
XVI. Project Listings by Organization

3M Company

- II.B.2 High-Performance, Long-Lifetime Catalysts for Proton Exchange Membrane Electrolysis
- V.A.7 Highly Active, Durable, and Ultra-Low PGM NSTF Thin Film ORR Catalysts and Supports
- V.A.8 Highly Accessible Catalysts for Durable High-Power Performance
- V.B.4 Novel Ionomers and Electrode Structures for Improved PEMFC Electrode Performance at Low PGM Loadings
- V.B.7 Fuel Cell Membrane Electrode Assemblies with Ultra-Low Pt Nanofiber Electrodes
- V.C.1 New Fuel Cell Membranes with Improved Durability and Performance
- V.C.2 Advanced Hybrid Membranes for Next Generation PEMFC Automotive Applications
- V.C.7 Advanced Ionomers and MEAs for Alkaline Membrane Fuel Cells

ACI Services

- III.2 Hydrogen Compression Application of the Linear Motor Reciprocating Compressor (LMRC)

Advent Technologies Inc.

- V.A.3 Innovative Non-PGM Catalysts for High-Temperature PEMFCs
- V.A.13 Development of Durable Active Supports for Low Platinum Group Metal Catalysts (SBIR I)
- V.D.2 Facilitated Direct Liquid Fuel Cells with High Temperature Membrane Electrode Assemblies

Air Liquide

- III.14 Advancing Hydrogen Dispenser Technology by Using Innovative Intelligent Networks
- VII.B.1 Innovative Advanced Hydrogen Mobile Fueler

Air Products and Chemicals, Inc.

- VIII.6 Hydrogen Safety Panel, Safety Knowledge Tools and First Responder Training Resources

ALD Nanosolutions

- V.A.6 Extended Surface Electrocatalyst Development

Alteryx

- VI.1 Fuel Cell Membrane Electrode Assembly Manufacturing R&D

Ames Laboratory

- III.6 Magnetocaloric Hydrogen Liquefaction
- IV.C.13 High-Capacity Hydrogen Storage Systems via Mechanochemistry

Ardica Technologies, Inc.

- IV.C.17 Low-Cost α -Alane for Hydrogen Storage

Argonne National Laboratory

- II.A.1 Analysis of Advanced H₂ Production Pathways
- III.9 Hydrogen Refueling Analysis of Heavy-Duty Fuel Cell Vehicle Fleet
- III.15 H2FIRST Consolidation
- IV.A.1 System Analysis of Physical and Materials-Based Hydrogen Storage
- IV.A.2 Hydrogen Storage Cost Analysis
- IV.C.9 HyMARC Seedling: “Graphene-Wrapped” Complex Hydrides as High-Capacity, Regenerable Hydrogen Storage Materials

Argonne National Laboratory (Continued)

- V.A.1 ElectroCat (Electrocatalysis Consortium)
- V.A.4 Tailored High-Performance Low-PGM Alloy Cathode Catalysts
- V.A.7 Highly Active, Durable, and Ultra-Low PGM NSTF Thin Film ORR Catalysts and Supports
- V.B.1 FC-PAD: Fuel Cell Performance and Durability Consortium
- V.B.2 FC-PAD: Components and Characterization
- V.B.3 FC-PAD: Electrode Layers and Optimization
- V.B.4 Novel Ionomers and Electrode Structures for Improved PEMFC Electrode Performance at Low PGM Loadings
- V.C.6 Advanced Materials for Fully-Integrated MEAs in AEMFCs
- V.E.4 Performance and Durability of Advanced Automotive Fuel Cell Stacks and Systems with Dispersed Alloy Cathode Catalyst in Membrane Electrode Assemblies
- V.E.5 Fuel Cell Vehicle Cost Analysis
- VII.D.1 H2@Scale Analysis
- IX.1 Employment Impacts of Hydrogen and Fuel Cell Technologies
- IX.2 Regional Water Stress Analysis with Hydrogen Production at Scale
- IX.3 Cost Benefits Analysis of Technology Improvement in Light-Duty Fuel Cell Vehicles
- IX.8 Greenhouse Gas (GHG) Emissions and Petroleum Use Reduction of Medium- and Heavy-Duty Trucks
- IX.9 Agent-Based Modeling of Consumer Behavior
- IX.10 Life-Cycle Analysis of Air Pollutants Emission for Refinery and Hydrogen Production from SMR
- IX.12 Benefits Analysis of Multi-Fuel/Vehicle Platforms with a Focus on Hydrogen Fuel Cell Electric Vehicles

Arizona State University

- II.C.1 High Efficiency Solar Thermochemical Reactor for Hydrogen Production

Aspen Aerogels

- IV.D.4 Integrated Insulation System for Automotive Cryogenic Storage Tanks

Automated Dynamics

- VI.5 Continuous Fiber Composite Electrofusion Coupler

A.V. Tchouvelev & Associates, Inc.

