PROLOGUE

Dear Colleague:

This document summarizes the comments provided by the peer reviewers at the U.S. Department of Energy (DOE) Hydrogen Program's FY 2007 Annual Merit Review and Peer Evaluation meeting, held on May 14-18, 2007 in Washington, D.C. This review process provides evaluations of the Program's projects in applied research, technology development and demonstration, and analysis in response to direction from the Under Secretary of Energy. 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) — participate in the meeting to provide the hydrogen community a 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 fuel cell related projects from SC were provided as oral or poster presentations, but not evaluated by the reviewers.

The recommendations of the reviewers have been taken into consideration by DOE Technology Development 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, 2007 to September 30, 2008). 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 2008 plans.

I would like to express my sincere appreciation to the reviewers. It is they who make this report possible, and upon whose comments we rely to help make project decisions for the new fiscal year. Thank you for participating in the FY 2007 Annual Merit Review and Peer Evaluation meeting.

We look forward to your participation in the FY 2008 Annual Merit Review and Peer Evaluation meeting, which is presently scheduled for June 9-13, 2008 at the Marriott Crystal Gateway hotel in Arlington, VA.

JoAnn Milliken
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Office of Energy Efficiency and Renewable Energy

Hydrogen Production and Delivery:

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
PD-01	*Low Cost Hydrogen Production Platform, Praxair, Tim Aaron*	3.24				X	Good focus on manufacturability and assembly. Reducing the cost and footprint of on-site hydrogen production is critical to reaching DOE goals. Additional data needed on hydrogen yield, generator durability, and space velocity. The research is viewed as needing to proceed to a demonstration phase.
PD-02	*Low-Cost Hydrogen Distributed Production Systems, H2Gen Inno. Inc., Frank Lomax*	3.41		X			Impressive accomplishment to complete 565 kg/day distributed natural gas platform. PSA developments will allow greater production flexibility. Lack of compression related work. Reviewers questioned whether ethanol testing would distract from primary objective (and asked to see more hydrogen generators built instead of directing the effort toward ethanol reforming) while also stating that funding H2Gen to research ethanol is a good idea. Partner roles unclear.
PD-03	*Integrated Hydrogen Production, Purification & Compression System, Linde, Satish Tamhankar*	3.06		X			Addresses fuel processor capital costs, O&M, and reliability and costs of hydrogen compression barriers by building an integrated membrane, fluidized bed reformer and metal hydride compressor system. Benefits of fluid bed reformer need to be clearly compared to conventional reforming technology. Process intensification will bring the cost down to DOE target levels.

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
PD-04	*Bio-Derived Liquids Reforming, PNNL, Yong Wang*	2.86		X			Potential long term solution to distributed reforming system with very low Well to Wheels CO_2 emissions. Critical to the realization of renewable sources for hydrogen at the DOE targeted production cost of $3.00/gge by 2017. Strong early evaluation of catalyst performance for reforming of bio-derived fuels – an important topic as distributed reforming research transitions from natural gas to renewable feedstocks.
PD-05	*Biomass Gasification, GTI, Michael Roberts*	2.56	X	X			The reviewers recognized that it will be very challenging to find or develop a membrane system that will not foul in the biomass gasifier as proposed in this project. However, if successful, this project potentially offers substantial capital cost reduction and improved efficiency for biomass gasification which was deemed highly relevant to the Hydrogen Program. This project is just getting started. As recommended, experiments with the membrane(s) in the gasifier environment will be moved forward in the plan, and the project will be carefully reviewed for a Go/No-Go decision as soon as practical based on membrane(s) performance and a more thorough cost analysis of the this approach to biomass gasification.
PD-07	*Carbon Molecular Sieve Membrane as Reactor for Water Gas Shift Reaction, Media & Process Tech., Paul KT Liu*	3.27		X			Developing reactive separation membranes that do not use expensive materials (such as Pd-alloys) can have very significant payoff in overall hydrogen production costs. A membrane within the shift reactor will improve the CO conversion and reduce the shift reactor size. One reviewer disagreed that membrane reactors are critical in replacing conventional water gas shift however.

