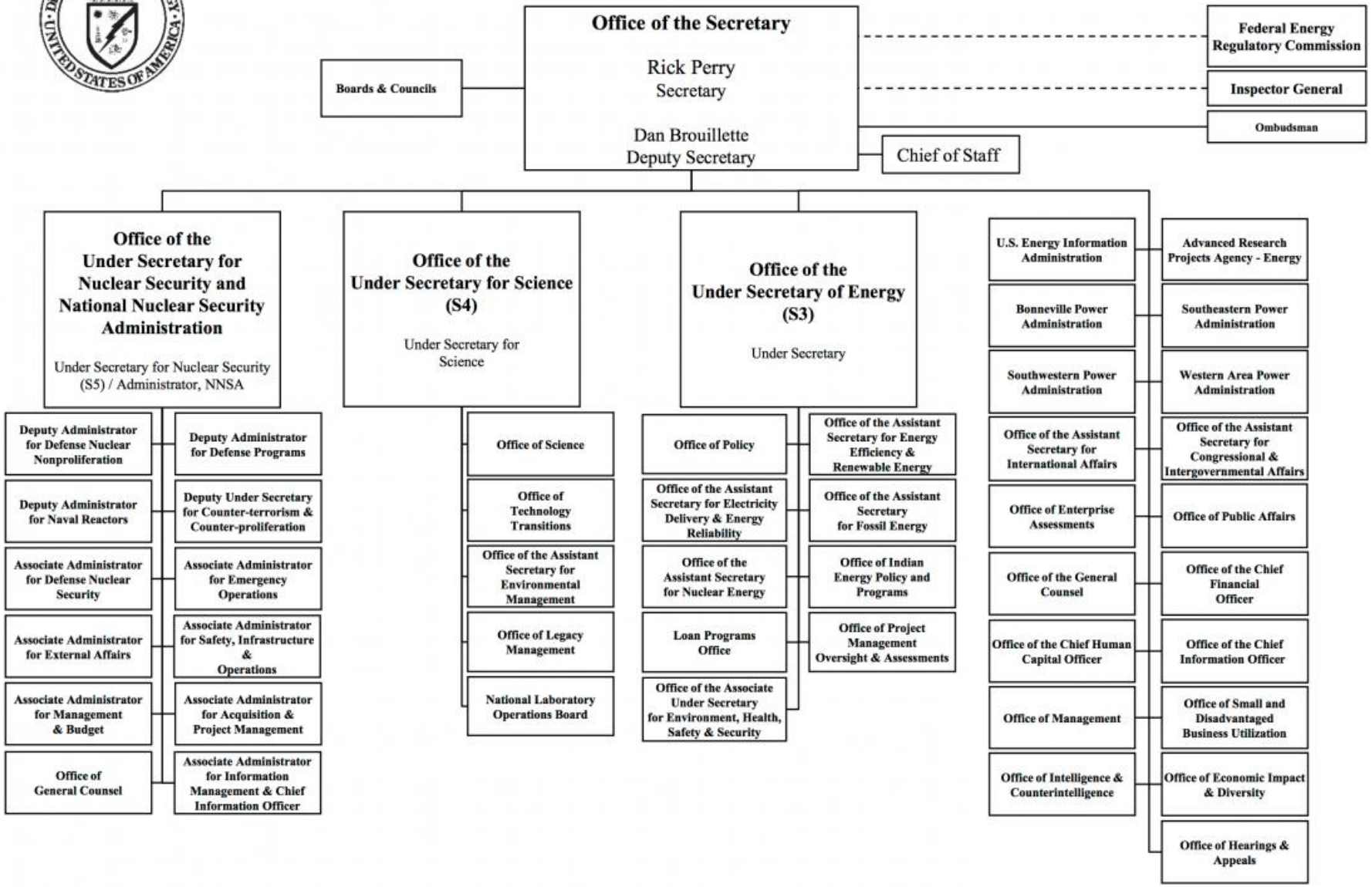
U.S. DEPARTMENT OF ENERGY | Office of Science

Biological and Environmental Research Update

BER Advisory Committee (BERAC)
Spring Meeting
April 25-26, 2018

Sharlene Weatherwax
Associate Director

DEPARTMENT OF ENERGY



BER Staff Changes

Roland Hirsch
(Retired January 2018)

Joanne Corcoran
(Retired December 2017)

Peter Wyckoff
AAAS Science and Technology Policy Fellow
(Completed Fellowship March 2018)

Seema Singh
Detailee from Sandia National Laboratory
(Started December 2017)
Welcome!!!

