Dr. Renu Joseph
		Earth System Modeling	35	36	36		Dr. Dorothy Koch
		Integrated Assessment	10	18	28		Dr. Robert Vallario
Program	Budget Line		FY15	FY16	FY17		
			Actual ($M)	**Enacted ($M)**	**PBR ($M)**		**Program Manager**
High Energy Physics Program (~40% to Universities, except for Adv Tech R&D)							
	Energy Frontier Experimental Physics Research		84	77	77		Dr. Abid Patwa
	Intensity Frontier Experimental Phsyics Research		54	56	56		Dr. Alan Stone
	Cosmic Frontier Experimental Physics Research		49	50	50		Dr. Kathy Turner
	Theoretical and Computational Physics		62	59	60		Dr. Simona Rolli
	Advanced Technology R&D Research		88	84	83		Dr. Lek Len
Program	Budget Line		FY15	FY16	FY17		
			Actual ($M)	**Enacted ($M)**	**PBR ($M)**		**Program Manager**
Nuclear Physics Program (~40% to Universities)							
	Medium Energy Nuclear Physics Research		35	38	40		Dr. Ted Barnes
	Heavy Ion Nuclear Physics Research		33	36	36		Dr. James Sowinski
	Low Energy Nuclear Physics Research		51	51	54		Dr. Cyrus Baktash
	Nuclear Theory Research		36	38	39		Dr. George Fai
	Isoptope Devel/Prod Research		5	6	10		Dr. Dennis Phillips
Program	Budget Line		FY15	FY16	FY17		
			Actual ($M)	**Enacted ($M)**	**PBR ($M)**		**Program Manager**
Fusion Energy Sciences Program (~35% to Universities)							
	Burning Plasma Science: Foundations - Theory and Simulatior		35	34	33		Dr. John Mandrekas
	Burning Plasma Science - Advanced Tokamak and Spherical T		179	175	157		Dr. Mark Foster
	Burning Plasma Science: Long Pulse - Tokamak and Stellarato		16	16	11		Dr. Steve Eckstrand
	Burning Plasma Science: Long Pulse - Materials and Fusion Nu		23	25	20		Dr. Peter Pappano
	Discovery Plasma Science - Plasma Science Frontiers		45	47	32		Dr. Nirmal Podder
	Discovery Plasma Science - Measurement Innovation		4	7	4		Dr. Francis Thio
Program			FY15	FY16	FY17		
			Actual ($M)	**Enacted ($M)**	**PBR ($M)**		**Manager**
Workforce Development for Teachers and Scientists			20	20	21		Dr. Patricia Dehmer

Applied Research Programs

The DOE applied Research, Development, Demonstration and Deployment (RDD&D) programs will frequently require some form of matching funds and industrial participation. Selected funding data on applied research and development is presented in Table 3.

The DOE offices that fund applied research grants at Universities are:

- **Office of Energy Efficiency & Renewable Energy (EERE)**
  Focus: RDD&D in clean energy technologies
- **Office of Electricity Delivery and Energy Reliability (EDER)**
  Focus: RDD&D in reliable, efficient energy
- **Office of Fossil Energy (FE)**
  Focus: RDD&D in energy from fossil resources
- **Office of Nuclear Energy (NE)**
  Focus: RDD&D in nuclear energy
- **Advanced Research Projects Agency – Energy (ARPA–E)**
  Focus: "Out-of-the-box," transformational energy RD&D
- **National Nuclear Security Administration (NNSA)**
  Focus: management and security of nuclear weapons / Naval reactors

Clean Energy Manufacturing Initiative
http://www.energy.gov/eere/cemi/about-clean-energy-manufacturing-initiative
The Clean Energy Manufacturing Initiative (CEMI) is a U.S. Department of Energy (DOE)-wide commitment to enhancing U.S. manufacturing competitiveness while advancing the nation's energy goals, boosting the economy, and contributing to energy security. CEMI engages in activities that focus on innovation and breaking down market barriers, including: Technology Research and Development, New Innovation Models and Competitiveness Analysis.

Innovation Hubs
http://energy.gov/hubs
Major multidisciplinary, multi-investigator, and multi-institutional integrated research centers, the Hubs are modeled after the centralized scientific management characteristics of the Manhattan Project. There are currently five funded Hubs (at ~$25M/yr each), two by the Office of Electricity Efficiency and Renewable Energy – Consortium for Building Energy Innovation, and Critical Materials; and one by the Office of Nuclear Energy - Nuclear Energy Modeling and Simulation.