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
PD-08	*Renewable Electrolysis Integrated System Development and Testing, NREL, Kevin Harrison*	3.13		X			The reviewers noted that hydrogen generation using renewable power was a very important part of the Hydrogen Initiative. They wanted to see more real world data which is in the plan. There was mixed comments on participation with industry- some of the reviewers indicated that there should be more participation and cost sharing from industry while others thought there was a great amount of industrial involvement already. Funding will continue on this project.
PD-09	*Biological Systems for Hydrogen Photoproduction, NREL, Maria Ghirardi*	3.46		X			The work is well aligned with the DOE technical targets and has made great progress considering its funding difficulties - the results could be far reaching and apply broadly to a variety of biological hydrogen production strategies. The scope should include milestones, decision points, down-select criteria, and an end date.
PD-10	*Photoelectrochemical Water Systems for H_2 Production, NREL, John Turner*	3.13		X			Good relevance and an important pathway to realize the DOE's long term objective of renewable hydrogen. The approach is appropriate to make progress toward the objectives. The work is open-ended, making it difficult to assess the degree to which this approach will contribute to the overall DOE objective of a technology readiness decision by 2015.

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
PD-11	*Development of Solar-powered Thermochemical Production of Hydrogen from Water, UNLV, Chris Perkins*	3.38		X			This project had a very favorable review. The Earmark contract will come to an end in December, 2007. Effort on solar driven high temperature thermochemical water splitting cycles will be continued by the Hydrogen Program as appropriate. The plan in this area calls for a further down-selection of the potential cycles in FY08 from the current 7 to 1-3 for development as recommended by the reviewers.
PD-12	*Hydrogen Delivery Infrastructure Options Analysis, Nexant Inc., Bruce Kelly*	3.50		X			This project had a very favorable review. Significant progress has been made. The storage infrastructure needs and modeling will be reviewed by energy company logistics experts as recommended. This project will be completed during FY08.
PD-13	*Fundamental and Modeling of Pipeline Hydrogen Embrittlement, U of Illinois, Petros Sofronis*	3.48		X			This project had a very favorable review and will be continued. It was recognized for significant progress with limited funding. A good balance of theory and modeling with experimental data, and a strong interaction with stakeholders in industry and national labs.
PD-14	*FRP Hydrogen Pipeline, ORNL, Barton Smith*	3.23		X			This project had a favorable review. It was recognized that the use of fiber reinforced composite pipe has the potential for a capital cost breakthrough and elimination of hydrogen steel pipeline embrittlement concerns for a hydrogen pipeline infrastructure. As recommended, the plan for testing these composite pipeline structures will be carefully reviewed and augmented as appropriate by additional experts on composite and steel pipelines.

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
PD-15	*Scale-up of Hydrogen Transport Membranes for IGCC and FutureGen Plants, Eltron Research Inc., Doug Jack*	3.26		X			This project had a favorable review and will be continued. The project was recognized for its relevance to the FutureGen project and Hydrogen Fuel Initiative. Additionally, the project is progressing to the next scale of development to further address critical issues. Some reviewers suggested that the timeline for development be accelerated.
PD-16	*Cost-Effective Method for Producing Self-Supporting Pd Alloy Membrane for Use in the Efficient Production of Coal-Derived Hydrogen, Southwest Research Institute, Kent Coulter*	3.33		X			Overall, this project had a favorable review. The initial phase of the project has been completed and the project team has been selected to continue work under a different solicitation. The team will continue to investigate its ultra-thin membrane technology and will continue to partner with the Colorado School of Mines in addition to Carnegie Mellon University and TDA Research.
PD-17	*Advanced Water Gas Shift Membrane Reactor, United Technologies, Suzanne Opalka*	3.10		X			This project scored an average review. The original contract of the project has been completed and the project is continuing under a new contract. The project team will undertake research, technology development, and economic analysis to further develop a sulfur-, halide-, and ammonia-resistant hydrogen-separation membrane. Based on alloys of palladium, copper, and transition metals, the membrane will potentially have commercially relevant hydrogen production flux and be capable of operating at high temperature and pressure.

