

BERAC

February 26, 2015

**Sharlene Weatherwax, Associate Director of Science
Biological and Environmental Research**



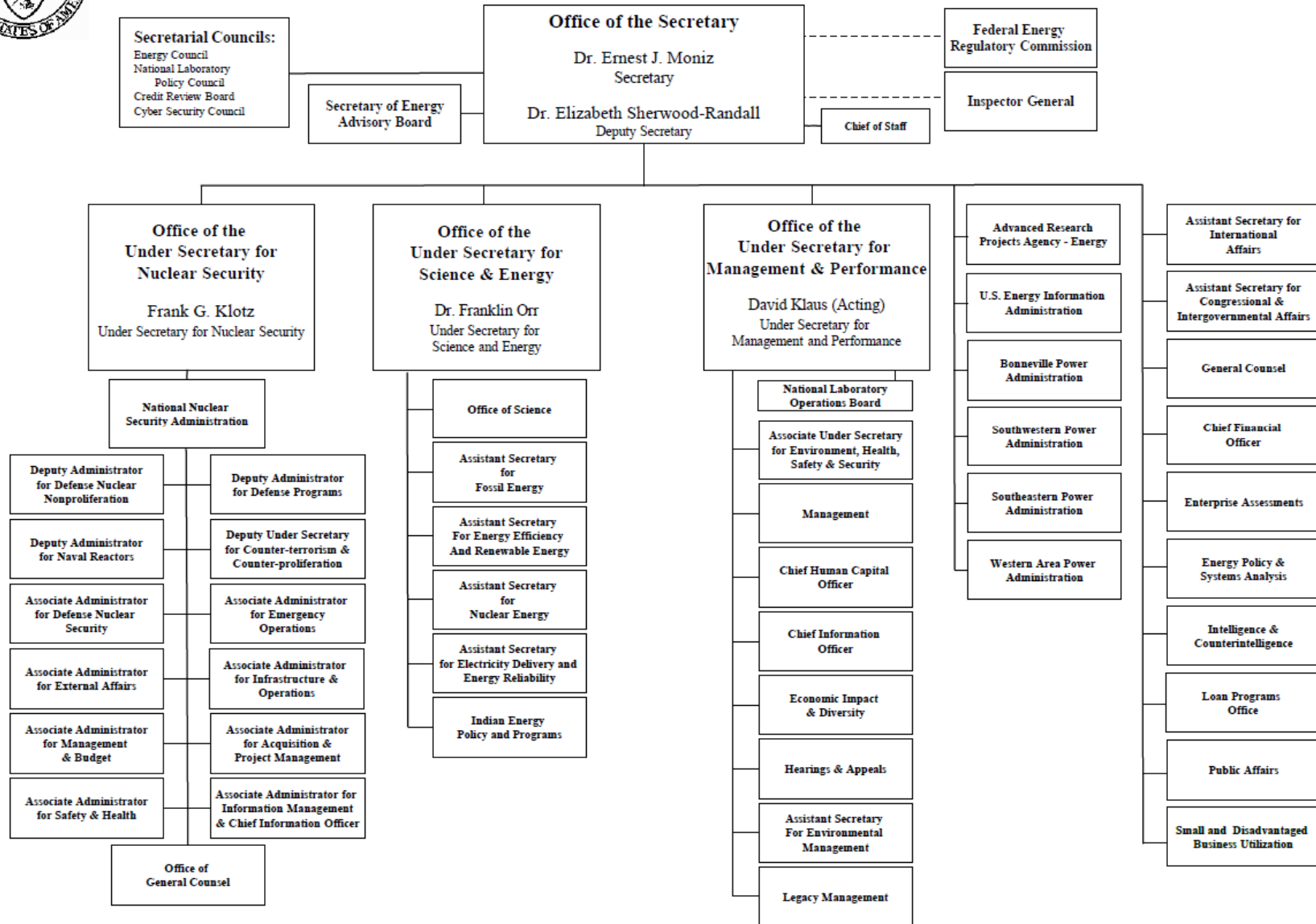
U.S. DEPARTMENT OF
ENERGY

Office
of Science

Office of Biological
and Environmental Research



DEPARTMENT OF ENERGY



17 Dec 2014

Departing BERAC Members – Thank you!