- VIII.1 National Codes and Standards Development and Outreach
- VIII.7 NREL Hydrogen Sensor Testing Laboratory

Ballard Power Systems

- X.4 Demonstration of Fuel Cell Auxiliary Power Unit (APU) to Power Truck Refrigeration Units (TRUs) in Refrigerated Trucks

Becht Engineering

- VIII.6 Hydrogen Safety Panel, Safety Knowledge Tools and First Responder Training Resources

Birch Studio

- VI.3 Fuel Cell and Hydrogen Opportunity Center, www.hfcnexus.com (Hydrogen Fuel Cell Nexus)

Bloomfield Automation

- VIII.7 NREL Hydrogen Sensor Testing Laboratory

Breakthrough Technologies Institute

- VI.3 Fuel Cell and Hydrogen Opportunity Center, www.hfcnexus.com (Hydrogen Fuel Cell Nexus)

Brookhaven National Laboratory

- II.F.6 Reversible Conversion between CO₂/H₂ and Formic Acid by Molecular Catalysts
- V.A.5 Platinum Monolayer Electrocatalysts

Brown University

- V.A.16 Advanced Electro-Catalysts through Crystallographic Enhancement

Bucknell University

- II.C.1 High Efficiency Solar Thermochemical Reactor for Hydrogen Production

Business Council on Climate Change

- VIII.11 Advancing Fuel Cell Electric Vehicles in San Francisco and Beyond

California Institute of Technology

- II.D.3 Tandem Particle-Slurry Batch Reactors for Solar Water Splitting
- IV.C.14 Design and Synthesis of Materials with High Capacities for Hydrogen Physisorption

Cardinal Rubber & Seal

- III.8 Cryogenically Flexible, Low Permeability H₂ Delivery Hose

Carnegie Mellon University

- V.A.8 Highly Accessible Catalysts for Durable High-Power Performance

CEA-Liten

- VIII.3 Hydrogen Fuel Quality

Center for Clean Energy Engineering

- V.A.15 Highly Robust Low PGM MEAs Based upon Composite Supports (SBIR I)

Center for Transportation and the Environment

- IV.D.1 Conformable Hydrogen Storage Coil Reservoir
- VII.A.3 Fuel Cell Hybrid Electric Delivery Van Project

Ceramatec, Inc.

- II.B.8 Multi-Scale Ordered Cell Structure for Cost Effective Production of Hydrogen by HTWS

CertainTech Inc.

- V.A.12 Mesoporous Non-Carbon Catalyst Supports of PEMFC (SBIR I)

City and County of San Francisco

- VIII.11 Advancing Fuel Cell Electric Vehicles in San Francisco and Beyond

City of Santa Fe Springs

- VIII.6 Hydrogen Safety Panel, Safety Knowledge Tools and First Responder Training Resources

Colorado School of Mines

- II.C.1 High Efficiency Solar Thermochemical Reactor for Hydrogen Production
- V.A.6 Extended Surface Electrocatalyst Development
- V.C.2 Advanced Hybrid Membranes for Next Generation PEMFC Automotive Applications
- V.C.7 Advanced Ionomers and MEAs for Alkaline Membrane Fuel Cells
- VI.1 Fuel Cell Membrane Electrode Assembly Manufacturing R&D

Connecticut Center for Advanced Technology

- VI.2 Clean Energy Supply Chain and Manufacturing Competitiveness Analysis for Hydrogen and Fuel Cell Technologies

Cornell University

- V.A.8 Highly Accessible Catalysts for Durable High-Power Performance

C P Industries

- III.3 Low Cost Hydrogen Storage at 875 bar Using Steel Liner and Steel Wire Wrap

CSA Group

- VIII.6 Hydrogen Safety Panel, Safety Knowledge Tools and First Responder Training Resources

DJW Technology, LLC

- VI.2 Clean Energy Supply Chain and Manufacturing Competitiveness Analysis for Hydrogen and Fuel Cell Technologies
- VI.4 U.S. Clean Energy Hydrogen and Fuel Cell Technologies: A Competiveness Analysis

Drexel University

- V.A.8 Highly Accessible Catalysts for Durable High-Power Performance

E4tech

- VI.4 U.S. Clean Energy Hydrogen and Fuel Cell Technologies: A Competiveness Analysis

Eastern Research Group, Inc.

- IX.10 Life-Cycle Analysis of Air Pollutants Emission for Refinery and Hydrogen Production from SMR

Electricore, Inc.

- VII.B.1 Innovative Advanced Hydrogen Mobile Fueler

Element One

- VIII.7 NREL Hydrogen Sensor Testing Laboratory

Emerald Energy NW LLC

- III.6 Magnetocaloric Hydrogen Liquefaction

Energy Florida

- IV.D.4 Integrated Insulation System for Automotive Cryogenic Storage Tanks

eT2M

- V.A.3 Innovative Non-PGM Catalysts for High-Temperature PEMFCs

EWII Fuel Cells LLC

- V.A.2 Development of PGM-Free Catalysts for Hydrogen Oxidation Reaction in Alkaline Media
- V.A.16 Advanced Electro-Catalysts through Crystallographic Enhancement
- V.A.17 Vapor Deposition Process for Engineering of Dispersed PEMFC ORR Pt/NbO_x/C Catalysts
- V.B.2 FC-PAD: Components and Characterization

Exothermics, Inc.

- V.A.17 Vapor Deposition Process for Engineering of Dispersed PEMFC ORR Pt/NbO_x/C Catalysts

Federal Express Corporation

X.5 FedEx Express Hydrogen Fuel Cell Extended-Range Battery Electric Vehicles

Firexplo

VIII.6 Hydrogen Safety Panel, Safety Knowledge Tools and First Responder Training Resources

Florida State University

VII.C.3 Dynamic Modeling and Validation of Electrolyzers in Real-Time Grid Simulation

Ford Motor Company

IV.C.15 Hydrogen Adsorbents with High Volumetric Density: New Materials and System Projections

V.A.17 Vapor Deposition Process for Engineering of Dispersed PEMFC ORR Pt/NbO_x/C Catalysts

VIII.9 Compatibility of Polymeric Materials Used in the Hydrogen Infrastructure

Forge Nano

V.A.15 Highly Robust Low PGM MEAs Based upon Composite Supports (SBIR I)

Frontier Energy

VIII.11 Advancing Fuel Cell Electric Vehicles in San Francisco and Beyond

Fuel Cell & Hydrogen Energy Association

VIII.8 Fuel Cell & Hydrogen Energy Association Codes and Standards Support

FuelCell Energy, Inc.