Office of Energy Efficiency & Renewable Energy (EERE)
www.eere.energy.gov/
The mission of EERE is to strengthen America's energy security, environmental quality, and economic vitality in public-private partnerships that: enhance energy efficiency and productivity; and bring clean, reliable and affordable energy technologies to the marketplace. The Research Development and Demonstration (RD&D) programs include:

- Transportation
  - vehicles
  - bioenergy
  - fuel cells
- Renewable Power
  - solar

    - wind
    - water power
    - geothermal
- Energy Efficiency
    - advanced manufacturing
    - buildings
    - sustainability performance

See Table 3 and MAPS DOE charts 37-41.

The Advanced Manufacturing Office (AMO)
http://energy.gov/eere/amo/research-development-projects
AMO R&D projects explore novel energy-efficient, next-generation materials and innovative process technologies for both specific industry sectors and a wider range of manufacturing industries. R&D projects also pursue foundational or advanced energy technologies for multiple industry sectors. AMO manages the DoE National Network for Manufacturing Innovation Institutes. DoE has MIIs on Smart Manufacturing: 1) Advanced Sensors, Controls, Platforms and Modeling for Manufacturing; 2) Composite Materials and Structures; and 3) Power America.

Office of Electrical Delivery and Energy Reliability (EDER or OE)
energy.gov/oe/office-electricity-delivery-and-energy-reliability
The mission of EDER is to lead national efforts to modernize the electric grid; enhance security and reliability of the energy infrastructure; and facilitate recovery from disruptions to energy supply. The areas of focus include:

- Advanced Grid Integration (smart grid)
- Power Systems Engineering Research and Development (transmission and distribution)
- Energy Infrastructure Modeling and Analysis
- National Electricity Delivery
- Infrastructure Security and Energy Restoration

See Table 3 and MAPS DOE charts 34-36.

Office of Fossil Energy (FE)
www.fossil.energy.gov/
The primary mission is ensuring that the U.S. can continue to rely on clean, affordable energy from our traditional fuel resources – coal, oil and natural gas. The RD&D programs include: Clean Coal Technologies, Oil and Natural Gas Technologies, Carbon Capture, Utilization and Storage, and Hydrogen & Other Clean Fuels. See MAPS DOE charts 43-46.

Office of Nuclear Energy (NE)
www.ne.doe.gov/
http://www.energy.gov/ne/nuclear-reactor-technologies/nuclear-energy-university-program
NE promotes nuclear power as a resource capable of meeting the Nation's energy, environmental and national security needs by resolving technical and regulatory barriers through research, development and demonstration. The RD&D programs include: advanced modeling and simulation, fuel cycle, and Generation IV Nuclear Energy Systems. The university support is consolidated into the Nuclear Energy University Programs (NEUP). See MAPS DOE charts 47-50.

ARPA-E
http://arpa-e.energy.gov/
The focus is on creative "out-of-the-box" transformational energy research that industry by itself cannot or will not support due to its high risk but where success would provide dramatic benefits for the nation. In addition to topic specific solicitations, there is also a solicitation for idea development that might lead to revolutionary ARPA-E applied energy research programs. See MAPS DOE charts 57-58.

National Nuclear Security Admin (NNSA):
nnsa.energy.gov/aboutus/ourprograms/defenseprograms/defensescienceuniversityprograms-0
There is a Stewardship Science Academic Alliances (SSAA) Program.
SSAA funds university research in unique scientific fields of relevance to stockpile stewardship. These include: materials under dynamic conditions and in extreme environments; hydrodynamics; low-energy nuclear science and radiochemistry; and high energy density science. See MAPS DOE charts 59-61.

