U.S. DEPARTMENT OF ENERGY | Office of Science

Funding Opportunities at the DOE Office of Science for Early Career Scientists

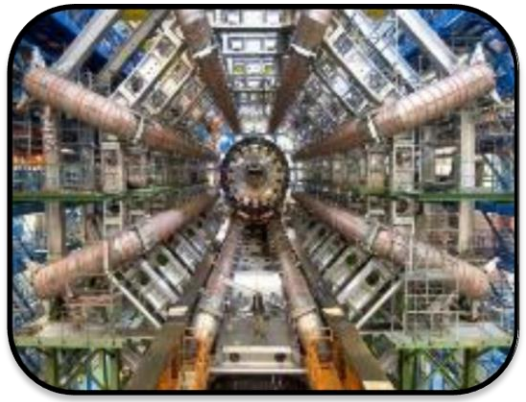
April 26, 2023

Gail McLean & Andy Schwartz

Basic Energy Sciences

Office of Science at a Glance

FY 2022 Enacted: $7.475B ($8.1B in FY23)



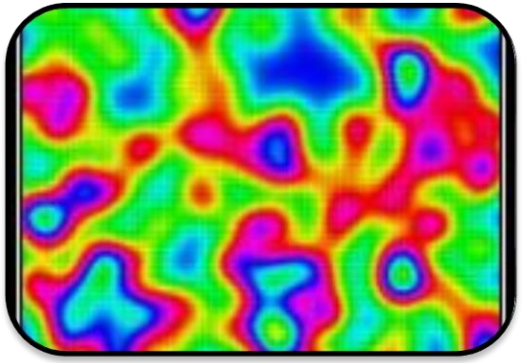
Largest Supporter of Physical Sciences in the U.S.

Funding at >300 Institutions, including 17 DOE Labs

Nearly 28,000 Researchers Supported

Nearly 36,000 Users of 28 SC Scientific Facilities

~38% of Research to Universities



Research: 40.2%, $3.003B

Facility Operations: 36.0%, $2.689B

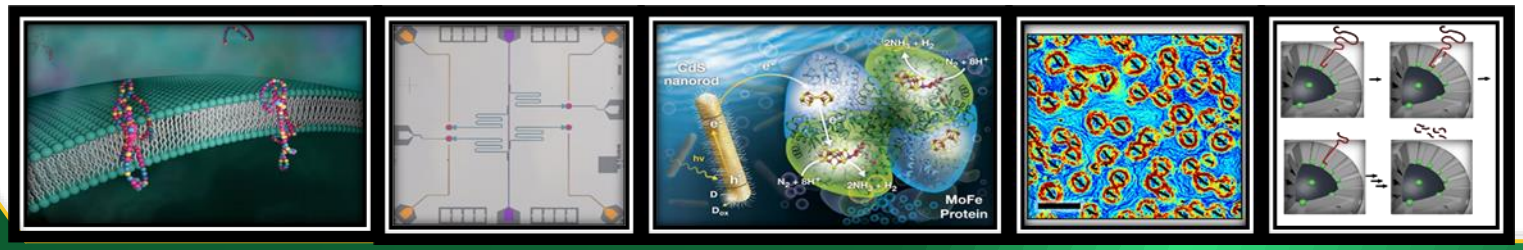
Projects/Other: 23.8%, $1.783B

The Office of Science Research Portfolio

Advanced Scientific Computing Research	• Delivering world leading computational and networking capabilities to extend the frontiers of science and technology
Basic Energy Sciences	• Understanding, predicting, and ultimately controlling matter and energy flow at the electronic, atomic, and molecular levels
Biological and Environmental Research	• Understanding complex biological, earth, and environmental systems
Fusion Energy Sciences	• Supporting the development of a fusion energy source and supporting research in plasma science
High Energy Physics	• Understanding how the universe works at its most fundamental level
Nuclear Physics	• Discovering, exploring, and understanding all forms of nuclear matter
Isotope R&D and Production	• Supporting isotope research, development, production, processing and distribution to meet the needs of the Nation
Accelerator R&D and Production	• Supporting new technologies for use in SC's scientific facilities and in commercial products

Basic Energy Sciences – Understanding Materials and Chemistry: From the Smallest Length Scales and Across Many Time Scales

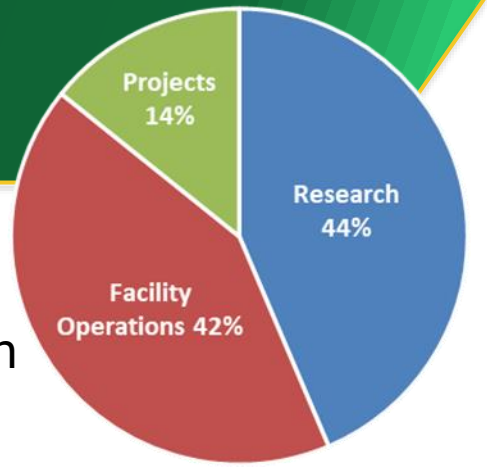
- **Supports basic research** through >1,500 active research awards (and review >1,500 applications with about 500 new/renew awards each year)
  - Knowledge and discoveries leading to new/improved materials and chemical processes relevant to a broad range of energy technologies
  - Expanding funding to institutions underrepresented in the portfolio
  - Home of the DOE Established Program to Stimulate Competitive Research (EPSCoR)
- **Operates 12 National User Facilities** that hosted over 15,000 users from many disciplines that cross the Office of Science
- **Manages 11 facility construction projects** for major upgrades



Basic Energy Sciences – Organization

Office of Basic Energy Sciences
Linda Horton
Associate Director

FY 2023
Appropriation
$2.5 B



Materials Sciences and Engineering Division
Andy Schwartz, Director

- Materials Discovery, Design and Synthesis
- Condensed Matter and Materials Physics
- Scattering and Instrumentation Sciences

Scientific User Facilities Division
Linda Horton, Acting Director

- Operations
- Construction

Chemical Sciences, Geosciences and Biosciences Division
Gail McLean, Acting Director

- Fundamental Interactions
- Photochemistry and Biochemistry
- Chemical Transformations

Collaborative Research Division
Andy Schwartz, Acting Director

- Energy Frontier Research Centers
- Energy Innovation Hubs
- Energy Earthshot Research Centers
- Cross-SC Coordination

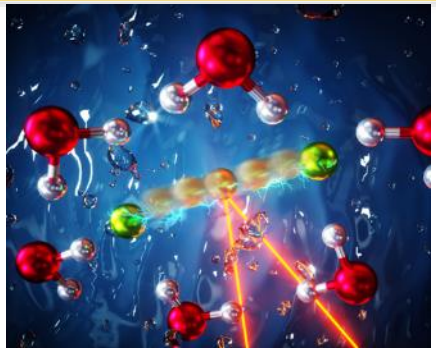
Research grouped by scientific topics, each impacting many energy technologies

