

---

## XVII. Project Listings by Organization

### 3M Company

V.D.2	Membranes and MEAs for Dry, Hot Operating Conditions . . . . .	748
V.D.7	Novel Approaches to Immobilized Heteropoly Acid (HPA) Systems for High Temperature, Low Relative Humidity Polymer-Type Membranes . . . . .	772
V.E.1	Advanced Cathode Catalysts and Supports for PEM Fuel Cells. . . . .	790
V.E.6	Durable Catalysts for Fuel Cell Protection during Transient Conditions. . . . .	825
V.E.8	Nanosegregated Cathode Alloy Catalysts with Ultra-Low Platinum Loading. . . . .	835
V.M.2	Fuel Cell Fundamentals at Low and Subzero Temperatures. . . . .	948

### A Mountaintop LLC

VII.16	HyDRA: Hydrogen Demand and Resource Analysis Tool . . . . .	1240
--------	---	------

### Acumentrics Corporation

V.G.2	Development of a Low Cost 3-10 kW Tubular SOFC Power System . . . . .	866
-------	---	-----

### Addison Bain

IX.8	Hydrogen Safety Panel. . . . .	1338
------	--------------------------------	------

### Adsorption Research, Inc.

II.D.1	Composite Pd and Alloy Porous Stainless Steel Membranes for Hydrogen Production and Process Intensification . . . . .	74
--------	--	----

### Advanced Technology Corporation

III.15	Materials Solutions for Hydrogen Delivery in Pipelines . . . . .	318
--------	--	-----

### AFCC Automotive Fuel Cell Cooperation Corporation

V.E.3	Development of Alternative and Durable High Performance Cathode Supports for PEM Fuel Cells. . . . .	805
-------	---	-----

### Air Products and Chemicals, Inc.

III.14	Reversible Liquid Carriers for an Integrated Production, Storage and Delivery of Hydrogen. . . . .	314
VIII.5	Validation of an Integrated Hydrogen Energy Station . . . . .	1273
VIII.6	California Hydrogen Infrastructure Project . . . . .	1277
IX.8	Hydrogen Safety Panel. . . . .	1338
XI.6	PEM Fuel Cell Systems Providing Back-Up Power to Commercial Cellular Towers and an Electric Utility Communications Network . . . . .	1456
XI.9	Fuel Cell-Powered Lift Truck FedEx Freight Fleet Deployment. . . . .	1466
XI.10	Fuel Cell-Powered Lift Truck Sysco Houston Fleet Deployment. . . . .	1468
XI.11	Fuel Cell-Powered Lift Truck GENCO Fleet Deployment . . . . .	1470
XI.12	Demonstrating Economic and Operational Viability of 72-Hour Hydrogen PEM Fuel Cell Systems to Support Emergency Communications on the Sprint Nextel Network . . . . .	1472

### Alameda-Contra Costa Transit

VIII.2	Controlled Hydrogen Fleet and Infrastructure Demonstration and Validation Project . . . . .	1261
--------	---	------

### Alaska Center for Energy and Power

VIII.9	TDX Foundation Hydrogen Project/PEV Project . . . . .	1288
--------	---	------

**Allegiance Consulting**

- VII.1 Scenario Evaluation, Regionalization and Analysis (SERA) Model . . . . . 1177

**Altery Systems, Folsom**

- XI.12 Demonstrating Economic and Operational Viability of 72-Hour Hydrogen PEM Fuel Cell  
Systems to Support Emergency Communications on the Sprint Nextel Network . . . . . 1472

**American Society of Mechanical Engineers**

- IX.2 Component Standard Research and Development . . . . . 1311

**Argonne National Laboratory**

- II.A.3 Hydrogen from Glycerol: A Feasibility Study . . . . . 34  
 II.A.5 Distributed Reforming of Renewable Liquids Using Oxygen Transport Membranes . . . . . 42  
 II.F.1 R&D Status for the Cu-Cl Thermochemical Cycle-2010. . . . . 115  
 III.1 Hydrogen Delivery Infrastructure Analysis . . . . . 255  
 III.18 Hydrogen Pipeline Compressors . . . . . 333  
 IV.C.1f Hydrogen Storage through Nanostructured Porous Organic Polymers (POPs) . . . . . 495  
 IV.E.1 On-Board and Off-Board Analyses of Hydrogen Storage Options. . . . . 566  
 V.A.1 Fuel Cell Systems with Low Platinum Loadings . . . . . 661  
 V.A.7 Fuel Cell Testing at Argonne National Laboratory . . . . . 699  
 V.E.1 Advanced Cathode Catalysts and Supports for PEM Fuel Cells. . . . . 790  
 V.E.4 Non-Platinum Bimetallic Cathode Electrocatalysts. . . . . 811  
 V.E.5 Advanced Cathode Catalysts . . . . . 816  
 V.E.8 Nanosegregated Cathode Alloy Catalysts with Ultra-Low Platinum Loading. . . . . 835  
 V.H.1 Polymer Electrolyte Fuel Cell Lifetime Limitations: The Role of Electrocatalyst Degradation . . . . . 876  
 V.H.2 Durability Improvements through Degradation Mechanism Studies . . . . . 881  
 V.H.3 Durability of Low Platinum Fuel Cells Operating at High Power Density . . . . . 886  
 V.L.3 Metallic Bipolar Plates with Composite Coatings . . . . . 934  
 V.P.8 Fundamental Studies of Electrocatalysis for Low Temperature Fuel Cell Catalysts . . . . . 1040  
 V.P.15 Structure/Composition/Function Relationships in Supported Nanoscale Catalysts  
for Hydrogen. . . . . 1065  
 VII.3 Agent-Based Model of the Transition to Hydrogen-Based Personal Transportation: Consumer  
Adoption and Infrastructure Development Including Combined Hydrogen, Heat, and Power. . . . . 1185  
 VII.9 Fuel Quality in Fuel Cell Systems . . . . . 1209  
 VII.11 Life-Cycle Analysis of Criteria Pollutant Emissions from Stationary Fuel Cell Systems  
with the GREET Model . . . . . 1217

**Arizona State University**

- II.C.3 Zeolite Membrane Reactor for Water-Gas Shift Reaction for Hydrogen Production. . . . . 67  
 V.D.10 Protic Salt Polymer Membranes: High-Temperature Water-Free Proton-Conducting Membranes . . . . . 786  
 VI.5 Adaptive Process Controls and Ultrasonics for High Temperature PEM MEA Manufacture . . . . . 1144

**Arkema Inc.**

- V.D.9 Improved, Low-Cost, Durable Fuel Cell Membranes . . . . . 782  
 V.J.2 Novel Materials for High Efficiency Direct Methanol Fuel Cells . . . . . 915

**ASME Standards and Technologies LLC**

- III.15 Materials Solutions for Hydrogen Delivery in Pipelines . . . . . 318

**ATI Wah Chang**

- II.B.3 One Step Biomass Gas Reforming-Shift Separation Membrane Reactor .....54

**Aväence, LLC**

- II.E.1 High-Capacity, High-Pressure Electrolysis System with Renewable Power Sources .....99

**Ballard Material Products, Inc.**

- V.M.5 Transport Studies and Modeling in PEM Fuel Cells .....960  
VI.2 Reduction in Fabrication Costs of Gas Diffusion Layers .....1131

**Ballard Power Systems**

- V.B.2 Water Transport in PEM Fuel Cells: Advanced Modeling, Material Selection, Testing,  
and Design Optimization.....711  
V.H.2 Durability Improvements through Degradation Mechanism Studies.....881  
V.H.5 Accelerated Testing Validation.....895  
V.H.6 Development of Micro-Structural Mitigation Strategies for PEM Fuel Cells: Morphological  
Simulations and Experimental Approaches .....899  
V.M.1 Air-Cooled Stack Freeze Tolerance.....943  
V.M.3 Development and Validation of a Two-Phase, Three-dimensional Model for PEM Fuel Cells .....952  
VI.2 Reduction in Fabrication Costs of Gas Diffusion Layers .....1131

**BASF Fuel Cell, Inc.**

- VI.9 High-Speed, Low-Cost Fabrication of Gas Diffusion Electrodes for Membrane Electrode  
Assemblies.....1162

**BASF GmbH**

- IV.D.1a Hydrogen Storage Engineering Center of Excellence .....514

**BASF-SE**

- IV.D.1g Ford/BASF-SE/UM Activities in Support of the Hydrogen Storage Engineering Center  
of Excellence.....546

**Battelle**

- V.A.6 Economic Analysis of Stationary PEM Fuel Cell Systems .....693  
VIII.7 Technology Validation: Fuel Cell Bus Evaluations .....1280

**BCS Fuel Cells**

- V.B.2 Water Transport in PEM Fuel Cells: Advanced Modeling, Material Selection, Testing,  
and Design Optimization.....711

**Becht Engineering**

- IX.8 Hydrogen Safety Panel.....1338

**BekkTech LLC**

- V.D.4 Lead Research and Development Activity for DOE's High Temperature, Low Relative  
Humidity Membrane Program .....758

**Betacom, Inc.**

- XI.6 PEM Fuel Cell Systems Providing Back-Up Power to Commercial Cellular Towers and  
an Electric Utility Communications Network .....1456

**Bethlehem Hydrogen**

IX.1	National Codes and Standards Template . . . . .	1307
IX.3	Codes and Standards Training and Outreach and Education for Emerging Fuel Cell Technologies . . . . .	1315
X.2	Education for Emerging Fuel Cell Technologies . . . . .	1382

**Black & Veatch Corporation**

XI.12	Demonstrating Economic and Operational Viability of 72-Hour Hydrogen PEM Fuel Cell Systems to Support Emergency Communications on the Sprint Nextel Network . . . . .	1472
-------	---	------

**BMW Technology Corporation**

III.14	Reversible Liquid Carriers for an Integrated Production, Storage and Delivery of Hydrogen. . . . .	314
--------	--	-----

**Boeing Research and Technology**

VI.10	Development of Advanced Manufacturing Technologies for Low Cost Hydrogen Storage Vessels . . . . .	1165
-------	--	------

**Brookhaven National Laboratory**

IV.A.1e	Aluminum Hydride Regeneration . . . . .	385
V.E.2	Highly Dispersed Alloy Catalyst for Durability . . . . .	799
V.E.5	Advanced Cathode Catalysts . . . . .	816
V.E.9	Contiguous Platinum Monolayer Oxygen Reduction Electrocatalysts on High-Stability Low-Cost Supports. . . . .	841
V.P.13	In-Situ Studies of Active Sites and Mechanism for the Water-Gas Shift Reaction on Metal/Oxide Nanocatalysts . . . . .	1058
V.P.23	Metal- and Metal Oxide-Supported Platinum Monolayer Electrocatalysts for Oxygen Reduction . . . . .	1092
VII.12	CO <sub>2</sub> Reduction Benefits Analysis for Fuel Cell Applications . . . . .	1223

**Brown University**

V.E.8	Nanosegregated Cathode Alloy Catalysts with Ultra-Low Platinum Loading. . . . .	835
-------	---	-----

