XV. Project Listings by State

Alabama	
IV.C.7	The University of Alabama: Novel Carbon(C)-Boron(B)-Nitrogen(N)-Containing H ₂ Storage Materials
IV.D.3	Toray Composites America: Enhanced Materials and Design Parameters for Reducing the Cost of Hydrogen Storage Tanks
Arizona	
II.C.1	Arizona State University: High Efficiency Solar Thermochemical Reactor for Hydrogen Production II-35
VIII.11	Custom Sensor Solutions: Hydrogen Safety, Codes and Standards: Sensors
Arkansas	
III.9	Ashok Saxena: Low Cost Hydrogen Storage at 875 Bar Using Steel Liner and Steel Wire Wrap III-45
California	
II.C.1	Sandia National Laboratories: High Efficiency Solar Thermochemical Reactor for Hydrogen
11.0.1	Production
II.C.1	Stanford University: High Efficiency Solar Thermochemical Reactor for Hydrogen Production II–35
II.C.5	Stanford University: Wide Bandgap Chalcopyrite Photoelectrodes for Direct Solar Water Splitting II–56
II.C.5	Lawrence Livermore National Laboratory: Wide Bandgap Chalcopyrite Photoelectrodes for Direct Solar Water Splitting
II.F.2	University of California, Irvine: Reformer-Electrolyzer-Purifier (REP) for Production of Hydrogen II-90
III.3	Sandia National Laboratories: Hydrogen Embrittlement of Structural Steels
III.8	Bevilacqua Knight, Inc.: Steel Concrete Composite Vessel for 875 bar Stationary Hydrogen Storage III-40
III.8	LightSail: Steel Concrete Composite Vessel for 875 bar Stationary Hydrogen Storage
III.11	Sandia National Laboratories: Reference Station Design
IV.B.1	Jet Propulsion Laboratory: Hydrogen Storage Engineering Center of Excellence
IV.B.1	California Institute of Technology: Hydrogen Storage Engineering Center of Excellence IV–22
IV.C.1	Lawrence Berkeley National Laboratory: Hydrogen Storage in Metal-Organic Frameworks IV-63
IV.C.2	H2 Technology Consulting LLC: Hydrogen Sorbent Measurement Qualification and Characterization IV-70
IV.C.2	University of California, Berkeley: Hydrogen Sorbent Measurement Qualification and Characterization IV-70
IV.C.2	University of California, San Diego: Hydrogen Sorbent Measurement Qualification and
III.O.	Characterization
	Ardica Technologies: Low-Cost α-Alane for Hydrogen Storage
IV.C.6	SRI International: Low-Cost α-Alane for Hydrogen Storage
IV.C.8 IV.C.8	HRL Laboratories, LLC: Boron-Based Hydrogen Storage: Ternary Borides and Beyond
IV.C.9	Lawrence Livermore National Laboratory: Improving the Kinetics and Thermodynamics of
	$Mg(BH_4)_2$ for Hydrogen Storage
IV.C.9	Sandia National Laboratories: Improving the Kinetics and Thermodynamics of $Mg(BH_4)_2$ for Hydrogen Storage
IV.D.1	Sandia National Laboratories: Innovative Development, Selection and Testing to Reduce Cost and Weight of Materials for BOP Components
IV.D.2	Lawrence Livermore National Laboratory: Thermomechanical Cycling of Thin Liner High Fiber Fraction Cryogenic Pressure Vessels Rapidly Refueled by LH ₂ Pump to 700 Bar
IV.D.2	Spencer Composites Corporation: Thermomechanical Cycling of Thin Liner High Fiber Fraction Cryogenic Pressure Vessels Rapidly Refueled by LH, Pump to 700 Bar