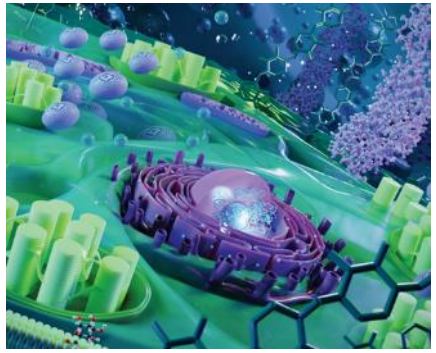
https://science.osti.gov/bes/About (See Organization Chart)

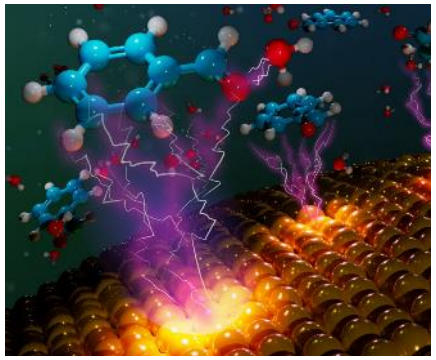
BES – The People…. Physicists, Chemists, Materials Scientists, Geoscientists, Biologists, and Engineers

Chemical Sciences, Geosciences & Biosciences Research

Broad Portfolio of Grand Challenge and Energy Use-Inspired Fundamental Research







Fundamental Interactions:

Control chemical reactivity and dynamics in gas and condensed phases and at interfaces

Photochemistry and Biochemistry:

Molecular mechanisms of light energy capture and its conversion into chemical and electrical energy

Chemical Transformations:

Chemical catalysis, synthesis, separation, stabilization, and transport processes, from atomic to geologic scales.

Crosscutting Research Themes:

Chemical Mechanisms for Clean Energy; Ultrafast Chemistry; Chemistry at Complex Interfaces; Charge Transport and Reactivity; Reaction Pathways in Diverse Environments; Chemistry in Aqueous Environments

Chemical Sciences, Geosciences & Biosciences Division

Gail McLean, Acting Division Director

Fundamental Interactions Team

Team Lead - Tom Settersten

- **Atomic, Molecular, & Optical Sciences** — Tom Settersten (acting)
- **Gas Phase Chemical Physics** — Wade Sisk
- **Condensed Phase and Interfacial Molecular Science** — Gregory Fiechtner
- **Computational and Theoretical Chem. & Computational Chemical Sciences** — Aaron Holder
- **Quantum Information Science** — Tom Settersten (acting)

Photochemistry and Biochemistry Team

Team Lead – Gail McLean

- **Photosynthetic Systems** — Stephen Herbert
- **Physical Biosciences** — Kate Brown
- **Solar Photochemistry & Fuels from Sunlight Energy Innovation Hub** — Chris Fecko, Jenny Roizen

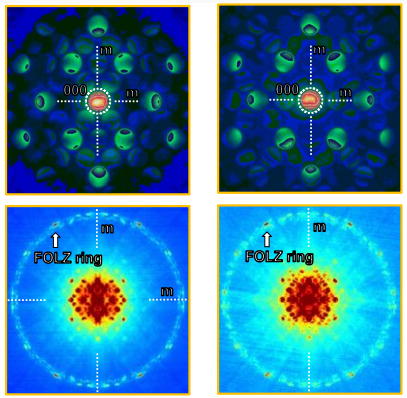
Chemical Transformations Team

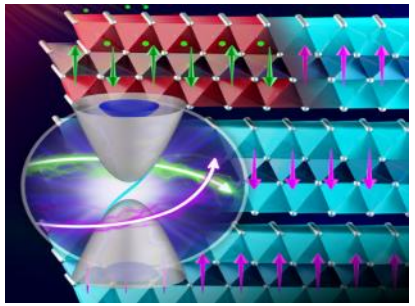
Team Lead – Raul Miranda

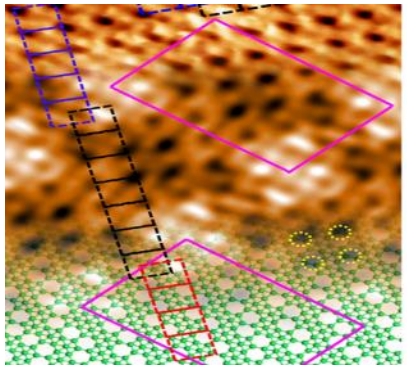
- **Catalysis Science** — Viviane Schwartz, Chris Bradley
- **Separation Science** — Raul Miranda (acting)
- **Heavy Element Chemistry** — Philip Wilk
- **Geosciences** — James Rustad

Materials Sciences and Engineering Research

Broad Portfolio of Grand Challenge and Energy Use-Inspired Fundamental Research







Scattering and Instrumentation Sciences:
Investigation of photon, neutron, and electron interactions with matter to characterize structures, dynamics, and functionality

Condensed Matter and Materials Physics:
Exploration of phenomena in condensed matter, such as quantum behavior and response to environmental stimuli

Materials Discovery, Design, and Synthesis:
Understanding synthesis and materials dynamics to discover/design new materials via innovative physical, chemical, and bio-molecular routes

Crosscutting Research Themes:
Clean energy materials research; Quantum materials;
Theory, computation, data science; Materials synthesis;
Science across length and time scales; Non-equilibrium dynamics;
In-situ, operando, and multi-modal characterization

Administrative Staff
Teresa Crockett

Materials Science and Engineering Division

Andy Schwartz, Director

Shawn Chen
AAAS S&TP Fellow

Materials Discovery, Design, and Synthesis Team

Team Lead – Mike Markowitz

Materials Chemistry

PMs – Craig Henderson and Chris Chervin

Biomolecular Materials

PM – Aura Gimm

Synthesis and Processing Science

PM – James Dorman

Batteries and Energy Storage Hub & Integrated Energy Research

PMs – Craig Henderson and John Vetrano

Condensed Matter and Materials Physics

Team Lead – Mick Pechan

Experimental Condensed Matter Physics

PM – Claudia Cantoni

Theoretical Condensed Matter Physics

PMs – Claudia Mewes and Matthias Graf

Physical Behavior of Materials

PM – Refik Kortan

Mechanical Behavior and Radiation Effects

PM – John Vetrano

Quantum Information Science

PM – Athena Sefat

Scattering and Instrumentation Sciences

Team Lead – Helen Kerch

X-Ray Scattering

PM – Lane Wilson

Neutron Scattering

PM – Mike Fitzsimmons

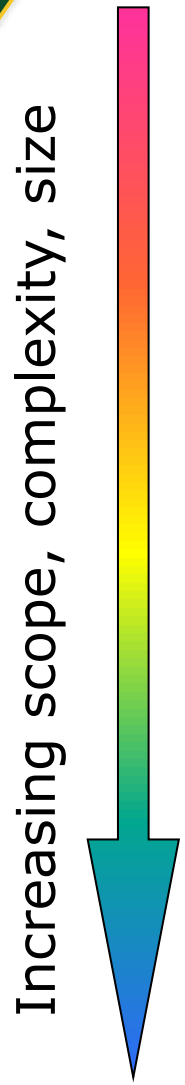
Electron and Scanning Probe Microscopies