Warren Washington, Member since 1990

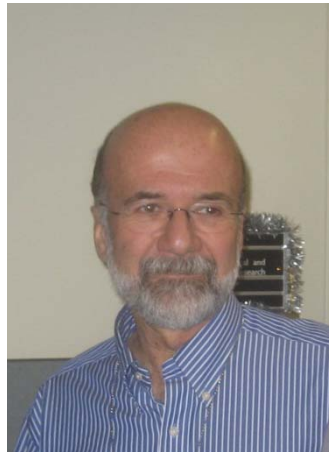


Gus Shaver, Member since 2011



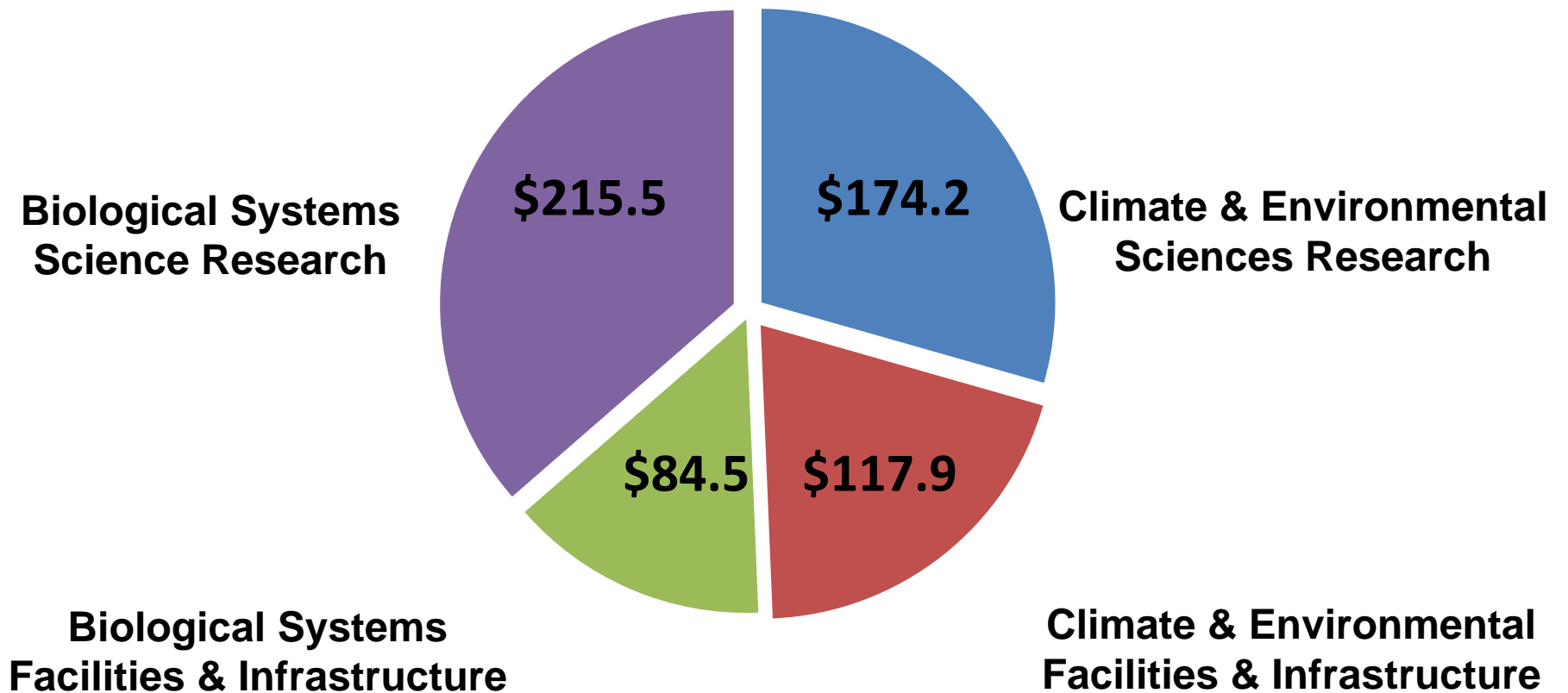
Judy Curry, Member since 2011

Personnel updates



David Thomassen retires

**BER FY 2015 Budget enacted
distribution
(\$ in millions)**



FY 2016 President's Budget Request— Office of Science

	FY 2014 Enacted Approp. (prior to SBIR/STTR)	FY 2014 Current Approp.	FY 2015 Enacted Approp.	FY 2016 President's Request	FY 2016 President's Request vs. FY 2015 Enacted Appropriation	
Advanced Scientific Computing Research	478,093	463,472	541,000	620,994	+79,994	+14.8%
Basic Energy Sciences	1,711,929	1,662,702	1,733,200	1,849,300	+116,100	+6.7%
Biological and Environmental Research	609,696	593,610	592,000	612,400	+20,400	+3.4%
Fusion Energy Sciences	504,677	495,855	467,500	420,000	-47,500	-10.2%
High Energy Physics	796,521	774,920	766,000	788,000	+22,000	+2.9%
Nuclear Physics	569,138	554,802	595,500	624,600	+29,100	+4.9%
Workforce Development for Teachers and Scientists	26,500	26,500	19,500	20,500	+1,000	+5.1%
Science Laboratories Infrastructure	97,818	97,818	79,600	113,600	+34,000	+42.7%
Safeguards and Security	87,000	87,000	93,000	103,000	+10,000	+10.8%
Program Direction	185,000	185,000	183,700	187,400	+3,700	+2.0%
SBIR/STTR (SC)	.....	128,539	.....	.....	.....	.....
Subtotal, Office of Science	5,066,372	5,070,218	5,071,000	5,339,794	+268,794	+5.3%
SBIR/STTR (DOE)	.....	64,666	.....	.....	.....	.....
Subtotal, Office of Science	5,066,372	5,134,884	5,071,000	5,339,794	+268,794	+5.3%
Use of Prior Year Balances (SBIR)	.....	-3,846	.....	.....	.....	.....
Rescission of Prior Year Balances	.....	.....	-3,262	.....	+3,262	-100.0%
Total, Office of Science	5,066,372	5,131,038	5,067,738	5,339,794	+272,056	+5.4%