Table 3: DOE Applied Research Budgets pertinent to Universities

Offic	Divis	Budget Line			
			FY15	FY16	FY17
			Actual ($M)	Enacted ($M)	PBR ($M)
ARPA-E					
	Projects		252	262	318
		Transportation Systems	126	105	127
		Stationary Power Systems	126	157	191
			FY15	FY16	FY17
EERE			Actual ($M)	Enacted ($M)	PBR ($M)
	Vehicle Technologies				
		Batteries and Electric Drive Technology	100	141	0
		Battery Technology			130
		Electric Drive Technologies			39
		Vehicle Systems	40	31	90
		Advanced Combustion Engine	47	37	75
		Materials Technology	34	27	83
		Fuels and Lubricants	19	23	21
	Bioenergy Technologies				
		Feedstock Supply and Logistics		17	22
		Advanced Algal Sustems		30	30
		Conversion (thermo-/bio-chemical)	93	86	141
	Hydrogen and Fuel Cell Technologies				
		Fuel Cell F&D	32	35	35
		Hydrogen Fuel F&D	34	41	45
		Manufacturing R&D	3	3	0
	Solar Energy				
		Concentrating Solar Power	45	48	43
		Photovoltaic R&D	35	53	64
		Systems Integration	43	52	83
	Wind Energy				
		Technolog Res, Devel and Testing	34	35	88
	Water Power				
		Hydropower Technologies	19	25	25
		Marine and Hydrokinetic Technologies	40	44	55
	Geothermal Technologies				
		Enhanced Geothermal Systems	32	45	45
		Hydrothermal	12	14	41
	Advanced Manufacturing				
		Next Generation Manufacturing R&D	81	102	103
		Advanced Manufacturing R&D Facilities	89	99	129
	Building Technologies				
		Emerging Technologies	53	86	169
			FY15	FY16	FY17
			Actual ($M)	Enacted ($M)	PBR ($M)
EDER		Clean Energy Transmission and Reliability	33	39	30
		Smart Grid Research and Development	15	35	30
		Cybersecurity for Energy Delivery Systems	45	62	46
		Energy Storage	12	21	45
		Transformer Resilience and Adv Components	0	5	15
			FY15	FY16	FY17
			Actual ($M)	Enacted ($M)	PBR ($M)
Nuclear Energy					
		Integrated University Program	5	5	0
			FY15	FY16	FY17
			Actual ($M)	Enacted ($M)	PBR ($M)
Fossil Energy					

Appendix 1: Growth/Change in FY2017 DOE Basic Research Programs

($M) growth in FY2017 from FY2016

ASCR

Exascale Computing Initiative (ECI) and Office 112 to154

The first four years of SC-ECP will focus on research in software (new algorithms and methods to support application and system software development) and hardware (node and system design). During the last six years of the SC-ECP, activities will focus on delivering application software, the system software stack, and hardware technologies that will be deployed in the exascale systems. Fund two teams to develop exascale node designs. Fund two teams to develop programming environments for exascale computing systems. The investment strategy for the ECI has five components:

- Conduct research, development, and design efforts in hardware, software, and mathematical technologies leading toward capable exascale systems.
- Prepare today's scientific and data-intensive computing applications to exploit fully the capabilities of exascale systems by coordinating their development with the emerging technologies from the research, development, and design efforts.
- Partner with HPC vendors to accelerate the pace of implementation of technologies required for capable exascale computing.
- Acquire and operate increasingly capable computing systems, starting with hundred-plus petaflop machines that incorporate emerging technologies from research investments.
- Collaborate with other Federal agencies to ensure broad applicability and use of capable exascale computing across the US Government.

SciDAC Partnerships 9.5 to 12

Recompetition and expansion of SciDACpartnerships, with new activities to include accelerating the development of clean energy technologies. The new portfolio will have a strong emphasis on integration and whole device modeling, focusing on the highest-priority research directions as identified by the community workshops held in FY 2015. To include partnerships with BES, BER and FES supporting the Administration's Clean Energy Initiatives.

BES

The BES Budget Request of $1.9B is an increase of $8.8M or 4.7 percent from the FY 2016 Enacted level. The FY 2017 Request includes increases for core research and the Energy Frontier Research Centers (EFRCs) in key areas related to Departmental priorities, such as the Subsurface Technology and Engineering RD&D and the Advanced Materials crosscutting initiatives. A new activity is initiated in Computational Chemical Sciences to advance U.S. leadership in computational chemistry codes in preparation for exascale computing and supports the Exoscale Computing Initiative.

Condensed Matter and Materials Physics 118 to 134

For structural materials, additional research will focus on lightweight polymer composites, emphasizing design of the matrix-reinforcement interfaces, including new characterization tools and predictive capabilities to design improved chemistries and structures. For materials in extreme environments, additional research will emphasize the development of a fundamental understanding of corrosion and degradation processes including the role of interfaces, linking nano/microscale and mesoscale phenomena, and development of quantitative prediction

capabilities for materials performance in multiple extreme conditions. In the area of quantum materials, research will focus on predictive modeling, evaluation of ultrafast regimes (non-equilibrium phenomena), and controlled synthesis and design of materials to enable high quality, tailored interfaces, controlled heterogeneity, and coherent manipulation of charge, spin and lattice dynamics.