PM – Jane Zhu

Experimental Program to Stimulate Competitive Research (DOE EPSCoR)

PM – Tim Fitzsimmons

BES-Supported Research Awards Range from Single PI to Large Team Modalities



- **Core Research (~1,500 awards)**

  Single investigators (~$150K/year) and small groups ($500K-$2M/year), ~3-year awards, fundamental research crosses all BES core research activities. Annual SC FOA open year-round. Includes SC Early Career Research Program awards (5-year awards, separate annual FOA) and awards under topical FOAs determined by DOE priorities.

- **Energy Frontier Research Centers (51 awards)**

  $2M-$4M/year research centers for 4-year award terms; teams focus on fundamental research described in Basic Research Needs Workshop reports. Recompetition every two years; next FY 2024.

- **Energy Earthshot Research Centers (New in FY 2023)**

  Team science to understand the phenomena critical for the Energy Earthshots' goals

- **Computational Materials & Chemical Sciences (21 awards)**

  $2M-$4M/year research centers for 4-year award terms; teams focus on delivering open-source, validated software for materials and chemistry by design for leadership class computing platforms.

- **Energy Storage & Fuels from Sunlight Hubs (3 awards)**

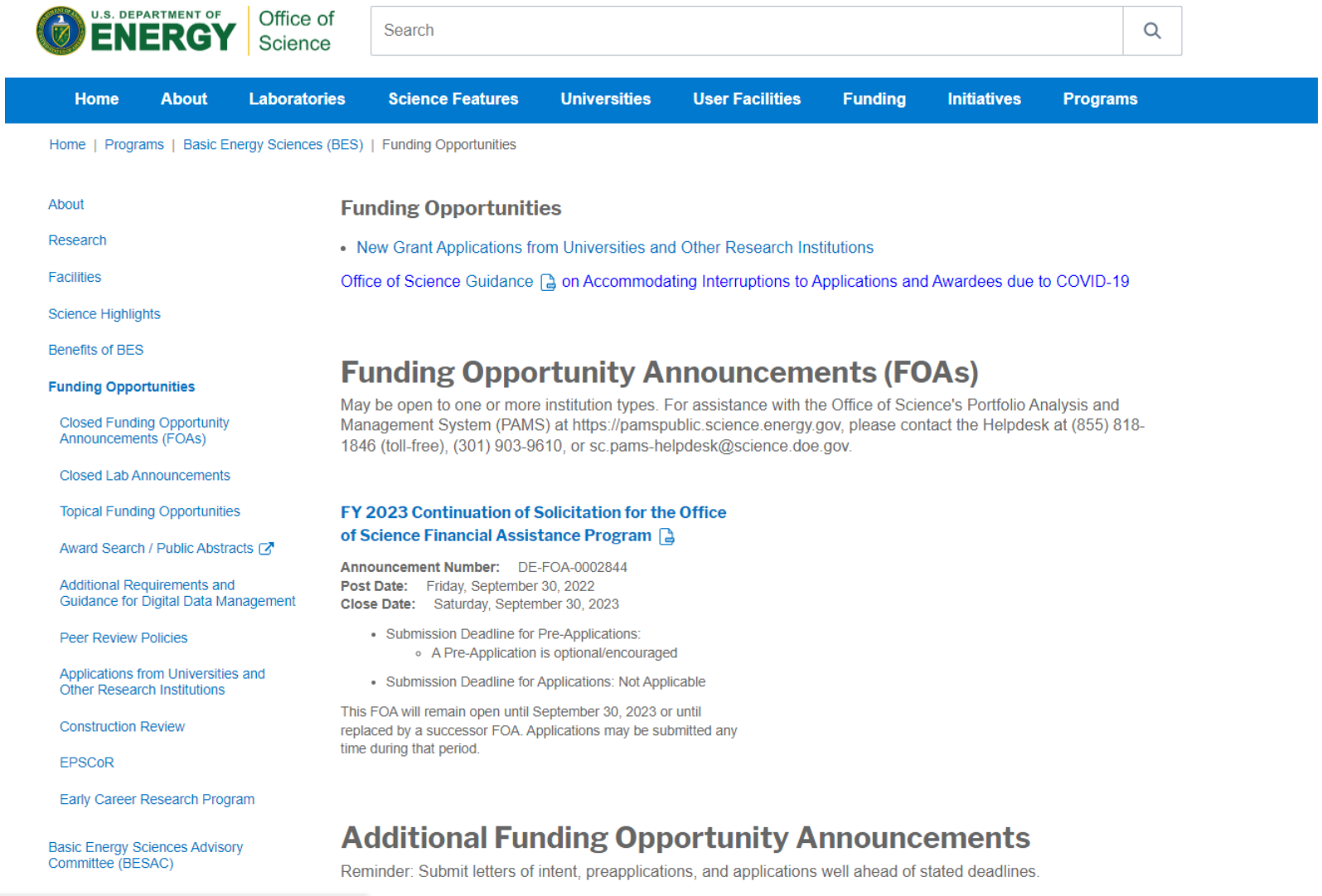
  Launched in 2010 ($8M-$25M/year, 5-year awards), focus on research topics that have proven challenging for traditional funding modalities and for which success could be transformative to science and technology. Project goals, milestones, and management structure are a significant part of the Hubs. Recompetition of the Batteries and Energy Storage Hub funding in FY 2023.

- **National QIS Research Centers (5 awards across SC)**

  5-year awards established in FY 2020 (~$25M/year/award). BES science is included in all awards.