http://science.energy.gov/~media/sc-1/pdf/2012/Dehmer_2016_Budget_Presentation.pdf

FY 2016 President's Budget Request

Office of Science is contributing to DOE Crosscuts

	Exascale Computing	Subsurface Engineering	Water Energy	Cyber Security	Total
Advanced Scientific Computing Research	177,894	0	0	0	177,894
Basic Energy Sciences	12,000	5,000	0	0	17,000
Biological and Environmental Research	18,730	0	11,800	0	30,530
Safeguards and Security	0	0	0	33,156	33,156
Total, Crosscuts	208,624	5,000	11,800	33,156	258,580

- Exascale:** The advanced computing crosscut addresses the needs of SC, NNSA, and the energy technology offices in the development of advanced computing technologies to provide better understanding complex physical systems. BES funding for exascale is the FY 2016 request for Computational Materials Sciences; BER funding is for Climate Model Development and Validation.
- Subsurface Engineering:** The subsurface crosscut addresses: intelligent wellbores using advanced sensors and adaptive materials; subsurface stress and induced seismicity to reduce risks associated with subsurface injection; permeability manipulation to control fluid flow; and new subsurface signals to enhance our ability to characterize subsurface systems.
- Water – Energy:** The water-energy crosscut addresses RD&D; robust datasets; and integrated models to inform decision-making, aligning with SC's leadership in high-performance computing and in modeling and simulation.
- Cybersecurity:** The SC request supports proper protection of the SC laboratories' computer resources and sensitive data. A review of the SC Cyber Security program recommended increased funding to protect the SC laboratories from cyber threats.

