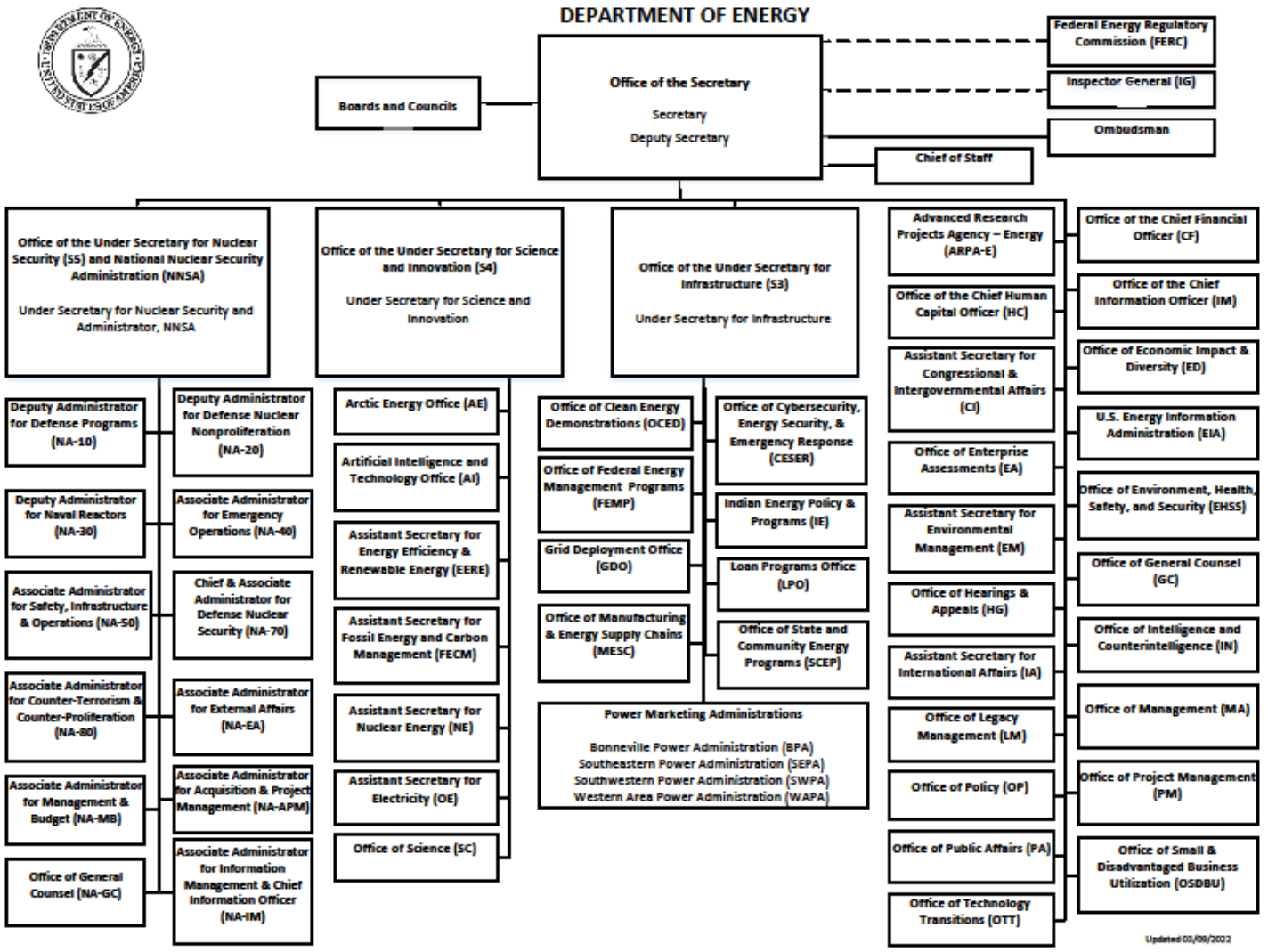
U.S. DEPARTMENT OF ENERGY | Office of Science

Biological and Environmental Research

BER Advisory Committee (BERAC)
Spring Meeting
April 21, 2022

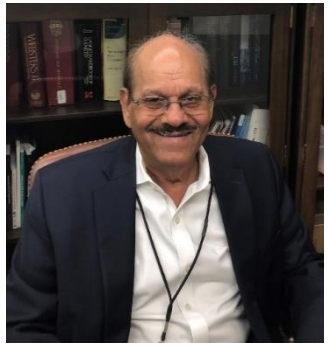
Sharlene Weatherwax
Associate Director

DOE Organization Chart



BER Staff Changes

Staff Departures



Dr. Prem Srivastava
Program Manager for
Biomolecular Characterization and Imaging
(December 2021)