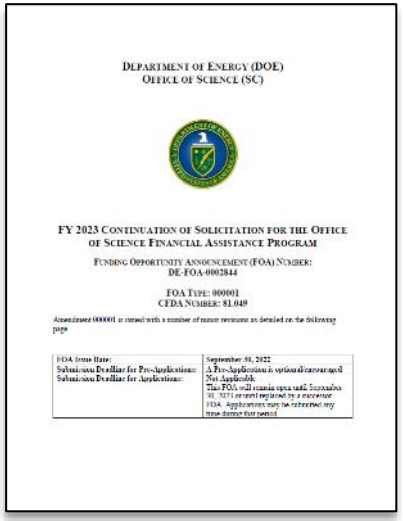
Funding Opportunities

How to Find BES Funding Opportunity Announcements



Continuation of Solicitation for the Office of Science Financial Assistance Program (annual "Open Call")

- The annual, broad, open solicitation that covers all research areas in the Office of Science and is open throughout the Fiscal Year for university applicants (not DOE National Lab)
- For BES, the solicitation includes brief descriptions of 22 core research areas, with current priorities/areas of interest and contact information for program managers (contacting program managers is encouraged)
- For the Open Call BES identifies the following "overarching research priorities" relevant to multiple core research areas:
  - Fundamental Science to Enable Clean Energy
  - Critical Materials/Minerals
  - Fundamental Science to Transform Manufacturing
  - Artificial Intelligence and Machine Learning (AI/ML)
  - Quantum Information Science (QIS)


DEPARTMENT OF ENERGY (DOE)
OFFICE OF SCIENCE (SC)

FY 2023 CONTINUATION OF SOLICITATION FOR THE OFFICE OF SCIENCE FINANCIAL ASSISTANCE PROGRAM

FUNDING OPPORTUNITY ANNOUNCEMENT (FOA) NUMBER:
DE-FOA-0002844

FOA TYPE: 000001
CFDA NUMBER: 81.049

If you want to submit a proposal to the BES Open Call:

- BES uses the "open call" to solicit proposals for its core programs
  - Open call is a continuous process (no fixed deadline for submission)
  - Reviews take 4 – 6 months to complete
  - Awards are made based on strength of the merit review and available resources
  - Proposals can be held up to one year for consideration
- Proposal/Review Process
  - Contact program manager, preferably by email, to discuss research ideas
  - White papers/pre-proposals are encouraged but not required for academic research
  - All proposals are peer reviewed
- Funding levels
  - Peer review will assess requests versus research needs (10 CFR 605)
  - Typical academic awards support 1 summer month for the PI plus students/postdoc
  - Multiple PI teams are allowed

Additional BES Funding Opportunities in FY 2023 (all closed)

- **Annual Early Career FOA**: Supports the development of individual research programs for outstanding scientists early in their careers in areas supported by the Office of Science; all BES core research areas and facilities operations
- **Accelerate:** New in FY 2023, supports research to accelerate the transition of science advances to technologies, enhances the science foundation for the bridge across the "valley of death" between basic and applied research
- **FAIR FOA:** Funding for Accelerated, Inclusive Research on topics that cross the Office of Science, supports research at non-R1 minority serving institutions (MSIs) and emerging research institutions, including partnering with DOE National Laboratories and facilities and R1 MSIs
- **RENEW FOA:** Doubling the FY 2022 investment, the SC-wide Reaching a New Energy Science Workforce initiative leverages SC's world-unique National Laboratories and user facilities to provide internships for students at academic institutions currently under-represented in the research portfolio
- **EPSCoR FOA:** Funding for U.S. states and territories that do not have large federally-supported academic research programs. FY 2023 focused on larger-team implementation awards that facilitate development of research infrastructure in the EPSCoR jurisdictions
- **Energy Earthshot Research Centers and Science Foundations:** New in FY 2023, fundamental research to advance the goals of the DOE Energy Earthshot Initiative

Office of Science Early Career Research Program

FOA Scope:

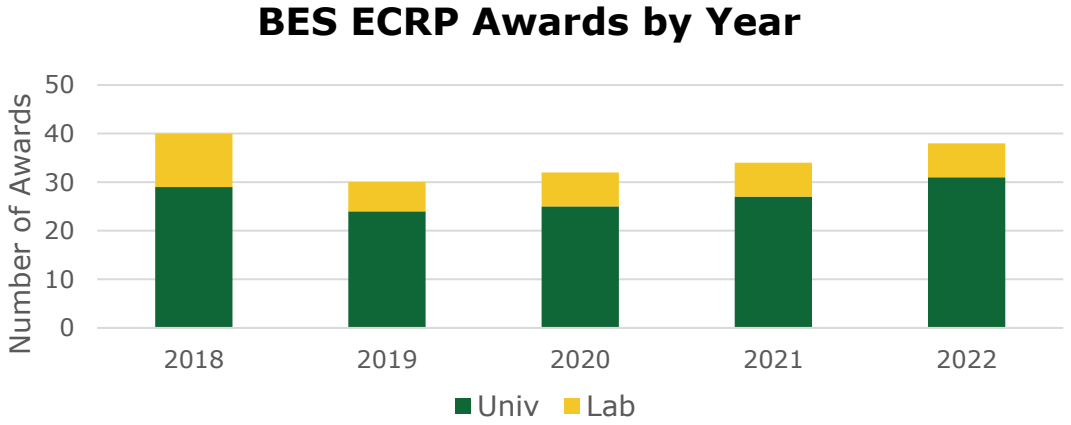
- Support the development of individual research programs of outstanding scientists early in their careers and to stimulate research careers in the areas supported by the Office of Science.
- All BES core research areas participate, including Scientific User Facilities
- Topics alternate to maintain reasonable applicant pool, ease reviewer burden, and improve success statistics.

FOA Details:

- **Eligible Applicants**: Untenured university professors on tenure track and DOE Lab Scientists, both within 12* years of PhD; each applicant may apply a maximum of three times; extension for major life events of at least 3 months
- **Typical funding**: University: $175K/yr for 5 years; DOE Lab: $500K/yr for 5 years
- **Timeline**: Typically released in Fall; Awards start in Summer

Active BES Awards (2018 – 2022)

- 40 states and 88 unique institutions
- 8 new institutions in 2022 (since program inception)
- 28 awards to EPSCoR institutions; 4 new in 2021
- 1 HBCU & 17 HSI awards; 3 HSI new in 2022



https://science.osti.gov/early-career

Office of Science Graduate Student Research (SCGSR) Program

The SCGSR Program provides supplemental awards to outstanding graduate students to spend 3 to 12 months conducting part of their doctoral thesis/dissertation research at a host DOE national laboratory/facility in collaboration with a DOE laboratory scientist.

- Graduate students must apply online through the online application system.
- The application requires a research proposal and letters of support from both the graduate student's thesis advisor and the collaborating DOE laboratory scientist.
- Student's research and proposed SCGSR project must be aligned with one of the identified SCGSR priority research areas defined by the SC Program Offices and specified in the solicitation.
- Applications proposing to use an SC user facility must apply for user facility time separately.