Cal	ifornia (Continued)	
	`	Linde LLC: Thermomechanical Cycling of Thin Liner High Fiber Fraction Cryogenic Pressure Vessels Rapidly Refueled by LH, Pump to 700 Bar	IV–113
	IV.D.4	Materia: Next Generation Hydrogen Storage Vessels Enabled by Carbon Fiber Infusion with a Low Viscosity, High Toughness System	
	IV.D.4	Spencer Composites Corporation: Next Generation Hydrogen Storage Vessels Enabled by Carbon Fiber Infusion with a Low Viscosity, High Toughness System.	. IV–122
	IV.E.2	Savannah River National Laboratory: Elucidation of Hydrogen Interaction Mechanisms with Metal-Doped Carbon Nanostructures	. IV–144
	IV.E.3	University of California, Davis: Activation of Hydrogen Under Ambient Conditions by Main Group Molecules	IV–145
	V.C.1	Lawrence Berkeley National Laboratory: High Performance, Durable, Low Cost Membrane Electrode Assemblies for Transportation Applications	V–73
	V.D.1	Electricore, Inc.: Roots Air Management System with Integrated Expander	V-96
	V.E.1	Lawrence Berkeley National Laboratory: Durability Improvements Through Degradation Mechanism Studies	V–101
	V.E.2	Lawrence Berkeley National Laboratory: Fuel-Cell Fundamentals at Low and Subzero Temperatures	V–108
	V.F.7	Lawrence Berkeley National Laboratory: A Total Cost of Ownership Model for Design and Manufacturing Optimization of Fuel Cells in Stationary and Emerging Market Applications	V–162
	V.F.7	University of California, Berkeley: A Total Cost of Ownership Model for Design and Manufacturing Optimization of Fuel Cells in Stationary and Emerging Market Applications	V–162
	V.F.17	Lawrence Berkeley National Laboratory: Advanced Hydroxide Conducting Membranes	V–205
	V.F.19	Lawrence Berkeley National Laboratory: Engineered Low-Pt Catalyst Layers	V–218
	VI.1	Lawrence Berkeley National Laboratory: Fuel Cell Membrane Electrode Assembly Manufacturing R&D	VI–7
	VII.2	Lawrence Livermore National Laboratory: Performance and Durability Testing of Volumetrically Efficient Cryogenic Vessels and High Pressure Liquid Hydrogen Pump	VII–13
	VII.2	Linde LLC: Performance and Durability Testing of Volumetrically Efficient Cryogenic Vessels and High Pressure Liquid Hydrogen Pump	VII–13
	VII.2	Spencer Composites Corporation: Performance and Durability Testing of Volumetrically Efficient Cryogenic Vessels and High Pressure Liquid Hydrogen Pump	VII–13
	VII.7	Sandia National Laboratories: Development of the Hydrogen Station Equipment Performance (HyStEP) Device	VII–36
	VII.8	California Fuel Cell Partnership: Station Operational Status System (SOSS) 3.0 Upgrade	VII–41
	VII.10	Linde Gas, LLC: Performance Evaluation of Delivered Hydrogen Fueling Stations	VII–50
	VII.12	California State University, Los Angeles: CSULA Hydrogen Refueling Facility Performance Evaluation and Optimization	VII–58
	VIII.3	Sandia National Laboratories: R&D for Safety, Codes and Standards: Materials and Components Compatibility	. VIII–17
	VIII.6	Fluer, Inc.: Hydrogen Safety Panel, Safety Knowledge Tools and First Responder Training Resources	. VIII–31
	VIII.6	BKi: Hydrogen Safety Panel, Safety Knowledge Tools and First Responder Training Resources	. VIII–31
	VIII.6	City of Santa Fe Springs: Hydrogen Safety Panel, Safety Knowledge Tools and First Responder Training Resources.	. VIII–31
	VIII.7	Branded by Media: Fuel Cell Technologies National Codes and Standards Deployment and Outreach	. VIII–38
	VIII.11	Lawrence Livermore National Laboratory: Hydrogen Safety, Codes and Standards: Sensors	. VIII–53
	VIII.11	Hydrogen Frontier: Hydrogen Safety, Codes and Standards: Sensors	
	VIII.12	Lawrence Livermore National Laboratory: Hands-on Hydrogen Safety Training	
	IX.7	Sandia National Laboratories: Hydrogen Analysis with the Sandia ParaChoice Model	

California ((Continued)	
IX.9	University of California, Irvine: Tri-Generation Fuel Cell Technologies for Location-Specific Applications (FY 2015)	IX-54
X.2	Sandia National Laboratories: Maritime Fuel Cell Generator Project	. X–10
X.5	US Hybrid Corporation: Demonstration and Deployment of a Fuel Cell-Electric Refuse Truck for Waste Transportation	
Colorado		
II.B.1	National Renewable Energy Laboratory: Renewable Electrolysis Integrated System Development and Testing	. II–18
II.B.1	Spectrum Automation Controls: Renewable Electrolysis Integrated System Development and Testing	
II.B.2	National Renewable Energy Laboratory: High-Performance, Long-Lifetime Catalysts for Proton Exchange Membrane Electrolysis	
II.C.1	Colorado School of Mines: High Efficiency Solar Thermochemical Reactor for Hydrogen Production	
II.C.2	University of Colorado Boulder: Flowing Particle Bed Solarthermal Redox Process to Split Water	
II.C.2	National Renewable Energy Laboratory: Flowing Particle Bed Solarthermal Redox Process to Split Water.	
II.C.4	National Renewable Energy Laboratory: High-Efficiency Tandem Absorbers for Economical Solar Hydrogen Production	
II.C.5	National Renewable Energy Laboratory: Wide Bandgap Chalcopyrite Photoelectrodes for Direct Solar Water Splitting	
II.C.6	University of Colorado Boulder: Accelerated Discovery of Advanced RedOx Materials for Solar Thermal Water Splitting to Produce Renewable Hydrogen	
II.E.1	National Renewable Energy Laboratory: Fermentation and Electrohydrogenic Approaches to Hydrogen Production	
II.E.2	National Renewable Energy Laboratory: Improving Cyanobacterial O ₂ -Tolerance using CBS Hydrogenase for H, Production	
III.6	National Renewable Energy Laboratory: Cryogenically Flexible, Low Permeability H, Delivery Hose	
III.11	National Renewable Energy Laboratory: Reference Station Design	
III.13	Spectrum Automation Controls: 700-Bar Hydrogen Dispenser Hose Reliability Improvement	
III.13	National Renewable Energy Laboratory: 700-Bar Hydrogen Dispenser Hose Reliability Improvement	
IV.B.1	National Renewable Energy Laboratory: Hydrogen Storage Engineering Center of Excellence	
IV.B.6	National Renewable Energy Laboratory: System Design, Analysis, and Modeling for Hydrogen Storage Systems.	
IV.C.2	National Renewable Energy Laboratory: Hydrogen Sorbent Measurement Qualification and Characterization.	
IV.D.7	Composite Technology Development: Optimizing the Cost and Performance of Composite Cylinders for H, Storage using a Graded Construction	
V.A.1	National Renewable Energy Laboratory: Extended, Continuous Pt Nanostructures in Thick, Dispersed Electrodes	
V.A.1	Colorado School of Mines: Extended, Continuous Pt Nanostructures in Thick, Dispersed Electrodes	
V.B.2	Colorado School of Mines: Advanced Hybrid Membranes for Next Generation PEMFC Automotive Applications	
V.B.2	National Renewable Energy Laboratory: Advanced Hybrid Membranes for Next Generation PEMFC Automotive Applications	
V.C.4	National Renewable Energy Laboratory: Advanced Ionomers & MEAs for Alkaline Membrane Fuel Cells	
V.C.4	Colorado School of Mines: Advanced Ionomers & MEAs for Alkaline Membrane Fuel Cells	

