Department of Energy

Energy Frontier Research Centers (EFRCs)

Institution	Location	State	EFRC Name	EFRC Director	EFRC Objective
Arizona State University*	Tempe	AZ	EFR Center for Bio-Inspired Solar Fuel Production	Gust, J. Devens	Adapt the fundamental principles of natural photosynthesis to the man-made production of hydrogen or other fuels from sunlight.
University of Arizona*	Tuscon	AZ	Center for Interface Science: Hybrid Solar-Electric Materials (CIS:HSEM)	Armstrong, Neal R.	Enhance the conversion of solar energy to electricity using hybrid inorganic-organic materials.
California Institute of Technology	Pasadena	CA	Light-Material Interactions in Energy Conversion	Atwater, Harry	Tailor the properties of advanced materials to control the flow of solar energy and heat.
Lawrence Berkeley National Laboratory	Berkeley	CA	Center for Nanoscale Control of Geologic CO_2	DePaolo, Donald	Establish the scientific foundations for the geological storage of carbon dioxide.
Stanford University	Stanford	CA	Center on Nanostructuring for Efficient Energy Conversion	Prinz, Fritz	Design, create, and characterize materials at the nanoscale for a wide variety of energy applications.
University of California, Berkeley	Berkeley	CA	Center for Gas Separations Relevant to Clean Energy Technologies	Smit, Berend	Design and synthesize new forms of matter with tailored properties for gas separations in applications including carbon capture and sequestration.
University of California, Los Angeles	Los Angeles	CA	Molecularly Assembled Material Architectures for Solar Energy Production, Storage, and Carbon Capture	Ozolins, Vidvuds	Acquire a fundamental understanding and control of nanoscale material architectures for conversion of solar energy to electricity, electrical energy storage, and separating/capturing greenhouse gases.
University of California, Santa Barbara*	Santa Barbara	CA	Center on Materials for Energy Efficiency Applications	Bowers, John	Discover and develop materials that control the interactions between light, electricity, and head at the nanoscale for improved solar energy conversion, solid-state lighting, and conversion of heat into electricity.
University of Southern California*	Los Angeles	CA	Emerging Materials for Solar Energy Conversion and Solid State Lighting	Dapkus, Paul Daniel	Simultaneously explore the light absorbing and emitting properties of hybrid inorganic-organic materials for solar energy conversion and solid-state lighting.
National Renewable Energy Laboratory	Golden	CO	Center for Inverse Design	Zunger, Alex	Replace trial-and-error methods used in the development of materials for solar energy conversion with an inverse design approach powered by theory and computation.

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Carnegie Institute of Washington	Washington	DC	Center for Energy Frontier Research in Extreme Environments (Efree)	Mao, Ho-Kwang	Accelerate the discovery of energy-relevant materials that can tolerate transient extremes in pressure and temperature.
University of Delaware*	Newark	DE	Rational Design of Innovative Catalytic Technologies for Biomass Derivative Utilization	Vlachos, Dionisios	Design and characterize novel catalysts for the efficient conversion of the complex molecules comprising biomass into chemicals and fuels.
Idaho National Laboratory	Idaho Falls	ID	Center for Materials Science of Nuclear Fuel	Wolf, Dieter	Develop predictive computational models, validated by experiments, for the thermal and mechanical behavior of analogues to nuclear fuel.
Argonne National Laboratory	Argonne	IL	Institute for Atom-Efficient Chemical Transformations (IACT)	Marshall, Christopher	Discover, understand, and control efficient chemical pathways for the conversion of coal and biomass into chemicals and fuels.
Argonne National Laboratory	Argonne	IL	Center for Electrical Energy Storage: Tailored Interfaces	Thackeray, Michael	Understand complex phenomena in electrochemical reactions critical to advanced electrical energy storage.
Northwestern University	Evanston	IL	Argonne-Northwestern Solar Energy Research (ANSER) Center	Wasielewski, Michael	Revolutionize the design, synthesis, and control of molecules, materials, and processes in order to dramatically improve conversion of sunlight into electricity and fuels.
Northwestern University*	Evanston	IL	Center for Integrated Training in Far-From-Equilibrium and Adaptive Materials (CITFAM)	Grzybowski, Bartosz	Synthesize, characterize, and understand new classes of materials under conditions far from equilibrium relevant to solar energy conversion, storage of electricity and hydrogen, and catalysis.
Purdue University*	West Lafayette	IN	Center for Direct Catalytic Conversion of Biomass to Biofuels (C3Bio)	McCann, Maureen	Use fundamental knowledge about the interactions between catalysts and plant cell walls to design improved processes for the conversion of biomass to energy, fuels, or chemicals.
University of Notre Dame*	Notre Dame	IN	Materials Science of Actinides	Burns, Peter C.	Understand and control, at the nanoscale, materials that contain actinides (radioactive heavy elements such as uranium and plutonium) to lay the scientific foundation for advanced nuclear energy systems.
Louisiana State University	Baton Rouge	LA	Computational Catalysis and Atomic-Level Synthesis of Materials: Building Effective Catalysts from First Principles	Spivey, James	Develop computational tools to accurately model catalytic reactions and thereby provide the basis for the design of new catalysts.

