PROLOGUE

Dear Colleague:

This document summarizes the comments provided by the Peer Review Panel at the U.S. Department of Energy Hydrogen Program FY 2006 Annual Merit Review and Peer Evaluation meeting, held on May 16-19, 2006 in the Washington, D.C. area. This was the second annual merit review of the research, development, demonstration, and analysis projects of the entire DOE Hydrogen Program. All four Offices that support the President's Hydrogen Fuel Initiative — Energy Efficiency and Renewable Energy (EERE), Fossil Energy (FE), Nuclear Energy (NE), and Science (SC) — are participants in the DOE Hydrogen Program and support this Review, in order to provide the hydrogen community an overall view of the breadth and depth of DOE's efforts under the Initiative. In addition to the overview presentations given by all four Offices during the opening plenary session, projects from EERE, FE, and NE were presented and peer reviewed, and the hydrogen storage-related projects from SC, awarded in May 2005, were provided as oral or poster presentations but not reviewed by the peer panel.

The recommendations of the Panel have been taken into consideration by DOE Technology Development Managers and Research Managers in the generation of future work plans. The table below lists the projects presented at the Review, evaluation scores, and the major actions to be taken during the upcoming fiscal year (October 1, 2006 to September 30, 2007). The projects have been grouped according to Program Element (production, delivery, storage, fuel cells, etc.), and the weighted scores are based on a 4-point scale involving five criteria. To furnish all principal investigators (PIs) with direct feedback, all evaluations and comments are provided to each presenter; however, the authors of the individual comments remain anonymous. The PI of each project is instructed to fully consider these summary evaluation comments, as appropriate, in their FY 2007 planning.

I would like to express my sincere appreciation to the members of the Peer Review Panel. It is they who make this report possible, and upon whose comments we rely to help make project funding decisions for the new fiscal year. Thank you for participating in the FY 2006 Annual Merit Review and Peer Evaluation meeting.

We look forward to your participation in the FY 2007 Annual Merit Review and Peer Evaluation which is presently scheduled for May 14-18, 2007 at the Marriott Crystal Gateway hotel in Arlington, VA.

JoAnn Milliken
Acting DOE Hydrogen Program Manager
Office of Energy Efficiency and Renewable Energy

MERIT REVIEW AND PEER EVALUATION SUMMARY TABLE

Hydrogen Production and Delivery:

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
PD-01	*Low-Cost Hydrogen Distributed Production Systems; H2Gen Inno. Inc.; Frank Lomax, Jr.*	3.4		X			Directly addresses Hydrogen Fuel Initiative goal of low cost hydrogen production from natural gas reforming as H2Gen aggressively pursues capital cost and operating cost reductions through improved hardware design and increased thermal efficiency. Delayed aqueous ethanol testing due to insufficient project funding. The technology is technically feasible and has a good chance of success, however need additional production data from hardware tests and to emphasize testing in multiple start - stop cycles to address real world durability issues. Also, more 3rd party work on PSA would assure process credibility.
PD-02	*Integrated Hydrogen Production, Purification & Compression System; BOC Group, Inc.; Satish Tamhankar*	3.4		X			Directly addresses Hydrogen Fuel Initiative goal of low cost hydrogen production from natural gas reforming as BOC approach to capital cost reduction employs several novel components integrating process steps. Integrating hydrogen production and separation eliminates need for water gas shift reactor; hydride compressor eliminates need for costly and high maintenance mechanical compression.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
PD-03	*Integrated Short Contact Time Hydrogen Generator; GE Global Res.; Ke Liu*	3.3		X			Directly addresses Hydrogen Fuel Initiative goal of low cost hydrogen production from natural gas reforming by combining contact partial oxidation and steam methane reforming. GE Global Research made significant progress in catalyst screening and selection, process and materials modeling, heat exchanger selection, PSA selection, and sulfur measurements. Excellent collaboration in that all team members are making important and unique contributions. Need to address CPO catalyst manufacturing.
PD-04	*Hydrogen Generation from Biomass-Derived Carbohydrates via the Aqueous-Phase Reforming (APR) Process; Virent Energy Sys.; Randy Cortright*	3.4		X			This project is making sound progress despite very limited funding due to budget constraints. It is focused on the important objective of distributed hydrogen production while utilizing renewable resources with near-zero net greenhouse gas evolution. Focus will be directed towards the use of lowest cost available sugars from lignocellulosic biomass, and improved yields of hydrogen. Good partnership with ADM and the University of Wisconsin. Expanding collaborations should be considered.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
PD-05	*Distributed Bio-Oil Reforming; NREL; Bob Evans*	3.5		X			Directly addresses Hydrogen Fuel Initiative goal of producing hydrogen from bio-derived liquids at the point of use (distributed). Good progress in volatilization (obtaining low residues of 6%) and oxidative cracking. Needs work on process economics to identify critically important process variables that will make or break commercial viability. Needs greater emphasis on catalyst development and dealing with undesirable byproducts.
PD-06	*Photoelectrochemical Hydrogen Production; Univ. of Nevada; Bob Perret*	3.3		X			This project is well organized with participation from labs, industry, and universities. This collaboration has and will continue to produce significant developments for this long term technology.
PD-07	*Renewable Electrolysis Integrated System Development and Testing; NREL; Ben Kroposki*	3.0		X			The collaborative approach (including research, analysis, industry, etc.) used by this project is effective in facilitating progress toward commercialization of renewable electrolysis. The focus of the project needs to be sharpened to clearly support commercialization of renewable electrolysis.
PD-08	*Advanced Alkaline Electrolysis; GE Global Res.; Richard Bourgeois*	3.4		X			This project is moving toward an economical, near-term product - further testing is needed for the scaled-up system.
PD-09	*Alkaline, High Pressure Electrolysis; Teledyne; Samir Ibrahim*	2.3		X			The scope of this project will be re-evaluated with the understanding that higher pressure operation is not feasible.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
PD-10	*Development of Solar-powered Thermochemical Production of Hydrogen from Water; U of Colorado; Alan Weimer*	3.0		X			This is a large collaborative project well aligned with the goal of hydrogen production with near-zero GHG and other emissions. Good progress is being made although there are clearly significant challenges to achieve the hydrogen cost target. This is a longer term approach for hydrogen production. Efforts should be focused on the cycles selected for R&D, including materials issues, and further down-selection should be made in a timely manner.
PD-11	*Hydrogen Delivery Infrastructure Options Analysis; Nexant Inc.; Bruce Kelly*	3.1		X			This analysis project is vital to properly focus the Delivery Program element R&D. Good progress has been made. The effort needs to focus on hydrogen delivery and eliminate peripheral issues such as distributed reforming which is handled in other analysis projects. Highly qualified organizations are involved and they need to more fully collaborate.
PD-12	*Scale-Up of Microporous Inorganic Hydrogen-Separation Membranes; ORNL; Rod Judkins*	3.0		X			Supports Hydrogen Fuel Initiative in providing a way to recover H_2 from a coal gasification stream as well as pressurized CO_2 for capture and sequestration. Good technology design approaches in constructing the membrane tube, particularly in the fabrication of the microporous separating layer. Not a one-step process for high-purity hydrogen. R&D should focus on improving flux, purity, and selectivity.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
PD-13	*Scale-up of Hydrogen Transport Membranes for IGCC and FutureGen Plants; Eltron Research Inc.; Paul Grimmer*	3.0		X			Supports Hydrogen Fuel Initiative by developing a critical element needed for hydrogen purification. Insufficient details are provided to justify the PSA cost reported. Comprehensive study to evaluate interferrants needed to determine their linkage to the membrane degradation. Further, one test is not a durability study. Need to know performance scatter between multiple membranes and if there are mechanical durability issues that may result from time on test or the interferrant in the gas stream. Need to understand why the flux degrades by a factor of 3 over the 11 months test.
PD-14	*Cost-Effective Method for Producing Self-Supporting Pd Alloy Membrane for Use in the Efficient Production of Coal-Derived Hydrogen; SwRI; James Arps*	3.3		X			Supports Hydrogen Fuel Initiative by developing a critical element needed for hydrogen purification. Good use of partner expertise. Focus on sputter deposition methods with careful attention to experimental variables to achieve goals. Need to test membranes in H2S-containing gas to ensure that thin PdCu films behave like the thick versions in terms of S effects on flux and selectivity.
PD-15	*Sulfur-Iodine Thermochemical Cycle; SNL/INL/GA; Paul Pickard*	3.3		X			Directly supports the goals of the Hydrogen Initiative and the Nuclear Hydrogen Program R&D Plan. A lot of progress has been made on this challenging effort with excellent international collaboration. Key issues are well identified and being worked on. Approach and need for catalyst development for the sulfuric acid decomposition step needs to be looked at carefully.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
PD-16	*Evaluation of Calcium-Bromine Thermochemical Cycle; ANL; Richard Doctor*	3.1		X			This project will receive some funding in FY07 in order to obtain some additional data. It will then be re-evaluated along with the other non-sulfur based thermochemical cycles for possible future efforts while the NHI program focuses on the more promising sulfur based cycles. Good progress has been on two novel approaches to overcome the basic barriers in this Ca-Br thermochemical cycle. The critical issues for these new approaches (plasma energy use and PEM electrolysis) have been identified and require further research for them to succeed.
PD-17	*Laboratory-Scale High-Temperature Electrolysis System; INL/ANL/Ceramatec; Steve Herring*	3.3		X			Directly addresses long-term future hydrogen generation issues of the Hydrogen Fuel Initiative. Good systematic approach with clear vision of 5MW engineering demonstration by 2015, however additional detail on pilot scale and engineering scale needed. Good overall plan for bench and integrated lab scale programs. Explanation of 25% degradation needed prior to scale up. Good project collaboration. More collaboration with other SOFC technologists and SECA needed.
PD-18	*Nuclear Reactor/Hydrogen Process Interface; INL; Steve Sherman*	3.1		X			This cross-cutting and process interface project is vital to the success of the NHI. Good approach and integration between tasks. Efforts to coordinate this project with the other NHI projects will be improved particularly in the area of materials research.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
PDP-02	*Low-Cost, High-Pressure Hydrogen Generator; Giner Electrochemical; Cecelia Cropley*	3.0		X			This project directly addresses DOE stated goals of increasing efficiency and decreasing capital cost through advanced membrane and reduced part counts. The project needs to further explore the trade offs of high-pressure operation vs. system simplification, performance and costs and also firm up demonstration plans.
PDP-06	*Adapting Planar Solid Oxide Fuel Cells for Distributed Power; Ohio University; David Bayless*	2.3				X	This project does not directly support the President's Hydrogen Fuel Initiative. It does support the more efficient use of coal for electricity production, however, by investigating H_2S contamination issues.
PDP-08	*Zeolite Membrane Reactor for Water-Gas-Shift Reaction for Hydrogen Production; U. of Cincinnati; Jerry Y.S. Lin*	3.6		X			Directly addresses Hydrogen Fuel Initiative goal of hydrogen production from natural gas and bio-derived liquids through a strong combination of relevant experimental and modeling capabilities at four universities. Need to show that the membrane reactor system is more cost effective than a multistage reactor system, and the impact of the membrane reactor on overall system cost as a function of transmembrane flux and selectivity and membrane reactor costs. Modeling should include the cost of adding heat transfer functionality to the membrane water gas shift reactor (heat is usually removed between stages of Water gas shift reaction). This analysis would help the researchers set specific flux, selectivity, and cost targets that would define project success.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
PDP-10	*Startech Hydrogen Production; Startech Environmental; David Lynch*	2.9				X	Project is a congressionally-directed project from a prior year and is expected to conclude this year.
PDP-12	*Critical Research for Cost-Effective Photoelectrochemical Production of Hydrogen; Midwest Optoelectronics; Liwei Xu*	3.1		X			The design and fabrication of PEC cells for production of hydrogen is directly in line with the President's Hydrogen Fuel Initiative. This project has made progress, but low levels of funding has retarded the work and will require the project schedule to be extended. More well defined durability targets and a basis for cost needs will help this project.
PDP-13	*Development of Water Splitting Catalysts Using a Novel Molecular Evolution Approach; Arizona State U.; Neal Woodbury*	3.0		X			This research project supports the long term objectives of DOE. The project is in an early stage of determining equipment design and set up with technical accomplishments forthcoming in the coming years.
PDP-15	*Fundamentals of a Solar-thermal Mn_2O_3/MnO Thermochemical Cycle to Split Water; U of Colorado; Alan Weimer*	3.2		X			Good progress is being made with the limited funding that has been available. The challenges have been well defined and focus has been appropriately put on the key issues. A more detailed plan for the remainder of the project would be very helpful.
PDP-16	*Hydrogen Embrittlement of Pipeline Steels: Causes & Remediation; U. of Illinois; Petros Sofronis*	3.1		X			A systematic approach, both computational and experimental, to studying the fundamentals of hydrogen embrittlement. A very important project to the cost effective and safe transport of hydrogen in pipelines. Very good progress has been despite reduced funding availability. Good collaborations with other researchers in this field.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
PDP-17	*Hydrogen Regional Infrastructure Program in Pennsylvania; Concurrent Tech. Corp; Eileen Schmura*	2.3		X			This project is conducting an in-depth look at hydrogen delivery options on a regional basis. As a congressionally directed project.
PDP-18	*Developing Improved Materials to Support the Hydrogen Economy; Edison Materials Tech Center; Michael Martin*	2.7		X			This project funds competitively awarded projects addressing DOE identified barriers. As a congressionally directed project.
PDP-31	*EVermont Renewable Hydrogen Fueling System; Northern Power Sys.; Tom Maloney*	2.9		X			This project will continue in FY2007 and has been funded.
PDP-33	*A Reversible Planar Solid Oxide Fuel-Fed Electrolysis Cell and Solid Oxide Fuel Cell; Materials and Systems Research; Greg Tao*	3.0		X			This project is not a truly reversible system as the fuel cell and electrolyzer are separate with thermal integration. The project needs to provide efficiency calculations and an economic analysis.
PDP-34	*High Performance Flexible Reversible Solid Oxide Fuel Cell; GE HPGS; Nguyen Minh*	2.9		X			This project is determining and optimizing the best trade-offs in device performance for both modes of operation and has a good mix of modeling and experimental work. Good progress.
PDP-36	*Solid Oxide Fuel Cell Carbon Sequestration; Nisource Energy Tech.; Norm Bessette*	2.3		X			This congressionally-directed project will continue in FY2007, operating on funds provided in FY2006.