Materials Discovery, Design, and Synthesis **70 to 77**

Research related to energy efficient use of heat, such as thermocaloric and thermoelectric materials, improved polymer chemistries to control interfaces related to light weight polymer composites, and discovery of new classes of porous materials and improved catalysts. Additional research will exploit advances in characterization of materials during synthesis, in combination with computation and theory, to develop new predictive models of synthesis for targeted functionality that incorporate metastability and focus on nonequilibrium matter and assembly of hierarchical inorganic-organic hybrid materials. Other cross-cutting opportunities include exploring materials phenomena that transcend the nano-micro-meso scales, and underpin the processes at interfaces which are ubiquitous in nearly all energy technologies.

EFRCs - Subsurface Science, Technology, and Engineering **54 to 87**

In FY 2015, BES organized and participated in two strategic planning activities that identified a grand challenge for subsurface science: "Advanced imaging of geophysical and geochemical signals in the subsurface." BES will initiate new Energy Frontier Research Centers in FY 2017 to support multidisciplinary teams to address this grand challenge. The scientific focus will be on fracture networks, associated fluid flow and reaction, and the gaps in fidelity, resolution, and conceptual understanding of subsurface imaging in hard-to-access environments.

Computational Chemical Sciences **0 to 14**

Develop open-source modular software tools that can be reused as plug-and-compute tools for the basic energy sciences community in preparation for the arrival of exascale computing facilities and for the optimized usage of existing petascale computers, leveraging the U.S. leadership in the development of computational chemistry codes. In this activity, computational chemists will deploy these capabilities in all major open-source chemical simulation-software used by the community, rewrite software and algorithms to fully realize the current and future gains in efficiency offered by massively parallel computing platforms and systematically alleviate the need to employ semi-empirical case-by-case corrections. Tackling these enormously complex challenges will require multi-investigator teams to combine theoretical, computational and algorithmic advances to jointly increase by at least 1,000 times the accuracy and speed of molecular and chemical design.

Chemical Transformations **92 to 106**

Enhance this program's contribution to the Subsurface crosscut with an emphasis on fundamental geochemistry and geophysics, specifically subsurface fluid flow and complex chemistry on timescales of microseconds to millennia with importance for oil and gas production, geothermal energy, and carbon capture and storage.

Photochemistry and Biochemistry **64 to 71**

Research support is increased to include a new multidisciplinary effort in energy efficiency and chemistry in extreme environments. This research is part of a synergistic cross-disciplinary

effort between the Photochemistry and Biochemistry Research and Chemical Transformations Research areas to establish energy efficient catalysts and understand chemical dynamics during energy conversion and in radiative environments, building on the expertise in radiation chemistry, photo(electro) catalysis, and enzymemediated (biological) catalysis.

BER

The BER Budget Request of $662M is an increase of $53M or 8.7 percent above the FY 2016 Enacted level. The FY 2017 Request continues to support for core research in Genomic Science and the three DOE Bioenergy Research Centers (BRC), and it increases support for research to understand microbiome interactions in diverse environments. The Request also increases support for field research and modeling to understand the dynamic physical, biogeochemical, microbial, and plant processes interactions involved in the energy-water nexus.

Genomic Science **76 to 104**

A new effort in microbiome research, which will provide insight into multiple microbiomes of relevance to DOE's sustainable bioenergy and environmental missions. It will also provide funding to initiate new work in biosystems design research to allow the selective transfer of genomic traits among plants and microbes.

Climate and Earth System Modeling **99 to 104**

New efforts in integrated assessment modeling to understand process interactions involving the energy-water nexus. Fund a set of three to four regional-scale data, modeling, and analysis test beds to accelerate synthesis of integrated toolsets in diverse environments and explore predictive challenges associated with the energy-water nexus. Increased BER funding for energy-water efforts in FY 2017 will support a set of regional-scale data, modeling and analysis (DMA) test beds focusing on the integration of diverse observational data and modeling outputs, data assimilation, and both analytic and visualization tools to exercise and extend capabilities, and test limits for predictive insights. The regional-scale DMA test beds will serve as the basis for a new high resolution modeling capability for impact, adaptation, and vulnerability (IAV) analysis of energy-water systems.