II.B.5 Solid Oxide Based Electrolysis and Stack Technology with Ultra-High Electrolysis Current Density (>3 A/cm²) and Efficiency

V.C.3 Smart Matrix Development for Direct Carbonate Fuel Cell

VII.C.4 Modular SOEC System for Efficient Hydrogen Production at High Current Density

Gaia Energy Research Institute LLC

II.B.8 Multi-Scale Ordered Cell Structure for Cost Effective Production of Hydrogen by HTWS

III.11 Electrochemical Compression

Gas Technology Institute

VII.B.3 Performance Evaluation of Delivered Hydrogen Fueling Stations

General Motors

V.A.8 Highly Accessible Catalysts for Durable High-Power Performance

V.B.2 FC-PAD: Components and Characterization

V.B.5 Durable High-Power Membrane Electrode Assemblies with Low Pt Loading

V.C.1 New Fuel Cell Membranes with Improved Durability and Performance

VI.1 Fuel Cell Membrane Electrode Assembly Manufacturing R&D

Georgia Institute of Technology

II.B.6 Economical Production of Hydrogen through Development of Novel, High Efficiency Electrocatalysts for Alkaline Membrane Electrolysis

V.B.7 Fuel Cell Membrane Electrode Assemblies with Ultra-Low Pt Nanofiber Electrodes

VI.1 Fuel Cell Membrane Electrode Assembly Manufacturing R&D

VI.6 In-line Quality Control of PEM Materials

Giner, Inc.

- II.B.2 High-Performance, Long-Lifetime Catalysts for Proton Exchange Membrane Electrolysis
- II.B.4 High Temperature Alkaline Water Electrolysis
- III.11 Electrochemical Compression
- V.A.10 Regenerative Fuel Cell System (SBIR Phase II)
- V.B.5 Durable High-Power Membrane Electrode Assemblies with Low Pt Loading
- V.C.4 Ionomer Dispersion Impact on Fuel Cell and Electrolyzer Performance and Durability (SBIR Phase II TTO)
- V.D.3 Advanced Catalysts and Membrane Electrode Assemblies (MEAs) for Reversible Alkaline Membrane Fuel Cells

GLWN, Westside Industrial Retention & Expansion Network

- VI.4 U.S. Clean Energy Hydrogen and Fuel Cell Technologies: A Competitiveness Analysis

Greenway Energy, LLC

- III.12 Hybrid Electrochemical Hydrogen/Metal Hydride Compressor
- V.A.11 Development of Corrosion Resistant Carbon (CRC) Support for Ultra-Low Platinum Group Metal (PGM) Catalysts (SBIR Phase I)

GVD Corporation

- III.4 Advanced Barrier Coatings for Harsh Environments

GWS Solutions of Tolland LLC

- VIII.6 Hydrogen Safety Panel, Safety Knowledge Tools and First Responder Training Resources

Hawaii Hydrogen Carriers LLC

- III.13 Metal Hydride Compression

Hawaii Natural Energy Institute

- V.D.1 Novel Structured Metal Bipolar Plates for Low Cost Manufacturing
- X.1 Hydrogen Energy Systems as a Grid Management Tool

Hexagon Lincoln

- IV.D.4 Integrated Insulation System for Automotive Cryogenic Storage Tanks

High Energy Coil Reservoirs, LLC

- IV.D.1 Conformable Hydrogen Storage Coil Reservoir

HRL Laboratories, LLC

- IV.C.7 HyMARC Seedling: Electrolyte Assisted Hydrogen Storage Reactions

Humboldt State University

- VII.C.3 Dynamic Modeling and Validation of Electrolyzers in Real-Time Grid Simulation

Hydrogen Technology & Energy Corporation

- VII.B.1 Innovative Advanced Hydrogen Mobile Fueler

Hydrogenics

- VII.A.3 Fuel Cell Hybrid Electric Delivery Van Project
- X.3 Maritime Fuel Cell Generator Project

Hy-Performance Materials Testing, LLC

- III.3 Low Cost Hydrogen Storage at 875 bar Using Steel Liner and Steel Wire Wrap
- IV.D.3 Development, Selection and Testing to Reduce Cost and Weight of Materials for BOP Components

Idaho National Laboratory

- VII.C.2 Integrated Systems Modeling of the Interactions between Stationary Hydrogen, Vehicles, and Grid Resources
- VII.C.3 Dynamic Modeling and Validation of Electrolyzers in Real-Time Grid Simulation
- VII.D.2 High Temperature Electrolysis Test Stand

Institute of Physics, Polish Academy of Sciences

- II.F.2 Hybrid Perovskites and Non-Adiabatic Dynamics Simulations: Catching Realistic Aspects of the Charge Recombination Process

International Organization for Standardization

- VIII.3 Hydrogen Fuel Quality

Ion Power Inc.

- V.B.1 FC-PAD: Fuel Cell Performance and Durability Consortium
- V.B.2 FC-PAD: Components and Characterization
- V.B.6 High Performance Polymer Electrolyte Membrane Fuel Cell Electrode Structures

ITB Inc.