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
PD-18	*The Integration of a Structural Water Gas Shift Catalyst with a Vanadium Alloy Hydrogen Transport Device, Western Res. Ins. & U of Wyoming Res.Corp., Thomas Barton*	2.96				X	This project scored slightly below average and has been completed. The project had been successful in addressing some of the technical issues, particularly with brazing as a potential way for catalyst attachment. However, the outcome of tests on a working gasifier may highlight some of the potential issues.
PD-19	*High Flux Metallic Membranes for Hydrogen Recovery and Membrane Reactors, REB Research & Consulting, Robert Buxbaum*	3.18		X			This project scored favorably and was noted for its strong collaborative efforts and research partners. The project is continuing and will continue its membrane development efforts to address issues surrounding the flux, durability, and cost goals.
PD-20	*Sulfur-Iodine Thermochemical Cycle Laboratory-Scale Experiment, SNL/GA/CEA, Paul Pickard*	3.19		X			This project is one of the baseline technologies for the Nuclear Hydrogen Initiative. Overall comments were favorable, with emphasis recommended on resolving materials issues.
PD-21	*Hybrid Sulfur Thermochemical Process Development, SRS, Bill Summers*	2.97		X			Project is one of the baseline technologies for the Nuclear Hydrogen Initiative. Overall comments were favorable. Reviewer recommendations suggested more analysis on economic viability.
PD-22	*Laboratory-Scale High-Temperature Electrolysis System, INL/ANL/Ceramatec, Steve Herring*	3.24		X			The reviewers ranked this project as slightly above average. They generally approved of the step wise approach to achieve their goals. This is a long term, project and only the next year's plan was presented, which caused some of the reviewers to be concerned about the planning. The reviewers indicated that the SOEC durability was a potential road block. There should be significant development to improve the stack. This project will receive continued funding.

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
PD-23	*Nuclear Reactor/Hydrogen Process Interface, INL, Steve Sherman*	3.22		X			This project scored very high on relevance but lower on accomplishments. Large number of collaborators was noted as both asset and weakness. Work is planned to continue with emphasis on actual heat exchanger testing, as well as continued modeling of reactor/process interactions.
PDP-01	*A Novel Slurry-Based Biomass Reforming Process, UTRC, Ying She*	2.88	X	X			The reviewers recognized that it may be very challenging for this biomass hydrolysis aqueous phase reforming approach to develop an effective catalyst that works well under the acidic conditions proposed and for this approach to match the favorable economics of standard biomass gasification. This project is just getting started. As recommended, the cost analysis task will be reviewed carefully including the assumptions concerning energy yields for the lignin stream. The plan focuses on the development of the catalyst as suggested by the reviewers. The plan will include a Go/No-Go decision as soon as is practical based on the cost analysis and catalyst development progress.
PDP-02	*Hydrogen from Water in a Novel Recombinant Oxygen-Tolerant Cyanobacteria System, Venter Institute, Qing Xu*	3.36		X			There was good progress on this project considering low level of government funding. Collaboration is good, but would benefit from more definitive check-points and cross-talk between the two research lines. The project represents a unique and attractive niche in the program.

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
PDP-06	*Investigation of Bio-ethanol Steam Reforming over Cobalt Based Catalysts, Ohio State U, Umit Ozkan*	3.32		X			This project received very high marks for its relevance and approach to developing a precious metal-free catalytic system, however some reviewers also found the focus on data and experimentation excessive. The focus on acquiring a fundamental understanding of reaction networks and active sites was appreciated. Project publications were well received. The need for greater collaboration with partners was noted.
PDP-07	*Distributed Bio-Oil Reforming, NREL, Bob Evans*	3.13		X			NREL developed the atomizer, cracking process and autothermal bench scale reactor and validated the need for oxidation to increase CO production. Recent funding from Chevron demonstrates project merit as does a subcontract with University of Minnesota in systematic catalyst study. The need to expand catalytic results beyond methanol conversion was noted.
PDP-08	*Hydrogen Generation from Biomass-Derived Carbohydrates via Aqueous-Phase Reforming Process, Virent Energy Sys., Randy Cortright*	3.06		X			Novel technology. While some reviewers were very clear that the project could provide significant advancement of DOE goals, others were not. The proprietary approach was considered an impediment to scoring. Overall, the aqueous phase reforming technology was viewed as a critical process for producing hydrogen from renewable feedstocks. Appreciated principal investigator thorough response to prior year comments.