Todd Ringler
Detailee from LANL
(Completed April 2018)

Departing BERAC members

Thank you!!

Dennis Baldocchi
University of California Berkeley

Karin Remington
Private Consulting

Minghua Zhang
Stony Brook University

Anthony Janetos
Boston University

Judy Wall
University of Missouri, Columbia

New BERAC members

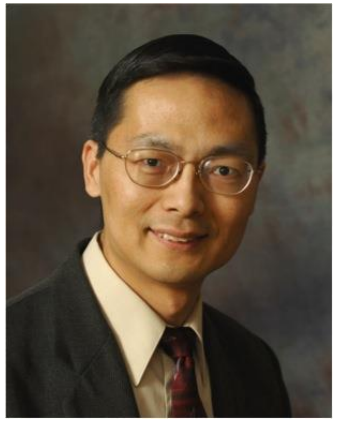
Julie Biteen
University of Michigan

Patrick Reed
Cornell University

Kerstin Kleese van Dam
Brookhaven National Laboratory

Matthew Shupe
University of Colorado – CIRES, ESRL

BERAC members recognized



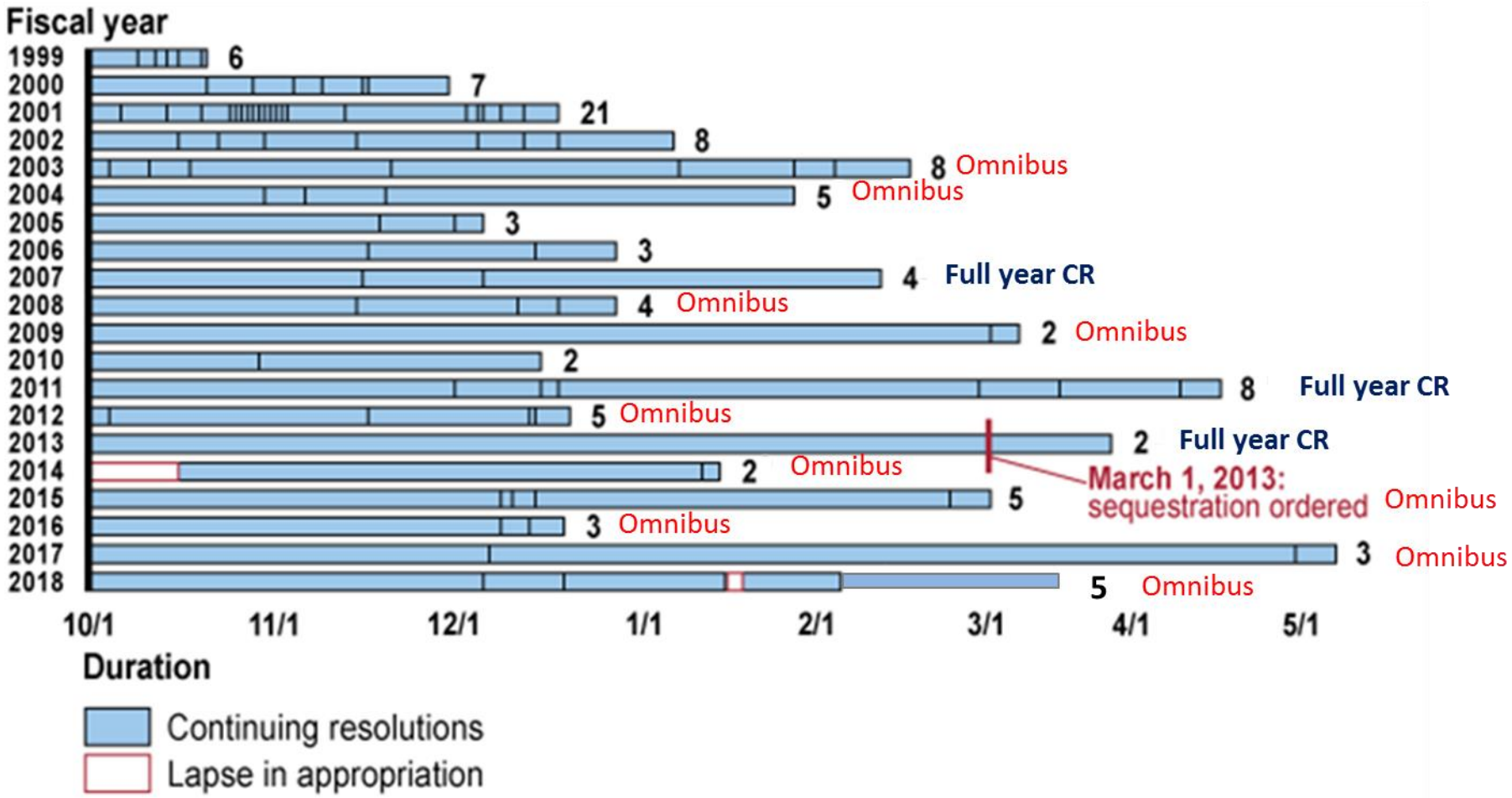
Huimin Zhao
2018 Marvin Johnson Award from the Biochemical Technology Division of the American Chemical Society