- IV.D.4 Integrated Insulation System for Automotive Cryogenic Storage Tanks

Ivys Energy Solutions

- III.14 Advancing Hydrogen Dispenser Technology by Using Innovative Intelligent Networks

Japan Automotive Research Institute

- VIII.3 Hydrogen Fuel Quality

Johns Hopkins University

- V.A.7 Highly Active, Durable, and Ultra-Low PGM NSTF Thin Film ORR Catalysts and Supports

Lawrence Berkeley National Laboratory

- II.D.3 Tandem Particle-Slurry Batch Reactors for Solar Water Splitting
- IV.C.3 HyMARC (Core): LBNL Effort
- IV.C.6 HyMARC (Support): LBNL Effort
- V.A.4 Tailored High-Performance Low-PGM Alloy Cathode Catalysts
- V.B.1 FC-PAD: Fuel Cell Performance and Durability Consortium
- V.B.2 FC-PAD: Components and Characterization
- V.B.3 FC-PAD: Electrode Layers and Optimization
- V.B.4 Novel Ionomers and Electrode Structures for Improved PEMFC Electrode Performance at Low PGM Loadings
- V.C.7 Advanced Ionomers and MEAs for Alkaline Membrane Fuel Cells
- VI.1 Fuel Cell Membrane Electrode Assembly Manufacturing R&D
- VII.C.2 Integrated Systems Modeling of the Interactions between Stationary Hydrogen, Vehicles, and Grid Resources
- VII.D.1 H2@Scale Analysis

Lawrence Livermore National Laboratory

- II.D.2 Wide Bandgap Chalcopyrite Photoelectrodes for Direct Solar Water Splitting
- III.10 Liquid Hydrogen Infrastructure Analysis
- IV.C.2 HyMARC (Core): LLNL Effort
- IV.C.12 Improving the Kinetics and Thermodynamics of $\text{Mg}(\text{BH}_4)_2$ for Hydrogen Storage
- VII.B.5 Liquid Hydrogen Pump Performance and Durability Testing

LifeGuard Technologies

- III.8 Cryogenically Flexible, Low Permeability H_2 Delivery Hose

Linde LLC

- VII.B.3 Performance Evaluation of Delivered Hydrogen Fueling Stations
- VII.B.5 Liquid Hydrogen Pump Performance and Durability Testing

Liox Power, Inc.

- IV.C.7 HyMARC Seedling: Electrolyte Assisted Hydrogen Storage Reactions

Los Alamos National Laboratory

- V.A.1 ElectroCat (Electrocatalysis Consortium)
- V.A.2 Development of PGM-Free Catalysts for Hydrogen Oxidation Reaction in Alkaline Media
- V.A.4 Tailored High-Performance Low-PGM Alloy Cathode Catalysts
- V.A.5 Platinum Monolayer Electrocatalysts
- V.A.16 Advanced Electro-Catalysts through Crystallographic Enhancement
- V.B.1 FC-PAD: Fuel Cell Performance and Durability Consortium
- V.B.2 FC-PAD: Components and Characterization
- V.B.3 FC-PAD: Electrode Layers and Optimization
- V.B.4 Novel Ionomers and Electrode Structures for Improved PEMFC Electrode Performance at Low PGM Loadings
- V.C.4 Ionomer Dispersion Impact on Fuel Cell and Electrolyzer Performance and Durability (SBIR Phase II TTO)
- V.C.6 Advanced Materials for Fully-Integrated MEAs in AEMFCs
- V.D.2 Facilitated Direct Liquid Fuel Cells with High Temperature Membrane Electrode Assemblies
- V.E.2 Technical Assistance to Developers
- VIII.3 Hydrogen Fuel Quality

Mainstream Engineering

- VI.1 Fuel Cell Membrane Electrode Assembly Manufacturing R&D
- VI.6 In-line Quality Control of PEM Materials

Manta Consulting

- VII.B.1 Innovative Advanced Hydrogen Mobile Fueler

Materia, Inc.

- IV.D.2 Next Generation Hydrogen Storage Vessels Enabled by Carbon Fiber Infusion with a Low Viscosity, High Toughness Resin System

Michigan Technological University

- V.B.4 Novel Ionomers and Electrode Structures for Improved PEMFC Electrode Performance at Low PGM Loadings

Montana State University

- IV.D.2 Next Generation Hydrogen Storage Vessels Enabled by Carbon Fiber Infusion with a Low Viscosity, High Toughness Resin System

MVP Co.

- III.3 Low Cost Hydrogen Storage at 875 bar Using Steel Liner and Steel Wire Wrap

N & R Engineering

- III.3 Low Cost Hydrogen Storage at 875 bar Using Steel Liner and Steel Wire Wrap

Nanosonic, Inc.

- III.8 Cryogenically Flexible, Low Permeability H₂ Delivery Hose

NASA

- IV.D.4 Integrated Insulation System for Automotive Cryogenic Storage Tanks

National Fuel Cell Research Center

- VI.2 Clean Energy Supply Chain and Manufacturing Competitiveness Analysis for Hydrogen and Fuel Cell Technologies

National Institute of Standards and Technology

- III.1 Fatigue Performance of High-Strength Pipeline Steels and Their Welds in Hydrogen Gas Service
- IV.C.4 HyMARC (Support): NREL Effort
- V.B.3 FC-PAD: Electrode Layers and Optimization
- V.E.1 Neutron Imaging Study of the Water Transport in Operating Fuel Cells

