Country	Institute	Category	Related programs (with short summary)	Target / Goal Outcome	Lead person / Organization	Partnership (if any)	Related information
USA	NREL/DOE	Production	H2@Scale is a U.S. Department of Energy (DOE) initiative that brings together stakeholders to advance affordable hydrogen production, transport, storage, and utilization to increase revenue opportunities in multiple energy sectors. It is a framework inwhich national laboratories and industry can work together through government co-funded projects to accelerate the early-stage research, development and demonstration of applicable hydrogen technologies.	Exploration of potential for wide-scale hydrogen production and utilization in the United States to enable resiliency of the power generation and transmission sectors, while also aligning diverse multibillion dollar domestic industries, domestic competitiveness, and job creation.	Dr. Sunita Satyapal / US DOE Dr. Eric Miller / US DOE Dr. Bryan Pivovar / NREL	14 National Laboratories to facilitates R&D projects that leverage the world-class capabilites of the national laboratories in partnership with industry and academia.	https://www.energy.gov/eere/fuelcells/h2scale
			HydroGEN Advanced Water Splitting Material consortium is funded by is funded by DOE's Fuel Cell Technologies Office in the Office of Energy Efficiency and Renewable Energy. It aims to facilitate collaborations between federal laboratories, academia and industry. Key capability areas include: Analysis, Benchmarking, Characterization, Computational Tools and Modeling, Material Synthesis, Process and Manufacturing Scale-Up, and System Integration	Acceleration of R&D of advanced water splitting technologies for clean, sustainable hydrogen production including photoelectrochemistry, high- and low-temperature electrolysis, and and solar thermochemical routes	Dr. Sunita Satyapal / US DOE Dr. Ned Stetson / US DOE Dr. Huyen Dinh / NREL	NREL (lead), Lawrence Berkeley National Laboratory, Sandia National Laboratories, Idaho National Laboratory, Lawrence Livermore National Laboratory, Savannah River National Laboratory, Academic and Industrial partners	https://www.h2awsm.org/
			The Solar Photochemistry core program at NREL, funded by the Office of Basic Energy Science, focuses on fundamental research of solar photoconversion including probing energy transfer, charge transport, and reactivity in subsystems with a semiconductor/electrolyte interface for solar water splitting and related processes	Fundamental research on solar fuels production including water splitting to hydrogen	Dr. Garry Rumbles / NREL Dr. Jao van de Lagemaat / NREL	NREL and academic collaborators	https://www.nrel.gov/chemistry-nanoscience/solar-photochemistry.html
		Utilization	ElectroCat (Electrocatalysis) consortium is funded by the Fuel Cell Technologies Office in the U.S. Department of Energy Office of Energy Efficiency and Renewable Energy. ElectroCat's initial areas of focus include: 1) Discovery, characterization, and development of catalysts for the oxygen reduction reaction (ORR) 2) Discovery and development of PGM-free catalysts and electrodes for the hydrogen oxidation reaction (HOR) and ORR in alkaline membrane fuel cells 3) Development of PGM-free electrodes and membrane electrode assemblies (MEAs) 4) Development and optimization of tools for synthesize and characterization including computational and experimental high-throughput/combinatorial methods 5) Aggregation of data into an easily searchable database.	Acceleration of the the development and deployment of platinum group metal-free (PGM-free) electrocatalysts in fuel cells to develop fuel cells that are cost-competitive with traditional hydrocarbon-based power sources.	Dr. Dimitrios Papageorgopoulos / US DOE	Argonne National Laboratory (co-lead), Los Alamos National Laboratory (co-lead), NREL, OakRidge National Laboratory	https://www.electrocat.org/
			FC-PAD (Fuel Cell Consortium for Performance and Durability) develops world-class improvements in fuel cell performance and durability to exceed the 2020 targets set by its sponsor the U.S. Department of Energy Fuel Cell Technologies Office (FCTO). It conducts research in six coordinated thrust areas: Electrocatalysts & Supports, Electrode Layers, Ionomers, Gas Diffusion Layers, Bipolar Plates, & Interfaces, Cross-Cutting Thrusts, Modeling & Validation, Operando Evaluation, and Component Characterization & Diagnostics.	Enhance the performance and durability of polymer electrolyte membrane (PEM) fuel cells, while simultaneously reducing their cost	Dr. Dimitrios Papageorgopoulos / US DOE Dr. Rod Borup / LANL Dr. KC Neyerlin / NREL	Los Alamos National Laboratory (lead), Argonne National Laboratory, Lawrence Berkeley National Laboratory, NREL, Oak Ridge National Laboratory, Academic and Industrial partners	https://www.fcpad.org/
		Testing/ Fabrication	NREL hosts advanced diagnostic test capabilities and the ability to test from small scale (single cm2 cells) to large scale (from 6-kilowatt stacks to 250-kilowatt systems). NREL also has an advanced electrode fabrication capability, which includes multiple automated ultrasonic and electro-spray systems and in-line, roll-to-roll coating capabilities.	Accelerate and de-risk development of fuel cells and electrolyzers by investigations at multiple-scale	Dr. Keith Wipke / NREL	NREL and National Laboratory, Academic and Industrial Partners	https://www.nrel.gov/hydrogen/index.html
		Storage	HyMARC (Hydrogen Materials Advanced Research Consortium), funded by DOE Fuel Cell Technologies Office (FCTO), large-scale parallel computing resources, innovative synthetic approaches, and high-resolution in-situ characterization tools to develop hydrogen storage materials that meet DOE targets. NREL is the laboratory lead for hydrogen storage characterization and optimization effort, which aims to develop and enhance the Fuel Cell Technologies Office hydrogen storage core capabilities and validate claims, concepts, and theories of storage materials.	Address the scientific gaps blocking the advancement of hydrogen storage materials to meet DOE targets	Dr. Ned Stetson / US DOE Dr. Thomas Gennett / NREL	NREL, Sandia National Laboratories, Pacific Northwest National Laboratory, Lawrence Livermore National Laboratory, Savannah River National Laboratory, Academic and Industrial partners	https://www.energy.gov/eere/fuelcells/hymarc-hydrogen-materials-advanced-research-consortium