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
PDP-09	*Integrated Short Contact Time Hydrogen Generator (SCPO), GE Global Res., Ke Liu*	3.12		X			Development of simplified reformers, particularly multi-fuel reformers viewed as a significant step towards meeting required DOE hydrogen cost targets (for the distributed production of natural gas). While some reviewers questioned the degree of innovation, others were very impressed with the novel science and engineering used to attack a difficult problem. Viewed as a model for industry, university, and national laboratory collaboration.
PDP-10	*Integrated Ceramic Membrane System for Hydrogen Production, Praxair, Joseph Schwartz*	2.67				X	Highly relevant for producing high purity hydrogen. Some reviewers noted differences in the research from project initiation to the conclusion questioning whether the hydrogen transport membrane research presented would result in a highly efficient, low cost hydrogen production platform (for the distributed production of natural gas).
PDP-11	*High-Performance, Durable, Palladium-Alloy Membrane for Hydrogen Separation & Purification, Pall Corp., Scott Hopkins*	3.21		X			While hydrogen permeance and separation factors meet or exceed DOE technical targets for metallic membranes, future testing of mixed gas streams (i.e. natural gas reformate) is important. Unclear how high hydrogen recovery will be achieved given low psi delta P tests. Future plans beyond durability, substrate and alloy testing were requested. Good team and work plan.
PDP-16	*Advanced Alkaline Electrolysis, GE Global Res., Richard Bourgeois*	3.16		X			This project received very high marks for its relevance and approach. The reviewers noted that a lot of progress has been made on the market analysis, but expected more to be accomplished on the technical side. The GE team is planning on building and demonstrating their units this year which will address many of the reviewer's comments. This project will continue.

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
PDP-17	*EVermont Renewable Hydrogen Production and Transportation Fueling System, EVermont, Inc., Harold Garabedian*	2.66				X	This project had a below average review score. The reviewers noted that there were not a lot of significant technical accomplishments reported, that they were not using renewable energy, and that the work is not new as there are other refueling stations around the world.
PDP-19	*Hydrogen Regional Infrastructure Program in Pennsylvania, Concurrent Tech. Corp, David Moyer*	2.69		X			This project had a below average review score. The project covers several areas. Some were viewed favorably including the work on Pennsylvania and the Northeast I-95 Production and Delivery infrastructure analysis using the H2A models as well as the work on off-board storage vessels. Other areas such as sensors development, pipeline R&D and PSA purification enhancements were viewed as duplicative of other work in the program or being done by suppliers. This project will be continued to the complete expenditure of Congressionally Directed funding. DOE will continue to work with the contractor to modify the effort to maximize its value.
PDP-23	*Evaluation of Alternative Thermochemical Cycles, ANL, Michele Lewis*	2.93		X			Ongoing research; was noted for good collaboration with universities. Project should reach a major milestone of selecting an alternative cycle for development in coming year.
PDP-24	*UNLV High Temperature Heat Exchanger Development, UNLV, Tony Hechanova*	2.82		X			Actually 5 projects in one. Complexity of managing and adequately presenting such a wide range of topics was reflected in lower scores on project approach. Comments on apparent lack of focus are hoped to be resolved by renewed efforts to better align this project with NHI goals.