Hydrogen Storage:

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
ST-01	*LANL work as part of the Chemical Hydrogen COE; LANL; Bill Tumas*	3.5		X			Focus on regeneration, develop go/no-go criteria and down select process, consider additional promising storage materials, and increase coordination on catalyst development for ammonia borane work.
ST-02	*PNNL work as part of the Chemical Hydrogen COE; PNNL; Chris Aardahl*	3.4		X			Focus on regeneration, investigate/evaluate on-board solid handling and thermal management issues for ammonia borane.
ST-03	*Amineborane Hydrogen Storage: New Methods for Promoting Amineborane Dehydrogenation/Regeneration Reactions; U. of Pennsylvania; Larry Sneddon*	3.6		X			Increase focus on regeneration, identify and pursue promising regeneration route while optimizing hydrogen storage and release parameters for the identified material.
ST-04	*Solutions for Chemical Hydrogen Storage: Hydrogenation/ Dehydrogenation of B-N Bonds; U. of Washington; Michael Heinekey*	2.7		X			Address iridium cost issue, and work with CoE partners towards coordination of catalyst work and regeneration of ammonia borane.
ST-05	*Chemical Hydrogen Storage Using Polyhedral Borane Anion Salts; UCLA; Fred Hawthorne*	2.8		X			Address precious metal catalyst cost issue, improve kinetics and capacity, and investigate/develop regeneration requirements.
ST-06	*Novel Approaches to Hydrogen Storage: Conversion of Borates to Boron Hydrides; Rohm and Haas; Suzanne Linehan*	3.1		X			Identify promising routes, demonstrate selected process in the lab and compile data needed for go/no-go decision.
ST-07	*Development of Advanced Chemical Hydrogen Storage and Generation System; Millennium Cell; Ying Wu*	2.9		X			Ensure that modeling work is general and applicable to a wide variety of chemical hydrides.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
ST-08	*Combinatorial Synthesis and High Throughput Screening of Effective Catalysts for Chemical Hydrides ALSO COVERS MH WORK; Intematix; Xiao-Dong Xiang*	3.0		X			Increase collaboration with additional CoE partners where appropriate for increased benefit with this approach within the CoE.
ST-09	*Hydrogen Storage by Reversible Hydrogenation of Liquid-phase Hydrogen Carriers Air Products & Chemicals, Inc.; Alan Cooper*	3.4		X			Pursue options for higher storage capacity materials, address catalyst cost issue and investigate potential hydrogenation issue.
ST-10	*Complex Hydride Compounds with Enhanced Hydrogen Storage Capacity; United Technologies Research Center; Susanne Opalka*	2.9		X			The project is entering its final year. Continue the modeling and experimental approach to emphasize on-board reversibility. Reducing the discharge reaction exotherm is top priority.
ST-11	*Discovery of Novel Complex Metal Hydrides for Hydrogen Storage through Molecular Modeling and Combinatorial Methods; UOP LLC; Greg Lewis*	3.0		X			The project is entering its final year. Leverage high throughput synthesis/testing capability on new materials such as borohydrides. Incorporate a metric of "usable capacity" that takes into account temperature for down-selecting materials.
ST-12	*Hydrogen Fuel Cells and Storage Technology Project at UNLV; UNLV; Clemens Heske*	1.4	X	X			This congressionally directed cross-cutting project (hydrogen storage, fuel cells and ICE combustion) will continue in FY2007, operating on funds provided in FY2006. Work scope is too broad and repeats prior work; redirect to be more in line with the program's goals. Consider outside partners for required expertise.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
ST-13	*Overview of Metal Hydride Center of Excellence and Sandia's Research; Sandia National Laboratory; Lennie Klebanoff*	3.1		X			Generate more "outside-the-box" concepts using a systematic modeling/experimental approach as opposed to focusing on further development of known systems. Incorporate a metric of "usable capacity" that takes into account temperature for down-selecting materials. Increase emphasis on CoE collaborations.
ST-14	*Lightweight Intermetallics for Hydrogen Storage; General Electric; J.C. Zhao*	3.1		X			The emphasis solely on Mg borohydride may be limiting. Continue to emphasize collaborations among the CoE partners. Incorporate a metric of "usable capacity" that takes into account temperature for down-selecting materials.
ST-15	*Synthesis of Aluminum Hydrides for Automotive Applications; BNL; Jason Graetz*	3.1		X			Off-board regeneration of alane is the key technical issue and should receive priority. Collaborations with the Chemical Hydrogen CoE may be helpful in this regard.
ST-16	*Thermodynamically Tuned Nanophase Materials for Reversible Hydrogen Storage; HRL Laboratories; Greg Olson*	3.1		X			A key issue with destabilized hydrides is kinetics. Emphasize studies with scaffolds. Incorporate a metric of "usable capacity" that takes into account temperature for down-selecting materials.
ST-17	*Development and Evaluation of Advanced Hydride Systems for Reversible Hydrogen Storage; Jet Propulsion Laboratory; Bob Bowman*	3.1		X			The NMR analyses are important for the CoE partners developing materials. Increase emphasis on engineering science and analysis in FY07.
ST-18	*Metal Hydride-Based Hydrogen Storage; U. of Illinois; Ian Robertson*	3.1		X			For both the material characterization and theoretical modeling activities, continue to expand communications with the material developers of the CoE.
ST-19	*Hydrogen Storage Systems Analysis; ANL; Rajesh Ahluwalia*	3.4		X			Consider addition of sensitivity analysis tab(s) to tools. Continue to increase coordination with TIAX on storage analyses.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
ST-20	*Analyses of Hydrogen Storage Materials and On-Board Systems; TIAX; Steve Lasher*	3.4		X			Continue focus on cost analysis to minimize overlap with ANL. Continue to increase coordination with ANL on storage analyses.
ST-21	*Carbide-Derived Carbons with Turnable Porosity Optimized for Hydrogen Storage; U of Penna/ Drexel Univ.; Jack Fischer*	2.6		X			Place emphasis on enabling room temperature adsorption and increasing volumetric capacity. Clarify benefits of CDCs over activated carbon.
ST-22	*New concepts for optimized hydrogen storage in metal-organic frameworks (MOFs); UCLA/University of Michigan; Omar Yaghi*	3.0		X			Focus material development to increase both gravimetric and volumetric capacity. Also explore methods to increase hydrogen binding energy.
ST-23	*Carbon Center of Excellence and NREL's Research; NREL; Mike Heben*	3.2		X			Pay equal attention to both gravimetric and volumetric capacity. Verify the modeling predictions with synthesis and material testing. Continue to stress storage approaching room temperature. Down selections and go/no-go decisions should continue and the project should be flexible to move on when required.
ST-24	*Enabling Discovery of Materials With A Higher Heat of H_2 Adsorption; Air Products & Chemicals; Alan Cooper*	3.0		X			Accelerate move to new boron and nitrogen-containing materials building on recent work stressing both volumetric and gravimetric capacity. Intensify partnerships for the material testing capability. Either in-house or through collaborations, test theory predictions with synthesis and testing.
ST-25	*Neutron Scattering Characterization at NIST in support of the Carbon and Metal Hydride Centers of Excellence; NIST; Dan Neumann*	3.5		X			Continue to support and speed the material selection process for both CoEs. Communication with the material developers is critical. Justify the Calphad modeling in the context of other theoretical work being done within the metal hydride CoE.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
ST-26	*Cloning Single Wall Carbon Nanotubes for Hydrogen Storage; Rice U.; James Tour*	3.3		X			Address volumetric capacity as well as hydrogen binding energy and uptake/discharge kinetics.