Dr. Kent Peters
Program Manager for
Bioenergy Research Centers
(March 2022)

Administrative Support Changes

Ms. Ashley Cottom
Program Analyst
(*Arrived* April 2022)

Ms. Nver Mekerdijian
Program Analyst
(*Departed* March 2022)

BERAC *Completed* Membership

Jim Randerson
University of California, Irvine

Kate Calvin
PNNL

BERAC *New* Membership

Caroline Ajo-Franklin
Rice University

Cris Argueso
Colorado State University

Ramon Gonzalez
University of South Florida

Jorge Gonzalez-Cruz
City College of New York

Randi Johnson
USDA/NIFA-Retired

Xiaohong Liu
Texas A&M University

Dev Niyogi
University of Texas, Austin

Gemma Reguera
Michigan State University

Karen Seto
Yale University

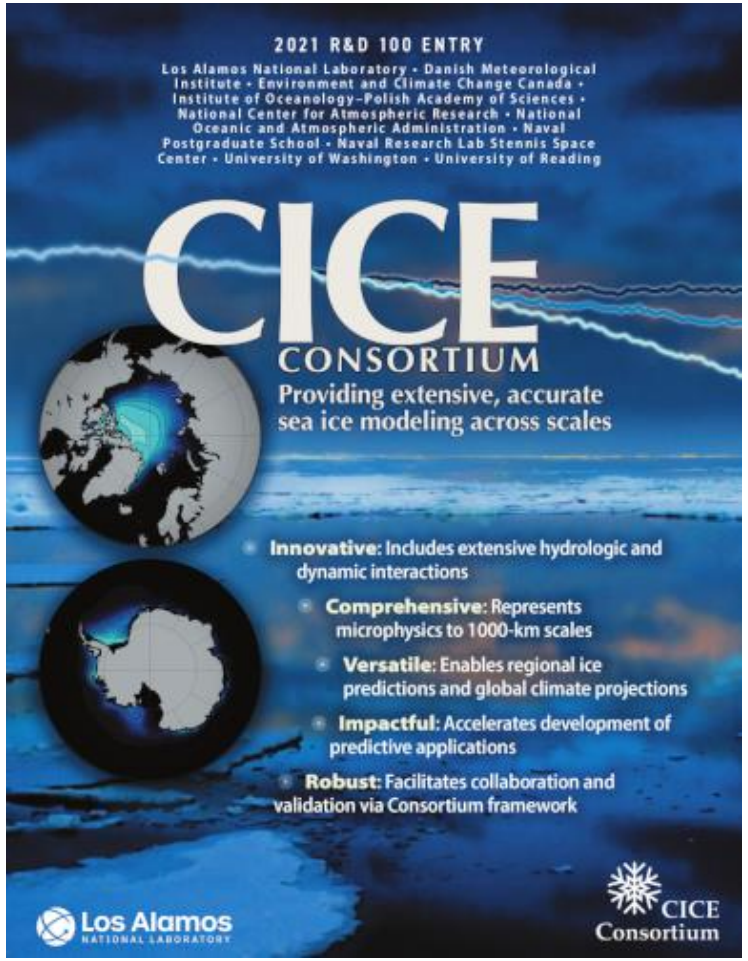
BERAC Researchers Recognized

Bruce Hungate
Northern Arizona State University
2021 AAAS Fellow

Bruno Basso
Michigan State University
2021 AAAS Fellow

Gemma Reguera
Michigan State University
2022 ASM Alice C. Evans Award

BER Researchers Recognized



https://www.youtube.com/watch?v=WxuCo15_Gy8

CICE Consortium won:

- 2021 R&D World's top 100 R&D innovation awards
- 2021 Gold Medal for Corporate Social Responsibility

CICE is a computational model that represents changes to sea ice and its interactions with the polar environment and ecosystems. CICE and its support infrastructure are the global standard for sea ice modeling across scales for multiple applications, including scientific research, climate modeling, forecasting, and operations planning.