National Renewable Energy Laboratory

- II.A.1 Analysis of Advanced H₂ Production Pathways
- II.B.1 Renewable Electrolysis Integrated Systems Development and Testing
- II.B.2 High-Performance, Long-Lifetime Catalysts for Proton Exchange Membrane Electrolysis
- II.C.2 Flowing Particle Bed Solarthermal Redox Process to Split Water
- II.D.1 High-Efficiency Tandem Absorbers for Economical Solar Hydrogen Production
- II.D.2 Wide Bandgap Chalcopyrite Photoelectrodes for Direct Solar Water Splitting
- II.E.1 Biomass to Hydrogen (B2H₂)
- II.F.4 Mechanistic Investigations on Hydrogen Catalysis by [FeFe]-Hydrogenase
- II.F.5 Bioenergetics of Photosynthetic Energy Transduction: Control of Pathways through Redox Biochemistry
- III.5 Improved Hydrogen Liquefaction through Heisenberg Vortex Separation of para- and ortho-hydrogen
- III.7 700 bar Hydrogen Dispenser Hose Reliability and Improvement
- III.8 Cryogenically Flexible, Low Permeability H₂ Delivery Hose
- III.11 Electrochemical Compression
- III.14 Advancing Hydrogen Dispenser Technology by Using Innovative Intelligent Networks
- III.15 H2FIRST Consolidation
- IV.B.1 Hydrogen Storage System Modeling: Public Access, Maintenance, and Enhancements
- IV.C.4 HyMARC (Support): NREL Effort
- V.A.1 ElectroCat (Electrocatalysis Consortium)
- V.A.6 Extended Surface Electrocatalyst Development
- V.A.8 Highly Accessible Catalysts for Durable High-Power Performance
- V.A.10 Regenerative Fuel Cell System (SBIR Phase II)

National Renewable Energy Laboratory (Continued)

- V.B.1 FC-PAD: Fuel Cell Performance and Durability Consortium
- V.B.2 FC-PAD: Components and Characterization
- V.B.3 FC-PAD: Electrode Layers and Optimization
- V.B.4 Novel Ionomers and Electrode Structures for Improved PEMFC Electrode Performance at Low PGM Loadings
- V.C.2 Advanced Hybrid Membranes for Next Generation PEMFC Automotive Applications
- V.C.5 Highly Stable Anion Exchange Membranes for High-Voltage Redox-Flow Batteries
- V.C.7 Advanced Ionomers and MEAs for Alkaline Membrane Fuel Cells
- V.D.3 Advanced Catalysts and Membrane Electrode Assemblies (MEAs) for Reversible Alkaline Membrane Fuel Cells
- V.E.3 Fuel Cell Technology Status: Degradation
- V.E.5 Fuel Cell Vehicle Cost Analysis
- VI.1 Fuel Cell Membrane Electrode Assembly Manufacturing R&D
- VI.2 Clean Energy Supply Chain and Manufacturing Competitiveness Analysis for Hydrogen and Fuel Cell Technologies
- VI.6 In-line Quality Control of PEM Materials
- VI.7 Manufacturing Competitiveness Analysis for Hydrogen Refueling Stations
- VII.A.1 Fuel Cell Electric Vehicle Evaluation
- VII.A.2 Technology Validation: Fuel Cell Bus Evaluations
- VII.B.2 Hydrogen Station Data Collection and Analysis
- VII.B.4 Hydrogen Component Validation
- VII.B.6 Hydrogen Meter Benchmark Testing
- VII.C.1 Optimal Stationary Fuel Cell Integration and Control (Energy Dispatch Controller)
- VII.C.2 Integrated Systems Modeling of the Interactions between Stationary Hydrogen, Vehicles, and Grid Resources
- VII.C.3 Dynamic Modeling and Validation of Electrolyzers in Real-Time Grid Simulation
- VII.D.1 H2@Scale Analysis
- VIII.1 National Codes and Standards Development and Outreach
- VIII.7 NREL Hydrogen Sensor Testing Laboratory
- IX.5 Sustainability Analysis: Hydrogen Regional Sustainability (HyReS)
- IX.6 Hydrogen Financial Analysis Scenario Tool (H2FAST) Updates with Analysis of 101st Station
- IX.7 Regional Supply of Hydrogen
- IX.11 Resource Availability for Hydrogen Production

Newcomb Anderson McCormick

- VIII.11 Advancing Fuel Cell Electric Vehicles in San Francisco and Beyond

Nissan Technical Center North America

- V.A.9 Corrosion-Resistant Non-Carbon Electrocatalyst Supports for PEFCs
- V.B.7 Fuel Cell Membrane Electrode Assemblies with Ultra-Low Pt Nanofiber Electrodes
- V.C.2 Advanced Hybrid Membranes for Next Generation PEMFC Automotive Applications

Northeastern University

- II.B.3 High Performance Platinum Group Metal Free Membrane Electrode Assemblies through Control of Interfacial Processes
- V.A.3 Innovative Non-PGM Catalysts for High-Temperature PEMFCs
- V.A.17 Vapor Deposition Process for Engineering of Dispersed PEMFC ORR Pt/NbO_x/C Catalysts

Norwegian University Science and Technology

- V.B.3 FC-PAD: Electrode Layers and Optimization

NOV Fiberglass Systems

- VI.5 Continuous Fiber Composite Electrofusion Coupler

Nuvera Fuel Cells

- X.4 Demonstration of Fuel Cell Auxiliary Power Unit (APU) to Power Truck Refrigeration Units (TRUs) in Refrigerated Trucks