ST-27	*Advanced Boron and Metal loaded High Porosity Carbons; Penn State U.; Peter Eklund*	3.1		X			Material testing and modeling should include understanding of hydrogen uptake/discharge kinetics as well as material volumetric capacity.
ST-28	*Hydrogen Storage in Graphite Nanofibers and the Spillover Mechanism; U. of Michigan; Ralph Yang*	3.2		X			Independent verification of promising materials is required. Stress understanding and improving the hydrogen uptake/discharge kinetics.
STP-02	*Effects and Mechanisms of Mechanical Activation on Hydrogen Sorption/ Desorption of Nanoscale Lithium Nitrides; U. of Connecticut; Leon Shaw*	2.8		X			Re-align focus on understanding and optimizing the mechanical activation effects (e.g. low temperature). Include limited cycling on reversible capacities. Increase collaborations to include new materials such as borohydrides.
STP-03	*First-Principles Modeling of Hydrogen Storage in Metal Hydride Systems; U. of Pittsburgh; Karl Johnson*	3.1		X			Increase collaborations to integrate theoretical activities with experimental synthesis/testing. Communication across all the theoretical activities within the CoE is also critical.
STP-04	*Hydrogen Storage Research in support of the DOE National Hydrogen Storage Project; Savannah River National Lab; Ted Motyka*	2.8		X			This review covered all storage work occurring at SRNL. Focus on SRNL's unique capabilities to develop materials and subsystems. Quantify the alane regeneration efficiency. Increase coordination with BNL. The microsphere work has limited potential.
STP-05	*Thermodynamically Tuned Nanophase Materials for Reversible Hydrogen Storage: Structure & Kinetics of Nanoparticle and Model System Materials; Stanford U.; Bruce Clemens*	2.9		X			Clarify planned synchrotron studies in FY07. After go/no-go decisions with MgSi, move to more promising materials for in situ studies.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
STP-06	*Fundamental Studies of Advanced High-Capacity Reversible Metal Hydrides; U. of Hawaii; Craig Jensen*	2.9		X			Deemphasize Ti catalyst/alanate work and increase emphasis on catalysis for the destabilized hydrides. Transfer alanate understanding to borohydrides, as applicable. The PI's collaborations are noteworthy.
STP-07	*High Throughput Combinatorial Chemistry Development of Complex Hydrides; Intermatix; Guanghui Zhu*	2.5		X			Increase collaborations with MHCoE partners involved in materials discovery to address the most promising materials. Coordinate theory portion with the existing MHCoE theory groups to reduce overlap.
STP-08	*Synthesis of Nanophase Materials for Thermodynamically Tuned Reversible Hydrogen Storage; California Institute of Tech; Channing Ahn*	2.8		X			Address the fate of the nanoparticles under cycling conditions. Move to materials other than the MgSi.
STP-09	*Effect of Trace Elements on Long-Term Cycling and Aging Properties of Complex Hydrides for Hydrogen Storage; U. of Nevada, Reno; Dhanesh Chandra*	3.0		X			Re-align work to address the most promising materials. Boron based materials are growing in importance. Top priority should be the impurities/cycling work over the characterization work.
STP-10	*Chemical Vapor Synthesis of Nanocrystalline binary and complex Metal Hydrides for Reversible Hydrogen Storage; U. of Utah; Zak Fang*	3.0		X			Re-align work to address the most promising materials. Move away from alanate/amide systems. Address the cyclic stability of nanocrystalline materials.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
STP-12	*ORNL's Hydrogen Storage Research in support of the DOE National Hydrogen Storage Project; Oak Ridge National Lab; Gilbert Brown*	2.7		X			Re-align work on materials that have little potential to meet storage system requirements. Carbon work: Increase collaboration with modeling efforts to estimate feasibility of enhancing hydrogen physisorption. Estimate bulk volumetric capacity. MH Work: Increase collaboration with MHCoE synthesis partners. Emphasize reversibility in new materials discovered.
STP-15	*Conducting Polymer as New Materials for Hydrogen Storage; U. of Pennsylvania; Alan MacDiarmid*	2.9		X			Should it be determined that conducting polymers are not suitable for hydrogen storage, this project should be redirected into a more promising related area of hydrogen storage materials research.
STP-16	*Enhanced Hydrogen Dipole Physisorption; California Institute of Tech; Channing Ahn*	2.7		X			Reiterate the strategy to achieve the optimum pore size quoted in the carbon-based materials. Establish a backup route to achieve pores with optimal surface area to mass ratio. Include volumetric capacity in optimization strategy.
STP-17	*Optimization of SWNT Production and Theoretical Models of H_2-SWNT Systems for Hydrogen Storage; Rice U.; Boris Yakobson*	2.9		X			Address the route to room temperature materials adsorption. Focus on new structures/ geometries that maximize storage potential (gravimetric and volumetric). Continue SWNT production improvements at a low effort level until scale-up is justified.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
STP-18	*Development of Carbon-Based Materials and Characterization of Hydrogen Adsorption by NMR; U. of North Carolina; Yue Wu*	3.2		X			Include a systematic study of the sources of error in the measurement technique and validate measurements before proceeding further to more challenging materials. Emphasize developing a low temperature capability (77K). Clarify which hydrogen storage materials this technique would be suitable. Collaborations are critical.
STP-19	*Growth of Uniform Carbon Nanotubes using Molecular Clusters as Catalysts; Duke U.; Jie Liu*	2.7		X			Stress increasing both gravimetric and volumetric capacity towards room temperature; include hydrogen binding energy and uptake/discharge kinetics with a minimal amount of metal loading. Increase collaborations for material testing.
STP-21	*Carbon-Based Hydrogen Storage; LLNL; Joe Satcher*	2.9		X			Measure relative benefit of a specific dopant in a carbon aerogel host as compared to other carbon hosts. A comparison should be made of room temperature vs. 77K uptake both in their pristine and doped forms. Design of the aerogels should also take into account volumetric capacity.
STP-25	*Electrochemical Hydrogen Storage Systems; Penn State U.; Digby Macdonald*	3.3		X			The electrochemical approach for B-O to B-H reduction through intermediates appears to hold some promise and should be continued along with the direct reduction pathway. Develop a plan that maximizes the information developed in this project that can be applied to the go/no-go decision process for this storage option.
STP-26	*Chemical Hydrogen Storage Using Ultra-High Surface Area Main Group Materials; UC Davis; Philip Power*	2.5		X			Conduct preliminary assessment of hydrogen up-take and release for synthesized materials and focus on the few promising candidates to optimize their storage capacities.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
STP-27	*Main Group Element Chemistry in Service of Hydrogen Storage and Activation; U. of Alabama; Anthony Arduengo*	3.6		X			Continue to pursue and develop higher capacity storage materials with increasing focus on regeneration work.
STP-37	*Clean Energy Research Project: Advanced Metal Hydrides; Univ. of South Carolina; Jim Ritter*	2.6		X			This project is a cross-cutting project covering hydrogen storage and fuel cell technology. The review addressed mainly the storage activities. Continue to stress materials that will meet volumetric and gravimetric capacity as well as transient performance targets.
STP-43	*Hydrogen Research at Univ. of South Florida; Univ. of South Florida; Lee Stefanakos*	2.5		X			This project is a cross-cutting project. Continue to eliminate weak tasks, focus on promising storage materials and conduct testing on materials to determine and verify performance.

