Funding Opportunities

February 27, 2023

*The opportunities listed here may be limited submissions. Please contact the **Research Office** to determine if there is an active or upcoming internal process for any opportunity of interest.*

Department of Energy – Advanced Research Projects Agency – Energy

Unlocking Lasting Transformative Resiliency Advances by Faster Actuation of Power Semiconductor Technologies (ULTRAFAST)

Concept Paper: March 28, 2023 | Full: TBD

Summary: Technological advances in power electronics have enabled the unprecedented growth of renewable energy sources in the electrical power grid. Power electronics innovations have brought improvements in controllability, performance, and energy availability at a specific electronic interface, but are also fundamentally changing the nature of the grid as a system. Because of the growing proportion of fast dynamic electronic interfaces relative to slow dynamic (i.e., conventional, asynchronous, machine-controlled) interfaces, grid performance, stability, and reliability are becoming increasingly jeopardized.

The goal of ULTRAFAST is to advance the performance limits of silicon (Si), wide bandgap (WBG), and ultra-wide bandgap (UWBG) semiconductor devices and significantly improve their actuation methods to support a more capable, resilient, and reliable future grid. ARPA-E expects that projects will create new material, device, and/or power module technologies that enable realization of transformative power management and control. More specifically, ARPA-E is looking for semiconductor material, device and/or power module level advances to enable faster switching and/or triggering at higher current and voltage levels for improved control and protection of the grid.

Specific categories include:

(1) Device and/or module technologies targeting protection functions at high current and voltage levels by achieving very fast by-pass, shunt, or interrupt capability at as low level of integration as possible with nanosecond-level reaction time (and corresponding slew rates).

(2) High switching frequency devices and/or modules which enable efficient, high-power, high-speed power electronics converters.

(3) Complementary technologies such as wireless sensing of voltage and current, high-density packaging with the integrated wireless actuators and device/module-level protection, power cell-level capacitors and inductors, and thermal management strategies to support (1) and (2).

Estimated Funding/Number of Awards: Total $48,000,000 / Ceiling: $1,000,000 / Floor: $250,000

Additional Information: **DE-FOA-0002998**

Department of Energy – OECD, FECM

Bipartisan Infrastructure Law Carbon Capture Demonstration Projects Program

LOI: March 28, 2023 | Full: May 23, 2023

Summary: The Department of Energy's (DOE) Office of Clean Energy Demonstrations (OCED) is issuing this Funding Opportunity Announcement (FOA) in collaboration with the Office of Fossil Energy and Carbon Management (FECM) for integrated carbon capture and storage (CCS) projects that demonstrate substantial improvements in the efficiency, effectiveness, cost, and environmental performance of carbon capture technologies for power, industrial, and other commercial applications.

CCS demonstration projects must be integrated with commercial facility operations and must be conducted in the United States. Applicants must demonstrate significant improvements in the efficiency, effectiveness, cost, operational and environmental performance of existing carbon capture technologies. This FOA seeks applications for transformational domestic, commercial-scale, integrated CCS, demonstration projects designed to further advance the development, deployment, and commercialization of technologies to capture, transport (if required), and store CO2 emissions from:

1) two projects at new or existing coal electric generation facilities two projects at new or existing natural gas electric generation facilities, and
2) two projects at new or existing industrial facilities not purposed for electric generation.

Proposed projects must demonstrate as part of the application and during the award at least 90% CO2 capture efficiency over baseline emissions and a path to achieve even greater CO2 capture efficiencies for power and industrial operations. Note that if the carbon capture project includes a new, on-site auxiliary system to generate power or

steam for its operation, it may need to include CO2 capture, compression, and storage from the auxiliary system if needed to achieve the minimum unit-wide 90% CO2 capture inclusive of the power industrial facility all new systems or processes associated with the CCS project.

Estimated Funding/Number of Awards: This FOA makes available up to $1,700,000,000 for approximately 6 projects at up to a 50% federal cost share. The maximum project period is 12 years, and the scope of the proposed project would determine the specific project period within the maximum project period.

Additional Information: **DE-FOA-0002962**

Department of Defense – Office of Naval Research, Army Research Office, Air Force Office of Scientific Research

FY24 Department of Defense Multidisciplinary Research Program of the University Research Initiative (MURI)

White Paper: May 19, 2023 | Full: September 8, 2023

Summary: The MURI program supports basic research in science and engineering at U.S. institutions of higher education (hereafter referred to as "universities") that is of potential interest to DoD. The program is focused on multidisciplinary research efforts where more than one traditional discipline interacts to provide rapid advances in scientific areas of interest to the DoD. DoD's basic research program invests broadly in many fields to ensure that it has early cognizance of new scientific knowledge.

Innovative ideas addressing the following research topics are highly encouraged.

ONR

- Topic 1: Interventions in Large and Complex Networks: Prediction, Monitoring and Evaluation
- Topic 2: The Deep Sea Benthic Boundary Layer; Interactions and Coupling with the Deep Seabed
- Topic 3: Machine Learning Methods for Phase Change Heat Transfer Modeling and Design
- Topic 4: Complexity Science Disorder-Promoted Synchronization
- Topic 5: Theory and Algorithms for Learning and Decision-Making in Multi-Agent Systems
- Topic 6: Reexamining Ocean Effects on Atmospheric Wind Drag and Enthalpy Flux
- Topic 7: Understanding Thermal and Mechanical Behavior in High Temperature Materials
- Topic 8: Understanding and Tailoring the Interactions between Metamaterials and Hypersonic Flows
- Topic 9: Cognitive and Neuroscience-Inspired Problem-Solving for Autonomous Systems in Physical Environments

AFOSR

- Topic 10: Plasmon-Controlled Single-Atom Catalysis
- Topic 11: A New Mathematical Paradigm for Integrating Data, Models, Decisions
- Topic 12: AlN Semiconductors for High-Power Electronics
- Topic 13: Compositionally Complex Ceramics (CCCs) via Knowledge-Guided Pyrolysis for Hypersonics
- Topic 14: Piezoelectric Materials Interfaced with Semiconductors for Integrated Quantum Systems
- Topic 15: Space-Based Characterization of Arctic Permafrost Dynamics
- Topic 16: Modeling and Measuring Multilevel Resonance
- Topic 17: Fundamental Limits of Passive Heterodyne Photodetection of Incoherent, Broadband Sources
- Topic 18: Tensor Networks and Low-Rank Methods for High-Dimensional Computing

ARO

- Topic 19: Bioinspired Vibronic Coherence in Molecular and Solid-State Systems
- Topic 20: Engineered Quantum Materials Approaches to Room-Temperature Single Photon Detection in Infrared Range
- Topic 21: The Ecological Succession of Environmental Films at the Gas-Solid Interface
- Topic 22: Predicting Performance Outcomes for Heterogeneous Materials under Complex Loading
- Topic 23: Synchronization in Natural and Engineered Systems
- Topic 24: Ferroelectric Group III and II-IV-Nitride Semiconductors for Photonics and Electronics
- Topic 25: SCAMP 3D- Synthetic Colloidal Assemblies for Meta-Photonics in Three Dimensions

Estimated Funding/Number of Awards: The total amount of funding for the five years available for grants resulting from this MURI FOA is estimated to be approximately $276 million dollars pending out-year appropriations. Typical annual funding per grant is in the $1.25M to $1.5M range.

Additional Information: **N00014-23-S-F003 | W911NF-23-S-0005**