Oak Ridge National Laboratory

- III.1 Fatigue Performance of High-Strength Pipeline Steels and Their Welds in Hydrogen Gas Service
- III.3 Low Cost Hydrogen Storage at 875 bar Using Steel Liner and Steel Wire Wrap
- III.4 Advanced Barrier Coatings for Harsh Environments
- III.13 Metal Hydride Compression
- V.A.1 ElectroCat (Electrocatalysis Consortium)
- V.A.4 Tailored High-Performance Low-PGM Alloy Cathode Catalysts
- V.A.7 Highly Active, Durable, and Ultra-Low PGM NSTF Thin Film ORR Catalysts and Supports
- V.B.1 FC-PAD: Fuel Cell Performance and Durability Consortium
- V.B.2 FC-PAD: Components and Characterization
- V.B.3 FC-PAD: Electrode Layers and Optimization
- V.B.4 Novel Ionomers and Electrode Structures for Improved PEMFC Electrode Performance at Low PGM Loadings
- V.C.4 Ionomer Dispersion Impact on Fuel Cell and Electrolyzer Performance and Durability (SBIR Phase II TTO)
- V.C.7 Advanced Ionomers and MEAs for Alkaline Membrane Fuel Cells
- VIII.9 Compatibility of Polymeric Materials Used in the Hydrogen Infrastructure

Ohio Fuel Cell Coalition

- VI.2 Clean Energy Supply Chain and Manufacturing Competitiveness Analysis for Hydrogen and Fuel Cell Technologies

Oregon State University

- II.E.3 Novel Hybrid Microbial Electrochemical System for Efficient Hydrogen Generation from Biomass

Pacific Northwest National Laboratory

- III.6 Magnetocaloric Hydrogen Liquefaction
- IV.A.2 Hydrogen Storage Cost Analysis
- IV.B.1 Hydrogen Storage System Modeling: Public Access, Maintenance, and Enhancements
- IV.C.5 HyMARC (Support): PNNL Effort
- VII.D.1 H₂@Scale Analysis
- VIII.6 Hydrogen Safety Panel, Safety Knowledge Tools and First Responder Training Resources
- VIII.9 Compatibility of Polymeric Materials Used in the Hydrogen Infrastructure
- X.4 Demonstration of Fuel Cell Auxiliary Power Unit (APU) to Power Truck Refrigeration Units (TRUs) in Refrigerated Trucks

Pajarito Powder, LLC

- II.B.6 Economical Production of Hydrogen through Development of Novel, High Efficiency Electrocatalysts for Alkaline Membrane Electrolysis
- V.A.2 Development of PGM-Free Catalysts for Hydrogen Oxidation Reaction in Alkaline Media

Pajarito Powder, LLC (Continued)

- V.A.3 Innovative Non-PGM Catalysts for High-Temperature PEMFCs
- V.A.13 Development of Durable Active Supports for Low Platinum Group Metal Catalysts (SBIR I)

Palo Alto Research Center

- II.B.8 Multi-Scale Ordered Cell Structure for Cost Effective Production of Hydrogen by HTWS

PDC Machines

- III.15 H2FIRST Consolidation

pH Matter LLC

- V.A.10 Regenerative Fuel Cell System (SBIR Phase II)
- V.A.14 Multi-Functional Catalyst Support (SBIR I)

Plug Power

- X.2 Ground Support Equipment Demonstration
- X.5 FedEx Express Hydrogen Fuel Cell Extended-Range Battery Electric Vehicles

Proton OnSite

- II.B.3 High Performance Platinum Group Metal Free Membrane Electrode Assemblies through Control of Interfacial Processes
- II.B.6 Economical Production of Hydrogen through Development of Novel, High Efficiency Electrocatalysts for Alkaline Membrane Electrolysis
- II.B.7 New Approaches to Improved PEM Electrolyzer Ion Exchange Membranes
- VIII.6 Hydrogen Safety Panel, Safety Knowledge Tools and First Responder Training Resources

Purdue University

- V.A.7 Highly Active, Durable, and Ultra-Low PGM NSTF Thin Film ORR Catalysts and Supports

Quong & Associates, Inc.

- VII.B.1 Innovative Advanced Hydrogen Mobile Fueler

RCF Economic and Financial Consulting, Inc.

- IX.1 Employment Impacts of Hydrogen and Fuel Cell Technologies

Rensselaer Polytechnic Institute

- III.11 Electrochemical Compression
- V.C.6 Advanced Materials for Fully-Integrated MEAs in AEMFCs

Rheonik GmbH

- III.14 Advancing Hydrogen Dispenser Technology by Using Innovative Intelligent Networks

SAE International

- VIII.3 Hydrogen Fuel Quality

Saint Louis University

- IV.C.10 HyMARC Seedling: Fundamental Studies of Surface-Functionalized Mesoporous Carbons for Thermodynamic Stabilization and Reversibility of Metal Hydrides

Sandia National Laboratories

- II.C.1 High Efficiency Solar Thermochemical Reactor for Hydrogen Production
- III.1 Fatigue Performance of High-Strength Pipeline Steels and Their Welds in Hydrogen Gas Service
- III.13 Metal Hydride Compression
- III.16 Reference Station Design, Phase II
- IV.C.1 HyMARC (Core): SNL Effort
- IV.C.12 Improving the Kinetics and Thermodynamics of $\text{Mg}(\text{BH}_4)_2$ for Hydrogen Storage
- IV.D.3 Development, Selection and Testing to Reduce Cost and Weight of Materials for BOP Components
- V.C.6 Advanced Materials for Fully-Integrated MEAs in AEMFCs
- VIII.2 R&D for Safety, Codes and Standards: Materials and Components Compatibility
- VIII.4 R&D for Safety, Codes and Standards: Hydrogen Behavior
- VIII.5 Hydrogen Quantitative Risk Assessment
- VIII.9 Compatibility of Polymeric Materials Used in the Hydrogen Infrastructure
- VIII.10 Enabling Hydrogen Infrastructure Through Science-Based Codes and Standards
- IX.4 Hydrogen Analysis with the Sandia ParaChoice Model
- X.3 Maritime Fuel Cell Generator Project