Colorado (C	ontinued)	
V.E.3	National Renewable Energy Laboratory: Effect of System Contaminants on PEMFC Performance and	
	Durability	V–113
V.E.3	$Colorado\ School\ of\ Mines:\ Effect\ of\ System\ Contaminants\ on\ PEMFC\ Performance\ and\ Durability\ \dots$	V–113
V.F.1	National Renewable Energy Laboratory: Optimal Stationary Fuel Cell Integration and Control	V–130
V.F.10	National Renewable Energy Laboratory: Fuel Cell Technology StatusDegradation	V-174
V.F.15	National Renewable Energy Laboratory: Magnetic Annealing of Pt-Alloy Nanostructured Thin Film Catalysts for Enhanced Activity	V–198
VI.1	National Renewable Energy Laboratory: Fuel Cell Membrane Electrode Assembly Manufacturing R&D	VI–7
VI.1	Colorado School of Mines: Fuel Cell Membrane Electrode Assembly Manufacturing R&D	VI–7
VII.1	National Renewable Energy Laboratory: Hydrogen Component Validation	VII–9
VII.1	Spectrum Automation Controls: Hydrogen Component Validation	VII–9
VII.3	National Renewable Energy Laboratory: FCTO INTEGRATE Stack Test Bed & Grid Interoperability	VII–17
VII.3	Spectrum Automation Controls: FCTO INTEGRATE Stack Test Bed & Grid Interoperability	VII–17
VII.4	National Renewable Energy Laboratory: Fuel Cell Electric Vehicle Evaluation	
VII.5	National Renewable Energy Laboratory: Technology Validation: Fuel Cell Bus Evaluations	VII–26
VII.6	National Renewable Energy Laboratory: Material Handling Equipment Data Collection and Analysis	
VII.11	National Renewable Energy Laboratory: Hydrogen Station Data Collection and Analysis	
VII.13	National Renewable Energy Laboratory: Stationary Fuel Cell Evaluation	
VIII.2	National Renewable Energy Laboratory: Component Standard Research & Development	
VIII.2	Spectrum Automation Controls: Component Standard Research & Development	
VIII.5	National Renewable Energy Laboratory: NREL Hydrogen Sensor Testing Laboratory	
VIII.5	Element One: NREL Hydrogen Sensor Testing Laboratory	
VIII.7	National Renewable Energy Laboratory: Fuel Cell Technologies National Codes and Standards Deployment and Outreach	
VIII.9	National Renewable Energy Laboratory: Hydrogen Contaminant Detector	
IX.3	National Renewable Energy Laboratory: Pathway Analysis: Projected Cost, Lifecycle Energy Use and	. VIII—40
174.5	Emissions of Emerging Hydrogen Technologies	IX-24
IX.12	National Renewable Energy Laboratory: Infrastructure Investment and Finance Scenario Analysis	
Connecticut		
II.B.3	Proton OnSite: Low-Noble-Metal-Content Catalysts/Electrodes for Hydrogen Production by Water	11 20
пеэ	Electrolysis	
II.F.2		
III.10	FuelCell Energy, Inc.: Electrochemical Hydrogen Compressor.	
III.10	Sustainable Innovations, LLC: Electrochemical Hydrogen Compressor	
IV.B.1	United Technologies Research Center: Hydrogen Storage Engineering Center of Excellence	IV-22
IV.B.4	United Technologies Research Center: Advancement of Systems Designs and Key Engineering Technologies for Materials Based Hydrogen Storage	
V.A.9	Proton OnSite: Non-Platinum Group Metal OER/ORR Catalysts for Alkaline Membrane Fuel Cells and Electrolyzers	
V.C.2	United Technologies Research Center: Rationally Designed Catalyst Layers for PEMFC Performance Optimization.	V-80
V.E.2	United Technologies Research Center: Fuel-Cell Fundamentals at Low and Subzero Temperatures	V–108
V.E.4	University of Connecticut: The Effect of Airborne Contaminants on Fuel Cell Performance and Durability	V–119
V.E.4	WPCSOL: The Effect of Airborne Contaminants on Fuel Cell Performance and Durability	

Connecticu	t (Continued)
V.F.9	FuelCell Energy, Inc.: Smart Matrix Development for Direct Carbonate Fuel Cell
V.F.9	University of Connecticut: Smart Matrix Development for Direct Carbonate Fuel Cell
VII.9	Proton OnSite: Validation of an Advanced High Pressure PEM Electrolyzer and Composite Hydrogen Storage, with Data Reporting, for SunHydro Stations
VII.9	SunHydro LLC: Validation of an Advanced High Pressure PEM Electrolyzer and Composite Hydrogen Storage, with Data Reporting, for SunHydro Stations
VIII.6	Proton OnSite: Hydrogen Safety Panel, Safety Knowledge Tools and First Responder Training Resources
VIII.6	GWS Solutions of Tolland, LLC: Hydrogen Safety Panel, Safety Knowledge Tools and First Responder Training Resources
Delaware	
V.A.1	University of Delaware: Extended, Continuous Pt Nanostructures in Thick, Dispersed Electrodes V-9
V.E.1	Ion Power: Durability Improvements Through Degradation Mechanism Studies
VI.1	Ion Power: Fuel Cell Membrane Electrode Assembly Manufacturing R&D
Georgia	
X.3	Center for Transportation and the Environment: Fuel Cell Hybrid Electric Delivery Van Project X–14
X.3	United Parcel Service: Fuel Cell Hybrid Electric Delivery Van Project
Hawaii	
II.C.4	University of Hawaii: High-Efficiency Tandem Absorbers for Economical Solar Hydrogen Production II-50
II.C.5	University of Hawaii: Wide Bandgap Chalcopyrite Photoelectrodes for Direct Solar Water Splitting II-56
V.C.3	University of Hawaii: Novel Structured Metal Bipolar Plates for Low Cost Manufacturing
V.E.4	Hawaii Natural Energy Institute: The Effect of Airborne Contaminants on Fuel Cell Performance and Durability
X.4	Hawaii Natural Energy Institute: Hydrogen Energy Systems as a Grid Management Tool
Idaho	
VII.14	Idaho National Laboratory: Dynamic Modeling and Validation of Electrolyzers in Real Time Grid Simulation VII–65
Illinois	
II.C.1	Northwestern University: High Efficiency Solar Thermochemical Reactor for Hydrogen Production II–35
III.1	Argonne National Laboratory: Hydrogen Delivery Infrastructure Analysis
III.11	Argonne National Laboratory: Reference Station Design III–53
III.12	Argonne National Laboratory: Hydrogen Fueling Station Pre-Cooling Analysis
IV.A.1	Argonne National Laboratory: System Analysis of Physical and Materials-Based Hydrogen Storage IV-11
V.A.2	Argonne National Laboratory: Nanosegregated Cathode Alloy Catalysts with Ultra-Low Platinum Loading
V.A.4	Illinois Institute of Technology: Synthesis and Characterization of Mixed-Conducting Corrosion Resistant Oxide Supports
V.A.8	Argonne National Laboratory: High-Throughput Synthesis, ORR Activity Modeling, and Testing of non-PGM PEMFC Cathode Catalysts
V.C.1	Argonne National Laboratory: High Performance, Durable, Low Cost Membrane Electrode Assemblies for Transportation Applications
V.C.2	Argonne National Laboratory: Rationally Designed Catalyst Layers for PEMFC Performance Optimization V=80