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
PDP-26	*Test of High Temperature Electrolysis ILS Half Module, Ceramatec, Joe Hartvigsen*	3.23	X			X	The reviewers indicated that this project definitely supported the NHI and that it made solid contribution to its development. They indicated that there should be more development work in seals and materials to improve the stack durability. There were also recommendations that greater efforts in identifying suitable BOP components may result in better data (less interruptions due to component failures). This work continues under the core HTE project (PD-22).
PDP-28	*NHI Catalyst and Membrane Studies for Thermochemical Cycles at INL, INL, Dan Ginosar*	3.52		X			Highly relevant, highly scored project is important for improving economics and efficiency of thermochemical cycles being studied.
PDP-30	*Materials Issues and Experiments for HTE and SO_3 Electrolysis, ANL, David Carter*	3.48		X			This was a highly ranked project. The reviewers indicated that the approach was correct and that significant technical progress has been achieved in identifying the stack failure mechanisms. Understanding these mechanisms may make it easier to achieve a robust durable, long life SOEC stack. Funding will continue on this project.
PDP-31	*Corrosion Studies of Metallic Materials for Thermochemical Cycles, General Atomics, Bunsen Wong*	3.39			X		Project planned for discontinuance due to lower prioritization among thermochemical R&D.
PDP-32	*Membrane Development for Hybrid Sulfur Electrolysis and Oxygen Separation, SNL, Mike Hickner*	3.74		X			Extremely highly-scored project is vital to success of Hybrid Sulfur cycle development, as well as improving efficiency of Sulfur-Iodine cycle. Scores reflect breakthroughs being made and good collaboration with other researchers in this area.

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
PDP-33	*Maximizing Light Utilization Efficiency & Hydrogen Production in Microalgal Cultures, UC Berkeley, Tasios Melis*	3.76		X			This highly scored project is very well aligned with the Program's R&D objectives for biological hydrogen production. Impressive progress has been made with limited funding.
PDP-36	*Photoelectrochemical Generation of Hydrogen Using Sonicated Hybrid Titania Nanotube Arrays, U of Nev. Reno, Mano Misra*	2.70		X			Considering the external bias requirements for effective photocurrent levels in this TiO_2 work, and the lack of a clear pathway for achieving the longer-term DOE photocurrent and STH efficiency goals with this material system, this work did not adequately address the DOE RD&D objectives for un-assisted PEC solar water splitting. It is difficult to differentiate from conventional TiO_2, which is known not to work – not clear how/why nanotubes are an improvement.
PDP-37	*Photoelectrochemical Hydrogen Production: UNLV-SHGR Program Subtask, UNLV, Eric Miller*	3.37		X			This project represents a great cross-university/ industry/national lab collaboration covering multiple topics that is clearly working toward DOE's PEC targets. A benefit of this approach will be the development of theoretical tools that will help all participants and periodic (quarterly) group feedback can accelerate attainment of R&D goals.
PDP-40	*Adapting Planar Solid Oxide Fuel Cells for Distributed Power Generation, Ohio University, Andres Marquez*	2.34		X			This project was rated very low. The reviewers noted that it seemed more aligned to the SECA program than to the Hydrogen Initiative. The reviewers noted that progress had been made in identifying contaminant concerns. However, they noted that progress seemed to be slow, that the integrated concept was not thought out very well, and that plans for future work need to be made. We will work with the researchers to increase their work on hydrogen production technologies.

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
PDP-42	*Ohio Distributed Hydrogen Project, Ohio University, David Bayless*	2.33		X			This project was rated very low. The reviewers noted that hydrogen production was one aspect of the work, but not the primary objective of the project. It seemed more focused on stationary power generation using coal and SOFC than hydrogen production. The reviewers thought the researcher covered too many areas, and that it should be more focused. This was reflected in their observations that technical progress has been slow. There were many recommendations the project scope be more focused on one or two areas, and one recommendation that funding be discontinued. We will work with the researchers to refine their scope.

Hydrogen Storage:

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
ST-01	*DOE Hydrogen Sorption CoE Overview, NREL, Mike Heben*	2.82		X			The HSCoE should incorporate down select decisions regularly to ensure that R&D stresses storage of hydrogen near ambient temperature and moderate pressure. Increase collaborations internally and externally to leverage resources.
ST-02	*NREL Research as part of Hydrogen Sorption CoE, NREL, Anne Dillon*	3.07		X			Increased experimental emphasis was recognized. Continue to emphasize synthesis of materials with improved binding energy and volumetric and gravimetric capacity.