Fuel Cells:

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
FC-01	*High-Temperature Polymer Electrolyte Membranes; ANL; Debbie Myers*	2.5				X	Project successfully completed in FY06. Continuation subject to results of lab call. Measure conductivity of membrane at low RH and >100°C.
FC-02	*Development of Polybenzimidazole-based, High Temperature Membrane and Electrode Assemblies for Stationary and Automotive Applications; Plug Power; Rhonda Staudt*	2.6		X			In FY07, Plug Power will continue long term acid trap testing and demonstrate sealing concept.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
FC-03	*Non-Nafion Membrane Electrode Assemblies; LANL; Yu Seung Kim*	3.2				X	Project successfully completed in FY06. Continuation subject to results of lab call. Focus and extend OCV and start/stop tests to interface-optimized MEAs using Nafion in electrodes and BPSH, 6F, 6FCN membranes.
FC-04	*Advanced Fuel Cell Membranes Based on Heteropolyacids; NREL; John Turner*	3.0				X	Project successfully completed in FY06. Continuation subject to results of lab call. Focus on understanding the binding mechanism of HPAs and the conductivity mechanism in the membrane.
FC-05	*Enabling Commercial PEM Fuel Cells with Breakthrough Lifetime Improvements; Dupont; Gonzalo Escobedo*	3.3		X			Understanding peroxide and mechanical-strength failure mechanisms is highly relevant to DOE objectives and durability goal. Continue to use University of Southern Mississippi analytical and post-mortem work to provide valuable insight into membrane degradation mechanisms. UTC mitigation technique appears successful. Reviewers would like to see more cost analysis primarily related to the impact of different mitigation techniques.
FC-06	*Development of a Low-Cost, Durable Membrane and MEA for Stationary and Mobile Fuel Cell Applications; Arkema Chemicals; Michel Foure*	3.0		X			The PVDF platform is an excellent scaffold for new ionomers that need more structural integrity. The high throughput casting method will help in developing a large scale manufacturing process. Morphology work is a good addition. Continue work on M40 material but future work needs to address drive cycle conditions, low RH, and high temperature.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
FC-07	*Hydrocarbon Membrane; SNL; Christopher Cornelius*	2.7				X	Project successfully completed in FY06. Continuation subject to results of lab call. Consider CV to help elucidate structure-property relationships, helox experiments need to be run to investigate mass-transport phenomena, and AFM work to gain understanding of morphology.
FC-08	*MEA and Stack Durability for PEM Fuel Cells; 3M; Mike Hicks*	3.6		X			In FY07, continue MEA and stack development and testing; continue MEA degradation studies and statistical lifetime predictions.
FC-09	*Low Pt Loading Fuel Cell Electrocatalysts; BNL; Radoslav Adzic*	3.5				X	Project successfully completed in FY06. Continuation subject to results of lab call. Continue outstanding work with gold nanoclusters; test catalyst at higher temperature and include cycling at higher potentials.
FC-10	*New Electrocatalysts for Fuel Cells; LBNL; Phil Ross*	3.5				X	Project successfully completed in FY06. PI has retired.
FC-11	*Development of transition metal/chalcogen based cathode catalysts for PEM fuel cells; Ballard; Stephen Campbell*	2.4		X			In FY07, additional non-precious-component ternary catalysts will be studied.
FC-12	*Novel Approach to Non-Precious Metal Catalysts; 3M; Radoslav Atanasoski*	3.2		X			In FY07, focus on resolving stability and activity issues.
FC-13	*Novel Non-Precious Metals for PEMFC: Catalyst Selection through Molecular Modeling and Durability Studies; U of So. Carolina; Branko N. Popov*	3.3		X			In FY07, focus on durability and MEA optimization.
FC-14	*Non-Precious Metal Catalysts; LANL; Piotr Zelenay*	3.0				X	Project successfully completed in FY06. Continuation subject to results of lab call. Focus on Co and other transition metals, less on Ru.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
FC-15	*Low-Platinum Catalysts for Oxygen Reduction at PEMFC Cathodes; NRL; Karen Swider-Lyons*	2.8				X	Project successfully completed in FY06. Don't spend too much time on gold unless very large activity increases are obtained.
FC-16	*Development of High-Performance, Low-Pt Cathodes Containing New Catalysts and Layer Structures; Superior MicroPowders; Paolina Atanassova*	3.3				X	Use of combinatorial screening, expertise in spray pyrolysis, and the scalability of the catalyst fabrication process offer real advantages to mass manufacturers. Compared with other screening techniques, the combinatorial method assures that the candidates initially tested for catalytic activity are made by the same process as those intended to be used in mass production of the final "commercial" catalyst. Achieving stable 2-3 nm particle size is excellent however more durability data is needed on the various compositions. This project will be completed in the fall of 2006 with FY06 funding.
FC-17	*Cathode Electrocatalysis: Platinum Stability and Non-Platinum Catalysts; ANL; Debbie Myers*	3.1		X			Include studies with different wt% of Pt on C (e.g., 50 wt %); characterize the changes in the carbon support that occur; studying stability of cathode catalysts while cycling the anode between H_2 and O_2.
FC-18	*Integrated Manufacturing for Advanced MEAs; E-TEK; Yu-Min Tsou*	3.1				X	Project successfully completed in FY06. Ion Beam Assisted Deposition (IBAD) results are good for a non-impregnated structure. IBAD may have significant advantages over other systems and for manufacturing if future cathode performance can be achieved. However, production costs and stack manufacturers' acceptance of cloth GDL material are still issues.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
FC-19	*Advanced MEAs for Enhanced Operating Conditions, Amenable to High Volume Manufacture; 3M; Mark Debe*	3.7				X	Project successfully completed in FY06. Holistic and methodical approach. Important recognition that any chemical system must be amenable to continuous manufacturing operations. Reviewers said product development data would have more credence if results were reported collaboratively with stack developers. Stack is awaiting testing at ANL.
FC-20	*Development of High Temperature Membranes and Improved Cathode Catalysts for PEM Fuel Cells; UTC; Lesia Protsailo*	3.1				X	Project successfully completed in FY06. Good integration of experimental and modeling work. Well thought out approach that looked at high-temperature MEA, not just high temperature membrane. Determined the relationship between O_2 permeability and membrane durability and extended durability of PtIrCo catalysts. Reviewers would like to see TEM analysis from accelerated testing to look for changes to catalyst population and distribution.
FC-21	*Electrocatalyst Supports and Electrode Structures; LANL; Mahlon Wilson*	2.8				X	Project successfully completed in FY06. Continuation subject to results of lab call. Focus on durability of the new supports; show reduced surface mobility and increased Pt activity.