Gloria Muday
2017 Jon Reinhardt Award for Distinguished Teaching, Wake Forest University

Kerstin Kleese van Dam
32nd Annual Women's Recognition Award in the science category, Brookhaven Town Office of Women's Services

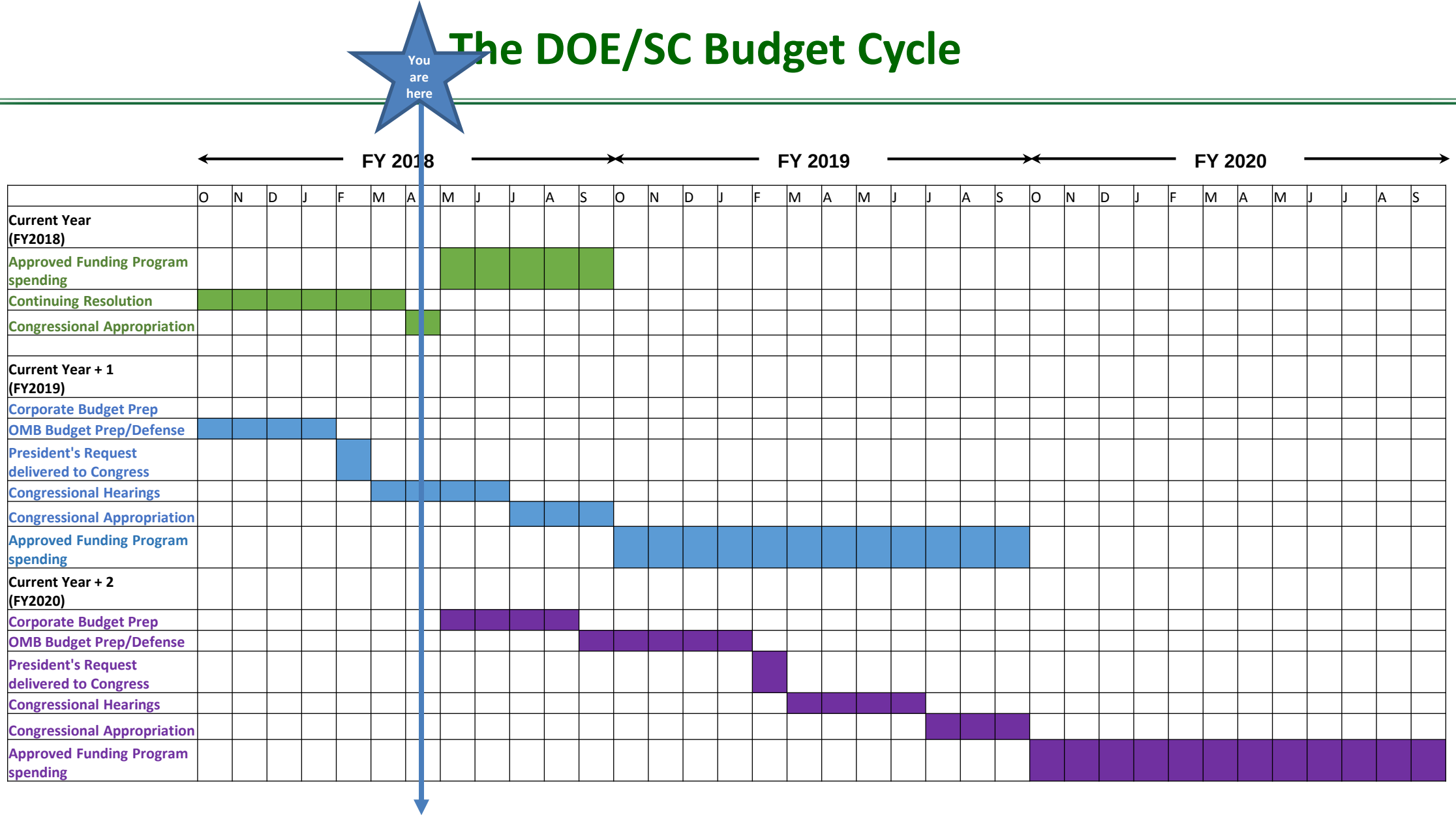
Gary Stacey
2018 St. Louis Academy of Science Fellows Award for outstanding achievement in science