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
ST-03	*Hydrogen Storage by Spillover, U of Michigan, Ralph Yang*	2.87		X			Increase collaborations to improve understanding of spillover mechanisms and to improve reproducibility of synthesis and performance of materials.
ST-04	*Theoretical Models of H_2-SWNT Systems for Hydrogen Storage and Optimization of SWNT Production, Rice U, Boris Yakobson*	3.16		X			Increase emphasis on understanding spillover and implications for materials synthesis. For material synthesis, stress optimizing binding energy while maintaining or increasing capacity.
ST-05	*Cloning Single Wall Carbon Nanotubes for Hydrogen Storage, Rice U, Jim Tour*	3.00		X			Emphasize property testing (capacity, binding energy, kinetics). Scaffold work is promising. Continue to emphasize higher temperature storage.
ST-06	*Metal-doped Carbon Aerogels for Hydrogen Storage, LLNL, Ted Baumann*	2.96		X			Emphasize understanding on whether metal doped C-aerogels are promising for near ambient storage. Continue collaborations with MHCoE for aerogel as a scaffold material.
ST-07	*Enabling Discovery of Materials With A Higher Heat of H_2 Adsorption, Air Products, Alan Cooper*	3.04		X			Stress synthesis of F-N nanoporous materials. Confirm predictions made on spillover materials (validate theory through experiments). Increase strategic leadership role in HSCoE.
ST-08	*Advanced Boron and Metal Loaded High Porosity Carbons, Penn State, Mike Chung*	2.97		X			Leverage resources on the most promising synthesis approaches. Widen the range of dopants explored. Clarify whether B-level achieved is reaching the limit and whether B-incorporation is increasing binding energy sufficiently.
ST-09	*Carbide-Derived Carbons with Tunable Porosity Optimized for Hydrogen Storage, U of Penn./Drexel Univ., Jack Fischer*	3.14		X			Emphasize material design towards non-cryogenic operation. Surface chemical modification results (to increase binding) look promising. Approaches to increase volumetric capacity appear promising.

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
ST-10	*Hydrogen Storage in Metal-Organic Frameworks, UCLA, Omar Yaghi*	3.42		X			Stress reticular and/or hybrid structures for storage towards ambient temperature. Working on frameworks with higher hydrogen binding energies seems to be essential. Currently the best in class for cryogenic storage materials.
ST-14	*DOE Metal Hydride CoE Overview, SNL, Lennie Klebanoff*	2.86		X			The MHCOE should formulate comprehensive down-select criteria and apply them regularly to their research areas. Improvement of kinetics needs more emphasis. The theoretical capabilities of the center should be better focused and utilized throughout all research areas of the center.
ST-15	*Sandia Research as part of the Metal Hydride CoE, SNL, Ewa Ronnebro*	3.26		X			Focus on lower temperature systems. Use the combinatorial approach to more rapidly screen systems for potential candidates and to search for catalysts to address kinetic barriers. The theoretical effort should continue to be used to guide the experimental effort.
ST-16	*Lightweight Intermetallics for Hydrogen Storage, General Electric, J.C. Zhao*	3.00		X			Greater emphasis is needed on criteria other than just weight capacity. Efforts should be made to identify catalysts to improve kinetics. Criteria for the go/no go decision on $Mg(BH_4)_2$ need to be formulated and applied. More collaborations are encouraged.
ST-17	*First-Principles Modeling of Hydrogen Storage in Metal Hydride Systems, Univ. of Pittsburgh, Karl Johnson*	2.96		X			Theoretical predictions are useful for improving the efficiency of experimental efforts, however closer collaboration with experimentalists is encouraged in all research areas of the center. The methodology needs to include consideration of reaction pathways and not just the predicted lowest energy reaction products.