FC-22	*Fundamental Science for Performance, Cost and Durability; LANL; Bryan Pivovar*	2.7		X			Identify the causes and solutions of delamination rather than correlating degree of delamination with performance. Project goals are in three areas so may need increased focus on less topics to meet deadlines.
FC-23	*Fuel Cell Systems Analysis; ANL; Rajesh Ahluwalia*	3.0	X	X			Expand the collaborative information sources and include more "real world" experience.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
FC-24	*Effect of Fuel and Air Impurities on Fuel Cell Performance; LANL; Fernando Garzon*	3.2				X	Project successfully completed in FY06. Continuation subject to results of lab call. Complete the work on sulfur and ammonia. Look at lower catalyst loadings in the range of the 2010 loading targets.
FC-25	*High Temperature/Low Humidity Polymer Electrolytes Derived from Ionic Liquids; LANL; Jim Boncella*	2.5		X			Consider splitting the test protocol up into mandatory tests and those which can be done in addition.
FC-26	*Neutron Imaging Study of the Water Transport Mechanism in a Working Fuel Cell; NIST; Muhammad Arif*	3.5		X			If possible, carry out experiments in a fuel cell stack. Try to ensure that reactants can be conditioned to the same temperature as the fuel cell when cold start experiments are performed.
FC-27	*Microstructural Characterization Of PEM Fuel Cell MEAs; ORNL; Karren More*	3.7		X			If possible, work on new membranes, catalysts, MEAs should be pursued.
FC-28	*PEM Fuel Cell Durability; LANL; Rodney Borup*	3.4		X			Spend more time on causes of degradation and mitigation.
FC-29	*Investigating Failure in Polymer-Electrolyte Fuel Cells; LBNL; John Newman*	2.8	X			X	Project successfully completed in FY06. Continuation subject to results of lab call. Coordinate with ANL to facilitate transfer of results between the modeling efforts.
FC-30	*Sub-Freezing Fuel Cell Effects; LANL; Rangachary Mukundan*	3.1				X	Project successfully completed in FY06. Continuation subject to results of lab call. Full-scale testing of complete systems would be valuable.
FC-31	*Back-up/Peak-Shaving Fuel Cells; Plug Power; John Vogel*	3.2				X	Project successfully completed in FY06. Fuel Cell unit is being tested at three independent locations.
FC-32	*Economic Analysis of Stationary PEM Fuel Cell Systems; Battelle; Harry J. Stone*	2.3		X			In FY07, study will be expanded to include emergency response back-up power (such as 911 call centers); specialty vehicles – airport tugs and fork lifts.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
FC-33	*Scale-Up of Carbon/Carbon Bipolar Plates; Porvair Corp.; David Haack*	2.8				X	Project to be completed by Nov 2006 with FY06 funding. Remaining plan is to address shortcomings in the material development such as finding a sealant that will withstand durability testing, and improving process time for high volume production.
FC-34	*Cost-Effective Surface Modification for Metallic Bipolar Plates; ORNL; Peter Tortorelli*	3.1				X	Project successfully completed in FY06. Continuation subject to results of lab call. Consider more accurate cost evaluation methods and cost effectiveness.
FC-35	*Platinum Recycling Technology Development; Ion Power, Inc.; Stephen Grot*	2.8		X			Platinum recycling will be very important in maintaining a viable supply of fuel cell catalyst precious metals required for full scale fuel cell commercialization. The project has achieved success in clearly demonstrated the viability of platinum recovery and good progress in recovery of membrane ionomers.
FC-36	*Platinum Group Metal Recycling Technology Development; Engelhard; Larry Shore*	2.8		X			Platinum recycling will be very important in maintaining a viable supply of fuel cell catalyst precious metals required for full scale fuel cell commercialization. Very well planned future work with go/no-go criteria established. It is beneficial that the prime contractor is a domestic producer and refiner of Pt group metals.
FCP-08	*High Temperature Membrane; LBNL; John Kerr*	3.1	X			X	Project successfully completed in FY06. Continuation subject to results of lab call. Consider *in situ* evaluation of candidate membranes with metrics for conductivity over a temperature range and sensitivity to known failure modes of PEMs.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
FCP-09	*Component Benchmarking; LANL; Tommy Rockward*	3.1				X	Project successfully completed in FY06. Continuation subject to results of lab call. Investigate more promising polymer types as well as preparing and characterizing polymer/ionic liquid blends.
FCP-13	*Montana PEM Membrane Degradation Study; Montana State Univ.; Lee Spangler*	2.4				X	Project successfully completed in FY06. Use the methods developed to probe into more fundamental degradation mechanisms.
FCP-20	*Residential Fuel Cell Demonstration by the Delaware County Electric Cooperative, Inc.; Del. Co. Electric Co-op; Mark Schneider*	2.9				X	Project successfully completing with FY06 funding; energy storage data collection will be completed in December 2006 and reporting will be completed in January 2007.
FCP-23	*Sub-Freeze Performance; ANL; Shabbir Ahmed*	2.9	X			X	Project successfully completed in FY06. Continuation subject to results of lab call. Add more fundamentals of transport of water during freeze/thaw.
FCP-25	*Corrosion Protection of Metallic Bipolar Plates for Fuel Cells; NREL; John Turner*	3.1				X	Project successfully completed in FY06. Continuation subject to results of lab call. Consider the impact of inclusions in the steels on the nitride protection. Develop a test plan for corrosion evaluation and formability evaluation.
FCP-26	*Development of Low-Cost, Clad Metal Bipolar Plates for PEM Fuel Cells; PNNL; Scott Weil*	3.3				X	Project successfully completed in FY06. Continuation subject to results of lab call. Breakout cost of the substrate, clad material, and any post processing and then add the cost of finishing operations to form flow fields. *In situ* experimentation on cladded plates will be able to confirm whether DOE targets are met.
FCP-27	*Advanced Catalysts for Fuel Cells; JPL; S. Narayanan*	2.6				X	Project successfully completed in FY06. Investigate origin of low values of the ORR onset potentials. Demonstrate viability of the Pt-M-Zr catalysts for fuel-cell type cathode.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
FCP-28	*Contaminant Effects; ANL; Debbie Myers*	3.1	X			X	Project successfully completed in FY06. Continuation subject to results of lab call. Carefully consider real pollutant and impurities that will be experienced by the early fuel cell cars in real air sheds.
FCP-29	*Non-Platinum Catalysts; ANL; Xiaoping Wang*	2.4	X			X	Project successfully completed in FY06. Continuation subject to results of lab call. Coordinate effort with other Labs.
FCP-40	*Tungsten Oxide Cathode Catalysts; ORSAM; Joel Christian*	2.2				X	This congressionally-directed effort was completed in FY06.
FCP-42	*Smart Fuel Cell Operated Residential Micro Micro-Grid Community Grid Community; U of S. Alabama; Mohammad Alam*	2.0				X	University of South Alabama is completing congressionally-directed work in FY07.