BER FY 2016 Budget

(\$ in millions)

	FY 2014	FY 2015	FY 2016
	Enacted	Enacted	Request
Biological Systems Science	\$311.8	\$299.9	\$294.3
Research	\$226.7	\$215.5	\$214.8
Facilities	\$85.1	\$84.4	\$79.5
Climate and Environmental Sciences	\$297.9	\$292.1	\$318.1
Research	\$178.2	\$174.2	\$202.4
Facilities	\$119.7	\$117.9	\$115.7
BER Total	\$609.7	\$592.0	\$612.4

Snapshot of BER FY 2016 Budget request

- **Genomic sciences** supports the Bioenergy Research Centers and expands efforts in biosystems design for bioenergy and renewable bioproducts
- **Mesoscale-to-molecules** research supports the development of new enabling technology to visualize key metabolic processes in plant and microbial cells at the subcellular and mesoscale
- **JGI** provides high quality genome sequence data, synthesis, and analysis
- **Radiological sciences** is completed
- **Climate and Earth System Modeling** expands efforts to focus on understanding the interdependencies of water, energy, and climate change
- A new activity in **Climate Model Development and Validation** combines advanced code development and numerical methods with ARM data to design a next-generation Earth system prediction model platform with sub-10 km resolution
- **ARM** continues measurements at fixed sites and mobile facilities. The ARM Southern Great Plains site expands efforts to include additional radars made available from closure of the ARM Tropical Western Pacific site
- **Climate and Environmental Data Analysis and Visualization** activity increases to employ server side analysis to simplify analysis of large scale observations with model generated data
- **EMSL** initiates research utilizing the High Resolution Mass Accuracy Capability

Climate Model Development and Validation

Model capabilities today

- Global and regional simulations to 50 km resolution in full integration mode; to 25 km with limited integration. *Unable to adequately represent extreme events, important to DOE and energy infrastructure.*
- No standard uncertainty quantification methodology applied to climate predictions. *Improved confidence in predictions is needed by scientists and stakeholders.*
- No common software infrastructure strategy in climate modeling community. *Current climate models will be unable to exploit DOE's next generation exascale computer architectures.*