**Burns & McDonnell Engineering Co., Inc.**

XI.12	Demonstrating Economic and Operational Viability of 72-Hour Hydrogen PEM Fuel Cell Systems to Support Emergency Communications on the Sprint Nextel Network . . . . .	1472
-------	---	------

**Cabot Fuel Cells**

V.E.5	Advanced Cathode Catalysts . . . . .	816
-------	--------------------------------------	-----

**California Fuel Cell Partnership**

IX.13	Hydrogen Safety Training for First Responders . . . . .	1360
X.1	Hydrogen Safety Training for First Responders . . . . .	1379

**California Institute of Technology**

IV.A.1j	Development and Evaluation of Advanced Hydride Systems for Reversible Hydrogen Storage. . . . .	408
IV.D.1a	Hydrogen Storage Engineering Center of Excellence . . . . .	514
IV.D.1i	Key Technologies, Thermal Management, and Prototype Testing for Advanced Solid-State Hydrogen Storage Systems. . . . .	556
V.E.4	Non-Platinum Bimetallic Cathode Electrocatalysts. . . . .	811

**California State University, Los Angeles**

X.3	Hydrogen and Fuel Cell Education at California State University, Los Angeles. . . . .	1385
-----	---	------

**Carolina Tractor & Equipment Co. Inc.**

- X.8 Dedicated to The Continued Education, Training and Demonstration of PEM Fuel Cell  
Powered Lift Trucks In Real-World Applications. . . . . 1404

**Case Western Reserve University**

- V.D.2 Membranes and MEAs for Dry, Hot Operating Conditions . . . . . 748  
V.D.5 Poly(p-Phenylene Sulfonic Acids): PEMs with Frozen-In Free Volume . . . . . 761  
V.P.3 Theory, Modeling, and Simulation of Ion Transport in Ionomer Membranes. . . . . 1023  
VI.9 High-Speed, Low-Cost Fabrication of Gas Diffusion Electrodes for Membrane Electrode  
Assemblies. . . . . 1162

**CFD Research Corp.**

- V.B.2 Water Transport in PEM Fuel Cells: Advanced Modeling, Material Selection, Testing,  
and Design Optimization. . . . . 711

**Chemical Composite Coatings Int'l, LLC**

- III.15 Materials Solutions for Hydrogen Delivery in Pipelines . . . . . 318

**Chevron Technology Ventures LLC**

- VIII.2 Controlled Hydrogen Fleet and Infrastructure Demonstration and Validation Project . . . . . 1261

**Cincinnati Test Systems**

- VI.3 Modular, High-Volume Fuel Cell Leak-Test Suite and Process. . . . . 1135

**City of Santa Fe Springs**

- IX.8 Hydrogen Safety Panel. . . . . 1338

**Clean Energy States Alliance**

- X.15 Hydrogen Education State Partnership Program. . . . . 1426

**Clemson University**

- V.C.2 Fundamental Effects of Impurities on Fuel Cell Performance and Durability. . . . . 727  
V.O.1 Center for Fundamental and Applied Research in Nanostructured and Lightweight Materials . . . . . 978  
V.P.1 Fluoropolymers, Electrolytes, Composites and Electrodes . . . . . 1018

**Colorado School of Mines**

- II.C.1 High-Performance Palladium-Based Membrane for Hydrogen Separation and Purification. . . . . 57  
V.D.2 Membranes and MEAs for Dry, Hot Operating Conditions . . . . . 748  
V.D.7 Novel Approaches to Immobilized Heteropoly Acid (HPA) Systems for High Temperature,  
Low Relative Humidity Polymer-Type Membranes . . . . . 772  
V.J.1 Novel Approach to Advanced Direct Methanol Fuel Cell (DMFC) Anode Catalysts . . . . . 911  
V.O.2 Renewable and Logistics Fuels for Fuel Cells at the Colorado School of Mines. . . . . 983  
V.O.9 Biomass Fuel Cell Systems. . . . . 1011

**Columbia Gas of Kentucky**

- III.15 Materials Solutions for Hydrogen Delivery in Pipelines . . . . . 318

**Columbia University**

- V.P.19 Nanostructured, Metal-Modified Oxide Catalysts for Steam Reforming of Methanol  
and the Water-Gas Shift Reactions . . . . . 1078

**Commonwealth of Virginia**

X.11 VA-MD-DC Hydrogen Education for Decision Makers ..... 1414

**Concepts NREC**

III.4 Development of a Centrifugal Hydrogen Pipeline Gas Compressor ..... 267

**Connecticut Center for Advanced Technology, Inc.**

X.12 State and Local Partnership Building ..... 1417

**Cornell University**

V.P.17 Transport Phenomena and Interfacial Kinetics in Planar Microfluidic Membraneless Fuel Cells ..... 1072

**CSA Standards**

IX.1 National Codes and Standards Template ..... 1307  
 IX.3 Codes and Standards Training and Outreach and Education for Emerging Fuel Cell Technologies ..... 1315  
 X.2 Education for Emerging Fuel Cell Technologies ..... 1382

**Cummins Power Generation**

V.I.1 Diesel-Fueled SOFC System for Class 7/Class 8 On-Highway Truck Auxiliary Power ..... 903

**Daimler**

VIII.3 Hydrogen to the Highways ..... 1264

**Dalhousie University**

V.E.1 Advanced Cathode Catalysts and Supports for PEM Fuel Cells ..... 790  
 V.E.6 Durable Catalysts for Fuel Cell Protection during Transient Conditions ..... 825

**Delaware State University**

IV.A.4 Hydrogen Storage Materials for Fuel Cell-Powered Vehicles ..... 433

**Delphi Corporation**

V.I.2 Solid Oxide Fuel Cell Development for Auxiliary Power in Heavy Duty Vehicle Applications ..... 907  
 XI.5 Jadoo Power Fuel Cell Demonstration ..... 1454

**Delphi Automotive Systems, LLC**

XI.2 Solid Oxide Fuel Cell Diesel Auxiliary Power Unit Demonstration ..... 1446

**DGS Metallurgical Solutions, Inc**

III.15 Materials Solutions for Hydrogen Delivery in Pipelines ..... 318

**Directed Technologies, Inc.**

II.A.5 Distributed Reforming of Renewable Liquids Using Oxygen Transport Membranes ..... 42  
 II.I.3 Aqueous Phase Base-Facilitated Reforming (BFR) of Renewable Fuels ..... 220  
 V.A.2 Mass-Production Cost Estimation for Automotive Fuel Cell Systems ..... 667  
 VII.10 Macro System Model ..... 1213

**dPoint Technologies, Inc.**

V.K.2 Materials and Modules for Low-Cost, High-Performance Fuel Cell Humidifiers ..... 922

**DTE Energy**

VIII.3 Hydrogen to the Highways ..... 1264

**Dynalene Inc.**

V.O.10 Fuel Cell Coolant Optimization and Scale Up . . . . .1015

**Eastman Chemical Company**

II.D.3 Scale Up of Hydrogen Transport Membranes for IGCC and FutureGen Plants . . . . .82

**Econotech, LLC**

VII.4 HyTrans Model: Analyzing the Potential for Stationary Fuel Cells to Augment Hydrogen Availability in the Transition to Hydrogen Vehicles . . . . .1187

**Edison Materials Technology Center**

II.J.1 Developing Improved Materials to Support the Hydrogen Economy . . . . .243

X.13 Raising H<sub>2</sub> and Fuel Cell Awareness in Ohio . . . . .1420

**Electricore, Inc.**

V.I.2 Solid Oxide Fuel Cell Development for Auxiliary Power in Heavy Duty Vehicle Applications . . . . .907

XI.2 Solid Oxide Fuel Cell Diesel Auxiliary Power Unit Demonstration . . . . .1446

**ElectroChem, Inc.**

II.I.4 Advanced PEM-Based Hydrogen Home Refueling Appliance . . . . .224

II.F.2 Solar High-Temperature Water-Splitting Cycle with Quantum Boost . . . . .120

**Element One, Inc.**

IX.11 International Energy Agency Hydrogen Implementing Agreement Task 19 Hydrogen Safety . . . . .1352

**Eltron Research Inc.**

II.D.3 Scale Up of Hydrogen Transport Membranes for IGCC and FutureGen Plants . . . . .82

**EnerFuels, Inc.**

VIII.11 Florida Hydrogen Initiative . . . . .1294

**Energetics, Inc.**

IX.8 Hydrogen Safety Panel . . . . .1338

**Energy Conversion Devices, Inc.**

II.I.3 Aqueous Phase Base-Facilitated Reforming (BFR) of Renewable Fuels . . . . .220

**Engineering Procurement & Construction**

II.E.3 Renewable Electrolysis Integrated System Development and Testing . . . . .107

**Entegris, Inc.**

II.E.4 High-Performance, Low-Cost Hydrogen Generation from Renewable Energy . . . . .112

**Ericsson Services, Inc.**

XI.12 Demonstrating Economic and Operational Viability of 72-Hour Hydrogen PEM Fuel Cell Systems to Support Emergency Communications on the Sprint Nextel Network . . . . .1472

**ESI US R&D**

V.B.2 Water Transport in PEM Fuel Cells: Advanced Modeling, Material Selection, Testing, and Design Optimization . . . . .711

**Evrax North America**

III.15 Materials Solutions for Hydrogen Delivery in Pipelines . . . . .318

**FedEx Freight**

- XI.9 Fuel Cell-Powered Lift Truck FedEx Freight Fleet Deployment. . . . .1466

**Fibras Sinteticas de Portugal, SA**

- IV.G.3 High Strength Carbon Fibers. . . . .622

**Firexplo**

- IX.8 Hydrogen Safety Panel. . . . . 1338

**Florida Solar Energy Center**

- VIII.11 Florida Hydrogen Initiative . . . . . 1294

**Ford Motor Company**

- IV.D.1a Hydrogen Storage Engineering Center of Excellence . . . . .514  
 IV.D.1g Ford/BASF-SE/UM Activities in Support of the Hydrogen Storage Engineering Center  
 of Excellence. . . . .546  
 V.M.3 Development and Validation of a Two-Phase, Three-dimensional Model for PEM Fuel Cells . . . . .952

**Fortune Wireless**

- XI.6 PEM Fuel Cell Systems Providing Back-Up Power to Commercial Cellular Towers and  
 an Electric Utility Communications Network . . . . .1456

**FP2 Fire Protection Engineering**

- IX.1 National Codes and Standards Template . . . . .1307  
 IX.3 Codes and Standards Training and Outreach and Education for Emerging Fuel Cell  
 Technologies . . . . .1315  
 X.2 Education for Emerging Fuel Cell Technologies . . . . . 1382

**Freudenberg-NOK General Partnership**

- V.L.4 Low-Cost Durable Seals for PEMFCs . . . . .939

**Front Range Wireless**

- XI.6 PEM Fuel Cell Systems Providing Back-Up Power to Commercial Cellular Towers and  
 an Electric Utility Communications Network . . . . .1456

**FuelCell Energy, Inc.**

- III.16 Development of Highly Efficient Solid-State Electrochemical Hydrogen Compressor . . . . .323  
 V.C.3 The Effects of Impurities on Fuel Cell Performance and Durability. . . . .731  
 V.D.8 High Temperature Membrane with Humidification-Independent Cluster Structure . . . . .777  
 VIII.5 Validation of an Integrated Hydrogen Energy Station . . . . .1273