Appendix 2: Growth/Change in FY2016 DOE Applied Research Programs

($M) growth in FY2017 from FY2016

Energy Efficiency and Renewable Energy (EERE)

Vehicle Technologies

Advanced Combustion Engine R&D **37 to 75**

The Advanced Combustion Engine R&D subprogram will competitively award cost-shared projects with industry to support the development of cost-competitive engine and powertrain systems for light-duty passenger vehicles capable of attaining at least a 35 percent fuel economy improvement for gasoline fueled vehicles and at least 50 percent fuel economy improvement for diesel fueled vehicles while meeting future emissions standards by 2020. The subprogram will support complementary combustion and emission control research at universities.

Battery Technology R&D **0 to 130**

An increased emphasis on beyond lithium-ion R&D, which complements and strengthens recent beyond lithium-ion advances and is a potential pathway to decrease battery cost below the 2022 target. Initiate up to eight new competitively selected FOA awards for advanced battery materials research to capitalize on recent beyond lithium ion advances and novel electrolyte concepts. Focus will be on the following: mesoscale heterogeneous electrolytes; organic/inorganic nano-composites; and interface-augmented ion conductors.

Electric Drive Technologies **0 to 39**

FOA to develop advanced materials and technologies for Wide Bandgap (WBG) packages and power module designs to accelerate power electronics innovation and commercialization. Competitively awarded efforts with teams from industry, universities, and National Laboratories will focus on overcoming barriers and gaps to commercializing WBG power electronics for vehicle electric drive systems.

Advanced Combustion Engine **37.1 to 74.8**

Initiate up to six competitively awarded projects with universities that will complement research at the National Laboratories for fundamental research to improve combustion efficiency and increase the effectiveness of catalyst to reduce emissions. Research will include modeling of fuel sprays, and other combustion processes, development of kinetic mechanisms for fuels and combustion, and characterization of catalyst for emissions reduction at low temperatures.

Solar Energy

Desalination R&D FOA **0 to 15**

Fund 8 to 12 competitively selected projects focused on advanced thermal desalination techniques.

Next Generation Renewable Fuels and Chemicals **0 to 10**

Issue a FOA and select 4 to 6 initial projects focused on feedstocks and conversion pathways for producing fuels from variable renewable solar power.

Geothermal Technologies

Hydrothermal **13.8 to 40.5**

The increase will also support additional R&D to address a new Subsurface grand challenge topic on “Advanced Imaging of Geophysical and Geochemical Signals in the Subsurface” identified in an

FY 2015 Subsurface workshop.

Advanced Manufacturing

Advanced Manufacturing R&D Facilities **0 to 25**

Provides for the first year of a newly launched Energy-Water Desalination Hub which will serve as a center of research focused on developing integrated technological system solutions and enabling technologies for de-energizing, decarbonizing, and reducing the cost of desalination to provide clean and safe water. While some research is currently underway on these topics in pockets of the U.S. innovation ecosystem, the proposed effort would serve as a significant first-of-a-kind centralized critical-mass RD&D effort on desalination and would establish a central pillar in DOE and the Nation's RD&D efforts in this critically important and highly multi-disciplinary field.

Building Technologies

Emerging Technologies **86 to 169**

Increase reflects new funding opportunity announcement (FOA) (up to $40M) on Low-GWP Advanced Cooling (HVAC) R&D and a new FOA ($17.5M) focused on use of advanced sensors and controls and R&D to reduce the rapidly growing fraction of building energy usage coming from miscellaneous electrical loads (plug loads such as consumer electronics, entertainment systems, and small kitchen appliances).