Award Benefits:

- A monthly stipend of up to $3,600/month for general living expenses
- Reimbursement of inbound/outbound traveling expenses to/from the host DOE laboratory/facility of up to $2,000

(Award payments are provided directly to the student)

Eligibility:

- U.S. Citizen or Lawful Permanent Resident
- Qualified graduate program & Ph.D. Candidacy
- Graduate research aligned with an SCGSR priority research area
- Establishment of a collaborating DOE laboratory scientist at the time of application

2023 Solicitation 1 – Application Due May 3, 2023, 5PM ET

More Information: https://science.osti.gov/wdts/scgsr
Program Contact: sc.scgsr@science.doe.gov

General Grant Writing Tips

- Read the Funding Opportunity Announcement (FOA) closely
  - Check eligibility rules and due dates (for topical FOAs)
  - Consider program descriptions and priorities in regard to your idea
  - Consider relevance of the proposed research for the program and DOE
  - Check whether a preapplication or letter of intent is required
  - Propose hypothesis-driven fundamental science
- Learn what kinds of research the program has funded previously.
  - Abstracts of funded research on DOE website
  - PI meeting books for BES programs
- Volunteer to review proposals for BES by contacting program managers

General Grant Writing Tips continued

- Plan ahead -- start writing early
- Keep review criteria in mind when writing the proposal
- Ensure that the key points are clearly articulated and obvious to the reader
- Reach out to colleagues and mentors during the writing process for feedback before you submit
  - Ask a colleague in your technical area to provide comments on clarity and logic, including the research plan and methodology
  - Ask a colleague outside your specific research area to review the proposal for clarity, logic, and significance
  - Try to obtain examples of successful proposals from your mentors and colleagues
  - If the proposal is a revision of a previously declined proposal, make sure you have considered the reviewers' concerns from the unsuccessful proposal
- Check grammar, spelling, formatting, and completeness
  - Ensure that you have followed the requirements for formatting (font, margins, page limits, etc.)
  - Check the document for consistent formatting and inclusion of all required components
- Contact the technical contact listed in the FOA if you have questions

Characteristics of Successful Proposals

- Easy to read and well-organized
- Objectives and rationale clearly fit the program and convince the reviewer of the need for the research
- Research plan is realistic for timeframe, personnel, and budget – not overly ambitious
- Appropriate literature review establishes the foundation for the research and helps the reader identify the knowledge gaps that need to be addressed
- Communication of importance and potential impact of the work
- Sufficient preliminary data to support the goals and feasibility of the planned research
- Appropriately detailed research plan
  - Discussion of potential pitfalls and alternative approaches
  - Not too much technical detail but not too vague either - colleague input can be particularly helpful
- Research team with appropriate expertise; if a new area for the PI, collaborators can bring in the needed expertise

Broadening Participation

- Applications are encouraged from:
  - New institutions
  - Institutions without current SC awards
  - Minority-serving institutions
  - Predominantly-undergraduate institutions
  - New investigators
  - Investigators from populations underrepresented in the SC portfolio
- Program managers are available to discuss research concepts, opportunities to submit proposals, or opportunities to form new collaborations (some topical FOAs have restrictions)

BES Oversight of Awards

- BES Program Managers use a variety of mechanisms to monitor active research projects
  - Annual Reports (submitted 3 months prior to end of each budget period)
  - Research Highlights (PIs asked to use a standardized highlight template)
  - Principal Investigator Meetings (held annually/biennially for each BES program)
  - Large multidisciplinary, multi-institutional team awards such as EFRCs and Hubs may include management reviews, mid-term reviews, and on-site scientific visits/reviews
- Most BES awards are eligible to submit renewal proposals
  - One exception: 5-year Early Career Awards are not renewable but may submit a new proposal to the core program to continue Early Career-related research
  - Discussion with program manager is encouraged before submission of a renewal proposal
  - If progress has been slow and productivity low, a no-cost extension may be appropriate
  - Renewal proposals typically due at least six months prior to end of current award period

Overview of New FY 2023 SC Requirements for Proposals

- **PIER Plans**: All FY 2023 SC Funding Opportunity Announcements (FOAs), DOE National Lab Announcements, and other funding solicitations require applicants to submit a **Promoting Inclusive and Equitable Research (PIER) Plan** as an appendix to their proposal narrative.
  - To aid in assessment of PIER Plans, merit review includes an additional standard criterion: "Quality and Efficacy of the Plan for Promoting Inclusive and Equitable Research"
- **Conference Proposals**: For FY 2023 applications to SC requesting funds to support a conference, the host organizations of the conference must have an established **code of conduct or policy** in place that addresses discrimination and harassment, including sexual harassment, other forms of harassment; and must include a **recruitment and accessibility plan** for speakers and attendees that includes discussion of recruitment of individuals from groups historically underrepresented in the research community.

Informational Resources on the SC Website

About

Funding Opportunity Announcements (FOAs)

DOE National Laboratory Announcements

Grants Policy and Guidance

Applicant and Awardee Resources

Grants Process

Promoting Inclusive and Equitable Research (PIER) Plans

Conference Proposals

Statement on Digital Data Management

Applicant FAQs

Awardee FAQs

DOE Public Access

Award Search / Public Abstracts

Publications Resulting from Federal Support

Promoting Inclusive and Equitable Research (PIER) Plans

Beginning in FY 2023, all Department of Energy (DOE) Office of Science Funding Opportunity Announcements (FOAs) and DOE National Lab Announcements and other funding solicitations will require applicants to submit a Promoting Inclusive and Equitable Research (PIER) Plan as an appendix to their proposal narrative. PIER Plans should describe the activities and strategies applicants will incorporate to promote diversity, equity, inclusion, and accessibility in their research projects. PIER Plans will be evaluated as part of the merit review process and will be used to inform funding decisions.

The Office of Science (SC) is deeply committed to supporting diverse, equitable, inclusive, and accessible work, research, and funding environments that value mutual respect and personal integrity, and SC is committed to promoting people of all backgrounds, including individuals from groups and communities historically underrepresented in STEM fields and SC activities in recognition of our responsibility to serve the public. Transforming our understanding of nature to advance scientific discovery and U.S. energy, economic, and national security can only be accomplished by harnessing a diverse range of views, expertise, and experiences to drive scientific and technological innovation. The inclusion of PIER Plans in funding applications makes this commitment to inclusive excellence explicit and a consistent expectation of all SC-funded research and research related activities.

Applications to the Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs do not require PIER Plans at this time but will be phased in at a later date. Applications for supplemental funding on existing awards and applications requesting funding for conferences do not require PIER Plans.