**Gas Equipment Engineering Corporation**

- III.13 Innovative Hydrogen Liquefaction Cycle . . . . .310

**Gas Technology Institute**

- II.B.3 One Step Biomass Gas Reforming-Shift Separation Membrane Reactor . . . . .54  
 IV.C.3 Electron Charged Graphite-Based Hydrogen Storage Material . . . . .510  
 V.L.2 Low-Cost PEM Fuel Cell Metal Bipolar Plates . . . . .930  
 V.L.3 Metallic Bipolar Plates with Composite Coatings . . . . .934  
 VIII.10 Texas Hydrogen Highway . . . . . 1291

**GENCO**

XI.11	Fuel Cell-Powered Lift Truck GENCO Fleet Deployment .....	1470
-------	---	------

**General Motors Company**

IV.D.1a	Hydrogen Storage Engineering Center of Excellence .....	514
IV.D.1f	System Design and Media Structuring for On-Board Hydrogen Storage Technologies .....	541
V.B.3	Visualization of Fuel Cell Water Transport and Performance Characterization Under Freezing Conditions .....	716
V.C.4	Effect of System and Air Contaminants on PEMFC Performance and Durability .....	737
V.L.1	Nitrided Metallic Bipolar Plates .....	925
VIII.4	Hydrogen Vehicle and Infrastructure Demonstration and Validation .....	1269
IX.8	Hydrogen Safety Panel .....	1338

**Georgetown University**

V.P.11	An in situ Electrode-Potential-Controlled Nuclear Magnetic Resonance Investigation of Sulfur-Poisoning Effect on Pt-Based Mono- and Bi-metallic Nanoscale Electrocatalysts .....	1051
--------	--	------

**Georgia Institute of Technology**

II.D.4	Amorphous Alloy Membranes for High Temperature Hydrogen Separation .....	86
V.H.6	Development of Micro-Structural Mitigation Strategies for PEM Fuel Cells: Morphological Simulations and Experimental Approaches .....	899
V.P.2	Ab-initio Screening of Alloys for Hydrogen Purification Membranes .....	1021

**Giner Electrochemical Systems, LLC**

II.E.2	PEM Electrolyzer Incorporating an Advanced Low-Cost Membrane .....	103
II.I.5	Unitized Design for Home Refueling Appliance for Hydrogen Generation to 5,000 psi .....	227
V.D.3	Dimensionally Stable Membranes (DSMs) .....	754
V.M.5	Transport Studies and Modeling in PEM Fuel Cells .....	960

**Greenway Energy**

X.10	Development of Hydrogen Education Programs for Government Officials .....	1411
------	---	------

**GWS Solutions of Tolland, LLC**

IX.1	National Codes and Standards Template .....	1307
IX.3	Codes and Standards Training and Outreach and Education for Emerging Fuel Cell Technologies .....	1315
IX.8	Hydrogen Safety Panel .....	1338
X.2	Education for Emerging Fuel Cell Technologies .....	1382

**H2 Technology Consulting LLC**

IV.E.6	Best Practices for Characterizing Hydrogen Storage Properties of Materials .....	591
--------	--	-----

**Hatch Mott MacDonald**

III.15	Materials Solutions for Hydrogen Delivery in Pipelines .....	318
--------	--	-----

**Hawaii Natural Energy Institute**

VIII.8	Hawaii Hydrogen Power Park .....	1284
--------	----------------------------------	------

**Henkel Corporation**

V.L.4	Low-Cost Durable Seals for PEMFCs .....	939
-------	---	-----

**Honeywell Aerospace**

V.K.1 Development of Thermal and Water Management System for PEM Fuel Cell . . . . . 919

**Houston Advanced Research Center**

VIII.10 Texas Hydrogen Highway . . . . . 1291  
 X.9 Hydrogen Education in Texas . . . . . 1408

**HSM Systems, Inc.**

IV.D.1c Advancement of Systems Designs and Key Engineering Technologies for Materials-Based Hydrogen Storage . . . . . 524

**Humboldt State University**

X.16 Hydrogen Technology and Energy Curriculum (HyTEC) . . . . . 1428

**Humboldt State University Sponsored Programs Foundation**

X.4 Hydrogen Energy in Engineering Education (H<sub>2</sub>E<sup>3</sup>) . . . . . 1389

**Hydrogen Safety, LLC**

IX.8 Hydrogen Safety Panel . . . . . 1338

**Hydrogenics**

X.8 Dedicated to The Continued Education, Training and Demonstration of PEM Fuel Cell Powered Lift Trucks In Real-World Applications. . . . . 1404

**HyGen Industries**

III.4 Development of a Centrifugal Hydrogen Pipeline Gas Compressor . . . . . 267

**HyPerComp Engineering, Inc.**

II.E.1 High-Capacity, High-Pressure Electrolysis System with Renewable Power Sources . . . . . 99

**Hyundai Motor Company**

VIII.2 Controlled Hydrogen Fleet and Infrastructure Demonstration and Validation Project . . . . . 1261

**Hyundai-KIA America Technical Center Inc.**

VIII.2 Controlled Hydrogen Fleet and Infrastructure Demonstration and Validation Project . . . . . 1261

**IBIS Associations, Inc.**

V.L.2 Low-Cost PEM Fuel Cell Metal Bipolar Plates . . . . . 930

**ICF, International**

VII.4 HyTrans Model: Analyzing the Potential for Stationary Fuel Cells to Augment Hydrogen Availability in the Transition to Hydrogen Vehicles . . . . . 1187

**IdaTech, LLC**

V.G.4 Research and Development for Off-Road Fuel Cell Applications . . . . . 873

**IDC Energy Insights**

VII.8 Analysis of Business Cases with the Fuel Cell Power Model . . . . . 1205

**Illinois Institute of Technology**

V.J.2 Novel Materials for High Efficiency Direct Methanol Fuel Cells . . . . . 915  
 V.P.23 Metal- and Metal Oxide-Supported Platinum Monolayer Electrocatalysts for Oxygen Reduction . . . . . 1092

**Indiana University**

- V.E.8 Nanosegregated Cathode Alloy Catalysts with Ultra-Low Platinum Loading. . . . . 835

**Institute of Basic Biological Problems**

- II.H.2 Biological Systems for Hydrogen Photoproduction. . . . . 198

**Intelligent Energy**

- V.G.1 Development and Demonstration of a New Generation High Efficiency 10-kW Stationary PEM Fuel Cell System . . . . . 861

**Intelligent Optical Systems, Inc.**

- IX.12 Safe Detector System for Hydrogen Leaks. . . . . 1355

**Ion Power**

- V.H.2 Durability Improvements through Degradation Mechanism Studies. . . . . 881  
V.H.5 Accelerated Testing Validation. . . . . 895

**J. Craig Venter Institute**

- II.H.4 Hydrogen from Water in a Novel Recombinant Oxygen-Tolerant Cyanobacterial System . . . . . 208

**Jadoo Power, Inc.**

- XI.5 Jadoo Power Fuel Cell Demonstration . . . . . 1454

**Jeffrey Rome and Associates**

- XI.6 PEM Fuel Cell Systems Providing Back-Up Power to Commercial Cellular Towers and an Electric Utility Communications Network . . . . . 1456

**Jet Propulsion Laboratory**

- IV.A.1j Development and Evaluation of Advanced Hydride Systems for Reversible Hydrogen Storage. . . . . 408  
IV.D.1a Hydrogen Storage Engineering Center of Excellence . . . . . 514  
IV.D.1i Key Technologies, Thermal Management, and Prototype Testing for Advanced Solid-State Hydrogen Storage Systems. . . . . 556  
V.E.1 Advanced Cathode Catalysts and Supports for PEM Fuel Cells. . . . . 790  
V.E.8 Nanosegregated Cathode Alloy Catalysts with Ultra-Low Platinum Loading. . . . . 835  
V.J.1 Novel Approach to Advanced Direct Methanol Fuel Cell (DMFC) Anode Catalysts . . . . . 911  
V.N.2 Resonance-Stabilized Anion Exchange Polymer Electrolytes. . . . . 967

**John Deere**

- V.C.2 Fundamental Effects of Impurities on Fuel Cell Performance and Durability. . . . . 727

**Johns Hopkins University**

- II.H.2 Biological Systems for Hydrogen Photoproduction. . . . . 198  
V.P.9 Engineering Catalytic Nanoporous Metals for Reactions Important to the Hydrogen Economy. . . . . 1044

**Johnson Matthey Fuel Cells**

- V.E.9 Contiguous Platinum Monolayer Oxygen Reduction Electrocatalysts on High-Stability Low-Cost Supports. . . . . 841  
V.H.1 Polymer Electrolyte Fuel Cell Lifetime Limitations: The Role of Electrocatalyst Degradation . . . . . 876  
V.J.3 New MEA Materials for Improved DMFC Performance, Durability, and Cost . . . . . 917  
V.M.4 Transport Studies Enabling Efficiency Optimization of Cost-Competitive Fuel Cell Stacks . . . . . 956  
V.D.9 Improved, Low-Cost, Durable Fuel Cell Membranes . . . . . 782

**Johnson Matthey Fuel Cells (Continued)**

- V.E.2 Highly Dispersed Alloy Catalyst for Durability . . . . . 799

**Karl Gross**

- IV.C.1e NREL Research as Part of the Hydrogen Sorption Center of Excellence . . . . . 486

**Kia Motors Corporation**

- VIII.2 Controlled Hydrogen Fleet and Infrastructure Demonstration and Validation Project . . . . . 1261

**Kidde-Fenwal**

- IV.E.4 Quantifying and Addressing the DOE Material Reactivity Requirements with Analysis  
and Testing of Hydrogen Storage Materials and Systems . . . . . 581

**Lawrence Berkeley National Laboratory**

- V.B.1 Water Transport Exploratory Studies . . . . . 706  
V.H.2 Durability Improvements through Degradation Mechanism Studies . . . . . 881  
V.H.5 Accelerated Testing Validation . . . . . 895  
V.M.3 Development and Validation of a Two-Phase, Three-dimensional Model for PEM Fuel Cells . . . . . 952  
V.M.4 Transport Studies Enabling Efficiency Optimization of Cost-Competitive Fuel Cell Stacks . . . . . 956  
V.P.30 Proton Conduction in Rare-Earth Phosphates . . . . . 1115