BUDGET: Duration and Number of Continuing Resolutions



Source: GAO analysis of Congressional Research Service data. | GAO-18-368T

The DOE/SC Budget Cycle



FY2018 Appropriation

FY 2018 Congressional Action on R&D in the Department of Energy						
(budget authority in millions of dollars)	FY 2016	FY 2017	FY 2018 President's Request	FY 2018 House Mark	FY 2018 Senate Mark	**FY 2018 Enacted**
Total DOE R&D	15,007	15,958	13,436	15,445	16,322	**17,991**
Conduct of R&D	13,850	14,850	12,459	14,281	15,145	**16,672**
R&D Facilities	1,157	1,108	977	1,164	1,177	**1,319**
DOE R&D by Function						
Defense	6,307	7,099	7,306	7,305	7,082	**7,575**
General Science	5,305	5,344	4,433	5,345	5,501	**6,204**
Energy	3,394	3,515	1,697	2,795	3,739	**4,212**
Science						
Adv Sci Computing Res (ASCR)	621	647	722	694	763	**810**
Basic Energy Sciences (BES)	1,849	1,872	1,555	1,872	1,980	**2,090**
Biological & Environmental Research (BER)	609	612	349	582	633	**673**
Fusion Energy Sciences (FES)	438	380	310	395	232	**532**
High-Energy Physics (HEP)	795	825	673	825	860	**908**
Nuclear Physics	617	622	503	619	639	**684**
Science Labs Infrastructure	114	130	76	106	143	**257**
Other	304	305	286	301	300	**306**
Total Science	5,347	5,392	4,473	5,393	5,550	**6,260**

Discretionary Spending Caps, 2017-2019 With Adjustments
billions of nominal dollars

	FY 2017 Caps	Original FY 2018 Caps	Additions in BBA 2018	New FY 2018 Caps	Year-Over-Year Change	Original FY 2019 Caps	Additions in BBA 2018	New FY 2019 Caps	Year-Over-Year Change
Defense	$551	$549	+$80	**$629**	**14.1%**	$562	+$85	**$647**	**2.9%**
Nondefense	$519	$516	+$63	**$579**	**11.7%**	$529	+$68	**$597**	**3.1%**
Total	$1,070	$1,065	$143	**$1,208**	**12.9%**	$1,091	$153	**$1,244**	**3.0%**

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SCIENCE

For Department of Energy expenses including the purchase, construction, and acquisition of plant and capital equipment, and other expenses necessary for science activities in carrying out the purposes of the Department of Energy Organization Act (42 U.S.C. 7101 et seq.), including the acquisition or condemnation of any real property or facility or for plant or facility acquisition, construction, or expansion, and purchase of not more than 16 passenger motor vehicles for replacement only, including one ambulance and one bus, $6,259,903,000, to remain available until expended: *Provided*, That of such amount, $183,000,000 shall be available until September 30, 2019, for program direction.