Santa Monica Fire Department

- VIII.6 Hydrogen Safety Panel, Safety Knowledge Tools and First Responder Training Resources

Savannah River Consulting

- IV.B.2 Investigation of Solid State Hydrides for Autonomous Fuel Cell Vehicles
- IV.C.16 Electrochemical Reversible Formation of Alane

Savannah River National Laboratory

- III.12 Hybrid Electrochemical Hydrogen/Metal Hydride Compressor
- IV.B.1 Hydrogen Storage System Modeling: Public Access, Maintenance, and Enhancements
- IV.B.2 Investigation of Solid State Hydrides for Autonomous Fuel Cell Vehicles
- IV.C.16 Electrochemical Reversible Formation of Alane
- IV.D.4 Integrated Insulation System for Automotive Cryogenic Storage Tanks
- V.A.11 Development of Corrosion Resistant Carbon (CRC) Support for Ultra-Low Platinum Group Metal (PGM) Catalysts (SBIR Phase I)
- VI.5 Continuous Fiber Composite Electrofusion Coupler

Smart Chemistry

- VII.B.4 Hydrogen Component Validation
- VIII.3 Hydrogen Fuel Quality

Southern Illinois University

- IV.C.9 HyMARC Seedling: "Graphene-Wrapped" Complex Hydrides as High-Capacity, Regenerable Hydrogen Storage Materials

Southwest Research Institute®

- III.2 Hydrogen Compression Application of the Linear Motor Reciprocating Compressor (LMRC)

Spectrum Automation Controls

- II.B.1 Renewable Electrolysis Integrated Systems Development and Testing
- III.7 701 bar Hydrogen Dispenser Hose Reliability and Improvement

Spectrum Automation Controls (Continued)

- VII.B.4 Hydrogen Component Validation
- VII.B.6 Hydrogen Meter Benchmark Testing

Spencer Composites Corporation

- IV.D.2 Next Generation Hydrogen Storage Vessels Enabled by Carbon Fiber Infusion with a Low Viscosity, High Toughness Resin System
- VII.B.5 Liquid Hydrogen Pump Performance and Durability Testing

SRI International

- IV.C.17 Low-Cost α -Alane for Hydrogen Storage

Stanford University

- II.C.1 High Efficiency Solar Thermochemical Reactor for Hydrogen Production
- II.D.2 Wide Bandgap Chalcopyrite Photoelectrodes for Direct Solar Water Splitting

State University of New York at Buffalo

- V.A.16 Advanced Electro-Catalysts through Crystallographic Enhancement
- V.D.3 Advanced Catalysts and Membrane Electrode Assemblies (MEAs) for Reversible Alkaline Membrane Fuel Cells

Strategic Analysis, Inc.

- II.A.1 Analysis of Advanced H₂ Production Pathways
- IV.A.2 Hydrogen Storage Cost Analysis
- V.E.5 Fuel Cell Vehicle Cost Analysis
- VI.4 U.S. Clean Energy Hydrogen and Fuel Cell Technologies: A Competitiveness Analysis

Structural Integrity Associates, Inc.

- III.3 Low Cost Hydrogen Storage at 875 bar Using Steel Liner and Steel Wire Wrap

Sustainable Innovations, LLC

- III.12 Hybrid Electrochemical Hydrogen/Metal Hydride Compressor

Tetramer Technologies, LLC

- II.B.7 New Approaches to Improved PEM Electrolyzer Ion Exchange Membranes

The Pennsylvania State University

- II.B.3 High Performance Platinum Group Metal Free Membrane Electrode Assemblies through Control of Interfacial Processes
- II.E.1 Biomass to Hydrogen (B2H2)
- IV.C.8 HyMARC Seedling: Developing a Novel Hydrogen Sponge with Ideal Binding Energy and High Surface Area for Practical Hydrogen Storage

Thesis Corporation

- IV.C.4 HyMARC (Support): NREL Effort

The University of Texas at Austin

- IV.D.1 Conformable Hydrogen Storage Coil Reservoir
- V.B.5 Durable High-Power Membrane Electrode Assemblies with Low Pt Loading
- VII.A.3 Fuel Cell Hybrid Electric Delivery Van Project

TreadStone Technologies, Inc.

V.D.1 Novel Structured Metal Bipolar Plates for Low Cost Manufacturing

Tufts University

V.B.3 FC-PAD: Electrode Layers and Optimization

V.B.4 Novel Ionomers and Electrode Structures for Improved PEMFC Electrode Performance at Low PGM Loadings

VI.1 Fuel Cell Membrane Electrode Assembly Manufacturing R&D

UL

VIII.6 Hydrogen Safety Panel, Safety Knowledge Tools and First Responder Training Resources

Umicore

V.B.2 FC-PAD: Components and Characterization

Unique Electric Solutions

VII.A.3 Fuel Cell Hybrid Electric Delivery Van Project

United Parcel Service

VII.A.3 Fuel Cell Hybrid Electric Delivery Van Project

United Technologies Research Center

V.B.3 FC-PAD: Electrode Layers and Optimization

V.B.6 High Performance Polymer Electrolyte Membrane Fuel Cell Electrode Structures

University of Alabama

III.1 Fatigue Performance of High-Strength Pipeline Steels and Their Welds in Hydrogen Gas Service

University of Alberta

V.B.3 FC-PAD: Electrode Layers and Optimization

University of Arkansas at Little Rock

V.B.6 High Performance Polymer Electrolyte Membrane Fuel Cell Electrode Structures