Illinois (Co	ntinued)
V.E.1	Argonne National Laboratory: Durability Improvements Through Degradation Mechanism Studies V-101
V.F.2	Argonne National Laboratory: Fuel Cells Systems Analysis
V.F.9	Illinois Institute of Technology: Smart Matrix Development for Direct Carbonate Fuel Cell
V.F.12	Argonne National Laboratory: Novel Non-PGM Catalysts from Rationally Designed 3-D Precursors V-184
VII.10	Gas Technology Institute: Performance Evaluation of Delivered Hydrogen Fueling Stations
IX.1	Argonne National Laboratory: Impact of Fuel Cell System Peak Efficiency on Fuel Consumption and Cost
IX.4	Argonne National Laboratory: Performance and Cost Analysis for a 300 kW Tri-generation Molten Carbonate Fuel Cell System
IX.5	Argonne National Laboratory: Employment Impacts of Infrastructure Development for Hydrogen and Fuel Cell Technologies
IX.5	RCF Economic & Financial Consulting: Employment Impacts of Infrastructure Development for Hydrogen and Fuel Cell Technologies
IX.5	Northwestern University: Employment Impacts of Infrastructure Development for Hydrogen and Fuel Cell Technologies
IX.6	Argonne National Laboratory: Life-Cycle Analysis of Water Consumption for Hydrogen Production IX–41
IX.10	Argonne National Laboratory: Analysis of Incremental Fueling Pressure Cost
IX.13	University of Chicago: The Business Case for Hydrogen-powered Passenger Cars: Competition and Solving the Infrastructure Puzzle
Indiana	
III.8	AccerlorMittal: Steel Concrete Composite Vessel for 875 bar Stationary Hydrogen Storage III-40
V.C.2	Indiana University Purdue University: Rationally Designed Catalyst Layers for PEMFC Performance Optimization
Iowa	
IV.C.4	Ames Laboratory: High-Capacity Hydrogen Storage Systems via Mechanochemistry IV-81
IV.E.1	Ames Laboratory: Complex Hydrides - A New Frontier for Future Energy Applications
Maryland	
IV.C.1	National Institute of Standards and Technology: Hydrogen Storage in Metal-Organic Frameworks IV-63
IV.C.2	National Institute of Standards and Technology: Hydrogen Sorbent Measurement Qualification and Characterization
IV.C.3	National Institute of Standards and Technology: Neutron Characterization in Support of the DOE Hydrogen Storage Sub-Program
V.C.1	Johns Hopkins University: High Performance, Durable, Low Cost Membrane Electrode Assemblies for Transportation Applications
V.F.5	National Institute of Standards and Technology: Neutron Imaging Study of the Water Transport in Operating Fuel Cells
V.F.8	Redox Fuel Cells, Inc.: Affordable, High Performance, Intermediate Temperature Solid Oxide Fuel Cells V-167
V.F.8	University of Maryland: Affordable, High Performance, Intermediate Temperature Solid Oxide Fuel Cells V-167
VI.1	W.L. Gore & Associates: Fuel Cell Membrane Electrode Assembly Manufacturing R&D
Massachuse	etts
II.B.2	Giner Electrochemical Systems: High-Performance, Long-Lifetime Catalysts for Proton Exchange Membrane Electrolysis
II.B.4	Giner Electrochemical Systems: High Temperature, High Pressure Electrolysis
IV.C.7	Boston College: Novel Carbon(C)-Boron(B)-Nitrogen(N)-Containing H, Storage Materials IV–92