**Lawrence Livermore National Laboratory**

- II.G.12 Characterization and Optimization of Photoelectrode Surfaces for Solar-to-Chemical Fuel  
Conversion . . . . . 187  
III.7 Inexpensive Delivery of Cold Hydrogen in High Performance Glass Fiber Pressure Vessels . . . . . 282  
III.20 Rapid Low-Loss Cryogenic Hydrogen Refueling . . . . . 341  
IV.A.2 Tunable Thermodynamics and Kinetics for Hydrogen Storage: Nanoparticle Synthesis Using  
Ordered Polymer Templates . . . . . 423  
IV.C.1h Carbon Aerogels for Hydrogen Storage . . . . . 502  
IV.G.1 Extended Dormancy, Vacuum Stability, and Para-Ortho Hydrogen Conversion in Cryogenic  
Pressure Vessels . . . . . 615  
V.D.1 New Polyelectrolyte Materials for High Temperature Fuel Cells . . . . . 741  
V.E.11 Molecular-Scale, Three-Dimensional Non-Platinum Group Metal Electrodes for Catalysis  
of Fuel Cell Reactions . . . . . 850  
V.M.2 Fuel Cell Fundamentals at Low and Subzero Temperatures . . . . . 948  
V.P.28 The Development of Nano-Composite Electrodes for Solid Oxide Electrolyzers . . . . . 1109  
VII.7 Hydrogen and Water: Engineering, Economics and Environment . . . . . 1200  
IX.14 Hydrogen Safety Training for Researchers . . . . . 1363

**Lehigh University**

- V.O.10 Fuel Cell Coolant Optimization and Scale Up . . . . . 1015  
V.P.27 Porous and Glued Ultrathin Membranes . . . . . 1106

**Lincoln Composites, Inc.**

- III.8 Development of High Pressure Hydrogen Storage Tank for Storage and Gaseous  
Truck Delivery . . . . . 290  
IV.D.1a Hydrogen Storage Engineering Center of Excellence . . . . . 514  
IV.D.1k Development of Improved Composite Pressure Vessels for Hydrogen Storage . . . . . 563

**Linde North America**

XI.11	Fuel Cell-Powered Lift Truck GENCO Fleet Deployment	1470
-------	---	------

**Lockheed Martin-IDT**

V.O.8	Fuel Cell Balance-of-Plant Reliability Testbed	1007
-------	--	------

**Los Alamos National Laboratory**

II.B.2	Catalytic Solubilization and Conversion of Lignocellulosic Feedstocks	50
IV.B.1a	2010 Overview and Wrapup: DOE Chemical Hydrogen Storage Center of Excellence (CHSCoE)	437
IV.B.1c	Chemical Hydrogen Storage R&D at Los Alamos National Laboratory	447
IV.D.1a	Hydrogen Storage Engineering Center of Excellence	514
IV.D.1d	Chemical Hydride Rate Modeling, Validation, and System Demonstration	529
IV.F.4	Capacitive Hydrogen Storage Systems: Molecular Design of Structured Dielectrics	610
V.A.8	Technical Assistance to Developers	703
V.B.1	Water Transport Exploratory Studies	706
V.C.1	Effects of Fuel and Air Impurities on PEM Fuel Cell Performance	722
V.C.4	Effect of System and Air Contaminants on PEMFC Performance and Durability	737
V.E.4	Non-Platinum Bimetallic Cathode Electrocatalysts	811
V.E.5	Advanced Cathode Catalysts	816
V.E.7	Extended, Continuous Pt Nanostructures in Thick, Dispersed Electrodes	830
V.E.10	The Science and Engineering of Durable Ultralow PGM Catalysts	845
V.H.2	Durability Improvements through Degradation Mechanism Studies	881
V.H.3	Durability of Low Platinum Fuel Cells Operating at High Power Density	886
V.H.4	Improved Accelerated Stress Tests Based on Fuel Cell Vehicle Data	890
V.H.5	Accelerated Testing Validation	895
V.H.6	Development of Micro-Structural Mitigation Strategies for PEM Fuel Cells: Morphological Simulations and Experimental Approaches	899
V.M.2	Fuel Cell Fundamentals at Low and Subzero Temperatures	948
V.M.3	Development and Validation of a Two-Phase, Three-dimensional Model for PEM Fuel Cells	952
V.N.2	Resonance-Stabilized Anion Exchange Polymer Electrolytes	967
V.N.3	Engineered Nano-Scale Ceramic Supports for PEM Fuel Cells	971
VI.6	Cause-and-Effect: Flow Field Plate Manufacturing Variability and its Impact on Performance	1149
IX.4	Hydrogen Safety Sensors	1319
IX.7	Hydrogen Fuel Quality	1335
X.11	VA-MD-DC Hydrogen Education for Decision Makers	1414
X.17	H <sub>2</sub> Educate – Middle School Hydrogen Education Program	1432

**Lynntech, Inc.**

II.I.6	Design, Optimization and Fabrication of a Home Hydrogen Fueling System	232
--------	--	-----

**Massachusetts Institute of Technology**

II.H.2	Biological Systems for Hydrogen Photoproduction	198
IV.A.2	Tunable Thermodynamics and Kinetics for Hydrogen Storage: Nanoparticle Synthesis Using Ordered Polymer Templates	423
V.E.9	Contiguous Platinum Monolayer Oxygen Reduction Electrocatalysts on High-Stability Low-Cost Supports	841
V.H.1	Polymer Electrolyte Fuel Cell Lifetime Limitations: The Role of Electrocatalyst Degradation	876
V.P.6	Activity and Stability of Nanoscale Pt-based Catalysts	1033

**Massachusetts Institute of Technology (Continued)**

III.13	Innovative Hydrogen Liquefaction Cycle . . . . .	310
--------	--	-----

**Materials and Systems Research, Inc.**

II.I.8	Development of a Hydrogen Home Fueling System . . . . .	240
--------	---	-----

**Media and Process Technology Inc.**

II.C.2	Development of Hydrogen Selective Membranes/Modules as Reactors/Separators for Distributed Hydrogen Production . . . . .	62
--------	--	----

**Mercedes-Benz Research & Development North America, Inc.**

VIII.3	Hydrogen to the Highways . . . . .	1264
--------	------------------------------------	------

**Mercedes-Benz USA LLC**

VIII.3	Hydrogen to the Highways . . . . .	1264
--------	------------------------------------	------

**Metal Hydride Technologies, Inc.**

II.D.5	Experimental Demonstration of Advanced Palladium Membrane Separators for Central High-Purity Hydrogen Production . . . . .	90
--------	--	----

**Michigan Technological University**

V.B.3	Visualization of Fuel Cell Water Transport and Performance Characterization Under Freezing Conditions . . . . .	716
V.H.6	Development of Micro-Structural Mitigation Strategies for PEM Fuel Cells: Morphological Simulations and Experimental Approaches . . . . .	899
V.O.1	Center for Fundamental and Applied Research in Nanostructured and Lightweight Materials . . . . .	978
X.5	Hydrogen Education Curriculum Path at Michigan Technological University . . . . .	1393

**Microcell Corporation**

V.O.7	Martin County Hydrogen Fuel Cell Development . . . . .	1005
-------	--	------

**Midwest Research Institute**

IV.C.1c	Multiply Surface-Functionalized Nanoporous Carbon for Vehicular Hydrogen Storage . . . . .	474
---------	--	-----

**Mitsubishi Heavy Industries, Ltd**

III.3	Oil-Free Centrifugal Hydrogen Compression Technology Demonstration . . . . .	263
-------	--	-----

**Mohawk Innovative Technologies, Inc.**

III.3	Oil-Free Centrifugal Hydrogen Compression Technology Demonstration . . . . .	263
III.19	Advanced Sealing Technology for Hydrogen Compression . . . . .	337

**MorEvents**

IX.1	National Codes and Standards Template . . . . .	1307
IX.3	Codes and Standards Training and Outreach and Education for Emerging Fuel Cell Technologies . . . . .	1315
X.2	Education for Emerging Fuel Cell Technologies . . . . .	1382

**MTI Micro Fuel Cells, Inc.**

XI.1	Commercialization Effort for 1 W Consumer Electronics Power Pack . . . . .	1443
------	--	------

**MVSystems, Incorporated**

II.G.7	Progress in the Study of Amorphous Silicon Carbide (a-SiC) as a Photoelectrode in Photoelectrochemical (PEC) Cells . . . . .	167
II.G.8	Progress in the Study of Tungsten Oxide Compounds as Photoelectrodes in Photoelectrochemical Cells . . . . .	171
II.G.9	Progress in the Study of Copper Chalcopyrites as Photoelectrodes in Photoelectrochemical Cells . . . . .	175

**National Conference of State Legislators**

X.15	Hydrogen Education State Partnership Program . . . . .	1426
------	--	------

**National Energy Education Development Project**

X.17	H <sub>2</sub> Educate – Middle School Hydrogen Education Program . . . . .	1432
------	---	------

**National Energy Technology Laboratory**

II.B.3	One Step Biomass Gas Reforming-Shift Separation Membrane Reactor . . . . .	54
II.D.2	Development of Robust Hydrogen Separation Membranes . . . . .	79

**National Institute of Standards and Technology**

IV.A.1h	Neutron Characterization and Calphad in Support of the Metal Hydride Center of Excellence . . . . .	399
IV.C.1d	Neutron Characterization in Support of the Hydrogen Sorption Center of Excellence . . . . .	481
V.A.5	Neutron Imaging Study of the Water Transport in Operating Fuel Cells . . . . .	686
V.B.1	Water Transport Exploratory Studies . . . . .	706
VI.6	Cause-and-Effect: Flow Field Plate Manufacturing Variability and its Impact on Performance . . . . .	1149
VI.7	Non-Contact Sensor Evaluation for Bipolar Plate Manufacturing Process Control . . . . .	1153
VI.8	Optical Scatterfield Metrology for Online Catalyst Coating Inspection of PEM Soft Goods . . . . .	1157

**National Renewable Energy Laboratory**

II.A.4	Distributed Bio-Oil Reforming . . . . .	38
II.E.3	Renewable Electrolysis Integrated System Development and Testing . . . . .	107
II.G.4	Semiconductor Materials for Photoelectrolysis . . . . .	150
II.G.6	Photoelectrochemical Materials: Theory and Modeling . . . . .	162
II.G.10	Critical Research for Cost-Effective Photoelectrochemical Production of Hydrogen . . . . .	179
II.G.13	Photoelectrochemical Generation of Hydrogen from Water Using Visible Light Sensitive Ferro-Electric BiFeO <sub>3</sub> and Semiconductor Nanotubes . . . . .	191
II.H.2	Biological Systems for Hydrogen Photoproduction . . . . .	198
II.H.3	Fermentation and Electrohydrogenic Approaches to Hydrogen Production . . . . .	203
II.I.8	Development of a Hydrogen Home Fueling System . . . . .	240
II.J.2	Purdue Hydrogen Systems Laboratory: Hydrogen Production . . . . .	245
III.2	H <sub>2</sub> A Delivery Analysis and H <sub>2</sub> A Delivery Components Model . . . . .	259
IV.C.1a	Overview of the DOE Hydrogen Sorption Center of Excellence . . . . .	460
IV.C.1e	NREL Research as Part of the Hydrogen Sorption Center of Excellence . . . . .	486
IV.D.1a	Hydrogen Storage Engineering Center of Excellence . . . . .	514
IV.D.1e	System Design, Analysis, Modeling, and Media Engineering Properties for Hydrogen Energy Storage . . . . .	537
IV.H.2	Purdue Hydrogen Systems Laboratory: Hydrogen Storage . . . . .	632
V.C.4	Effect of System and Air Contaminants on PEMFC Performance and Durability . . . . .	737
V.E.7	Extended, Continuous Pt Nanostructures in Thick, Dispersed Electrodes . . . . .	830
V.J.1	Novel Approach to Advanced Direct Methanol Fuel Cell (DMFC) Anode Catalysts . . . . .	911