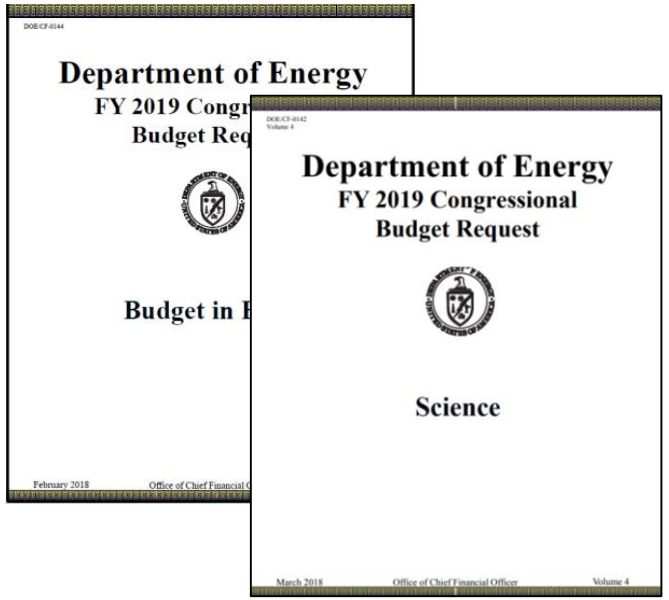
SC FY2019 President's Request summary

Office of Science

(B/A in thousands)

	FY 2017 Enacted Approp.	FY 2018 Enacted Approp.	FY 2019 President's Request	FY 2019 President's Request vs. FY 2017 Enacted		FY 2019 President's Request vs. FY 2018 Enacted	
ASCR	647,000	810,000	899,010	252,010	38.95%	89,010	10.99%
BES	1,871,500	2,090,000	1,850,000	-21,500	-1.15%	-240,000	-11.48%
BER	612,000	673,000	500,000	-112,000	-18.30%	-173,000	-25.71%
FES	380,000	532,111	340,000	-40,000	-10.53%	-192,111	-36.10%
HEP	825,000	908,000	770,000	-55,000	-6.67%	-138,000	-15.20%
NP	622,000	684,000	600,000	-22,000	-3.54%	-84,000	-12.28%
WDTS	19,500	19,500	19,000	-500	-2.56%	-500	-2.56%
SLI	130,000	257,292	126,852	-3,148	-2.42%	-130,440	-50.70%
S&S	103,000	103,000	106,110	3,110	3.02%	3,110	3.02%
PD	182,000	183,000	180,000	-2,000	-1.10%	-3,000	-1.64%
SBIR/STTR (SC)	.....	.....	.....	.....	.....	.....	.....
Subtotal, Science	5,392,000	6,259,903	5,390,972	-1,028	-0.02%	-868,931	-13.88%
SBIR/STTR (DOE)	.....	.....	.....	.....	.....	.....	.....
Rescission of PY Bal [d]	-1,028	.....	.....	1,028	-100.0%	.....	.....
Total, Science	**5,390,972**	**6,259,903**	**5,390,972**	**.....**	**.....**	**-868,931**	**-13.9%**
(SBIR/STTR total)							

[a] Rescission of PY funds in the amount -$239K for FY 2012 and older; -$239K for FY 2013; and -$550K for FY 2014 - FY 2016



Priorities:

- Continue operations of the national laboratories
- Continue exascale computing research for delivery in FY 2021
- Expand quantum computing and quantum information science efforts
- Provide sufficient funding to ensure robust cybersecurity program
- Focus on cutting edge, early stage research and development
- Maintain interagency and international partnerships

BER Budget

	FY2017 ($M) Enacted	FY 2018 ($M) Enacted	FY 2019 ($M) President's Request
Biological Systems Science	$306.7	$351.4	$318.5
Research	$227.2	$282.0	$248.5
Facilities	$79.5	$69.4	$70.0
Earth and Environmental Systems Sciences	$305.3	$321.6	$181.5
Research	$189.6	$206.6	$73.5
Facilities	$115.7	$115.0	$108.0
TOTAL	$612.0	$673.0	$500.0

FY2019 request fully supports all three BER user facilities
Priorities: Genomic Science (Bioenergy Research Centers), Earth and Environmental Systems Modeling