Massachuse	tts (Continued)
IV.C.7	Protonex Technology Corporation: Novel Carbon(C)-Boron(B)-Nitrogen(N)-Containing H ₂ Storage Materials
V.A.5	Northeastern University: Development of Novel Non-PGM Electrocatalysts for Proton Exchange Membrane Fuel Cell Applications
V.F.11	Giner, Inc.: Ionomer Dispersion Impact on Advanced Fuel Cell and Electrolyzer Performance and Durability
VIII.6	Firexplo: Hydrogen Safety Panel, Safety Knowledge Tools and First Responder Training Resources VIII-31
Michigan	
IV.B.1	General Motors Company: Hydrogen Storage Engineering Center of Excellence
IV.B.1	Ford Motor Company: Hydrogen Storage Engineering Center of Excellence
IV.B.1	University of Michigan: Hydrogen Storage Engineering Center of Excellence
IV.B.2	Ford Motor Company: Ford/BASF-SE/UM Activities in Support of the Hydrogen Storage Engineering Center of Excellence
IV.B.2	University of Michigan: Ford/BASF-SE/UM Activities in Support of the Hydrogen Storage Engineering Center of Excellence
IV.B.9	General Motors Company: Testing, Modeling, and Evaluation of Innovative Hydrogen Storage System Designs
IV.C.1	General Motors Company: Hydrogen Storage in Metal-Organic Frameworks
IV.C.9	University of Michigan: Improving the Kinetics and Thermodynamics of Mg(BH ₄) ₂ for Hydrogen Storage
IV.D.3	Ford Motor Company: Enhanced Materials and Design Parameters for Reducing the Cost of Hydrogen Storage Tanks
V.A.4	Nissan Technical Center, North America: Synthesis and Characterization of Mixed-Conducting Corrosion Resistant Oxide Supports
V.A.5	Michigan State University: Development of Novel Non-PGM Electrocatalysts for Proton Exchange Membrane Fuel Cell Applications
V.A.5	Nissan Technical Center, North America: Development of Novel Non-PGM Electrocatalysts for Proton Exchange Membrane Fuel Cell Applications. V–29
V.A.7	General Motors Company: Non-Precious Metal Fuel Cell Cathodes: Catalyst Development & Electrode Structure Design
V.B.1	General Motors Company: New Fuel Cell Membranes with Improved Durability and Performance V-64
V.B.2	Nissan Technical Center, North America: Advanced Hybrid Membranes for Next Generation PEMFC Automotive Applications
V.C.1	Michigan Technological University: High Performance, Durable, Low Cost Membrane Electrode Assemblies for Transportation Applications
V.C.1	General Motors Company: High Performance, Durable, Low Cost Membrane Electrode Assemblies for Transportation Applications. V-73
V.D.1	Kettering University: Roots Air Management System with Integrated Expander
V.E.3	General Motors Company: Effect of System Contaminants on PEMFC Performance and Durability V–113
VI.1	General Motors Company: Fuel Cell Membrane Electrode Assembly Manufacturing R&D
Minnesota	
II.B.2	3M Company: High-Performance, Long-Lifetime Catalysts for Proton Exchange Membrane Electrolysis II–23
V.B.1	3M Company: New Fuel Cell Membranes with Improved Durability and Performance
V.B.2	3M Company: Advanced Hybrid Membranes for Next Generation PEMFC Automotive Applications V-69
V.C.1	3M Company: High Performance, Durable, Low Cost Membrane Electrode Assemblies for Transportation Applications.

Minnesota	(Continued)
V.C.4	3M Company: Advanced Ionomers & MEAs for Alkaline Membrane Fuel Cells
V.E.2	3M Company: Fuel-Cell Fundamentals at Low and Subzero Temperatures
Missouri	
IV.C.4	University of Missouri: High-Capacity Hydrogen Storage Systems via Mechanochemistry IV-81
IV.C.8	University of Missouri: Boron-Based Hydrogen Storage: Ternary Borides and Beyond IV–97
VIII.6	Becht Engineering: Hydrogen Safety Panel, Safety Knowledge Tools and First Responder Training Resources
Montana	
IV.D.4	Montana State University: Next Generation Hydrogen Storage Vessels Enabled by Carbon Fiber Infusion with a Low Viscosity, High Toughness System
Nebraska	
III.5	Hexagon Lincoln: Development of High Pressure Hydrogen Storage Tank for Storage and Gaseous Truck
****	Delivery
IV.B.1	Hexagon Lincoln: Hydrogen Storage Engineering Center of Excellence
IV.B.7	Hexagon Lincoln: Development of Improved Composite Pressure Vessels for Hydrogen Storage IV–53
IV.D.3	Hexagon Lincoln: Enhanced Materials and Design Parameters for Reducing the Cost of Hydrogen Storage Tanks
IV.D.6	Hexagon Lincoln: Achieving Hydrogen Storage Goals through High-Strength Fiber Glass IV–134
Nevada	
II.C.4	University of Nevada, Las Vegas: High-Efficiency Tandem Absorbers for Economical Solar Hydrogen Production
II.C.5	University of Nevada, Las Vegas: Wide Bandgap Chalcopyrite Photoelectrodes for Direct Solar Water Splitting
New Hamp	shire
III.6	New England Wire Technologies: Cryogenically Flexible, Low Permeability H, Delivery Hose III–28
III.8	SustainX: Steel Concrete Composite Vessel for 875 bar Stationary Hydrogen Storage
New Jersey	
II.D.2	Rutgers, the State University of New Jersey: Tunable Photoanode-Photocathode-Catalyst Interface Systems for Efficient Solar Water Splitting
V.A.9	Rutgers, the State University of New Jersey: Non-Platinum Group Metal OER/ORR Catalysts for Alkaline Membrane Fuel Cells and Electrolyzers
V.C.3	TreadStone Technologies, Inc.: Novel Structured Metal Bipolar Plates for Low Cost Manufacturing V-86
VI.1	New Jersey Institute of Technology: Fuel Cell Membrane Electrode Assembly Manufacturing R&D VI-7
New Mexic	
IV.B.1	Los Alamos National Laboratory: Hydrogen Storage Engineering Center of Excellence
IV.B.8	Los Alamos National Laboratory: Chemical Hydrogen Rate Modeling, Validation, and System
IV.C.2	Demonstration
IV.D.7	Adherent Technologies, Inc.: Optimizing the Cost and Performance of Composite Cylinders for H ₂ Storage using a Graded Construction
V.A.5	University of New Mexico: Development of Novel Non-PGM Electrocatalysts for Proton Exchange Membrane Fuel Cell Applications V-29