**National Renewable Energy Laboratory (Continued)**

V.P.16	Fundamentals of Hydroxide Conducting Systems for Fuel Cells and Electrolyzers . . . . .	1069
VI.1	Fuel Cell Membrane Electrode Assembly Manufacturing R&D . . . . .	1127
VII.1	Scenario Evaluation, Regionalization and Analysis (SERA) Model . . . . .	1177
VII.5	Biogas Resources Characterization . . . . .	1191
VII.6	Cost and GHG Implications of Hydrogen for Energy Storage . . . . .	1196
VII.8	Analysis of Business Cases with the Fuel Cell Power Model . . . . .	1205
VII.10	Macro System Model . . . . .	1213
VII.14	Fuel Cell Power Model: Evaluation of CHP and CHHP Applications . . . . .	1232
VII.16	HyDRA: Hydrogen Demand and Resource Analysis Tool . . . . .	1240
VIII.1	Controlled Hydrogen Fleet and Infrastructure Analysis . . . . .	1253
VIII.7	Technology Validation: Fuel Cell Bus Evaluations . . . . .	1280
IX.1	National Codes and Standards Template . . . . .	1307
IX.2	Component Standard Research and Development . . . . .	1311
IX.3	Codes and Standards Training and Outreach and Education for Emerging Fuel Cell Technologies . . . . .	1315
X.2	Education for Emerging Fuel Cell Technologies . . . . .	1382

**NextEnergy**

VIII.3	Hydrogen to the Highways . . . . .	1264
--------	------------------------------------	------

**North Carolina State University**

II.H.2	Biological Systems for Hydrogen Photoproduction . . . . .	198
--------	---	-----

**Northeastern University**

V.J.3	New MEA Materials for Improved DMFC Performance, Durability, and Cost . . . . .	917
IV.A.3	Efficient Discovery of Novel Multicomponent Mixtures for Hydrogen Storage: A Combined Computational/Experimental Approach . . . . .	428
IV.F.2	New Carbon-Based Porous Materials with Increased Heats of Adsorption for Hydrogen Storage . . . . .	600
V.P.18	High Performance Nano-Crystalline Oxide Fuel Cell Materials . . . . .	1075

**Nuvera Fuel Cells, Inc.**

V.F.1	CIRRUS: Cell Ice Regulation & Removal Upon Start-Up . . . . .	857
V.H.3	Durability of Low Platinum Fuel Cells Operating at High Power Density . . . . .	886
V.M.4	Transport Studies Enabling Efficiency Optimization of Cost-Competitive Fuel Cell Stacks . . . . .	956
XI.8	H-E-B Grocery Total Power Solution for Fuel Cell-Powered Material Handling Equipment . . . . .	1462

**Oak Ridge National Laboratory**

II.C.1	High-Performance Palladium-Based Membrane for Hydrogen Separation and Purification . . . . .	57
III.11	Composite Technology for Hydrogen Pipelines . . . . .	302
III.17	Hydrogen Permeability and Integrity of Steel Welds . . . . .	326
III.21	Range Optimization for Fuel Cell Vehicles . . . . .	344
IV.A.1i	Metal Borohydrides, Ammines, and Aluminum Hydrides as Hydrogen Storage Materials . . . . .	404
IV.G.2	Lifecycle Verification of Polymeric Storage Liners . . . . .	619
IV.G.3	High Strength Carbon Fibers . . . . .	622
V.A.4	Characterization of Fuel Cell Materials . . . . .	680
V.B.1	Water Transport Exploratory Studies . . . . .	706
V.D.9	Improved, Low-Cost, Durable Fuel Cell Membranes . . . . .	782

**Oak Ridge National Laboratory (Continued)**

V.E.3	Development of Alternative and Durable High Performance Cathode Supports for PEM Fuel Cells. . . . .	805
V.E.4	Non-Platinum Bimetallic Cathode Electrocatalysts. . . . .	811
V.E.5	Advanced Cathode Catalysts. . . . .	816
V.E.6	Durable Catalysts for Fuel Cell Protection during Transient Conditions. . . . .	825
V.E.7	Extended, Continuous Pt Nanostructures in Thick, Dispersed Electrodes. . . . .	830
V.E.8	Nanosegregated Cathode Alloy Catalysts with Ultra-Low Platinum Loading. . . . .	835
V.H.2	Durability Improvements through Degradation Mechanism Studies. . . . .	881
V.H.4	Improved Accelerated Stress Tests Based on Fuel Cell Vehicle Data. . . . .	890
V.H.5	Accelerated Testing Validation. . . . .	895
V.L.1	Nitrided Metallic Bipolar Plates. . . . .	925
V.N.3	Engineered Nano-Scale Ceramic Supports for PEM Fuel Cells. . . . .	971
VII.4	HyTrans Model: Analyzing the Potential for Stationary Fuel Cells to Augment Hydrogen Availability in the Transition to Hydrogen Vehicles. . . . .	1187
IX.15	Optically Read MEMS Hydrogen Sensor. . . . .	1366

**Ohio Fuel Cell Coalition**

X.13	Raising H <sub>2</sub> and Fuel Cell Awareness in Ohio. . . . .	1420
II.A.1	Investigation of Reaction Networks and Active Sites in Bio-Ethanol Steam Reforming over Co-based Catalysts. . . . .	23
II.C.3	Zeolite Membrane Reactor for Water-Gas Shift Reaction for Hydrogen Production. . . . .	67
IV.A.1c	Lightweight Metal Hydrides for Hydrogen Storage. . . . .	371
V.P.12	Investigation of the Oxygen Reduction Reaction Activity of Heteroatom-containing Carbon Nano-structures. . . . .	1055

**Oregon State University**

IV.D.1a	Hydrogen Storage Engineering Center of Excellence. . . . .	514
IV.D.1j	Microscale Enhancement of Heat and Mass Transfer for Hydrogen Energy Storage. . . . .	560

**Orion Industries**

V.L.3	Metallic Bipolar Plates with Composite Coatings. . . . .	934
-------	--	-----

**Orlando Science Center**

VIII.11	Florida Hydrogen Initiative. . . . .	1294
---------	--------------------------------------	------

**Ovonic Hydrogen Systems LLC**

IV.I.1	Standardized Testing Program for Solid-State Hydrogen Storage Technologies. . . . .	647
--------	---	-----

**PACCAR, Inc.**

V.I.2	Solid Oxide Fuel Cell Development for Auxiliary Power in Heavy Duty Vehicle Applications. . . . .	907
XI.2	Solid Oxide Fuel Cell Diesel Auxiliary Power Unit Demonstration. . . . .	1446

**Pacific Northwest National Laboratory**

II.A.2	Distributed Hydrogen Production from Biomass Reforming. . . . .	29
III.14	Reversible Liquid Carriers for an Integrated Production, Storage and Delivery of Hydrogen. . . . .	314
IV.B.1d	Chemical Hydrogen Storage Research at PNNL. . . . .	453
IV.D.1a	Hydrogen Storage Engineering Center of Excellence. . . . .	514
IV.D.1b	Systems Engineering of Chemical Hydride, Pressure Vessel, and Balance of Plant for On-Board Hydrogen Storage. . . . .	519

**Pacific Northwest National Laboratory (Continued)**

V.E.3	Development of Alternative and Durable High Performance Cathode Supports for PEM Fuel Cells . . . . .	805
V.P.14	Bio-Inspired Molecular Catalysts for Hydrogen Oxidation and Hydrogen Production . . . . .	1062
V.P.29	Charge Transfer, Transport, and Reactivity in Complex Molecular Environments: Theoretical Studies for the Hydrogen Fuel Initiative. . . . .	1112
VI.3	Modular, High-Volume Fuel Cell Leak-Test Suite and Process. . . . .	1135
VII.13	Pathways to Commercial Success: Technologies and Products Supported by the FCT Program . . . . .	1228
IX.6	Hydrogen Safety Knowledge Tools . . . . .	1332
IX.8	Hydrogen Safety Panel . . . . .	1338
IX.13	Hydrogen Safety Training for First Responders . . . . .	1360
X.1	Hydrogen Safety Training for First Responders . . . . .	1379

**Pall Corporation**

II.C.1	High-Performance Palladium-Based Membrane for Hydrogen Separation and Purification. . . . .	57
II.D.5	Experimental Demonstration of Advanced Palladium Membrane Separators for Central High-Purity Hydrogen Production . . . . .	90

**Parker Hannifin Ltd**

II.E.2	PEM Electrolyzer Incorporating an Advanced Low-Cost Membrane . . . . .	103
--------	--	-----

**Peek Site-Com, Inc.**

XI.6	PEM Fuel Cell Systems Providing Back-Up Power to Commercial Cellular Towers and an Electric Utility Communications Network . . . . .	1456
------	--	------

**Pennsylvania State University**

II.E.4	High-Performance, Low-Cost Hydrogen Generation from Renewable Energy. . . . .	112
II.H.3	Fermentation and Electrohydrogenic Approaches to Hydrogen Production . . . . .	203
IV.F.3	Hydrogen Trapping through Designer Hydrogen Spillover Molecules with Reversible Temperature and Pressure-Induced Switching. . . . .	605
V.M.2	Fuel Cell Fundamentals at Low and Subzero Temperatures. . . . .	948
V.M.3	Development and Validation of a Two-Phase, Three-dimensional Model for PEM Fuel Cells . . . . .	952
V.M.4	Transport Studies Enabling Efficiency Optimization of Cost-Competitive Fuel Cell Stacks . . . . .	956
VI.2	Reduction in Fabrication Costs of Gas Diffusion Layers . . . . .	1131

**Physical Optics Corporation**

II.I.1	Photochemical System for Hydrogen Generation . . . . .	212
--------	--	-----

**Plug Power Inc.**

V.G.3	Intergovernmental Stationary Fuel Cell System Demonstration . . . . .	870
V.M.1	Air-Cooled Stack Freeze Tolerance. . . . .	943
XI.3	Highly Efficient, 5 kW CHP Fuel Cells Demonstrating Durability and Economic Value in Residential and Light Commercial Applications . . . . .	1449
XI.7	Accelerating Acceptance of Fuel Cell Backup Power Systems . . . . .	1460
XI.9	Fuel Cell-Powered Lift Truck FedEx Freight Fleet Deployment. . . . .	1466
XI.10	Fuel Cell-Powered Lift Truck Sysco Houston Fleet Deployment. . . . .	1468
XI.11	Fuel Cell-Powered Lift Truck GENCO Fleet Deployment . . . . .	1470

**PoroGen, LLC**

IV.C.2	Nanostructured Activated Carbon for Hydrogen Storage. . . . .	506
--------	---	-----

**Powdermet Inc.**

IX.8	Hydrogen Safety Panel . . . . .	1338
------	---------------------------------	------