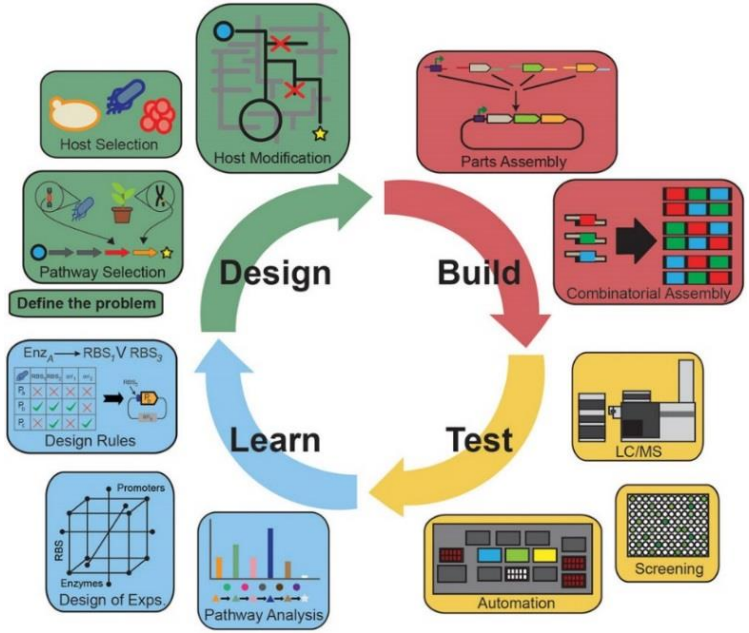
Biological Systems Science Research

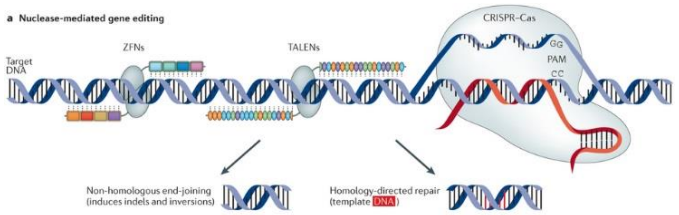
- Foundational Genomics supports secure biosystems design to understand genome structure and function.
- Environmental Genomics supports the understanding of environment-relevant microbiomes.
- The four BRCs will begin their second recompeted year of research to underpin efforts to produce innovative biofuels and bioproducts.
- The new Biomolecular Characterization and Imaging activity (combines Mesoscale to Molecules and Structural Biology) will develop new bioimaging, measurement, and characterization approaches using QIS materials.

- The JGI will continue providing genome sequencing data and analysis techniques, and will incorporate new capabilities to sequence, interpret, manipulate, and synthesize DNA in support of bioenergy and bioproducts research.

Secure Biosystems Design

- Leverages the significant, historical DOE leadership in gene-based research over the last two decades
- Accelerates DOE progress in developing gene-based understanding and manipulation technologies in biological systems relevant to DOE missions by:
  - Systematizing the underlying biological design principles for redesign and optimization of plant and microbial pathways
  - Expanding systems biology research to a broader range of platform species (plants, microbes)
  - Extending bioenergy research beyond the production of fuels to higher value chemicals and bioproducts

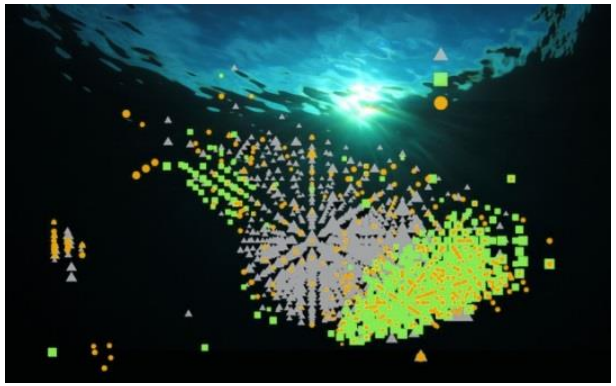


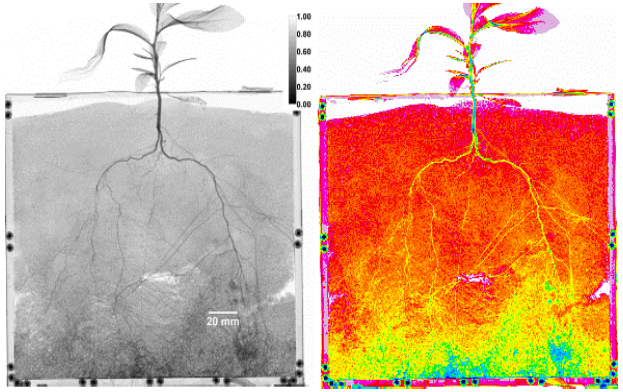


Developing genome-scale design tools to easily introduce synthetic genomes or Megabase-size gene constructs into microbes and plants to understand secure controls for microbe-plant interactions in the environment