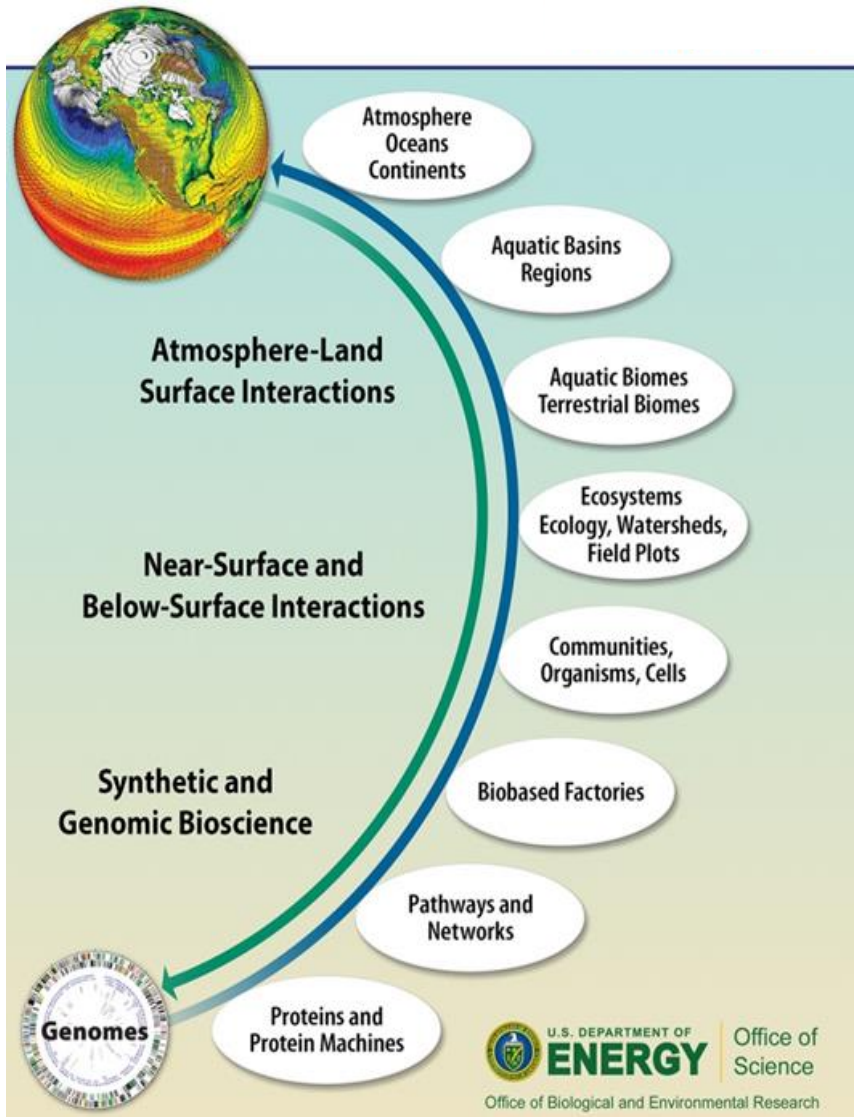
DOE, Office of Science, and BER

DOE Mission: To ensure America's security and prosperity by addressing its energy, environmental, and nuclear challenges through transformative science and technology solutions. (www.energy.gov/mission)

Office of Science Mission: To deliver scientific discoveries and major scientific tools to transform our understanding of nature and to advance the energy, economic, and national security of the United States. (www.energy.gov/science/mission)

Office of Biological & Environmental Research Mission: To support transformative science and scientific user facilities to achieve a predictive understanding of complex biological, Earth and environmental systems for energy and infrastructure security, independence and prosperity. (science.osti.gov/ber)