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Massachusetts Institute of Technology	Cambridge	MA	Solid-State Solar-thermal Energy Conversion Center (S3TEC CENTER)	Chen, Gang	Create novel, solid-state materials for the conversion of sunlight and heat into electricity.
Massachusetts Institute of Technology*	Cambridge	MA	Center for Excitonics	Baldo, Marc	Understand the transport of charge carriers in synthetic disordered systems, which hold promise as new materials for conversion of solar energy to electricity and electrical energy storage.
University of Massachusetts*	Amherst	MA	Polymer-Based Materials for Harvesting Solar Energy	Russell, Thomas	Use novel, self-assembled polymer materials in systems for the conversion of sunlight into electricity.
University of Maryland	College Park	MD	Science of Precision Multifunctional Nanostructures for Electrical Energy Storage	Rubloff, Gary	Understand and build nano-structured electrode components as the foundation for new electrical energy storage technologies.
Michigan State University	East Lansing	MI	Revolutionary Materials for Solid State Energy Conversion	Morelli, Donald	Investigate the underlying physical and chemical principles of advanced materials for the conversion of heat into electricity.
University of Michigan*	Ann Arbor	MI	Solar Energy Conversion in Complex Materials (SECCM)	Green, Peter	Study complex material structures on the nanoscale to identify key features for their potential use as materials to convert solar energy and heat to electricity.
Donald Danforth Plant Science Center	St. Louis	MO	Center for Advanced Biofuels Systems	Sayre, Richard	Generate the fundamental knowledge required to increase the efficiency of photosynthesis and production of energy-rich molecules in plants.
Washington University, St. Louis	St. Louis	MO	Photosynthetic Antenna Research Center	Blankenship, Robert	Understand the basic scientific principles that underlie the efficient functioning of the natural photosynthetic antenna system as a basis for man-made systems to convert sunlight into fuels.
University of North Carolina*	Chapel Hill	NC	Solar Fuels and Next Generation Photovoltaics	Meyer, Thomas	Synthesize new molecular catalysts and light absorbers and integrate them into nanoscale architectures for improved generation of fuels and electricity from sunlight.
Princeton University	Princeton	NJ	Energy Frontier Research Center for Combustion Science	Law, Chung K.	Develop a suite of predictive combustion modeling capabilities for the chemical design and utilization of non-petroleum based fuels in transportation.
Los Alamos National Laboratory	Los Alamos	NM	The Center for Advanced Solar Photophysics	Klimov, Victor	Capitalize on recent advances in the science of how nanoparticles interact with light to design materials that have vastly greater efficiencies for the conversion of sunlight into electricity.