New Mexico	(Continued)
V.A.5	Pajarito Powder, LLC: Development of Novel Non-PGM Electrocatalysts for Proton Exchange Membrane Fuel Cell Applications
V.A.7	Los Alamos National Laboratory: Non-Precious Metal Fuel Cell Cathodes: Catalyst Development & Electrode Structure Design
V.A.7	IRD Fuel Cells: Non-Precious Metal Fuel Cell Cathodes: Catalyst Development & Electrode Structure Design
V.A.8	Los Alamos National Laboratory: High-Throughput Synthesis, ORR Activity Modeling, and Testing of non-PGM PEMFC Cathode Catalysts
V.C.1	Los Alamos National Laboratory: High Performance, Durable, Low Cost Membrane Electrode Assemblies for Transportation Applications
V.E.1	Los Alamos National Laboratory: Durability Improvements Through Degradation Mechanism Studies V-101
V.E.2	Los Alamos National Laboratory: Fuel-Cell Fundamentals at Low and Subzero Temperatures
V.E.5	University of New Mexico: Open Source Performance and Durability Model: Consideration of Membrane Properties on Cathode Degradation
V.F.11	Los Alamos National Laboratory: Ionomer Dispersion Impact on Advanced Fuel Cell and Electrolyzer Performance and Durability
V.F.14	Los Alamos National Laboratory: High Performance and Durable Low PGM Cathode Catalysts V-194
V.F.17	Los Alamos National Laboratory: Advanced Hydroxide Conducting Membranes
V.F.17	Sandia National Laboratories: Advanced Hydroxide Conducting Membranes
V.F.18	Sandia National Laboratories: DOE's High Acid Content Diels Alder Poly(Phenylene)s for High Temperature and Low Humidity Applications
V.F.19	Los Alamos National Laboratory: Engineered Low-Pt Catalyst Layers
VIII.1	Sandia National Laboratories: Hydrogen behavior and Quantitative Risk Assessment
VIII.4	Los Alamos National Laboratory: Hydrogen Fuel Quality
VIII.10	Sandia National Laboratories: Enabling Hydrogen Infrastructure Through Science-based Codes and Standards
VIII.11	Los Alamos National Laboratory: Hydrogen Safety, Codes and Standards: Sensors
New York	
II.B.3	Brookhaven National Laboratory: Low-Noble-Metal-Content Catalysts/Electrodes for Hydrogen Production by Water Electrolysis
V.A.3	Brookhaven National Laboratory: Contiguous Platinum Monolayer Oxygen Reduction Electrocatalysts on High-Stability-Low-Cost Supports
V.A.7	University of Rochester: Non-Precious Metal Fuel Cell Cathodes: Catalyst Development & Electrode Structure Design
V.F.17	Rensselaer Polytechnic University: Advanced Hydroxide Conducting Membranes
V.F.20	Brookhaven National Laboratory: Semi-Automated MEA Fabrication with Ultra-Low Total PGM Loadings
X.1	Plug Power: Ground Support Equipment Demonstration
X.3	Unique Electric Solutions: Fuel Cell Hybrid Electric Delivery Van Project
North Caro	lina
II.F.1	Cormetech, Inc.: Monolithic Piston-Type Reactor for Hydrogen Production through Rapid Swing of Reforming/Combustion Reactions
Ohio	
II.D.1	University of Toledo: New Metal Oxides for Efficient Hydrogen Production via Solar Water Splitting II-67
III.6	Swagelok: Cryogenically Flexible, Low Permeability H, Delivery Hose III–28

Ohio (Cont	inued)	
III.7	Norm Shade: Hydrogen Compression Application of the Linear Motor Reciprocating Compressor (LMRC)	33
III.9	N & R Engineering: Low Cost Hydrogen Storage at 875 Bar Using Steel Liner and Steel Wire Wrap III-	45
V.A.10	pH Matter, LLC: Non-Precious Metal Bi-Functional Catalysts	60
V.F.6	Battelle: Stationary and Emerging Market Fuel Cell System Cost Analysis—Primary Power and Combined Heat and Power Applications	58
VI.2	GLWN – Westside Industrial Retention & Expansion Network: U.S. Clean Energy Hydrogen and Fuel Cell Technologies: A Competitiveness Analysis	12
VI.2	DJW Technologies: U.S. Clean Energy Hydrogen and Fuel Cell Technologies: A Competitiveness Analysis	12
Oklahoma		
IX.14	Kalibrate: Retail Marketing Analysis: Hydrogen Refueling Stations	67
Oregon		
III.2	Harris Thermal Transfer Products: Vessel Design and Fabrication Technology for Stationary High-Pressure Hydrogen Storage	-13
IV.B.1	Oregon State University: Hydrogen Storage Engineering Center of Excellence	22
IV.B.3	Oregon State University: Microscale Enhancement of Heat and Mass Transfer for Hydrogen Energy Storage	-32
IV.D.1	Hy-Performance Materials Testing LLC: Innovative Development, Selection and Testing to Reduce Cost and Weight of Materials for BOP Components	08
Pennsylvan	ia	
II.C.1	Bucknell University: High Efficiency Solar Thermochemical Reactor for Hydrogen Production II–	35
II.E.1	Pennsylvania State University: Fermentation and Electrohydrogenic Approaches to Hydrogen Production	-76
III.2	Temple University: Vessel Design and Fabrication Technology for Stationary High-Pressure Hydrogen Storage	-13
III.8	Temple University: Steel Concrete Composite Vessel for 875 bar Stationary Hydrogen Storage III—	
III.9	C P Industries: Low Cost Hydrogen Storage at 875 Bar Using Steel Liner and Steel Wire Wrap III–	45
IV.D.6	PPG Industries, Inc.: Achieving Hydrogen Storage Goals through High-Strength Fiber Glass IV-1	34
V.A.7	Carnegie Mellon University: Non-Precious Metal Fuel Cell Cathodes: Catalyst Development & Electrode Structure Design	
VII.9	Air Products and Chemicals, Inc.: Validation of an Advanced High Pressure PEM Electrolyzer and Composite Hydrogen Storage, with Data Reporting, for SunHydro Stations	44
VIII.6	Air Products and Chemicals, Inc.: Hydrogen Safety Panel, Safety Knowledge Tools and First Responder Training Resources	
South Caro	lina	
II.C.3	Savannah River National Laboratory: Electrolyzer Component Development for the HyS Thermochemical Cycle	46
II.C.3	Savannah River Consultants: Electrolyzer Component Development for the HyS Thermochemical Cycle II—	
III.4	Savannah River National Laboratory: Fiber Reinforced Composite Pipelines	
IV.B.1	Savannah River National Laboratory: Hydrogen Storage Engineering Center of Excellence	
IV.C.5	Savannah River National Laboratory: Electrochemical Reversible Formation of α-Alane	
V.A.6	University of South Carolina: Development of Ultra-Low Doped-Pt Cathode Catalysts for PEM Fuel	