Earth and Environmental Systems Sciences Research

- **Earth and Environmental Systems Modeling**
  - Reflects all previous modeling activities (Regional and Global Model Analysis, Earth System Modeling, and Integrated Assessment)
  - Prioritizes high resolution Earth system models with analytic tools for system diagnostics, intercomparisons, validation, visualization, and uncertainty quantification, focused on energy, infrastructure resilience, and security needs.
- Environmental System Science continues long-term field studies and subsurface understanding of the fate and transport of nutrients.
- The EMSL Facility will maintain a focus on biological and environmental molecular research and will initiate development of a next-generation Dynamic Transmission Election Microscope.
- ARM—see next slide





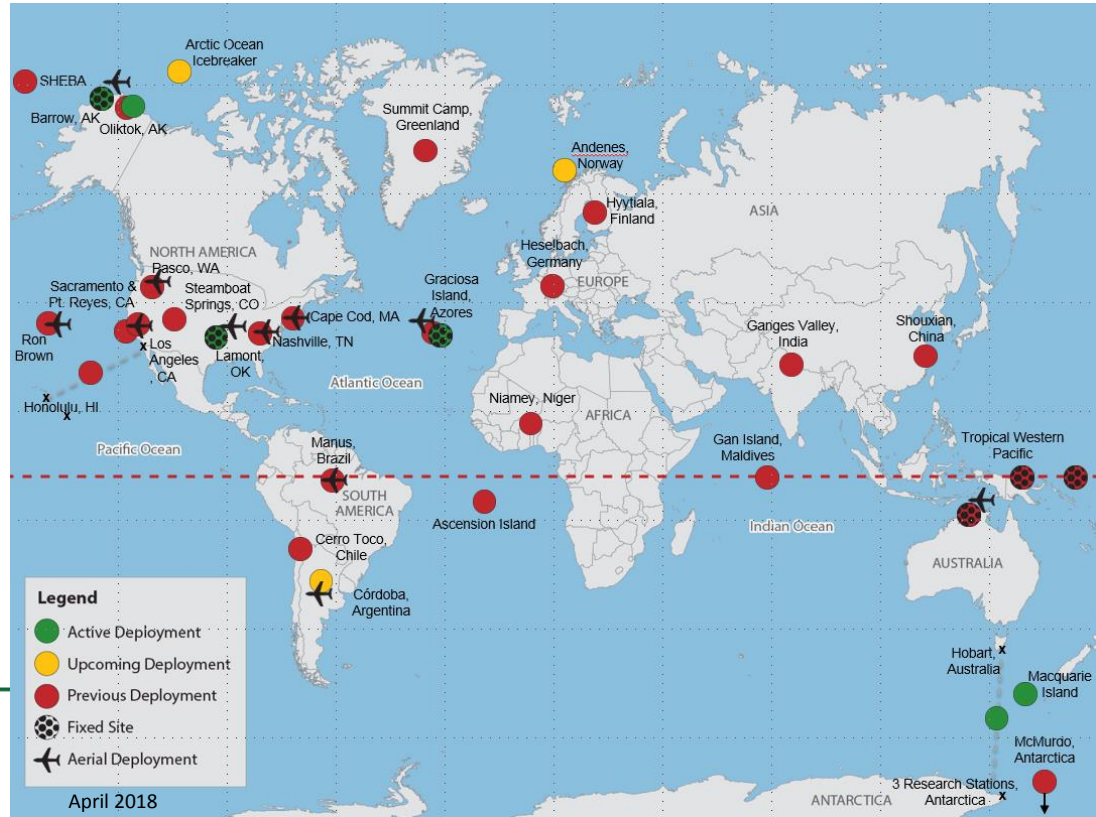
Atmospheric Radiation Measurement (ARM) Research Facility

Provides the research community with observations of aerosol, clouds, & radiation to advance fundamental understanding of atmospheric & Earth system processes

- 3 fixed measurement sites (Oklahoma, Alaska, Azores)
- Mobile facilities deploy to under-observed locations
- Remote sensing instrumentation including radiometers, lidars, scanning cloud radars
- Long-term data archive; all data freely available

In FY2019

- A mobile facility deploys to the Southern Andes for the Cloud, Aerosol, and Complex Terrain Interactions (CACTI) field campaign.
- Initiates acquisition and replacement of its manned aerial capability to:
  - Carry best-in-class sensors to measure aerosol, clouds, trace gases, radiation, and state properties
  - Be available to the ARM research community to participate in field campaigns
- Prepare for FY2020 mobile facility deployment to central Arctic, as part of the MOSAiC international expedition.



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Thank you!