**Power+Energy, Inc.**

II.D.5	Experimental Demonstration of Advanced Palladium Membrane Separators for Central High-Purity Hydrogen Production . . . . .	90
--------	--	----

**Praxair, Inc.**

III.4	Development of a Centrifugal Hydrogen Pipeline Gas Compressor . . . . .	267
III.5	Advanced Hydrogen Liquefaction Process. . . . .	274

**Prometheus Energy**

III.6	Active Magnetic Regenerative Liquefier . . . . .	278
-------	--	-----

**Proton Energy Systems**

II.E.4	High-Performance, Low-Cost Hydrogen Generation from Renewable Energy. . . . .	112
II.I.7	Hydrogen by Wire - Home Fueling System . . . . .	236

**Protonex Technology Corporation**

V.I.1	Diesel-Fueled SOFC System for Class 7/Class 8 On-Highway Truck Auxiliary Power . . . . .	903
V.O.2	Renewable and Logistics Fuels for Fuel Cells at the Colorado School of Mines. . . . .	983

**Public Technology Institute**

X.14	H2L3: Hydrogen Learning for Local Leaders . . . . .	1422
------	---	------

**Purdue University**

II.J.2	Purdue Hydrogen Systems Laboratory: Hydrogen Production. . . . .	245
IV.H.2	Purdue Hydrogen Systems Laboratory: Hydrogen Storage. . . . .	632

**Quantum Fuel Systems Technologies Worldwide, Inc.**

VI.10	Development of Advanced Manufacturing Technologies for Low Cost Hydrogen Storage Vessels . . . . .	1165
-------	--	------

**QuantumSphere Inc.**

V.J.2	Novel Materials for High Efficiency Direct Methanol Fuel Cells. . . . .	915
-------	---	-----

**Queen's University**

V.H.6	Development of Micro-Structural Mitigation Strategies for PEM Fuel Cells: Morphological Simulations and Experimental Approaches . . . . .	899
-------	---	-----

**R&D Dynamics**

III.13	Innovative Hydrogen Liquefaction Cycle. . . . .	310
--------	---	-----

**Reaction Systems, LLC**

V.O.2	Renewable and Logistics Fuels for Fuel Cells at the Colorado School of Mines. . . . .	983
-------	---	-----

**Reference Metals Company**

III.15	Materials Solutions for Hydrogen Delivery in Pipelines . . . . .	318
--------	--	-----

**ReliOn, Inc.**

- XI.6 PEM Fuel Cell Systems Providing Back-Up Power to Commercial Cellular Towers and an Electric Utility Communications Network . . . . .1456
- XI.12 Demonstrating Economic and Operational Viability of 72-Hour Hydrogen PEM Fuel Cell Systems to Support Emergency Communications on the Sprint Nextel Network . . . . .1472

**Rensselaer Polytechnic Institute**

- VI.5 Adaptive Process Controls and Ultrasonics for High Temperature PEM MEA Manufacture . . . . .1144

**Rochester Institute of Technology**

- V.B.3 Visualization of Fuel Cell Water Transport and Performance Characterization Under Freezing Conditions . . . . .716

**Rolls-Royce Fuel Cell Systems Inc.**

- V.O.5 Extended Durability Testing of an External Fuel Processor for SOFC. . . . .997

**Russell Hewett**

- IX.1 National Codes and Standards Template . . . . .1307
- IX.3 Codes and Standards Training and Outreach and Education for Emerging Fuel Cell Technologies . . . . .1315
- X.2 Education for Emerging Fuel Cell Technologies . . . . .1382

**Rutgers University**

- IV.F.3 Hydrogen Trapping through Designer Hydrogen Spillover Molecules with Reversible Temperature and Pressure-Induced Switching. . . . .605

**SAE International**

- IX.1 National Codes and Standards Template . . . . .1307
- IX.2 Component Standard Research and Development . . . . .1311
- IX.3 Codes and Standards Training and Outreach and Education for Emerging Fuel Cell Technologies . . . . .1315
- X.2 Education for Emerging Fuel Cell Technologies . . . . .1382

**Sandia National Laboratories**

- III.12 Hydrogen Embrittlement of Structural Steels . . . . .306
- IV.A.1a Five-Year Review of Metal Hydride Center of Excellence. . . . .361
- IV.A.1d Development of Metal Hydrides at Sandia National Laboratories . . . . .377
- IV.A.2 Tunable Thermodynamics and Kinetics for Hydrogen Storage: Nanoparticle Synthesis Using Ordered Polymer Templates . . . . .423
- IV.E.5 The Reactivity Properties of Hydrogen Storage Materials in the Context of Systems. . . . .586
- V.B.1 Water Transport Exploratory Studies . . . . .706
- V.M.3 Development and Validation of a Two-Phase, Three-dimensional Model for PEM Fuel Cells . . . . .952
- V.N.2 Resonance-Stabilized Anion Exchange Polymer Electrolytes. . . . .967
- VII.2 Analysis of Energy Infrastructures and Potential Impacts from an Emergent Hydrogen Fueling Infrastructure. . . . .1181
- IX.5 Materials and Components Compatibility . . . . .1326
- IX.9 Hydrogen Release Behavior. . . . .1342
- IX.10 Risk-Informed Separation Distances for H<sub>2</sub> Facilities. . . . .1347
- IX.11 International Energy Agency Hydrogen Implementing Agreement Task 19 Hydrogen Safety . . . . .1352

**Savannah River National Laboratory**

III.9	Fiber Reinforced Composite Pipelines . . . . .	293
IV.A.1g	Electrochemical Reversible Formation of Alane . . . . .	394
IV.A.1k	Li-Mg-N Hydrogen Storage Materials . . . . .	413
IV.D.1a	Hydrogen Storage Engineering Center of Excellence . . . . .	514
IV.D.1h	SRNL Technical Work Scope for the Hydrogen Storage Engineering Center of Excellence. . . . .	551
IV.E.3	Fundamental Reactivity Testing and Analysis of Hydrogen Storage Materials . . . . .	576
V.C.2	Fundamental Effects of Impurities on Fuel Cell Performance and Durability. . . . .	727

**Schatz Energy Research Center**

X.14	H2L3: Hydrogen Learning for Local Leaders . . . . .	1422
------	---	------

**Schott North America**

II.B.3	One Step Biomass Gas Reforming-Shift Separation Membrane Reactor . . . . .	54
III.15	Materials Solutions for Hydrogen Delivery in Pipelines . . . . .	318

**Science Applications International Corporation**

II.F.2	Solar High-Temperature Water-Splitting Cycle with Quantum Boost . . . . .	120
--------	---	-----

**Scribner Associates, Inc.**

V.D.4	Lead Research and Development Activity for DOE's High Temperature, Low Relative Humidity Membrane Program . . . . .	758
-------	---	-----

**Secat, Inc.**

III.15	Materials Solutions for Hydrogen Delivery in Pipelines . . . . .	318
--------	--	-----

**Sentech, Inc.**

II.I.3	Aqueous Phase Base-Facilitated Reforming (BFR) of Renewable Fuels . . . . .	220
X.17	H <sub>2</sub> Educate – Middle School Hydrogen Education Program . . . . .	1432

**SGL Carbon**

V.B.2	Water Transport in PEM Fuel Cells: Advanced Modeling, Material Selection, Testing, and Design Optimization. . . . .	711
V.F.1	CIRRUS: Cell Ice Regulation & Removal Upon Start-Up . . . . .	857

**SGL Technologies GmbH**

V.B.1	Water Transport Exploratory Studies . . . . .	706
-------	---	-----

**Shengbai Zhang**

IV.C.1e	NREL Research as Part of the Hydrogen Sorption Center of Excellence . . . . .	486
---------	---	-----

**Sierra Marine Technologies**

II.I.3	Aqueous Phase Base-Facilitated Reforming (BFR) of Renewable Fuels . . . . .	220
--------	---	-----

**SiGNa**

IV.H.1	NaSi and Na-SG Powder Hydrogen Fuel Cells . . . . .	628
--------	---	-----

**Sloane Solutions**

IX.1	National Codes and Standards Template . . . . .	1307
IX.3	Codes and Standards Training and Outreach and Education for Emerging Fuel Cell Technologies . . . . .	1315
X.2	Education for Emerging Fuel Cell Technologies . . . . .	1382

**Smart Chemistry**

IX.1 National Codes and Standards Template . . . . .1307  
 IX.3 Codes and Standards Training and Outreach and Education for Emerging Fuel Cell Technologies . . . . .1315  
 X.2 Education for Emerging Fuel Cell Technologies . . . . . 1382

**South Carolina Hydrogen and Fuel Cell Alliance**

X.10 Development of Hydrogen Education Programs for Government Officials . . . . . 1411

**Southern California Edison**

VIII.2 Controlled Hydrogen Fleet and Infrastructure Demonstration and Validation Project . . . . .1261

**Southern Illinois University Carbondale**

V.L.3 Metallic Bipolar Plates with Composite Coatings . . . . . 934

**Southwest Research Institute®**

II.D.4 Amorphous Alloy Membranes for High Temperature Hydrogen Separation . . . . . .86  
 IV.I.1 Standardized Testing Program for Solid-State Hydrogen Storage Technologies . . . . .647

**Spectrum Automation**

II.E.3 Renewable Electrolysis Integrated System Development and Testing . . . . .107

**Spencer Composites**

III.7 Inexpensive Delivery of Cold Hydrogen in High Performance Glass Fiber Pressure Vessels . . . . .282

**Sprint Nextel**

XI.12 Demonstrating Economic and Operational Viability of 72-Hour Hydrogen PEM Fuel Cell Systems to Support Emergency Communications on the Sprint Nextel Network . . . . .1472

**Stanford University**

II.G.2 Nanostructured MoS<sub>2</sub> and WS<sub>2</sub> for the Solar Production of Hydrogen . . . . .138  
 II.G.4 Semiconductor Materials for Photoelectrolysis . . . . .150  
 V.E.7 Extended, Continuous Pt Nanostructures in Thick, Dispersed Electrodes . . . . .830  
 V.P.24 Development and Mechanistic Characterization of Alloy Fuel Cell Catalysts . . . . . 1095

**Stark State College of Technology**

V.O.8 Fuel Cell Balance-of-Plant Reliability Testbed . . . . .1007

**State University of New York, Albany**

V.E.7 Extended, Continuous Pt Nanostructures in Thick, Dispersed Electrodes . . . . .830

**State University of New York, Stony Brook**

V.L.2 Low-Cost PEM Fuel Cell Metal Bipolar Plates . . . . .930

**State University of New York, Syracuse**

IV.C.2 Nanostructured Activated Carbon for Hydrogen Storage . . . . . 506  
 V.D.3 Dimensionally Stable Membranes (DSMs) . . . . .754

**Steele Consulting**

IX.1 National Codes and Standards Template . . . . .1307  
 IX.3 Codes and Standards Training and Outreach and Education for Emerging Fuel Cell Technologies . .1315  
 X.2 Education for Emerging Fuel Cell Technologies . . . . . 1382

**Superior Graphite Company**

- IV.C.3 Electron Charged Graphite-Based Hydrogen Storage Material ..... 510

**Sustainable Innovations, LLC**

- III.16 Development of Highly Efficient Solid-State Electrochemical Hydrogen Compressor ..... 323