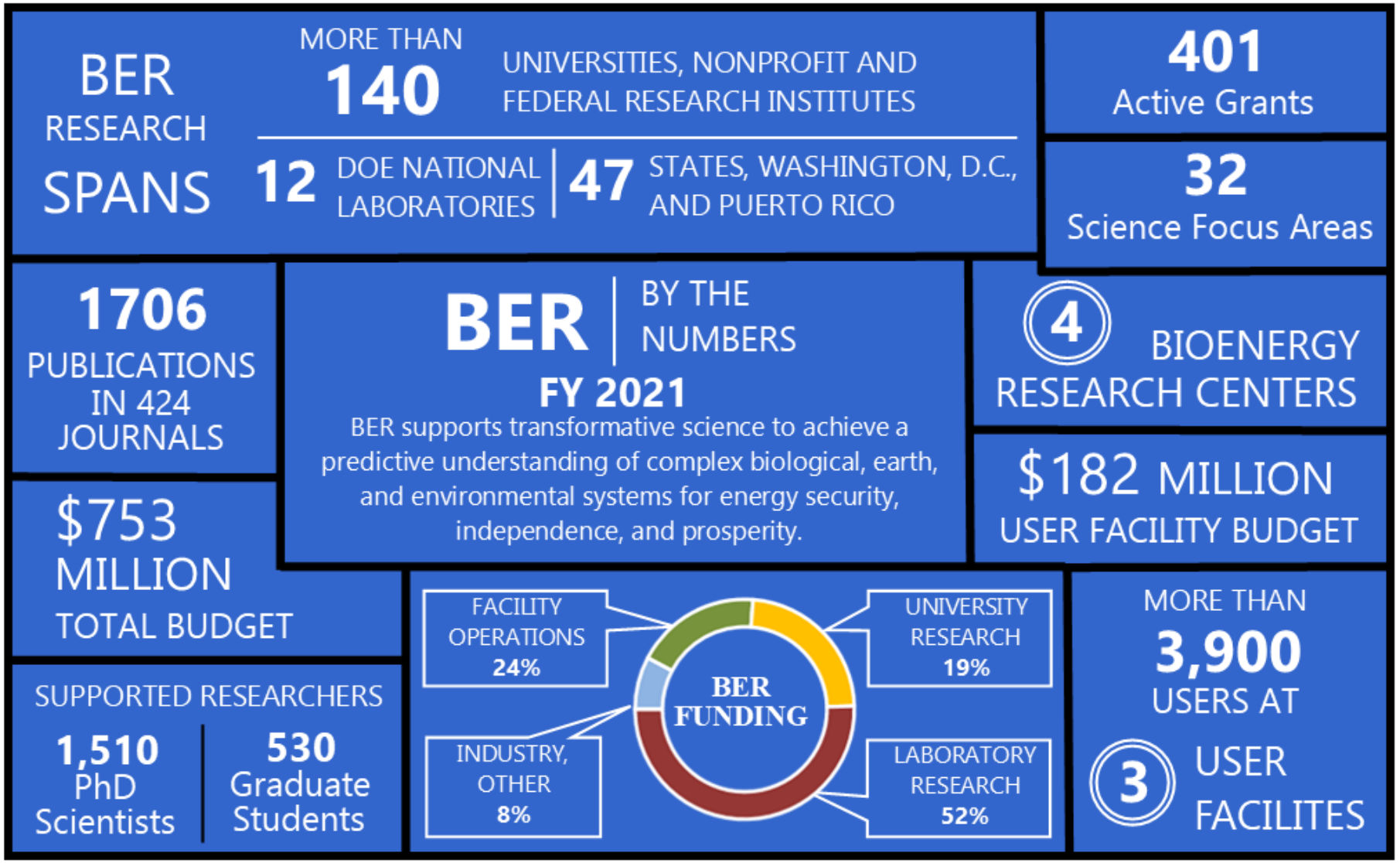
Biological and Environmental Research



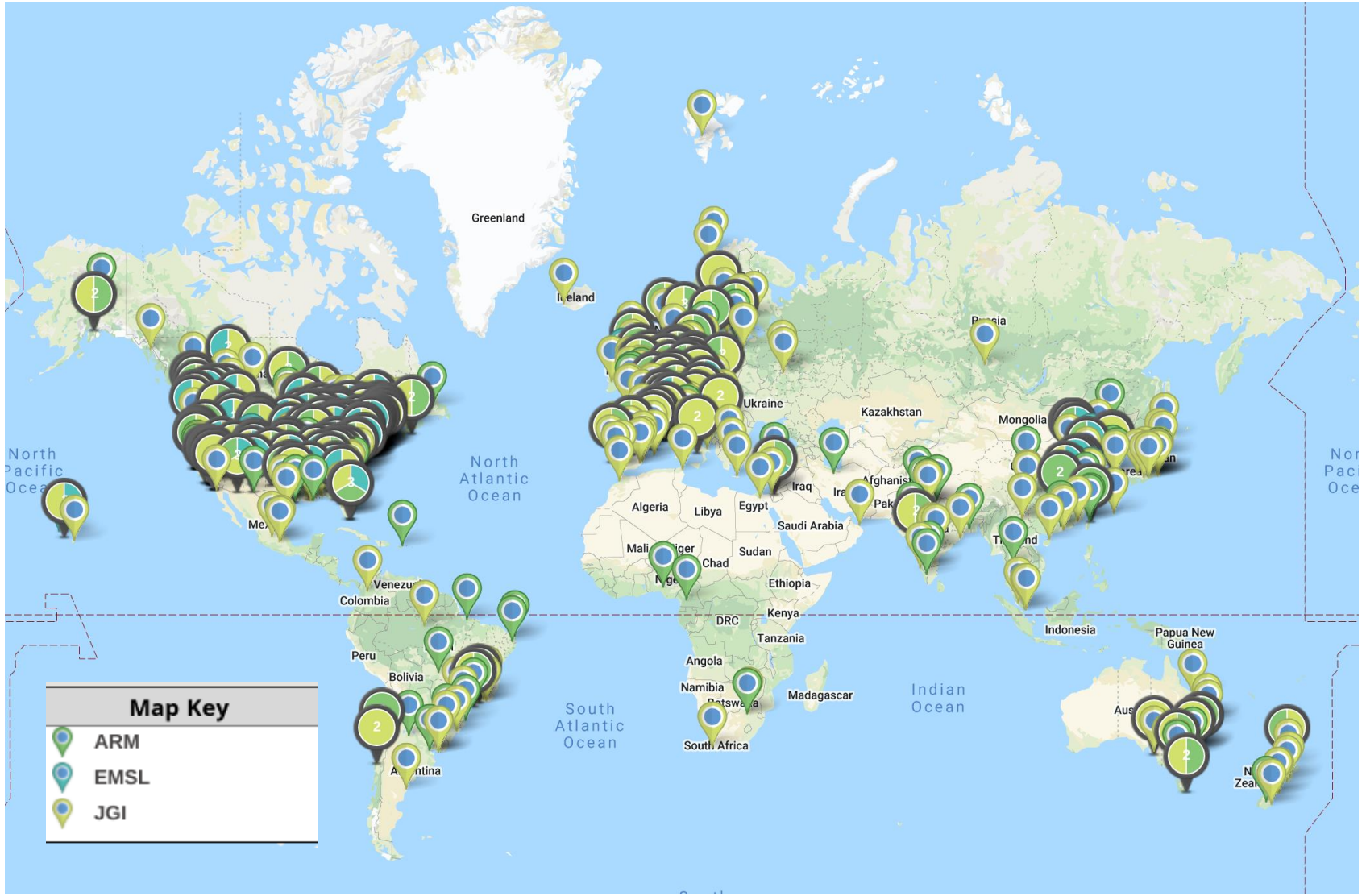
Predictive understanding of complex biological, earth, and environmental systems

- Explore the frontiers of genome-enabled biology