Sot	uth Caro	ina (Continued)
	V.E.3	University of South Carolina: Effect of System Contaminants on PEMFC Performance and Durability V-113
	V.F.13	Savannah River National Laboratory: PGM Free Catalysts for PEMFC
Геі	nnessee	
	III.2	Oak Ridge National Laboratory: Vessel Design and Fabrication Technology for Stationary High-Pressure Hydrogen Storage
	III.8	Oak Ridge National Laboratory: Steel Concrete Composite Vessel for 875 bar Stationary Hydrogen Storage
	III.9	Oak Ridge National Laboratory: Low Cost Hydrogen Storage at 875 Bar Using Steel Liner and Steel Wire Wrap
	IV.D.3	AOC, LLC: Enhanced Materials and Design Parameters for Reducing the Cost of Hydrogen Storage Tanks
	IV.D.5	Oak Ridge National Laboratory: Melt Processable PAN Precursor for High Strength, Low-Cost Carbon Fibers (Phase II)
	V.A.2	Oak Ridge National Laboratory: Nanosegregated Cathode Alloy Catalysts with Ultra-Low Platinum Loading
	V.A.7	Oak Ridge National Laboratory: Non-Precious Metal Fuel Cell Cathodes: Catalyst Development & Electrode Structure Design
	V.B.1	Vanderbilt University: New Fuel Cell Membranes with Improved Durability and Performance
	V.E.1	Oak Ridge National Laboratory: Durability Improvements Through Degradation Mechanism Studies V-101
	V.F.4	Oak Ridge National Laboratory: Characterization of Fuel Cell Materials
	V.F.15	Oak Ridge National Laboratory: Magnetic Annealing of Pt-Alloy Nanostructured Thin Film Catalysts for Enhanced Activity
	V.F.16	Oak Ridge National Laboratory: High Conductivity Durable Anion Conducting Membranes
	V.F.18	Oak Ridge National Laboratory: DOE's High Acid Content Diels Alder Poly(Phenylene)s for High Temperature and Low Humidity Applications
	V.F.19	Oak Ridge National Laboratory: Engineered Low-Pt Catalyst Layers
	IX.2	Oak Ridge National Laboratory: GPRA Analysis: Impact of Program Targets on Vehicle Penetration and Benefits
	IX.8	University of Tennessee: Status and Prospects of the N.A. Non-Automotive Fuel Cell Industry: 2014 Update
	IX.11	Oak Ridge National Laboratory: Analysis of Optimal On-Board Storage Pressure for Hydrogen Fuel Cell Vehicles
Гез	xas	
102	III.2	Hanson Pressure Pipe: Vessel Design and Fabrication Technology for Stationary High-Pressure Hydrogen Storage
	III.7	Southwest Research Institute®: Hydrogen Compression Application of the Linear Motor Reciprocating Compressor (LMRC)
	III.8	Air Liquide: Steel Concrete Composite Vessel for 875 bar Stationary Hydrogen Storage III–40
	III.8	Hanson Pressure Pipe: Steel Concrete Composite Vessel for 875 bar Stationary Hydrogen Storage III–40
	III.9	Pressure Science, Inc.: Low Cost Hydrogen Storage at 875 Bar Using Steel Liner and Steel Wire Wrap III–45
	IV.C.2	Texas A&M University: Hydrogen Sorbent Measurement Qualification and Characterization IV–70
	V.C.2	University of Texas at Austin: Rationally Designed Catalyst Layers for PEMFC Performance Optimization
	VIII.6	Air Liquide: Hydrogen Safety Panel, Safety Knowledge Tools and First Responder Training Resources VIII–31
	X.3	University of Texas: Fuel Cell Hybrid Electric Delivery Van Project
	X 3	Valence: Fuel Cell Hybrid Electric Delivery Van Project X_14