- **Information about PIER Plans**
- **Frequently Asked Questions**
- **PIER Plan Resources for SC Program Staff** (Internal to SC network only)

Information about Promoting Inclusive and Equitable Research (PIER) Plans

TOP

https://science.osti.gov/grants/Applicant-and-Awardee-Resources

DOE Data Management Overview

DOE data management principles		
Enable discovery	Share, preserve, validate	Cost management

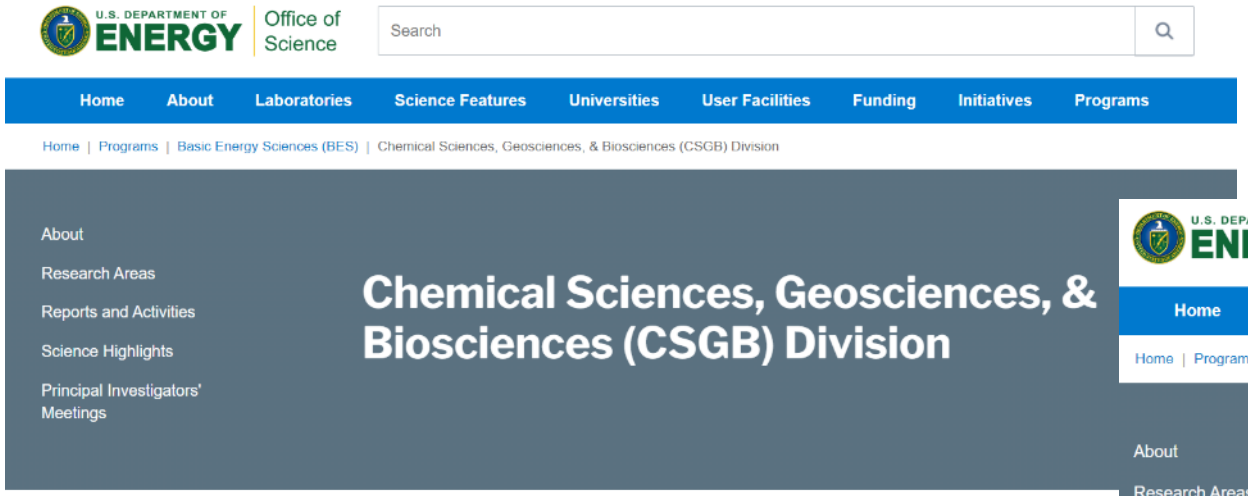
DOE Data Management Plan (DMP) requirements			
Share, preserve, validate	Make data associated with publications accessible	Availability of data management resources	Privacy, security, confidentiality

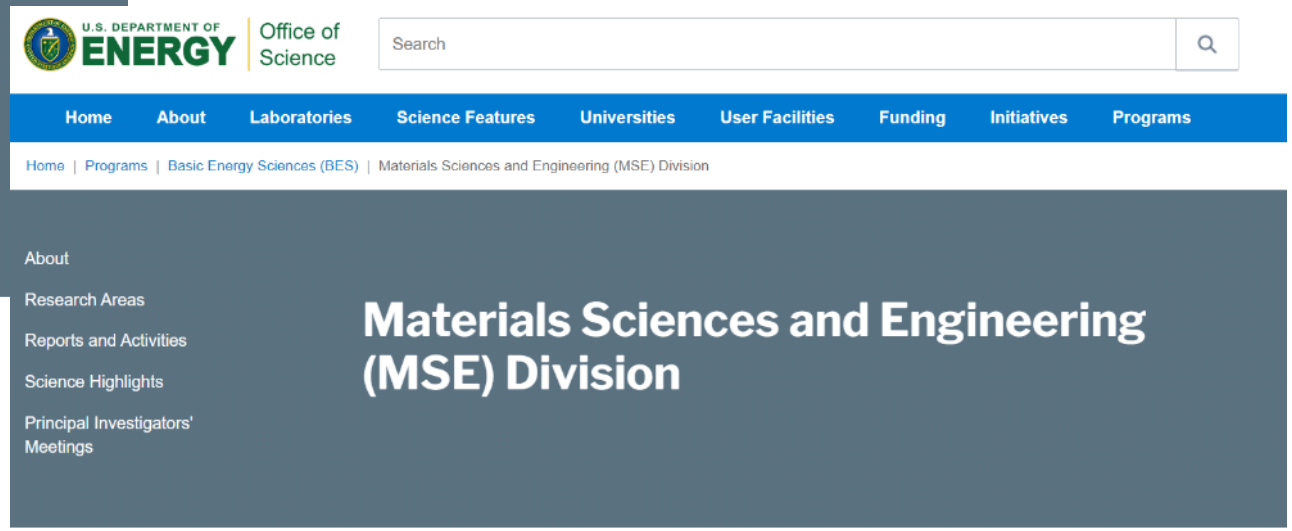
- Office of Science (SC) DMPs are reviewed as part of the proposal merit review process
  - Additional requirements and review criteria for the DMP may be identified in a solicitation
  - Proposals may request funding to implement a DMP, which is considered during merit review

Full DOE policy: https://www.energy.gov/datamanagement/doe-policy-digital-research-data-management
Full SC policy: https://science.osti.gov/Funding-Opportunities/Digital-Data-Management

Where to find more information

BES Research Division Webpages (CSGB and MSE)



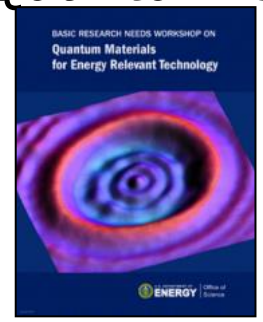


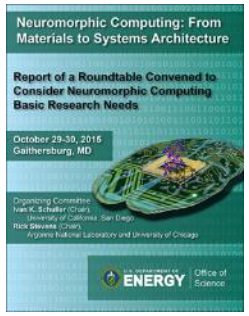
- Descriptions of all core research areas (funding programs)
- Abstract books from Principal Investigator Meetings
- Contact information for Program Managers

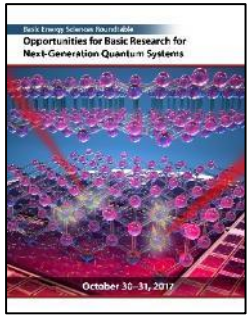
https://science.osti.gov/bes/mse
https://science.osti.gov/bes/csgb

Defining Research Priorities: Basic Research Needs Strategic Planning Workshops and Roundtables