**Synkera Technologies, Inc.**

- II.I.2 Nanotube Array Photoelectrochemical Hydrogen Production ..... 216

**Sysco of Houston**

- XI.10 Fuel Cell-Powered Lift Truck Sysco Houston Fleet Deployment ..... 1468

**Tanadgusix Foundation**

- VIII.9 TDX Foundation Hydrogen Project/PEV Project ..... 1288

**TDA Research, Inc.**

- XI.2 Solid Oxide Fuel Cell Diesel Auxiliary Power Unit Demonstration ..... 1446

**TDX Power**

- VIII.9 TDX Foundation Hydrogen Project/PEV Project ..... 1288

**Tech-Etch**

- V.M.5 Transport Studies and Modeling in PEM Fuel Cells ..... 960

**Technology Transition Corporation**

- X.14 H2L3: Hydrogen Learning for Local Leaders ..... 1422

**Techverse**

- V.B.2 Water Transport in PEM Fuel Cells: Advanced Modeling, Material Selection, Testing,  
and Design Optimization ..... 711

**Telecom, Tower and Power, LLC**

- XI.6 PEM Fuel Cell Systems Providing Back-Up Power to Commercial Cellular Towers and  
an Electric Utility Communications Network ..... 1456

**Texas A&M University**

- III.4 Development of a Centrifugal Hydrogen Pipeline Gas Compressor ..... 267  
IV.C.1b A Biomimetic Approach to Metal-Organic Frameworks with High H<sub>2</sub> Uptake ..... 468  
V.E.2 Highly Dispersed Alloy Catalyst for Durability ..... 799  
V.P.25 Metal dissolution mechanisms in Pt-based alloys: Ideas for advanced PEM cathode design ..... 1099

**Texas H2 Coalition**

- VIII.10 Texas Hydrogen Highway ..... 1291  
X.9 Hydrogen Education in Texas ..... 1408

**Texas Tech University**

- V.P.20 Strategies for Probing Nanometer-Scale Electrocatalysts: From Single Particles to  
Catalyst-Membrane Architectures ..... 1081

**Thanos Stubos**

- IV.C.1e NREL Research as Part of the Hydrogen Sorption Center of Excellence ..... 486

**The Toro Company**

- V.G.4 Research and Development for Off-Road Fuel Cell Applications ..... 873

**TIAX, LLC**

- IV.E.2 Analyses of Hydrogen Storage Materials and On-Board Systems ..... 572  
 V.A.3 Cost Analyses of Fuel Cell Stacks/Systems ..... 672  
 VII.15 Geo-Spatial Analysis of Hydrogen Infrastructure ..... 1236

**TreadStone Technologies, Inc.**

- V.L.2 Low-Cost PEM Fuel Cell Metal Bipolar Plates ..... 930

**Trulite Inc.**

- IV.H.1 NaSi and Na-SG Powder Hydrogen Fuel Cells ..... 628

**Tufts University**

- V.P.19 Nanostructured, Metal-Modified Oxide Catalysts for Steam Reforming of Methanol and the Water-Gas Shift Reactions..... 1078

**UltraCell Corporation**

- VI.3 Modular, High-Volume Fuel Cell Leak-Test Suite and Process..... 1135

**United Commercial Real Estate Services, Inc.**

- XI.6 PEM Fuel Cell Systems Providing Back-Up Power to Commercial Cellular Towers and an Electric Utility Communications Network ..... 1456

**United Technologies – Hamilton Sundstrand**

- V.C.3 The Effects of Impurities on Fuel Cell Performance and Durability..... 731

**United Technologies Research Center**

- II.B.1 A Novel Slurry-Based Biomass Reforming Process ..... 46  
 II.D.5 Experimental Demonstration of Advanced Palladium Membrane Separators for Central High-Purity Hydrogen Production ..... 90  
 III.14 Reversible Liquid Carriers for an Integrated Production, Storage and Delivery of Hydrogen..... 314  
 IV.D.1a Hydrogen Storage Engineering Center of Excellence ..... 514  
 IV.D.1c Advancement of Systems Designs and Key Engineering Technologies for Materials-Based Hydrogen Storage..... 524  
 IV.E.4 Quantifying and Addressing the DOE Material Reactivity Requirements with Analysis and Testing of Hydrogen Storage Materials and Systems..... 581  
 V.H.1 Polymer Electrolyte Fuel Cell Lifetime Limitations: The Role of Electrocatalyst Degradation ..... 876  
 V.H.4 Improved Accelerated Stress Tests Based on Fuel Cell Vehicle Data..... 890  
 V.M.2 Fuel Cell Fundamentals at Low and Subzero Temperatures..... 948

**Université du Québec à Trois-Rivières**

- IV.D.1h SRNL Technical Work Scope for the Hydrogen Storage Engineering Center of Excellence..... 551

**University of Akron**

- V.D.10 Protic Salt Polymer Membranes: High-Temperature Water-Free Proton-Conducting Membranes..... 786  
 V.O.3 Development of Kilowatt-Scale Coal-Based Fuel Cell Technology ..... 988

**University of Arizona**

- V.D.10 Protic Salt Polymer Membranes: High-Temperature Water-Free Proton-Conducting Membranes..... 786

**University of Arkansas, Little Rock**

II.G.11	Photoelectrochemical Generation of Hydrogen . . . . .	182
II.G.13	Photoelectrochemical Generation of Hydrogen from Water Using Visible Light Sensitive Ferro-Electric BiFeO <sub>3</sub> and Semiconductor Nanotubes . . . . .	191
IV.H.4	An Integrated Approach of Hydrogen Storage in Complex Hydrides of Transitional Elements . . . . .	639

**University of California, Berkeley**

II.H.1	Maximizing Light Utilization Efficiency and Hydrogen Production in Microalgal Cultures . . . . .	195
X.4	Hydrogen Energy in Engineering Education (H <sub>2</sub> E <sup>3</sup> ) . . . . .	1389
X.16	Hydrogen Technology and Energy Curriculum (HyTEC) . . . . .	1428

**University of California, Davis**

V.G.4	Research and Development for Off-Road Fuel Cell Applications . . . . .	873
-------	--	-----

**University of California, Irvine**

VIII.6	California Hydrogen Infrastructure Project . . . . .	1277
XI.3	Highly Efficient, 5 kW CHP Fuel Cells Demonstrating Durability and Economic Value in Residential and Light Commercial Applications . . . . .	1449

**University of California, Los Angeles**

IV.A.3	Efficient Discovery of Novel Multicomponent Mixtures for Hydrogen Storage: A Combined Computational/Experimental Approach . . . . .	428
IV.F.1	A Joint Theory and Experimental Project in the Synthesis and Testing of Porous COFs for On-Board Vehicular Hydrogen Storage . . . . .	595

**University of California, Riverside**

V.E.5	Advanced Cathode Catalysts . . . . .	816
V.E.7	Extended, Continuous Pt Nanostructures in Thick, Dispersed Electrodes . . . . .	830

**University of California, Santa Barbara**

II.G.3	Photoelectrochemical Hydrogen Production Using New Combinatorial Chemistry Derived Materials . . . . .	145
--------	---	-----

**University of Central Florida**

II.F.2	Solar High-Temperature Water-Splitting Cycle with Quantum Boost . . . . .	120
V.D.4	Lead Research and Development Activity for DOE's High Temperature, Low Relative Humidity Membrane Program . . . . .	758
VIII.11	Florida Hydrogen Initiative . . . . .	1294
X.6	Bachelor of Science Engineering Technology Hydrogen and Fuel Cell Program Concentration . . . . .	1396

**University of Chicago**

IV.C.1f	Hydrogen Storage through Nanostructured Porous Organic Polymers (POPs) . . . . .	495
---------	--	-----

**University of Cincinnati**

II.C.3	Zeolite Membrane Reactor for Water-Gas Shift Reaction for Hydrogen Production . . . . .	67
--------	---	----

**University of Colorado**

II.F.3	Solar-Thermal Atomic Layer Deposition Ferrite-Based Water Splitting Cycles . . . . .	126
--------	--	-----

**University of Connecticut**

V.C.3	The Effects of Impurities on Fuel Cell Performance and Durability. . . . .	731
V.E.3	Development of Alternative and Durable High Performance Cathode Supports for PEM Fuel Cells. . . . .	805

**University of Delaware**

V.E.3	Development of Alternative and Durable High Performance Cathode Supports for PEM Fuel Cells. . . . .	805
V.F.1	CIRRUS: Cell Ice Regulation & Removal Upon Start-Up . . . . .	857
VI.4	Manufacturing of Low-Cost, Durable Membrane Electrode Assemblies Engineered for Rapid Conditioning. . . . .	1139

**University of Detroit Mercy**

V.D.2	Membranes and MEAs for Dry, Hot Operating Conditions . . . . .	748
-------	--	-----

**University of Florida**

V.J.3	New MEA Materials for Improved DMFC Performance, Durability, and Cost . . . . .	917
XI.4	Advanced Direct Methanol Fuel Cell for Mobile Computing . . . . .	1452

**University of Hawaii**

IV.A.1b	Fundamental Studies of Advanced High-Capacity, Reversible Metal Hydrides . . . . .	364
V.C.4	Effect of System and Air Contaminants on PEMFC Performance and Durability . . . . .	737
V.D.9	Improved, Low-Cost, Durable Fuel Cell Membranes . . . . .	782
IX.1	National Codes and Standards Template . . . . .	1307
IX.3	Codes and Standards Training and Outreach and Education for Emerging Fuel Cell Technologies . . . . .	1315
X.2	Education for Emerging Fuel Cell Technologies . . . . .	1382

**University of Hawaii at Manoa**

II.G.1	Photoelectrochemical Hydrogen Production: DOE PEC Working Group Overview. . . . .	131
--------	---	-----

**University of Hawaii at Manoa (Continued)**

II.G.7	Progress in the Study of Amorphous Silicon Carbide (a-SiC) as a Photoelectrode in Photoelectrochemical (PEC) Cells . . . . .	167
II.G.8	Progress in the Study of Tungsten Oxide Compounds as Photoelectrodes in Photoelectrochemical Cells . . . . .	171
II.G.9	Progress in the Study of Copper Chalcopyrites as Photoelectrodes in Photoelectrochemical Cells . . . . .	175

**University of Houston**

V.P.24	Development and Mechanistic Characterization of Alloy Fuel Cell Catalysts . . . . .	1095
--------	---	------

**University of Illinois**

V.E.4	Non-Platinum Bimetallic Cathode Electrocatalysts. . . . .	811
-------	---	-----

**University of Illinois at Urbana-Champaign**

III.10	Hydrogen Embrittlement of Pipeline Steels: Fundamentals, Experiments, Modeling. . . . .	296
IV.A.1f	Reversible Hydrogen Storage Materials - Structure, Chemistry, and Electronic Structure . . . . .	389
V.E.5	Advanced Cathode Catalysts . . . . .	816
V.P.7	Cathode Catalysis in Hydrogen/Oxygen Fuel Cells: Mechanism, New Materials, and Characterization . . . . .	1037