- Understand interdependencies of physical and biogeochemical Earth processes
- Enable innovation and discovery through user facilities

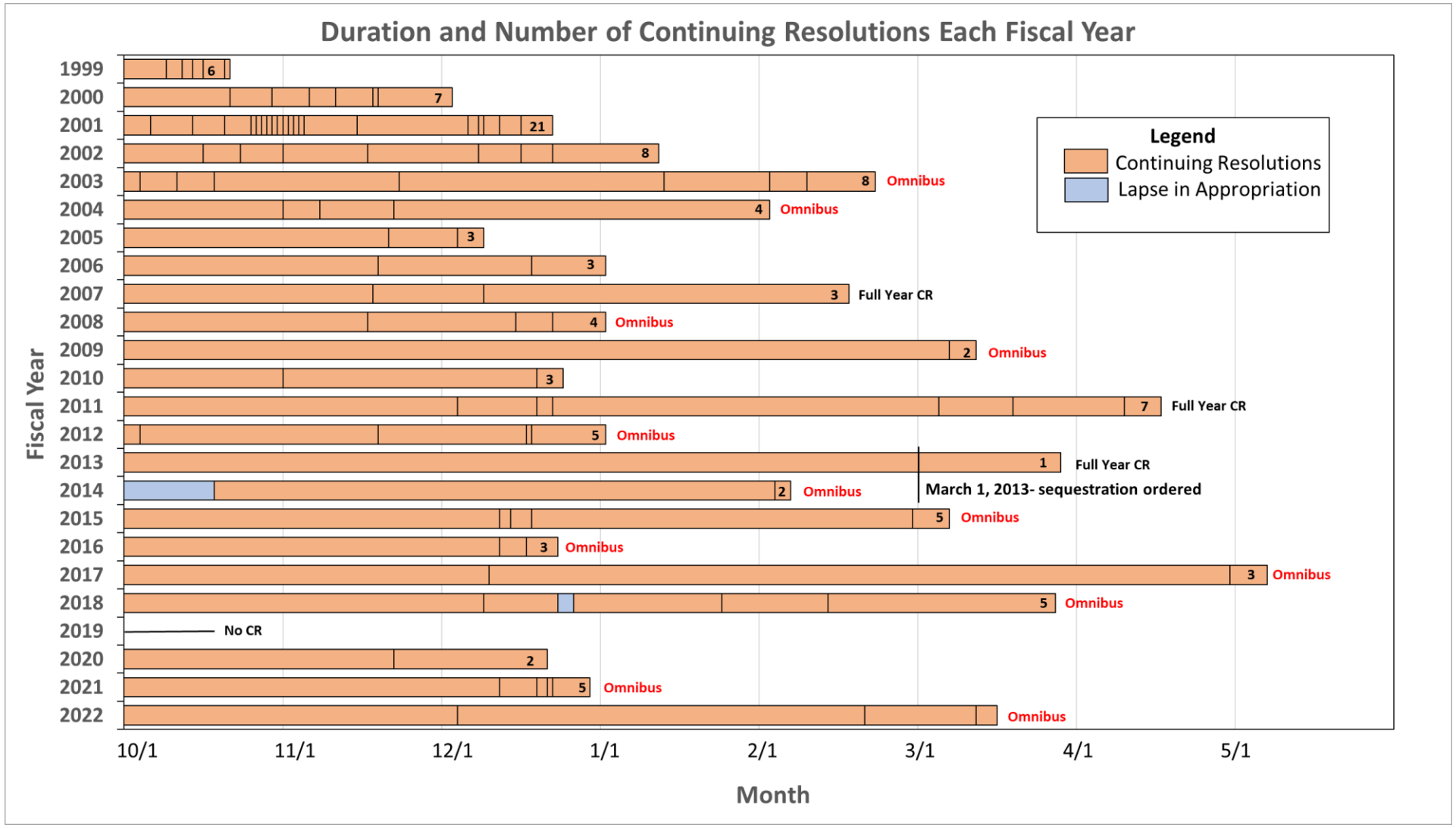
Biological and Environmental Research - at a glance