Strategic Programs

As part of the mandatory spending request, propose a new 21st Century Clean Transportation Plan ($1,335M), including transportation systems R&D ($500M), regional fueling infrastructures for low-carbon fuels ($750M), and deployment of clean vehicle fleets for local government first responders ($85M)

The President's Budget calls for major new investments in our Nation's infrastructure, beginning in the transportation system; and calls for greater collaboration between the public and private sectors to increase private investment in infrastructure and help rebuild America. The President's 21st Century Clean Transportation Plan would set America on a long-term path to achieving our economic and climate goals. As part of the 21st Century Clean Transportation Plan, the 21st Century Clean Transportation Department of Energy will:

- Scale-up clean transportation research and development (R&D) through initiatives to accelerate cutting the cost of battery technology; advanced the next generation of low carbon fuels such as biofuels, in particular for intermodal freight and fleets; and investigate system level energy implications of future mobility and intelligent transportation system technologies such as vehicle connectivity and automation;
- Ensure all Americans have access to at least one alternative fuel by 2020 by providing funding for the development of regional low-carbon fuel fueling infrastructure including charging stations for electric vehicles, advanced biofuels, hydrogen fuel cells, and other low carbon options. Additionally, the Department of Energy (DOE) will launch an Electric Vehicle Accelerators Communities program with the goal of deploying 10,000 new grid connected solar powered fast charge stations or renewable hydrogen refueling stations by 2025 through public-private partnerships; and
- Launch the Clean Fleets Competition program that will use challenge grants to drive state, tribal, and local government vehicle fleets to purchase clean transportation options and operate them on low-carbon fuels, including those for first responders.

21st Century Clean Transportation	FY2017
Clean Transportation R&D	200
Next-Generation Biofuels R&D	100
Smart Mobility Research Center	200
Clean Fleets Competitions – Municipalities and First-Responders	85
Low-Carbon Fueling Infrastructure Deployment	750
Total, 21st Century Clean Transportation	1,335

Energy Delivery and Energy Reliability

Energy storage **20.5 to 44.5**

Included in the growth is $2M to support new university R&D activities targeted toward new, more cost-effective chemistries and materials, advanced power electronics, and conduct system performance and evaluation.

Clean Energy and Transmission Grid Institute **0 to 14**

In FY 2017 the Office of Electricity Delivery and Energy Reliability will establish a Grid Clean Energy Manufacturing Innovation Institute focused on projects that facilitate the transition of innovative material processes and production technologies for grid application to industry. This institute is part of the larger multi-agency National Network for Manufacturing Innovation (NNMI). The NNMI model promotes collaboration, complements university research, and supports innovation to increase the competitiveness of U.S. manufacturers. Manufacturing Institutes are a partnership among government, industry, and academia, supported with cost-share funding from Federal and non-Federal sources. Within 5 years of its launch, the Grid Institute is expected to be financially independent and sustainable using only private sector and other sources without further federal funding.

Manufacturing innovations for grid components were informed through DOE workshops and engagement with industry stakeholders. Potential topic areas for the Grid Institute include:

- Alloys (homogeneous structures)—Covetics are a relatively new class of alloy that involve nano-carbon particles fused into metal systems (e.g., aluminum, copper, gold, silver, zinc, tin, lead, and iron). These materials have enhanced properties such as lower electrical resistivity, improved thermal conductivity, and enhanced mechanical strength compared to their base metals. Electrical conductors made from copper covetics could reduce energy losses by more than 40%.
- Metal Matrix/Hybrid Composites (heterogeneous structures)—Cobalt-rich nano-composite steel has tunable magnetic properties, improved corrosion resistance, and better mechanical strength. Magnetic cores made from these materials can produce transformers that are more efficient (less core losses), more reliable (less corrosion), and possibly more compact (operation at higher frequencies).
- Metal/Hybrid Laminates (structures in discrete layers)—Laminates of different metals, alloys, and composites (metallic or non-metallic) can exhibit properties such as enhanced strength, toughness, or functionality. Large power transformers already use magnetic cores with electrical steel laminates to reduce eddy current losses. Laminates could also be applied to the housing of transformers to reduce noise, reduce weight, and increase resilience (i.e., withstand ballistic attacks).

ARPA-E

New Programs **291 to 350**

Release funding opportunity announcements (FOAs) for seven to eight focused programs each funded in the range of $10 - $40M. Those programs will be defined to address new areas not represented in the present portfolio, and to develop new opportunities opened by the outcomes of previous programs. Throughout FY 2016, workshops will be held to assess new program

topics for FY 2017, building on the strategic innovation areas. Three workshops already planned are:

- Innovative Approaches to Ocean Cultivation and Processing of Macro Algae for the Production of Low-carbon Fuels
- Advanced Materials, Sensors, and Controls Enabling Inherently Safe and Secure Designs for MW Scale Nuclear Energy
- High-Impact Building Efficiency through Data Analytics