University of California, Irvine

II.D.3 Tandem Particle-Slurry Batch Reactors for Solar Water Splitting

II.F.1 Tailoring Hydrogen Evolution Reaction (HER) Catalysts for Operation at Specific pH Values

University of Colorado Boulder

II.C.2 Flowing Particle Bed Solarthermal Redox Process to Split Water

V.A.6 Extended Surface Electrocatalyst Development

VII.C.1 Optimal Stationary Fuel Cell Integration and Control (Energy Dispatch Controller)

University of Connecticut

V.C.3 Smart Matrix Development for Direct Carbonate Fuel Cell

University of Delaware

V.A.6 Extended Surface Electrocatalyst Development

V.B.1 FC-PAD: Fuel Cell Performance and Durability Consortium

V.C.5 Highly Stable Anion Exchange Membranes for High-Voltage Redox-Flow Batteries

University of Georgia

- II.E.2 Sweet Hydrogen: High-Yield Production of Hydrogen from Biomass Sugars Catalyzed by in vitro Synthetic Biosystems

University of Hawaii

- II.D.1 High-Efficiency Tandem Absorbers for Economical Solar Hydrogen Production
- II.D.2 Wide Bandgap Chalcopyrite Photoelectrodes for Direct Solar Water Splitting

University of Hawaii at Mānoa

- IV.C.5 HyMARC (Support): PNNL Effort
- IV.C.11 HyMARC Seedling: Development of Magnesium Boride Etherates as Hydrogen Storage Materials

University of Michigan

- IV.C.12 Improving the Kinetics and Thermodynamics of $\text{Mg}(\text{BH}_4)_2$ for Hydrogen Storage
- IV.C.15 Hydrogen Adsorbents with High Volumetric Density: New Materials and System Projections
- V.A.17 Vapor Deposition Process for Engineering of Dispersed PEMFC ORR Pt/ NbO_x /C Catalysts

University of Missouri

- IV.C.13 High-Capacity Hydrogen Storage Systems via Mechanochemistry

University of Missouri—St. Louis

- IV.C.10 HyMARC Seedling: Fundamental Studies of Surface-Functionalized Mesoporous Carbons for Thermodynamic Stabilization and Reversibility of Metal Hydrides

University of Nevada, Las Vegas

- II.D.1 High-Efficiency Tandem Absorbers for Economical Solar Hydrogen Production
- II.D.2 Wide Bandgap Chalcopyrite Photoelectrodes for Direct Solar Water Splitting

University of New Mexico

- II.B.3 High Performance Platinum Group Metal Free Membrane Electrode Assemblies through Control of Interfacial Processes
- V.A.2 Development of PGM-Free Catalysts for Hydrogen Oxidation Reaction in Alkaline Media
- V.A.3 Innovative Non-PGM Catalysts for High-Temperature PEMFCs
- V.A.9 Corrosion-Resistant Non-Carbon Electrocatalyst Supports for PEFCs

University of Pennsylvania

- V.A.16 Advanced Electro-Catalysts through Crystallographic Enhancement

University of Rochester

- II.F.3 Nano-bio Systems for Light-Driven Hydrogen Production

University of Southern California

- II.F.2 Hybrid Perovskites and Non-Adiabatic Dynamics Simulations: Catching Realistic Aspects of the Charge Recombination Process

US Hybrid

- X.6 Northeast Demonstration and Deployment of FCRx200

Valence Technology

- VII.A.3 Fuel Cell Hybrid Electric Delivery Van Project

Vanderbilt University

- V.B.7 Fuel Cell Membrane Electrode Assemblies with Ultra-Low Pt Nanofiber Electrodes
- V.C.1 New Fuel Cell Membranes with Improved Durability and Performance

VENCORE Solutions and Services

- IV.D.4 Integrated Insulation System for Automotive Cryogenic Storage Tanks

Versa Power Systems

- II.B.5 Solid Oxide Based Electrolysis and Stack Technology with Ultra-High Electrolysis Current Density ($>3 \text{ A/cm}^2$) and Efficiency
- VII.C.4 Modular SOEC System for Efficient Hydrogen Production at High Current Density

Virginia Clean Cities at James Madison University

- VI.3 Fuel Cell and Hydrogen Opportunity Center, www.hfcnexus.com (Hydrogen Fuel Cell Nexus)

Virginia Polytechnic Institute and State University

- II.E.2 Sweet Hydrogen: High-Yield Production of Hydrogen from Biomass Sugars Catalyzed by in vitro Synthetic Biosystems

VTT

- VIII.3 Hydrogen Fuel Quality

Washington State University

- VII.C.1 Optimal Stationary Fuel Cell Integration and Control (Energy Dispatch Controller)

Washington University in St. Louis

- II.B.6 Economical Production of Hydrogen through Development of Novel, High Efficiency Electrocatalysts for Alkaline Membrane Electrolysis
- IV.C.10 HyMARC Seedling: Fundamental Studies of Surface-Functionalized Mesoporous Carbons for Thermodynamic Stabilization and Reversibility of Metal Hydrides
- V.A.9 Corrosion-Resistant Non-Carbon Electrocatalyst Supports for PEFCs

WireTough Cylinders, LLC

- III.3 Low Cost Hydrogen Storage at 875 bar Using Steel Liner and Steel Wire Wrap

Witte Engineered Gases

- VIII.6 Hydrogen Safety Panel, Safety Knowledge Tools and First Responder Training Resources

W.L. Gore & Associates

- VI.1 Fuel Cell Membrane Electrode Assembly Manufacturing R&D

Workhorse Technologies Inc.

- X.5 FedEx Express Hydrogen Fuel Cell Extended-Range Battery Electric Vehicles