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Los Alamos National Laboratory	Los Alamos	NM	Extreme Environment-Tolerant Materials via Atomic Scale Design of Interfaces	Nastasi, Michael	Understand, at the atomic scale, the behavior of materials subject to extreme radiation doses and mechanical stress in order to synthesize new materials that maintain their desired properties under such conditions.
Sandia National Laboratories	Albuquerque	NM	EFRC for Solid State Lighting Science	Simmons, Jerry	Study energy conversion in tailored nanostructures as a basis for dramatically improved solid-state lighting.
Brookhaven National Laboratory	Upton	NY	Center for Emergent Superconductivity	Davis, J.C. Seamus	By understanding the fundamental physics of superconductivity, discover new high-temperature superconductors and improve the performance of known superconductors.
Columbia University*	New York	NY	Re-Defining Photovoltaic Efficiency Through Molecule-Scale Control	Yardley, James	Develop the enabling science needed to realize breakthroughs in the efficient conversion of sunlight into electricity in nanometer sized thin films.
Cornell University*	Ithaca	NY	Nanostructured Interfaces for Energy Generation, Conversion, and Storage	Abruna, Hector	Understand and control the nature, structure, and dynamics of reactions at electrodes in fuel cells, batteries, solar photovolataics, and catalysts.
General Electric Global Research	Niskayuna	NY	Center for Electrocatalysis, Transport Phenomena and Materials for Innovative Energy Storage	Soloveichik, Grigorii	Explore the fundamental chemistry needed for an entirely new approach to energy storage that combines the best properties of a fuel cell and a flow battery.
State University of New York, Stony Brook	Stony Brook	NY	Northeastern Chemical Energy Storage Center (NOCESC)	Grey, Clare P.	Understand how fundamental chemical reactions occur at electrodes and use that knowledge to tailor new electrodes to improve the performance of existing batteries or to design entirely new ones.
Pennsylvania State University*	University Park	PA	Center for Lignocellulose Structure and Formation	Cosgrove, Daniel	Dramatically increase our fundamental knowledge of the physical structure of bio-polymers in plant cell walls to provide a basis for improved methods for converting biomass into fuels.
University of South Carolina	Columbia	SC	Science Based Nano-Structure Design and Synthesis of Heterogeneous Functional Materials for Energy Systems	Reifsnider, Kenneth	Build a scientific basis for bridging the gap between making nano-structured materials and understanding how they function in a variety of energy applications.

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Oak Ridge National Laboratory	Oak Ridge	TN	Energy Frontier Center for Defect Physics in Structural Materials (CDP)	Stocks, G. Malcolm	Enhance our fundamental understanding of defects, defect interactions, and defect dynamics that determine the performance of structural alloys in extreme radiation environments.
Oak Ridge National Laboratory	Oak Ridge	TN	Fluid Interface Reactions, Structures and Transport (FIRST) Center	Wesolowski, David	Provide basic scientific understanding of phenomena that occur at interfaces in electrical energy storage, conversion of sunlight into fuels, geological sequestration of carbon dioxide, and other advanced energy systems.
University of Texas, Austin	Austin	TX	Frontiers of Subsurface Energy Security	Pope, Gary A.	Harness recent theoretical and experimental advances to explain the transport of native and injected fluids, particularly carbon dioxide, in geological systems over multiple length scales.
University of Texas, Austin*	Austin	TX	Understanding Charge Separation and Transfer at Interfaces in Energy Materials and Devices (CST)	Barbara, Paul	Pursue fundamental research on charge transfer processes that underpin the function of highly promising molecular materials for photovoltaic and electrical energy storage applications.
University of Virginia	Charlottesville	VA	Center for Catalytic Hydrocarbon Functionalization	Gunnoe, T. Brent	Develop novel catalysts and manipulate their reactivity for the efficient conversion of hydrocarbon gases into liquid fuels.
Pacific Northwest National Laboratory	Richland	WA	Center for Molecular Electrocatalysis	Bullock, R. Morris	Develop a comprehensive understanding of how chemical and electrical energy contained in fuels is exchanged, stored and released.

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