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
ST-18	*Thermodynamically Tuned Nanophase Materials for Reversible Hydrogen Storage, HRL Laboratories, Ping Liu*	3.27		X			The overall approach and work effort was found appropriate. Incorporation of materials other than just Mg is encouraged.
ST-20	*Synthesis and Characterization of Alanes for Automotive Applications, BNL, Jason Graetz*	2.98		X			The alane project was considered extremely relevant and the use of organic adducts praised. Focus future work on regeneration processes and energetics of regeneration.
ST-21	*Chemical Vapor Synthesis of Nanocrystalline Binary and Complex Metal Hydrides for Hydrogen Storage - Understanding and Discovery of H_2 Storage Materials Involving Metal Amides, Univ. of Utah, Zak Fang*	2.82		X			The quantification of NH_3 desorbed from the amide systems needs to be a top priority. Consider a go/no go decision if the NH_3 concentration is found to be too high. The determination of reaction mechanisms should also be of higher priority.
ST-22	*Fundamental Safety Testing and Analysis of Hydrogen Storage Materials & Systems, SRNL, Don Anton*	3.06		X			This project was considered to be very important for the program as a whole, however there was a concern that results may be used to preclude R&D of materials that might be of value. The test plans should be expanded to be more applicable to on-board applications versus materials transport.
ST-23	*Hydrogen Storage by Reversible Hydrogenation of Liquid-phase Hydrogen Carriers, Air Products, Alan Cooper*	2.97		X			Continue to pursue material with high capacity, lower release temperature and efficient & inexpensive catalyst while taking the system analysis results of ST-31 into consideration.
ST-24	*DOE Chemical Hydrogen CoE Overview, LANL, Bill Tumas*	3.59		X			Apply up-front system analysis (e.g. R&H analysis) to identify show stoppers and guide material development. Pursue new promising materials including non-boron materials. Pursue high throughput approach (including catalyst discovery) to accelerate both hydrogen release and ammonia regeneration approaches.

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
ST-25	*Novel Approaches to Hydrogen Storage: Conversion of Borates to Boron Hydrides, Rohm and Haas, Suzanne Linehan*	3.28		X			Complete experimental work and calculate sodium borohydride regeneration efficiency as well as cost-include consideration of forecourt operation and return of spent fuel.
ST-26	*Electrochemical Hydrogen Storage Systems, Penn State, Digby Macdonald*	2.91		X			Complete experimental work and present data for sodium borohydride go/no-go decision review. Include energy efficiency and cost analyses.
ST-27	*Amineborane Hydrogen Storage, U of Penn., Larry Sneddon*	3.67		X			Continue to develop and optimize additives to improve capacity and release rates (especially for release of the second equivalent of hydrogen). Increase emphasis on efficient and economic spent fuel regeneration.
ST-28	*PNNL Research as part of the Chemical Hydrogen CoE, PNNL, Chris Aardahl*	3.50		X			Increase emphasis on identifying better digestion process for efficient regeneration of ammonia borane. Improve hydrogen release kinetics (especially for release of the second equivalent of hydrogen) as well as capacity. Investigate and identify path forward for the scaffold work.
ST-29	*LANL Research as part of the Chemical Hydrogen CoE, LANL, Tom Baker*	3.35		X			Place focused effort on efficient catalyst screening and development to meet hydrogen release kinetics and capacity needs. Transform homogeneous catalyst for heterogeneous catalyst applications. Narrow down regeneration options expeditiously and further develop promising approaches. Conduct up-front engineering studies to identify show stoppers early and guide material development to address critical material development issues.
ST-30	*Main Group Element and Organic Chemistry for Hydrogen Storage and Activation, U of Alabama, David Dixon*	3.39		X			Compare experimental and computational data and confirm/adjust the gas phase computational model as appropriate. Focus experimental work on material with promising capacity taking system requirements into consideration.