Technology Validation:

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
TV-01	*DTE Energy Hydrogen Technology Park; DTE Energy; Rob Bacyinski*	3.2		X			This program has broad education and demonstration capability and is providing essential H2 delivery infrastructure facility and education in a key vehicle test area.
TV-02	*Power Parks System Simulation; SNL; Andy Lutz*	3.3		X			A good understanding of energy peak performance parameters. Strong effort to validate tools using real world systems.
TV-03	*High-Pressure Cold H2 Storage Vehicle Demo; LLNL; Salvador Aceves*	3.1		X			Reasonable plan to install cryo-gas tank on a hydrogen hybrid vehicle. 2nd generation hardware suitable for vehicle use.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
TV-04	*Development of a Natural Gas-to-Hydrogen Fueling System; GTI; Bill Liss*	2.9				X	Good technical progress in fuel reforming efficiency, fast-fill testing, and fuel dispensing. Little progress made in hydrogen compression technology.
TV-05	*Development of a Turnkey Hydrogen Fueling Station; Air Products; David Guro*	2.9		X			New PSA appears to be of high value. Insufficient station operation for complete demonstration.
TV-06	*Validation of an Integrated System for a Hydrogen-Fueled Power Park; Air Products; Greg Keenan*	3.0		X			Molten Carbonate Fuel Cell project relies on mature technologies. Engineering design should be able to be implemented. Phase 3, detailed design and fabrication, of the project should be done.
TV-07	*Hydrogen Vehicle and Infrastructure Demonstration and Validation; General Motors; Roz Sell*	3.4		X			These were well-directed projects critical to the support of the President's Hydrogen Fuel Initiative.
TV-08	*Controlled Hydrogen Fleet and Infrastructure Demonstration and Validation Project; DaimlerChrysler; Klaus BonHoff*	3.7		X			These were well-directed projects critical to the support of the President's Hydrogen Fuel Initiative.
TV-09	*Hydrogen Fuel Cell Vehicle & Infrastructure Demonstration Program Review; Ford; Greg Frenette*	3.7		X			These were well-directed projects critical to the support of the President's Hydrogen Fuel Initiative.
TV-10	*Controlled Hydrogen Fleet and Infrastructure Demonstration and Validation Project; Chevron Texaco; Linda Gallaher*	3.5		X			These were well-directed projects critical to the support of the President's Hydrogen Fuel Initiative.
TV-11	*California Hydrogen Infrastructure Project; Air Products; Mark Pedersen*	2.9		X			Work with OEM's station operators, and other objectives similar to the learning demonstrations, is good. The pipeline concept provides a low cost hydrogen production option while securing delivery capacity.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
TV-12	*Controlled Hydrogen Fleet & Infrastructure Analysis; NREL; Keith Wipke*	3.6		X			The Analysis conducted by NREL is critical to be able to convey information to the public.
TVP-01	*Hawaii Hydrogen Center for Development and Deployment of Distributed Energy Systems; Hawaii Natural Energy Inst.; Richard Rocheleau*	3.0		X			This is a good example of a hydrogen technology center with a good track record capable of reliable hydrogen and renewable energy technology project deployment, evaluation, and education.
TVP-03	*Novel Compression and Fueling Apparatus to Meet Hydrogen Vehicle Range Requirements; Air Products; Todd Carlson*	3.1				X	This is a good example of a hydrogen technology center with a good track record capable of reliable hydrogen and renewable energy technology project deployment, evaluation, and education.
TVP-05	*Chattanooga Fuel Cell Demonstration Project; City of Chattanooga; Joe Ferguson*	2.5				X	Actively communicating the collected information to the community and Hydrogen program stakeholders, as well as soliciting H_2 uses will round out the project.
TVP-06	*NextEnergy Microgrid and Hydrogen Fueling Facility; NextEnergy; Dave McLean*	2.6				X	The basic need to have a good hydrogen refueling center with capability to evolve with the rapidly emerging hydrogen vehicle technologies in the area is really the key feature of the facility.
TVP-08	*Hydrogen Filling Station; UNLV; Robert Boehm*	2.7				X	The approach is not clear, collaborators are not adequately addressed and the project is working on areas that don't fit together and would be better if focused on particular process improvements.
TVP-10	*Fuel Cell Powered Underground Mine Loader Vehicle; Vehicle Projects LLC; David Barnes*	2.5				X	Program has shown that Hydrogen and fuel cells can be deployed successfully in specialized applications. The project, while successful, is a somewhat less important project for fulfilling the President's H_2 Initiative.