Distribution of BER Facility Users by Institution, 2020



Budget: Duration and Number of Continuing Resolutions



Reproduced from: GAO-18-368T, GAO Analysis of Congressional Research Service data.

BER - FY 2023 President's Request

(Dollars in thousands)

	FY 2021 Enacted	FY 2022 Enacted	FY 2023 Request	FY 2023 Request vs FY 2022 Enacted		FY 2023 Request vs FY 2021 Enacted	
Biological and Environmental Research							
Genomic Science	277,574	275,500	338,185	62,685	22.75%	60,611	21.84%
Biomolecular Characterization and Imaging Science	45,000	45,000	45,000	...	...	...	...
Biological Systems Facilities & Infrastructure	80,000	84,500	85,000	500	0.59%	5,000	6.25%
Biological Systems Science	**402,574**	**405,000**	**468,185**	**63,185**	**15.60%**	**65,611**	**16.30%**
Atmospheric System Research	36,000	36,000	39,000	3,000	8.33%	3,000	8.33%
Environmental System Sciences	87,777	114,000	127,500	13,500	11.84%	39,723	45.25%
Earth and Environmental Systems Modeling	100,674	105,000	118,000	13,000	12.38%	17,326	17.21%
Earth and Environmental Systems Sciences Facilities and Infrastructure	125,975	155,000	151,000	-4,000	-2.58%	25,025	19.87%
Earth and Environmental Systems Sciences	**350,426**	**410,000**	**435,500**	**25,500**	**6.22%**	**85,074**	**24.28%**
Total Biological and Environmental Research	**753,000**	**815,000**	**903,685**	**88,685**	**10.88%**	**150,685**	**20.01%**

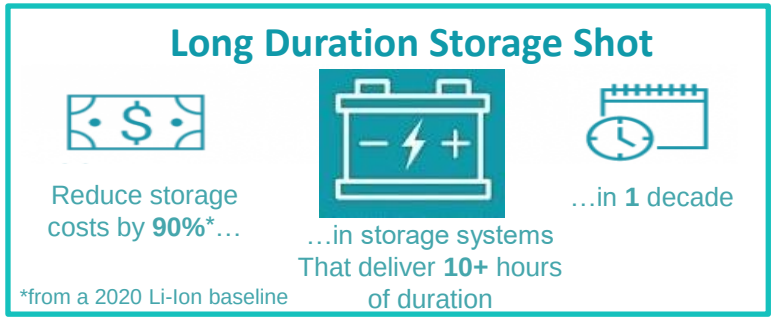
BER - FY 2023 Highlights--BSSD

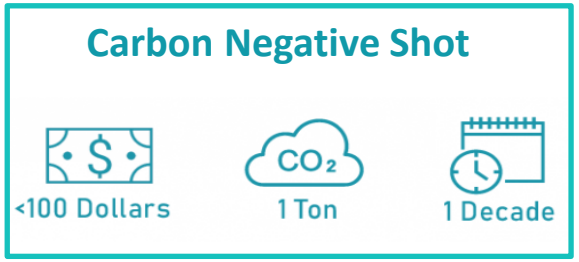
The FY 2023 Request of ~$904M for Biological and Environmental Research will:

- Support the four Bioenergy Research Centers (BRCs) which will be renewed (pending review) to initiate new cross-BRC collaborative research addressing clean energy challenges to underpin production of chemicals and bioproducts from sustainable biomass resources for translation of basic research results to industry
- Expand the Biopreparedness Research Virtual Environment (BRaVE) to link a broader set of next generation experimental research capabilities, data, and workflows within a single portal allowing distributed networks of scientists to work together on multidisciplinary research priorities and/or national emergency challenges
- Participate in the new Funding for Accelerated, Inclusive Research (FAIR) initiative to provide focused investment on enhancing biological research on clean energy, climate, and related topics at minority serving institutions, including attention to underserved and environmental justice regions. The activities will build beneficial relationships between MSIs and DOE national laboratories and facilities.
- Launch Energy Earthshot Research Centers (EERCs) to address key biological research challenges at the interface between currently supported basic research and applied research and development activities as part of the DOE SC Carbon Negative Earthshot

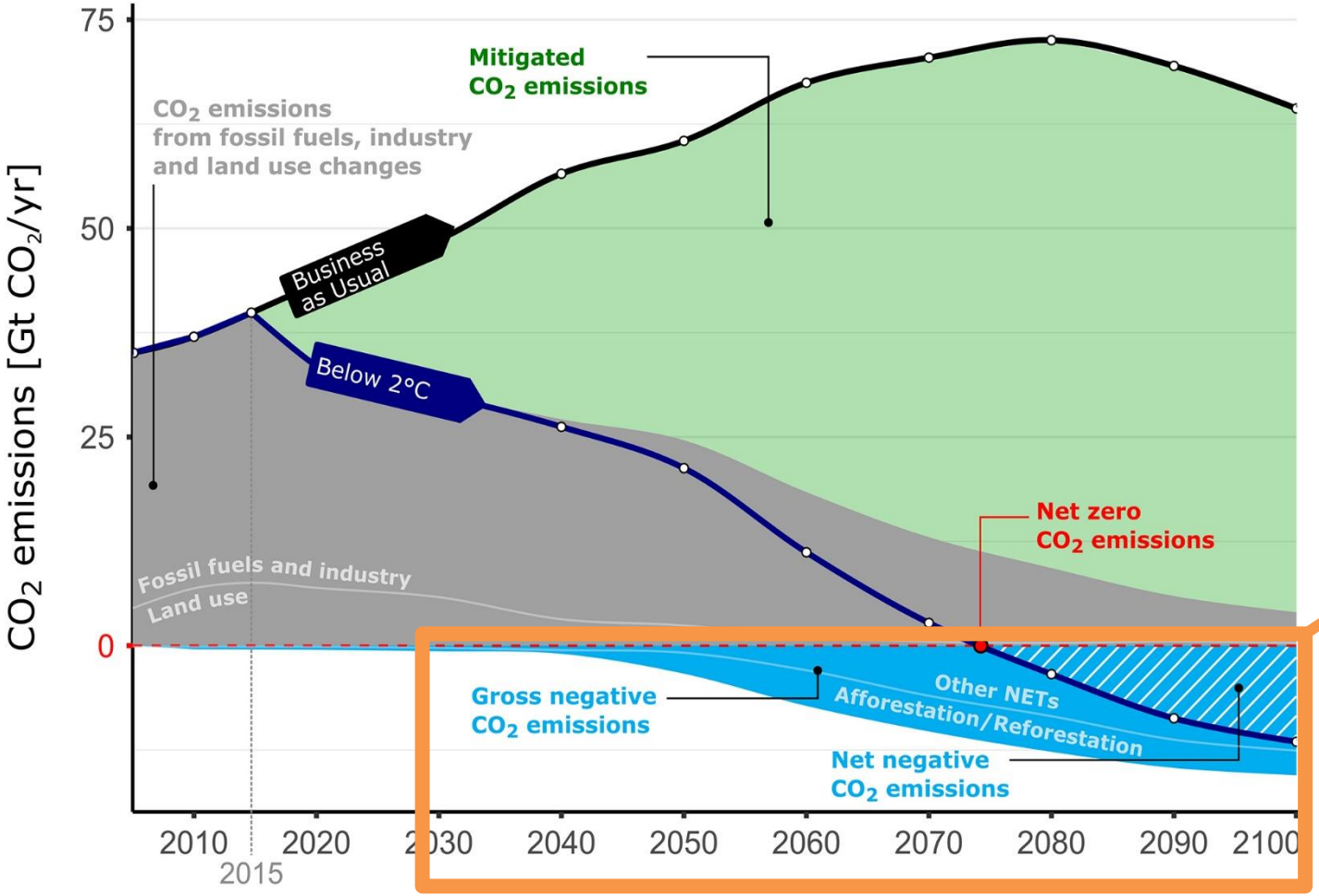
SC Energy Earthshots Initiative

- **Accelerates breakthroughs to realize abundant, affordable, and reliable clean energy solutions within the decade**
- **Addresses key research challenges at the interface of basic and applied research to bridge the R&D gap**
- **Initiates new research modality, Energy Earthshot Research Centers (EERCs)**
  - Advances foundational knowledge and state-of-the-art capabilities in experimental, theoretical, and computational sciences needed to realize new approaches and solutions
  - Brings together large, multi-investigator, multi-disciplinary teams
  - Coordinates closely with the Energy Technology Offices and existing research consortia/demonstration projects for a new era of cross-office research cooperation
- **EERCs will be complemented by small group awards focused on use-inspired fundamental research to address knowledge gaps that limit achievement of the Energy Earthshot goals**





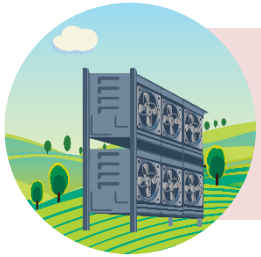
What is Carbon Dioxide Removal (CDR)?