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USA	NREL/DOE	Power to X	NREL's Electrons to Molecules strategic intiative uses capabilities in electrochemistry, synthetic biology, nanoscience, catalysis, materials discovery, biological/chemical/materials processing, interfacial science, advanced spectroscopy and imaging, to develop a number of electrocatalytic, biological, and hybrid approaches for CO2 utilization such as: electrochemical reduction of CO2 to intermediates such as CO, formate, methanol, methane, and/or higher carbon number compounds, conversion of CO2-derived reactive intermediates via either catalytic or biological processes to higher carbon number molecules (with or without hydrogen).	Innovative science and technology for using electricity and electrochemical processes to convert low-energy molecules such as water, carbon dioxide (CO_2), and nitrogen (N_2) to higher-value molecules, fuels, products and materials.	Randy Cortright / NREL Todd Deutsch / NREL William Tumas / NREL	NREL with a number of national lab, university and academic partners	www.nrel.gov
		CO2 Utilization	NREL has a number of projects funded by DOE Bioenergy Techologies Office (BETO) and Fuel Cell Technologies Office (FCTO) aimed at developing innovative concepts for carbon dioxide through one or more electrochemical, biological, or thermal catalytic processes.	New processes for CO2 reduction	Keith Wipke / NREL Zia Abdullah / NREL	NREL with a number of national lab, university and academic partners	www.nrel.gov

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USA	NREL/DOE	Solar	Solar energy research at NREL includes photovoltaics, concentrating solar power, solar grid and systems integration, and market research and analysis. This work is largely funded by the DOE Solar Energy Technologies Office (SETO) but also includes a number of projects funded by other sponsors. This work ranges from foundational research to working closely with industry to help develop and demonstrate new technologies.	Cost, Efficiency, Scalability, Reliability/Durability, Manufacturability, CAPEX, Grid Integration	Mary Werner / NREL	NREL with other national laboratories, industrial and academic partners	https://www.nrel.gov/solar/index.html
			NREL has an extensive program in Photovoltaics (PV) that spans materials discovery, interfacial science, advanced characterization/spectroscopy/microscopy/imaging, cells, modules, innovative processing, certification, and reliability for a wide range of technology platforms including: thin-film PV (CdTe, CIGS), high-efficiency crystalline PV (Si, III-V), perovskites, quantum dot solar cells, and tandem systems. NREL capabilities range from fundamental and applied R&D, including theory and modeling, materials deposition, device design, measurements and characterization, and reliability testing and engineering.	Cost, Efficiency, Scalability, Reliability/Durability, Manufacturability, CAPEX	Mowafak Al-Jassim / NREL Nancy Haegel / NREL Wyatt Metzger / NREL	NREL with other national laboratories, industrial and academic partners	https://www.nrel.gov/pv/index.html
			The Solar Photochemistry core program at NREL, funded by the Office of Basic Energy Science, focuses on fundamental research of solar photoconversion in molecular, nanoscale, and semiconductor systems to capture, control, and convert solar radiation with high efficiency into electrochemical potential for electricity, chemicals, or fuels. We probe energy transfer, charge transport, and reactivity in subsystems with a semiconductor/electrolyte interface.	Three fundamental R&D thrusts: Excitons to Charge Carriers in Molecular and Nanoscale Systems, Quantum-Confined Semiconductors, Solar Fuels	Garry Rumbles / NREL Jao van de Lagemaat / NREL	NREL and academic collaborators	https://www.nrel.gov/chemistry-nanoscience/solar-photochemistry.html
		Materials Chemistry	NREL leads two Energy Frontier Research Centers (EFRC) funded by DOE Basic Energy Sciences (BES). The Center for Next Generation Materials Design (CNGMD) aims to accelerate the discovery of functional energy materials through multiple-property search, incorporation of metastable materials into predictive design, and the development of theory to guide materials synthesis. The Center for Hybrid Organic Inorganic Semiconductors for Energy (CHOISE) is accelerating discovery and elucidating design principles for unprecedented control over emergent properties involving spin, charge, and light-matter interactions, leading to new energy-efficient advanced technologies.	Fundamental materials and chemical science aimed at discovering new materials and understanding properties and phenemona related to energy science	William Tumas / NREL (CNGMD) Matthew Beard / NREL (CHOISE)	CNGMD: NREL, Lawrence Berkeley National Lab, SLAC National Laboratory, Harvard University, Oregon State University, University of Colorado CHOISE: NREL, Duke University, San Diego State University, SLAC National Accelerator Laboratory, University of Chicago, University of North Carolina at Chapel Hill, University of Toledo, University of Utah	www.cngmd-efrc.org www.choise-efrc.org
		Grid Integration	The US DOE Grid Modernization Initiative develops concepts, tools, and technologies needed to measure, analyze, predict, protect, and control the grid of the future.	Integration of sources of electricity, grid secutiry, solutoins to challenges of energy storage and distributed generation	DOE	The Grid Modernization Laboratory Consortium (GMLC) is a strategic partnership between DOE and US DOE national laboratories	https://www.energy.gov/grid-modernization-initiative