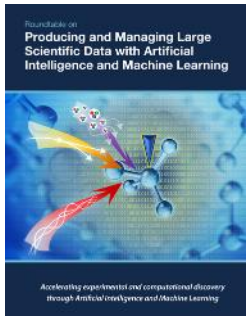
Quantum Science

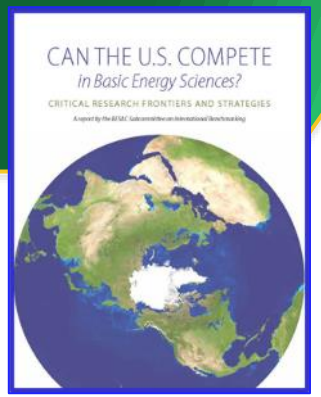






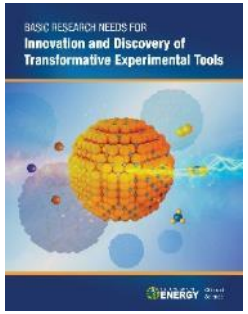
Theory, Modeling & Computation

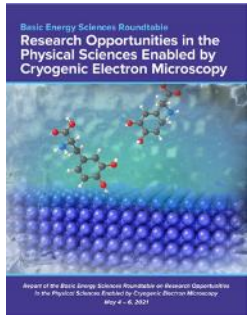




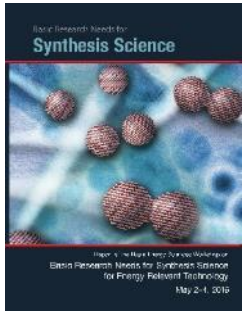
BES Advisory Committee: International Benchmarking