XV. Project Listings by State

Utah	
III.2	MegaStir Technologies, LLC: Vessel Design and Fabrication Technology for Stationary High-Pressure Hydrogen Storage
III.8	MegaStir Technologies, LLC: Steel Concrete Composite Vessel for 875 bar Stationary Hydrogen Storage
Virginia	
II.A.1	Strategic Analysis, Inc.: Hydrogen Pathways Analysis for Solid Oxide Fuel Cell (SOFC) and Dark Fermentation
II.B.4	Virginia Polytechnic Institute: High Temperature, High Pressure Electrolysis
III.6	Nanosonic: Cryogenically Flexible, Low Permeability H ₂ Delivery Hose
III.8	WireTough Cylinders: Steel Concrete Composite Vessel for 875 bar Stationary Hydrogen Storage III-40
III.9	WireTough Cylinders: Low Cost Hydrogen Storage at 875 Bar Using Steel Liner and Steel Wire Wrap III-45
IV.A.2	Strategic Analysis, Inc.: Hydrogen Storage Cost Analysis
IV.D.5	Virginia Polytechnic Institute: Melt Processable PAN Precursor for High Strength, Low-Cost Carbon Fibers (Phase II)
IV.E.4	Virginia Commonwealth University: Elucidation of Hydride Interaction Mechanisms with Carbon Nanostructures and the Formation of Novel Nanocomposites
V.F.3	Strategic Analysis, Inc.: Fuel Cell Vehicle and Bus Cost Analysis
V.F.7	Strategic Analysis, Inc.: A Total Cost of Ownership Model for Design and Manufacturing Optimization of Fuel Cells in Stationary and Emerging Market Applications
VI.2	Strategic Analysis, Inc.: U.S. Clean Energy Hydrogen and Fuel Cell Technologies: A Competitiveness Analysis
Washingtor	1
II.F.1	Pacific Northwest National Laboratory: Monolithic Piston-Type Reactor for Hydrogen Production through Rapid Swing of Reforming/Combustion Reactions
II.F.1	Washington State University: Monolithic Piston-Type Reactor for Hydrogen Production through Rapid Swing of Reforming/Combustion Reactions
II.F.1	Dason Technology, Inc.: Monolithic Piston-Type Reactor for Hydrogen Production through Rapid Swing of Reforming/Combustion Reactions
III.2	Global Engineering and Technology, LLC: Vessel Design and Fabrication Technology for Stationary High-Pressure Hydrogen Storage
III.8	Global Engineering and Technology, LLC: Steel Concrete Composite Vessel for 875 bar Stationary Hydrogen Storage
III.14	Pacific Northwest National Laboratory: Magnetocaloric Hydrogen Liquefaction
III.14	Emerald Energy NW LLC: Magnetocaloric Hydrogen Liquefaction
IV.B.1	Pacific Northwest National Laboratory: Hydrogen Storage Engineering Center of Excellence IV–22
IV.B.5	Pacific Northwest National Laboratory: Systems Engineering of Chemical Hydrogen Storage and Cryo-Sorbent Storage, Pressure Vessel, and Balance of Plant for Onboard Hydrogen Storage
IV.C.7	Pacific Northwest National Laboratory: Novel Carbon(C)-Boron(B)-Nitrogen(N)-Containing H ₂ Storage Materials
IV.D.3	Pacific Northwest National Laboratory: Enhanced Materials and Design Parameters for Reducing the Cost of Hydrogen Storage Tanks
IV.D.6	Pacific Northwest National Laboratory: Achieving Hydrogen Storage Goals through High-Strength Fiber Glass
V.F.14	Pacific Northwest National Laboratory: High Performance and Durable Low PGM Cathode Catalysts V-194
VIII.6	Pacific Northwest National Laboratory: Hydrogen Safety Panel, Safety Knowledge Tools and First Responder Training Resources VIII-31

Washington (Continued)	
VIII.6	Excelsior Design, Inc.: Hydrogen Safety Panel, Safety Knowledge Tools and First Responder Training Resources
Washingtor	n, D.C.
VIII.8	Fuel Cell & Hydrogen Energy Association: Fuel Cell & Hydrogen Energy Association Codes and Standards Support
Wisconsin	
V.D.1	Eaton Corporation: Roots Air Management System with Integrated Expander
Foreign (Countries
Canada	
IV.B.1	Université du Québec à Trois-Rivières: Hydrogen Storage Engineering Center of Excellence
V.A.7	University of Waterloo: Non-Precious Metal Fuel Cell Cathodes: Catalyst Development & Electrode Structure Design
V.D.1	Ballard Power Systems: Roots Air Management System with Integrated Expander
V.E.4	Ballard Power Systems: The Effect of Airborne Contaminants on Fuel Cell Performance and Durability V–119
V.E.5	Ballard Power Systems: Open Source Performance and Durability Model: Consideration of Membrane Properties on Cathode Degradation
V.E.5	University of Calgary: Open Source Performance and Durability Model: Consideration of Membrane Properties on Cathode Degradation
VI.1	Automotive Fuel Cell Corporation: Fuel Cell Membrane Electrode Assembly Manufacturing R&D VI-7
VI.2	eon™ Consultants Ltd.: U.S. Clean Energy Hydrogen and Fuel Cell Technologies: A Competitiveness Analysis
VII.7	Powertech Labs, Inc.: Development of the Hydrogen Station Equipment Performance (HyStEP) DeviceVII-36
VII.12	Hydrogenics: CSULA Hydrogen Refueling Facility Performance Evaluation and Optimization VII–58
X.2	Hydrogenics: Maritime Fuel Cell Generator Project
X.3	Hydrogenics: Fuel Cell Hybrid Electric Delivery Van Project
Germany	
IV.B.2	BASF SE: Ford/BASF-SE/UM Activities in Support of the Hydrogen Storage Engineering Center of Excellence. IV–27
Israel	
V.C.4	CellEra, Inc.: Advanced Ionomers & MEAs for Alkaline Membrane Fuel Cells
Japan	
III.2	Kobe Steel, LTD: Vessel Design and Fabrication Technology for Stationary High-Pressure Hydrogen Storage
South Kore	a
III.8	POSCO: Steel Concrete Composite Vessel for 875 bar Stationary Hydrogen Storage III-40
Switzerland	
VI.2	E4tech: U.S. Clean Energy Hydrogen and Fuel Cell Technologies: A Competitiveness Analysis VI–12

XV. Project Listings by State

United Kingdom