Work to develop the additional workshops for defining FY 2017 programs is in progress. Broad areas under assessment (each may yield more than one potential workshop concept) are:

- Hybrid Solar Systems
- Expanded Investments in Information and Computing Technologies (ICT)
- Light Metals in Transportation and Advanced Manufacturing
- Innovations in Production of Fuels and Chemicals

It is also proposed that five-year mandatory spending authority enable new multi-stage, systems-level development that will accelerate large impacts on the energy system ($150M in FY 2017; total of $1.85 billion over five years)

Appendix 3: Illustration of DOE program manager data sheet

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Biosketch:
Dr. Pederson is the program manager for Theoretical and Computational Chemistry.
From 1996 until joining DOE, he was the section head in the "Theory of Molecules, Clusters and Nanoscale Devices" section at the Naval Research Laboratory (NRL). He also spent one year at Max-Planck-Institute (1992) and one year at NSF (2002) as a program director in Theoretical and Computational Chemistry. In 1986, Dr. Pederson joined the NRL as a National Research Council (NRC)-NRL postdoctoral researcher; he was hired as a permanent employee in 1988.

Education
Ph.D., Theoretical Physics, University of Wisconsin, 1986
B.S., Physics, University of Michigan, 1981

Program: Computational and Theoretical Chemistry
http://science.energy.gov/bes/csgb/research-areas/computational-and-theoretical-chemistry/
Research in Computational and Theoretical Chemistry emphasizes integration and development of new and existing theoretical and computational approaches for the accurate and efficient description of processes relevant to the BES mission. Supported efforts are tightly integrated with the research and goals of the Condensed-Phase and Interfacial Molecular Sciences and Gas Phase Chemical Physics programs-which together comprise the Chemical Physics Research portfolio-and many have wider crosscutting relevance, advancing goals of other BES chemistry, biochemistry and geochemistry programs. …

Illustrative Papers Reflecting Personal Research Interests:
Photoelectron spectroscopic and computational studies of the Pt@Pb(10)(1-) and Pt@Pb(12)(1-/2-) anions
Grubisic Andrej; Wang Haopeng; Li Xiang; et al.
Proc of the National Academy of Sciences of the USA 108(36), 14757-14762 SEP 6 2011

Density-functional-based determination of vibrational polarizabilities in molecules within the double-harmonic approximation: Derivation and application
Pederson MR; Baruah T; Allen PB; et al.
J of Chemical Theory and Computation 1(4), 590-596 JUL-AUG 2005

Vibrational signatures for low-energy intermediate-sized Si clusters
Pederson MR; Jackson K; Porezag DV; et al.
Physical Review B 54(4), 2863-2867 JUL 15 1996

Appendix 4: Acronym and Abbreviation Glossary

Agency Specific

ALCC	ASCR Leadership Computing challenge
AOP	Annual Operating Plan (for National Labs)
AMP	Advanced Manufacturing Program (in EERE)
ARM	Atmospheric Radiation Measurement
ARPA-E	Advanced Research Project Agency - Energy
ASCR	Advanced Scientific Computing Research Program (in SC)
BER	Biological and Environmental Research Program (in SC)
BES	Basic Energy Sciences Program, SC
CEBAF	Continuous Electron Beam Accelerator Facility
CEMI	Clean Energy Manufacturing Initiative (program in EERE's Adv Manuf)
CRA	Core Research Areas (for BES)
CSP	Concentrating Solar Power
Defense Prog	National Nuclear Security Administration Defense Programs
ECI	Exoscale Computing Initiative
EDER	Office of Energy Delivery and Energy Reliability
EERE	Office of Energy Efficiency and Renewable Energy
EFRC	Energy Frontier Research Center
EGS	Enhanced Geothermal Systems
ELSI	Ethical, legal, social implications
Envir Mgmt	Office of Environmental Management
EPAct	Energy Policy Act
ESC2M2	Electricity Subsector Cybersecurity Capability Maturity Model
EV	Electric Vehicle
FE	Office of Fusion Energy
FERC	Federal Energy Research Commision
FES	Fusion Energy Science Program (in SC)
FOA	Funding Opportunity Announcement
FORGE	Frontier Observatory for Research in Geothermal Energy (initiative).
Fossil	Office of Fossil Energy
HEDLP	High Energy Density Laboratory Plasma
HEP	High Energy Physics Program (in SC)
HVAC	Heating, Ventilation and Air Conditioning
IAV	Integrated assessment and impacts, analysis and vulnerability
INCITE	Innovative and Novel Computational Impact on Theory and Experiment
LCF	Leadership Computing Facility
LED	Light Emitting Diode
LHC	Large Hadron Collider
LWR	Light Water Reactor
MDF	Manufacturing Demonstration Facility
MEA	Membrane Electrode Assembly
MRI	Major Research Instrumentation
NE	Office of Nuclear Energy
NERSC	National Energy Research Scientific Computing Center
NEUP	Nuclear Energy University Program
NNSA	National Nuclear Security Administration (part of DOE)