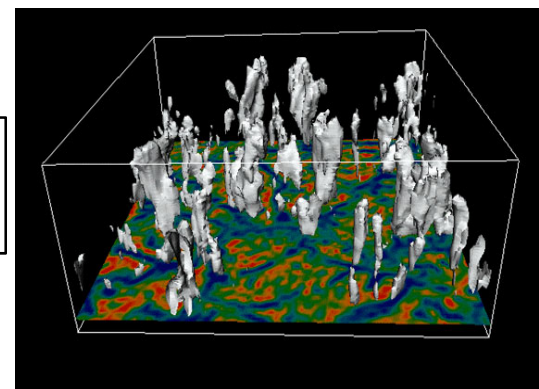
ARM Oklahoma



FY 2016 Research Efforts

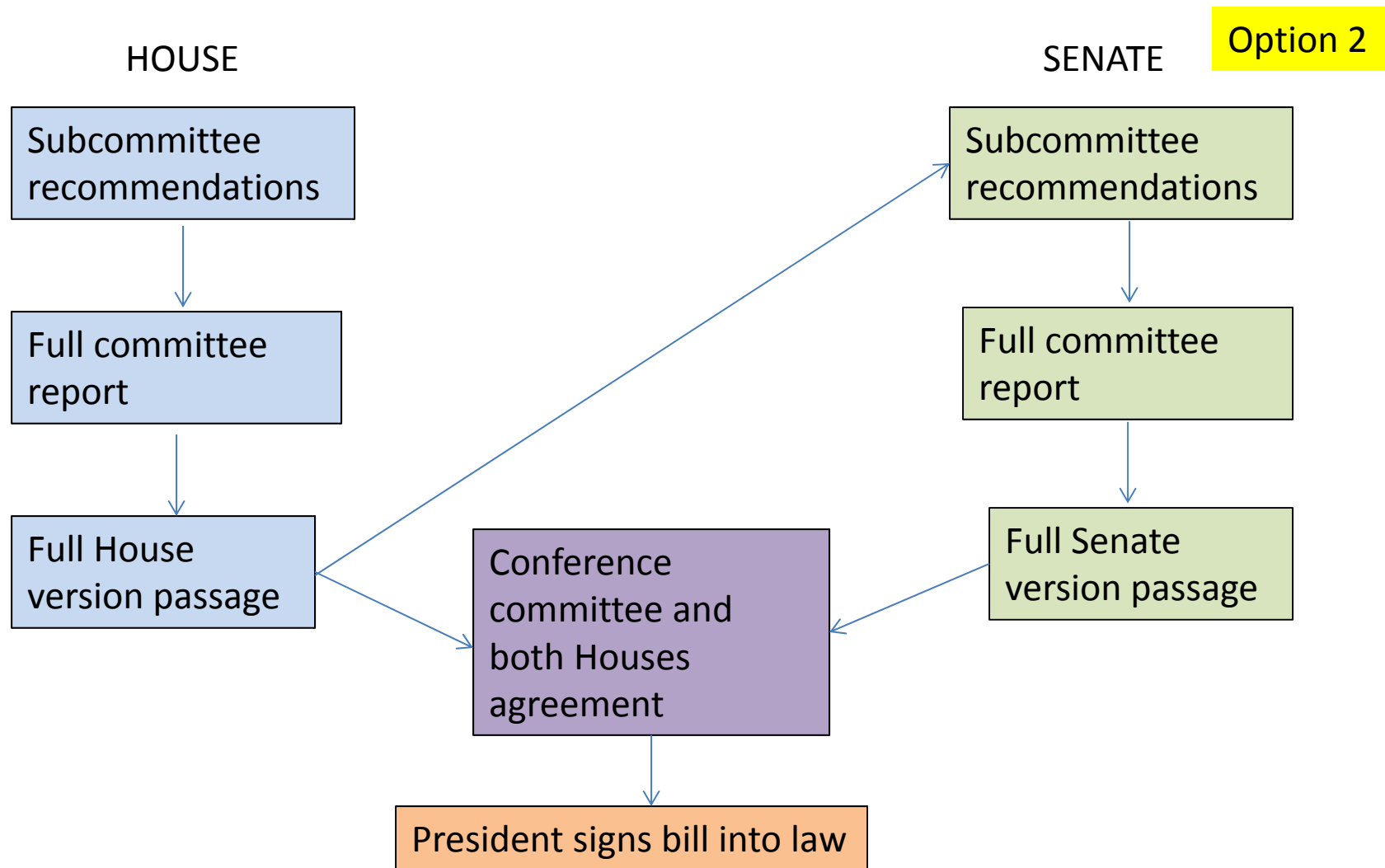
- Combine major upgrades in advanced software code development and validation against testbeds using the Atmospheric Radiation Measurement Climate User Facility (ARM) Oklahoma site.
- Develop scale-aware physics appropriate for very high resolution phenomena extending 10 km to below 1 km.
- Integrate scale-aware physics into improved climate modeling codes for use on next generation and exascale computers.

Best-in-class software and supercomputing



First ever modeling of high resolution extreme phenomena with Uncertainty Quantification methodologies

The Congressional Budget Process



Key events in the budget process that you don't see!

- White House sets priorities through the Office of Science and Technology Policy
- Senior DOE officials set priorities, define key initiatives
- Programs run workshops and gather input from public meetings and advisory committees
- Initial budget request is drafted to submit to OMB
- Office of Management and Budget briefings and discussions
- President's State of the Union previews high-level points in budget request
- Briefings and Testimony of senior DOE officials to House and Senate
- Community engagement—professional scientific societies, citizen groups, DOE labs

The DOE/SC Budget Cycle