Safety Codes and Standards:

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
SA-01	*Hydrogen Codes and Standards; NREL; Jim Ohi*	3.4		X			This project is well organized with participation from domestic and international codes and standards development organizations and will continue to produce significant results toward the development of a comprehensive and performance-based set of codes and standards for the safe use of hydrogen and hydrogen systems.
SA-02	*Research and Development for Hydrogen Safety, Codes and Standards; SNL; Jay Keller*	3.5		X			A systematic approach to developing the experimental data needed on hydrogen behavior and to ensure that scientifically sound data is available for the codes and standards development process. This project also includes the development of a hydrogen materials compatibility database and risk assessment efforts.
SA-03	*International Standards and Regulations; LANL; Cathy Padro*	2.6		X			This project supports the development of a Global Technical Regulation for hydrogen vehicle systems under the United Nations Economic Commission for Europe, World Forum for Harmonization of Vehicle Regulations, and Working Party on Pollution and Energy Program (ECE-WP29/GRPE). This project supports and works with DOT/NHTSA and EPA to coordinate US position on the development of international hydrogen/fuel cell codes, standards, and regulations that are performance-based.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
SA-04	*First Responder Training Hardware & Incident Reporting Database; PNNL; Bruce Kinzey*	3.6		X			This project consists of establishing a web-based system for open sharing of lessons learned from hydrogen incidents and near misses and developing a Hydrogen Best Practices document to share the knowledge and experience already attained in industry, aerospace and elsewhere. Excellent progress despite the limited funding.
SA-05	*Hydrogen Safety Review Panel; PNNL; Steven Weiner*	3.3		X			This project helps ensure the safety of the DOE funded projects and brings expertise from industry, academia, government and the private sector to conduct safety reviews and to make safety recommendations. Excellent progress despite the limited funding.

Education:

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
ED-01	*Hydrogen Technology and Energy Curriculum (HyTEC); U of Cal. Berkeley; Barbara Nagle*	3.4		X			Important project to address long-term education objectives. Good progress despite limited funding. Coordinate with related projects where possible, build on partnerships, and use established network for widespread dissemination and to extend project reach. Continue, pending FY2007 Appropriations.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
ED-02	*H2 Educate!; NEED; Mary Spruill*	3.5		X			Important project to address long-term education objectives. Excellent progress despite limited funding. Coordinate with related projects where possible, build on partnerships, and use established network for widespread dissemination and to extend project reach. Continue, pending FY2007 Appropriations.
ED-03	*Training for Safety and Code Officials; PNNL; Bruce Kinzey*	3.2	X	X			Important for near-term demonstration and deployment. Good collaboration with Safety, Codes and Standards program. Stakeholder input, pilot tests, and broad review greatly strengthen project. Continue, pending FY2007 Appropriations.
ED-04	*Hydrogen Community Education Program; The Media Network; Henry Gentenaar*	3.2	X	X			Project is in early stages but has good potential for success. Scope must remain realistic, given budget constraints. Simple messaging and partnerships are critical. Continue, pending FY2007 Appropriations.
EDP-01	*Hydrogen/Alternative Energy Center; Lansing Comm. College; Ruth Borger*	3.1				X	FY2004 Congressionally- directed project. Should be completed in FY2007 with no additional funding required.
EDP-02	*Shared Technology Transfer Project; Nicholls State U.; John Griffin*	2.1				X	FY2004 Congressionally- directed project. Should be completed in FY2006 with no additional funding required.
EDP-03	*Montana Hydrogen Futures Project; U. of Montana; Paul Williamson*	2.3				X	FY2004 Congressionally- directed project. Should be completed in FY2006 with no additional funding required.

Analysis:

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
AN-01	*Hydrogen Production Infrastructure Options Analysis; Directed Techs.; Brian D. James*	2.9		X			Continue to support. The model enables analysis of optimum hydrogen production technologies and is critical to the hydrogen transition analysis.
AN-02	*Impact of Hydrogen Production on U.S. Energy Markets; EEA; Harry Vidas*	2.8		X			Continue to support. In FY 2006, the project was in the initial phase due to funding delays. The project will provide critical data for resource and hydrogen infrastructure.
AN-03	*Analysis of the Hydrogen Production and Delivery Infrastructure as a Complex Adaptive System; RCF, Inc.; George Tolley*	2.9		X			Continue to support. In FY 2006, the project is in the initial phase due to funding delays. The project will provide infrastructure analysis based on risk analysis, imperfect knowledge and behavioral changes of consumers.
AN-04	*WinDS-H_2 Model and Analysis; NREL; Keith Parks*	3.1		X			Continue to support. This model enables infrastructure analysis with available resources and optimum supply of hydrogen.
AN-05	*Macro-System Model; NREL; Mark Ruth*	3.7		X			Continue to support. This model is essential for linking models of varying complexity to enable complete pathway cost and well-to-wheels analysis. The test version of the model was issued in FY 2006 with links to the H2A and GREET models. Additional models will be linked in FY2007.
AN-06	*Hydrogen Transition Infrastructure Analysis; NREL; Margo Melendez*	2.7				X	The project is complete. The project information will be used as inputs to the other analysis projects.
AN-07	*Hydrogen Transition Modeling and Analysis: HYTRANS v. 1.0; ORNL; David Greene*	3.4		X			Continue to support. This project is co-funded with PBA. The project should continue since it will be a useful model for vehicle penetration and transition analysis. The model is planned to be linked with the Macro System Model.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	Summary Comment
AN-08	*Hydrogen Analysis Support; PNNL; Marylynn Placet*	3.1		X			Continue to support. The hydrogen data base and website will be updated annually with the most current information related to hydrogen. This information center provides critical information for consistent analysis.