NP	Nuclear Physics Program (in SC)
NSAC	Nuclear Science Advisory Committee
ONRL	Oak Ridge National Laboratory
OoS	Office of Science
PGM	Platinum Group Metals
PV	Photovoltaic
RD&D	Research, Development and Demonstration
RDD&D	Research, Development, Demonstration and Deployment
SC	Office of Science
SciDAK	Science Discovery through Advanced Computing (in ASCR)
SISG	Single Investigator - Small Group
SGIP	Standard Interconnection Agreement Proceedures
SSAA	Stewardship Science Academic Alliances (program of NNSA)

General

AMNPO	Advanced Manufacturing National Program Office
AMP	Advanced Manufacturing Partnership
ASEE	American Society for Engineering Education
BAA	Broad Agency Announcement
BRAIN	Brain Research through Advancing Innovative Neurotechnologies
CA	Congressional add
CFDA	Catalog of Federal Domestic Assistance Number
CMOS	Complementary Metal Oxide Semiconductor (electronics)
COE	Center of Excellence
CSI	Congressional Special Interest
DHS	Department of Homeland Security
DNI	Director of National Intelligence
DOC	Department of Commerce
DOD	Department of Defense
DOE	Department of Energy
DoEd	Department of Education (alternative)
DoI	Department of Interior
DOJ	Department of Justice
ED	Department of Education
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FBO	Federal Business Opportunity
FDA	Food and Drug Administration
FFO	Federal Funding Opportunity
FFDRC	Federally Funded Research and Development Center
FHWA	Federal Highway Administration
FOA	Funding Opportunity Announcement
FY	Fiscal Year (1 Oct to 30 Sep for Federal government)
HBCU/MI	Historically Black Colleges/Universities and Minority Institutions
HTM	Hierarchical Temporal Memory
IHE	Institutions of Higher Education
IMI	Institute for Manufacturing Innovation
INTEL	The various agencies that gather intelligence

IR	Infra-Red
IT	Information Technology
IWG	Interagency Working Group
MAPS	Mission Agency Program Summary (provided by USC Res. Adv.)
MEMS/NEMS	Micro- Nano-ElectroMechanical Systems
MRL	Manufacturing Readiness Level
NASA	National Aeronautics and Space Administration
NDI/E	Non-Destructive Inspection/Evaluation
NIST	National Institute for Standards and Technology (in DOC)
NNMI	National Network for Manufacturing Innovation
NOAA	National Oceanic and Atmospheric Administration (in DOC)
NOFO	Notice of Funding Opportunity
NRC	National Research Council
NRI	Nanoelectronics Research Initiative
NRO	National Reconnaissance Office
NSA	National Security Agency
NSF	National Science Foundation
NSTC	National Science and Technology Council
NTIA	National Telecommunications and Information Administration
OMB	Office of Management and Budget
OPM	Office of Personnel Management
ORAU	Oak Ridge Associated Universities
OSD	Office of the Secretary of Defense
OSTP	Office of Science and Technology Policy (White House)
PBR	President's Budget Request (submitted to Congress)
PCAST	President's Council of Advisors on Science and Technology
PTSD	Post-traumatic Stress Syndrome
RD&I	Research, Development and Innovation
RDT&E	Research, Development, Test and Evaluation
RF	Radio-frequency
RFA	Request for Application
S&T	Science and Technology
SBIR	Small Business Innovative Research
SME	Subject Matter Expert
SN	Special Notice
STEM	Science, Technology, Engineering and Mathematics (education)
STTR	Small Business Technology Transfer
TBA	To be announced
TBI	Traumatic Brain Injury
TRL	Technology Readiness Level
UARC	University Affiliated Research Center
USDA	US Department of Agriculture
YIP	Young Investigator Program