What is CDR: *Approaches that capture carbon dioxide (CO_2) directly from the atmosphere and durably store it in geological, biobased, or ocean reservoirs, or in products to create* ***negative emissions.***

What is it not: Point source carbon capture of emissions from the fossil power sector and heavy industry.

Example CDR Pathways



Direct Air Capture with Storage (DACS)

Machines and processes that suck carbon dioxide directly out of the atmosphere and put it underground or into products

Bioenergy with Carbon Capture and Sequestration (BECCS)

Machines and processes that capture CO_2 from bioenergy facilities and store it underground

Enhanced Mineralization

Crushed rocks that are spread over land to absorb CO_2 from the air or from carbon dioxide-rich fluids (and others)

Soil Carbon Sequestration

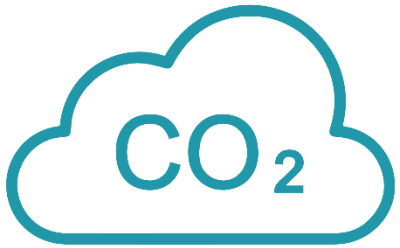
Practices and crops that increase the amount of carbon stored in the soils

and many more…

ENERGY earthshots
U.S. DEPARTMENT OF ENERGY

Carbon Negative

<100 Dollars



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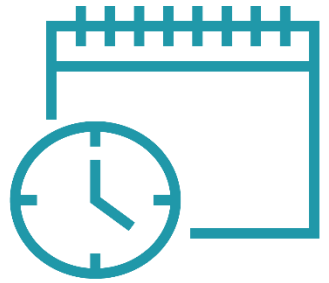

1 Decade

BER - FY 2023 Highlights--EESSD

- Expansion of Urban Integrated Field Laboratories (Urban IFLs) that will build integrated models and tools that improve our understanding of the interdependence of the natural and human components of the climate system
- Utilizing the enhanced National Virtual Climate Laboratory (NVCL), to serve as a one stop portal to advance access to climate science and as a partner to the Reaching a New Energy Sciences Workforce (RENEW) training initiative
- Continued planning for a network of climate resilience centers, affiliated with Historically Black Colleges and Universities (HBCUs) or Minority Serving Institutions (MSIs)
- The E3SM system will expand and enhance activities to utilize advanced software and AI/ML for running on future DOE exascale computer architectures, with version 3 released in FY 2023 together with a prototype 3 km atmosphere model
- New investments in AI methodologies and applications for improving Earth system predictability via new designs for hybrid modeling, efficient observing networks, and nonlinear data assimilation, and with new studies involving the nexus of energy and water
- Continue investments in coastal science with major efforts in the Chesapeake Bay, Puget Sound, and Great Lakes regions

Thank you!