**University of Maryland**

V.P.21	Atomic-scale Design of a New Class of Alloy Catalysts for Reactions Involving Hydrogen: A Theoretical and Experimental Approach . . . . .	1084
X.11	VA-MD-DC Hydrogen Education for Decision Makers . . . . .	1414

**University of Michigan**

IV.C.1g	Hydrogen Storage by Spillover . . . . .	499
IV.D.1a	Hydrogen Storage Engineering Center of Excellence . . . . .	514
IV.D.1g	Ford/BASF-SE/UM Activities in Support of the Hydrogen Storage Engineering Center of Excellence. . . . .	546

**University of Minnesota**

II.A.4	Distributed Bio-Oil Reforming . . . . .	38
--------	---	----

**University of Missouri**

IV.C.1c	Multiply Surface-Functionalized Nanoporous Carbon for Vehicular Hydrogen Storage. . . . .	474
---------	---	-----

**University of Missouri, St. Louis**

IV.A.1d	Development of Metal Hydrides at Sandia National Laboratories . . . . .	377
IV.A.2	Tunable Thermodynamics and Kinetics for Hydrogen Storage: Nanoparticle Synthesis Using Ordered Polymer Templates. . . . .	423

**University of Nevada**

V.E.4	Non-Platinum Bimetallic Cathode Electrocatalysts. . . . .	811
-------	---	-----

**University of Nevada, Las Vegas**

II.G.4	Semiconductor Materials for Photoelectrolysis . . . . .	150
II.G.5	Characterization of Materials for Photoelectrochemical Hydrogen Production. . . . .	157
IV.H.3	HGMS: Glasses and Nanocomposites for Hydrogen Storage . . . . .	637

**University of Nevada, Reno**

II.G.13	Photoelectrochemical Generation of Hydrogen from Water Using Visible Light Sensitive Ferro-Electric BiFeO <sub>3</sub> and Semiconductor Nanotubes . . . . .	191
IV.A.11	Effect of Gaseous Impurities on Long-Term Thermal Cycling and Aging Properties of Complex Hydrides for Hydrogen Storage. . . . .	417

**University of New Brunswick**

IV.A.1b	Fundamental Studies of Advanced High-Capacity, Reversible Metal Hydrides . . . . .	364
---------	--	-----

**University of New Mexico**

V.E.5	Advanced Cathode Catalysts . . . . .	816
V.H.2	Durability Improvements through Degradation Mechanism Studies. . . . .	881
V.H.6	Development of Micro-Structural Mitigation Strategies for PEM Fuel Cells: Morphological Simulations and Experimental Approaches . . . . .	899
V.N.3	Engineered Nano-Scale Ceramic Supports for PEM Fuel Cells. . . . .	971

**University of North Carolina at Charlotte**

X.6	Bachelor of Science Engineering Technology Hydrogen and Fuel Cell Program Concentration . . . . .	1396
-----	---	------

**University of North Dakota**

II.B.1	A Novel Slurry-Based Biomass Reforming Process . . . . .	46
X.7	Development of a Renewable Hydrogen Production and Fuel Cell Education Program. . . . .	1400

**University of North Florida**

- V.J.3 New MEA Materials for Improved DMFC Performance, Durability, and Cost . . . . . 917  
 XI.4 Advanced Direct Methanol Fuel Cell for Mobile Computing . . . . . 1452

**University of Oregon**

- IV.B.1b Hydrogen Storage by Novel CBN Heterocycle Materials . . . . . 443

**University of Pennsylvania**

- V.P.28 The Development of Nano-Composite Electrodes for Solid Oxide Electrolyzers . . . . . 1109

**University of Pittsburgh**

- V.P.22 Multiscale Tailoring of Highly Active and Stable Nanocomposite Catalysts for the Production  
 of Clean Hydrogen Streams . . . . . 1088

**University of Québec**

- IV.D.1a Hydrogen Storage Engineering Center of Excellence . . . . . 514

**University of South Carolina**

- V.C.4 Effect of System and Air Contaminants on PEMFC Performance and Durability . . . . . 737  
 V.M.5 Transport Studies and Modeling in PEM Fuel Cells . . . . . 960  
 V.O.6 Hydrogen Fuel Cell Development in Columbia (SC) . . . . . 1001

**University of South Carolina Research Foundation**

- IX.1 National Codes and Standards Template . . . . . 1307  
 IX.3 Codes and Standards Training and Outreach and Education for Emerging Fuel Cell  
 Technologies . . . . . 1315  
 X.2 Education for Emerging Fuel Cell Technologies . . . . . 1382

**University of Southern California, Los Angeles**

- II.C.2 Development of Hydrogen Selective Membranes/Modules as Reactors/Separators for  
 Distributed Hydrogen Production . . . . . 62  
 V.N.2 Resonance-Stabilized Anion Exchange Polymer Electrolytes . . . . . 967

**University of Southern Mississippi**

- V.O.4 Alternate Fuel Cell Membranes for Energy Independence . . . . . 993

**University of Tennessee**

- V.B.1 Water Transport Exploratory Studies . . . . . 706  
 V.D.2 Membranes and MEAs for Dry, Hot Operating Conditions . . . . . 748  
 V.E.7 Extended, Continuous Pt Nanostructures in Thick, Dispersed Electrodes . . . . . 830  
 V.P.4 The Study of Proton Transport Using Reactive Molecular Dynamics . . . . . 1027  
 VI.4 Manufacturing of Low-Cost, Durable Membrane Electrode Assemblies Engineered for  
 Rapid Conditioning . . . . . 1139  
 VII.4 HyTrans Model: Analyzing the Potential for Stationary Fuel Cells to Augment Hydrogen  
 Availability in the Transition to Hydrogen Vehicles . . . . . 1187  
 V.P.31 The Dielectric Response of Hydrated PFSA membranes – Measurements with Single Post  
 Dielectric Resonators . . . . . 1118

**University of Texas**

- IV.H.1 NaSi and Na-SG Powder Hydrogen Fuel Cells . . . . . 628

**University of Texas at Austin**

V.B.1	Water Transport Exploratory Studies . . . . .	706
V.E.7	Extended, Continuous Pt Nanostructures in Thick, Dispersed Electrodes . . . . .	830
V.H.1	Polymer Electrolyte Fuel Cell Lifetime Limitations: The Role of Electrocatalyst Degradation . . . . .	876
VIII.10	Texas Hydrogen Highway . . . . .	1291

**University of Toledo**

II.G.10	Critical Research for Cost-Effective Photoelectrochemical Production of Hydrogen. . . . .	179
---------	---	-----

**University of Utah**

V.P.26	Mechanism of Proton Transport in Proton Exchange Membranes: Insights from Computer Simulation . . . . .	1103
--------	---	------

**University of Victoria**

V.B.2	Water Transport in PEM Fuel Cells: Advanced Modeling, Material Selection, Testing, and Design Optimization. . . . .	711
-------	---	-----

**University of Virginia**

V.P.10	Theoretical Insights Into Active and Durable Oxygen Reduction Catalysts . . . . .	1048
--------	---	------

**University of Wisconsin, Madison**

V.H.1	Polymer Electrolyte Fuel Cell Lifetime Limitations: The Role of Electrocatalyst Degradation . . . . .	876
V.P.6	Activity and Stability of Nanoscale Pt-based Catalysts . . . . .	1033
V.P.21	Atomic-scale Design of a New Class of Alloy Catalysts for Reactions Involving Hydrogen: A Theoretical and Experimental Approach . . . . .	1084

**University of Wyoming**

II.J.2	Purdue Hydrogen Systems Laboratory: Hydrogen Production. . . . .	245
IV.H.2	Purdue Hydrogen Systems Laboratory: Hydrogen Storage. . . . .	632

**UTC Power**

V.E.2	Highly Dispersed Alloy Catalyst for Durability . . . . .	799
V.H.4	Improved Accelerated Stress Tests Based on Fuel Cell Vehicle Data. . . . .	890
V.L.4	Low-Cost Durable Seals for PEMFCs . . . . .	939
VI.4	Manufacturing of Low-Cost, Durable Membrane Electrode Assemblies Engineered for Rapid Conditioning . . . . .	1139
VIII.2	Controlled Hydrogen Fleet and Infrastructure Demonstration and Validation Project . . . . .	1261

**Vanderbilt University**

V.D.6	NanoCapillary Network Proton Conducting Membranes for High Temperature Hydrogen/Air Fuel Cells . . . . .	767
V.P.5	Surface-Directed Fabrication of Integrated Membrane-Electrode Interfaces . . . . .	1029

**Versa Power Systems**

V.N.1	Advanced Materials for RSOFC Dual Operation with Low Degradation. . . . .	963
-------	---	-----

**Vertical Horizons Contracting**

XI.6	PEM Fuel Cell Systems Providing Back-Up Power to Commercial Cellular Towers and an Electric Utility Communications Network . . . . .	1456
------	--	------

**Virginia Polytechnic Institute and State University**

I.E.2 PEM Electrolyzer Incorporating an Advanced Low-Cost Membrane . . . . . 103  
 IV.G.3 High Strength Carbon Fibers . . . . . 622  
 V.D.9 Improved, Low-Cost, Durable Fuel Cell Membranes . . . . . 782  
 V.L.4 Low-Cost Durable Seals for PEMFCs . . . . . 939  
 V.M.5 Transport Studies and Modeling in PEM Fuel Cells . . . . . 960

**Volpentest HAMMER Training and Education Center**

IX.13 Hydrogen Safety Training for First Responders . . . . . 1360  
 X.1 Hydrogen Safety Training for First Responders . . . . . 1379

**Volvo Trucks North America**

V.I.2 Solid Oxide Fuel Cell Development for Auxiliary Power in Heavy Duty Vehicle Applications . . . . . 907

**W.L. Gore & Associates, Inc.**

V.F.1 CIRRUS: Cell Ice Regulation & Removal Upon Start-Up . . . . . 857  
 V.K.2 Materials and Modules for Low-Cost, High-Performance Fuel Cell Humidifiers . . . . . 922  
 VI.4 Manufacturing of Low-Cost, Durable Membrane Electrode Assemblies Engineered for Rapid Conditioning . . . . . 1139

**Western Michigan University**

I.I.3 Aqueous Phase Base-Facilitated Reforming (BFR) of Renewable Fuels . . . . . 220

**Western Research Institute**

II.D.4 Amorphous Alloy Membranes for High Temperature Hydrogen Separation . . . . . 86

**William C. Fort**

IX.8 Hydrogen Safety Panel . . . . . 1338

**Worcester Polytechnic Institute**

II.D.1 Composite Pd and Alloy Porous Stainless Steel Membranes for Hydrogen Production and Process Intensification . . . . . 74  
 II.D.6 Supported Molten Metal Membrane (SMMM) for Hydrogen Separation. . . . . 95

**Wright State University**

V.D.6 NanoCapillary Network Proton Conducting Membranes for High Temperature Hydrogen/Air Fuel Cells . . . . . 767

**Xunlight Corporation**

II.G.10 Critical Research for Cost-Effective Photoelectrochemical Production of Hydrogen. . . . . 179