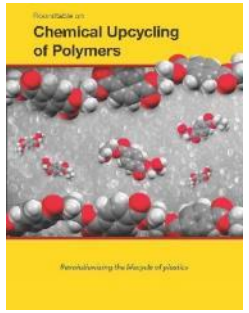
Characterization

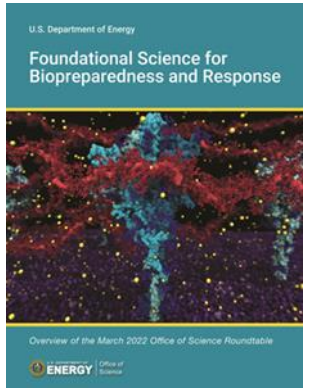




Synthesis

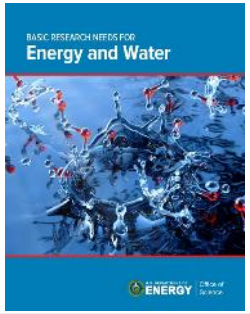


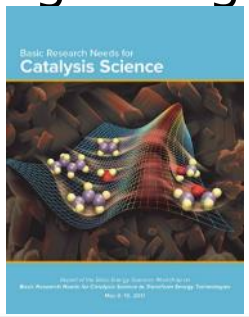


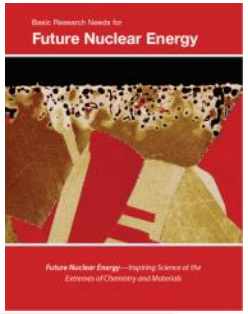


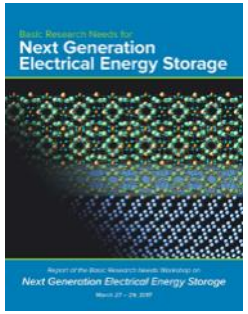
SC Biopreparedness & Response

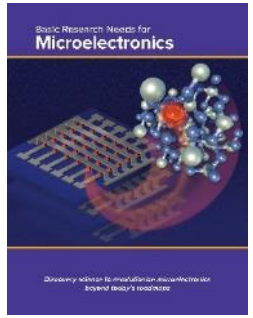
Cross-Cutting Energy

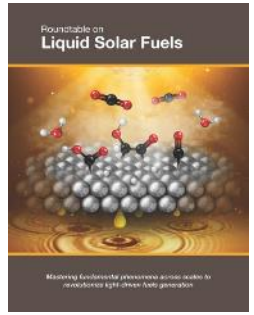








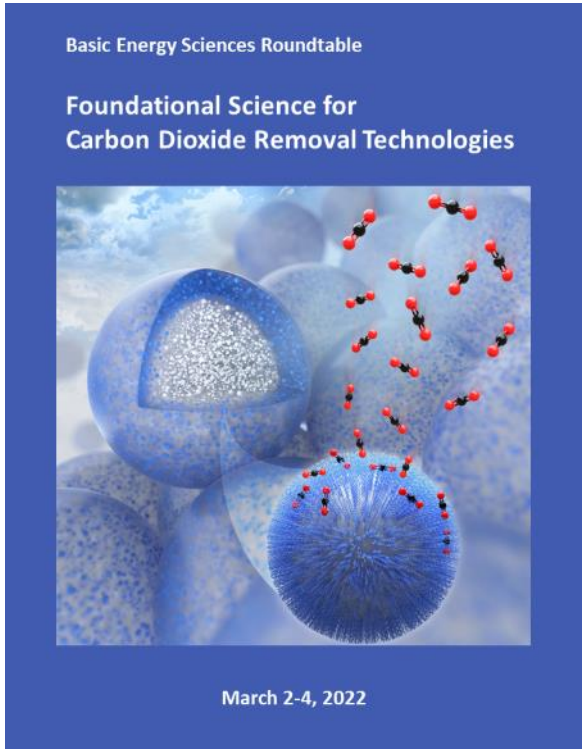




https://science.osti.gov/bes/Community-Resources/Reports

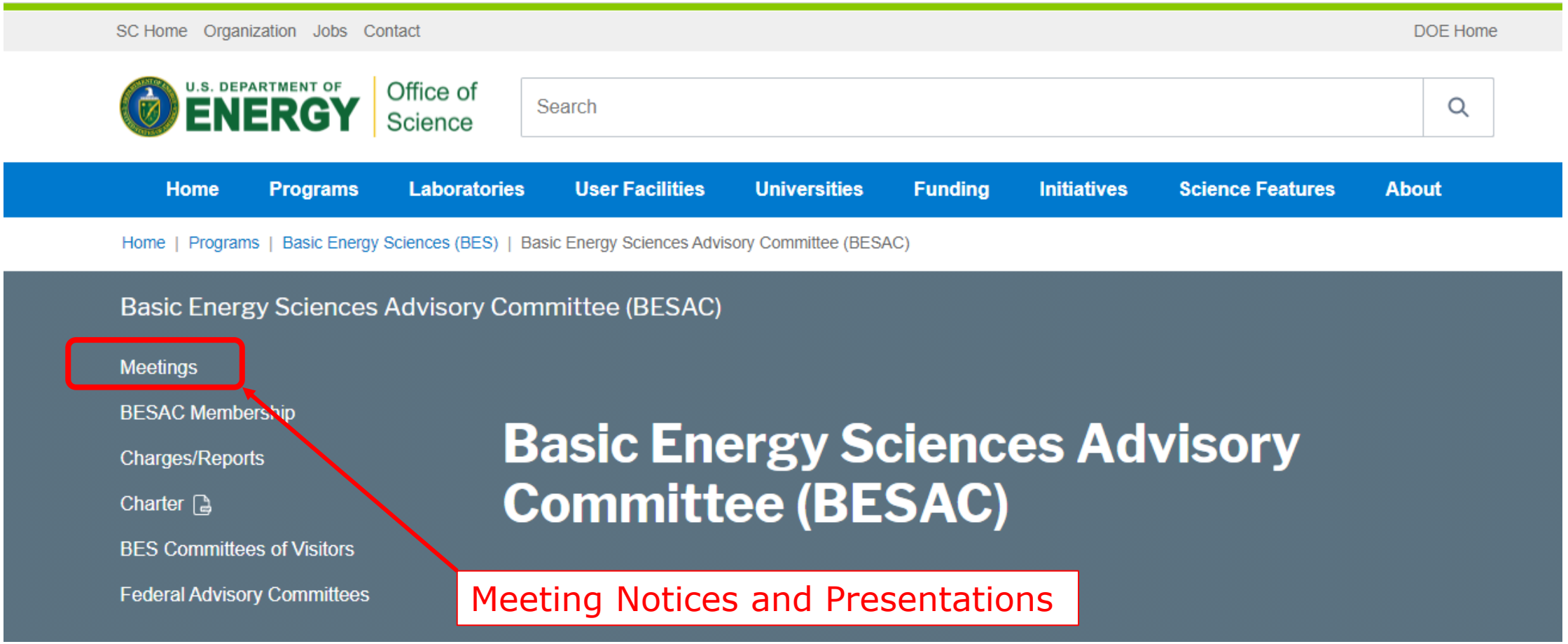
Priority Research Opportunities to Advance Foundational Science for Carbon Dioxide Removal Technologies (Roundtable held March 2-4, 2022)

- Co-chairs: Jim De Yoreo (PNNL) and Krista Walton (Georgia Institute of Technology)
- Organized by BES in coordination with Energy Efficiency and Renewable Energy, Fossil Energy and Carbon Management, and Advanced Research Projects Agency-Energy (ARPA-E)
- Five Priority Research Opportunities were identified:
  - Master Interfacial Processes of CO_2 Transport and Reactivity Across Multiple Length and Time Scales
  - Create Materials that Simultaneously Exhibit Multiple Properties for CO_2 Capture and Release or Conversion
  - Discover Unconventional Pathways for Energy-Efficient CO_2 Capture, Release, and Conversion
  - Control Multiphase Interactions Required for CO_2 Conversion into Minerals and Materials
  - Achieve Predictive Understanding of Coupled Processes in Complex Subsurface Geologic Systems for Secure Carbon Storage



Summary brochure published; full report to be published soon.

Basic Energy Sciences Advisory Committee (BESAC)



Meeting held April 25, 2023. Next BESAC Meeting will be held in July 2023.

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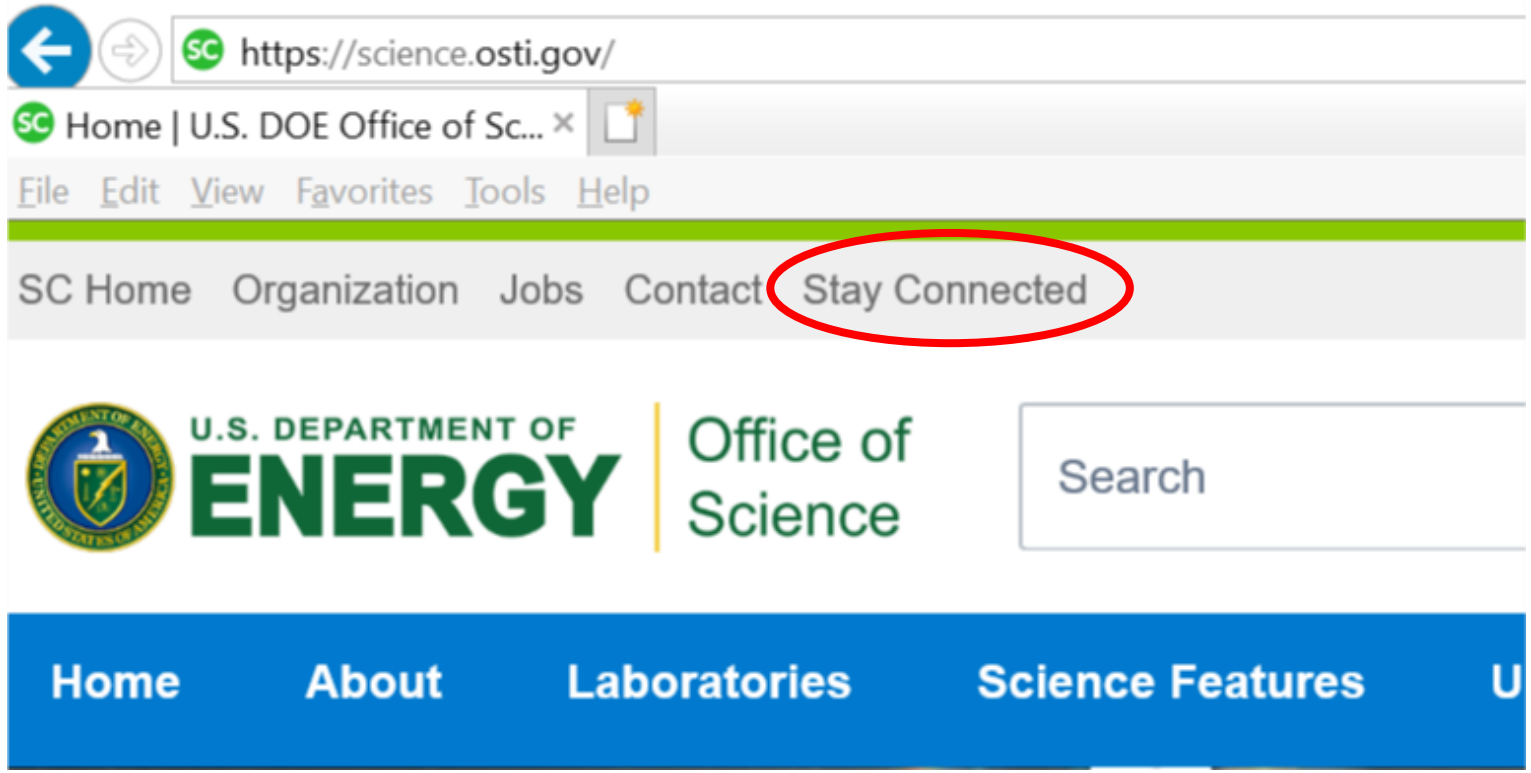

Thank you.

Gail McLean & Andy Schwartz

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andrew.schwartz@science.doe.gov