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
ST-31	*System Level Analysis of Hydrogen Storage Options, ANL, Rajesh Ahluwalia*	3.34		X			Continue sensitivity analyses for current designs to assess potential design parameters for future systems. Cross-check underlying assumptions with other stakeholders.
ST-32	*Analyses of Hydrogen Storage Materials and On-Board Systems, TIAX, Stephen Lasher*	3.43		X			Periodically revisit estimates made in previous years, work with industry to check validity of original assumptions and update as required. Must also stay current with progress made outside DOE portfolio.
ST-33	*International Standardized Testing Protocols for Hydrogen Storage Materials, NREL/HyEnergy, Karl Gross*	2.95		X			Consider addressing sample handling conditions and respective protocols and integrate feedback from experts. Coordinate with SwRI standardized testing facility and publicize documentation widely.
STP-02	*Conducting Polymers as New Materials for Hydrogen Storage, U of Penn., Pen-Cheng Wang*	2.62			X		This project is discontinued- PI recently deceased. This is a promising avenue of research for sorbent materials; DOE is exploring options to continue similar work elsewhere within its portfolio.
STP-03	*Characterization of Hydrogen Adsorption by NMR, U of North Carolina, Yue Wu*	3.45		X			This project has an important characterization role in the HSCoE. Extend study to spillover materials, advanced MOFs, and SWNT networks.
STP-04	*Synthesis of Small Diameter Carbon Nanotubes and Microporous Carbon Materials for Hydrogen Storage, Duke U, Jie Liu*	3.04		X			The shift from small diameter nanotubes towards microporous carbon materials is recommended. Coordination is needed to avoid unnecessary duplication.
STP-06	*Single Walled Carbon Nanohorns for Hydrogen Storage and Catalyst Supports, ORNL, David Geohegan*	2.75		X			Need to demonstrate/ assess that the nanostructured materials under study have the potential to reach room temperature storage at moderate pressure.
STP-07	*Enhanced Hydrogen Dipole Physisorption, CalTech, Channing Ahn*	2.73		X			The characterization capabilities of this group are key to the HSCoE. Effort should be increased on new material syntheses. Collaborations should be increased as appropriate.

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
STP-10	*Solutions for Chemical Hydrogen Storage: Hydrogenation/ Dehydrogenation of B-N Bonds, U of Washington, Karen Goldberg*	3.26		X			Improve hydrogen release for the catalyst with fast kinetics. Continue to develop non-precious metal catalyst while addressing selectivity, efficiency and capacity issues. Investigate if there is a hydrogen purity issue related to the organic linker of the catalyst.
STP-11	*Chemical Hydrogen Storage Using Polyhedral Borane Anion Salts, UMO, Fred Hawthorne*	2.42		X			Need to improve both hydrogen release kinetics and capacity. Continue to identify non-precious metal catalysts. Increase communication and collaboration with center partners working on sodium borohydride regeneration- this work is tied to the sodium borohydride go/no-go decision since spent fuel regeneration also involves conversion of B-O to B-H.
STP-12	*Development of Advanced Chemical Hydrogen Storage and Generation System, Millennium Cell, Oscar Moreno*	3.03		X			Complete storage system and cost analysis for the modeled design to meet the sodium borohydride go/no-go decision schedule.
STP-13	*Combinatorial Synthesis and High Throughput Screening of Effective Catalysts for Chemical Hydrides, Intematix, Jonathan Melman*	2.79		X			Provide more data and detail of work done, including catalyst library selection rationale.
STP-14	*Chemical Hydrogen Storage using Ultra-High Surface Area Main Group Elements, UC Davis, Susan Kauzlarich*	2.71		X			Determine viability of the high surface area material under investigation soon. Continue support to the Chemical Hydrogen Storage Center partners for ammonia borane regeneration.
STP-17	*Hydrogen Fuel Cells and Storage Technology Project at UNLV, UNLV, Clemens Heske*	2.07		X			Candidate materials should be identified and tested for hydrogen storage capacity as soon as possible. There is concern that this project will produce an in-depth investigation of materials and processes that aren't particularly relevant to the overall DOE hydrogen storage program.

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
STP-24	*Complex Hydrides for Hydrogen Storage Studies of the $Al(BH_4)_3$ System, ORNL, Gilbert Brown*	2.92		X			While the investigation of unique high weight capacity borohydrides is of interest, a go/no go decision on these types of materials should be made within a year or so. Consideration should be given to the toxicity of B_2H_6 and other volatile species and their elimination from the desorbed H_2.
STP-25	*High Throughput Combinatorial Chemistry Development of Complex Hydrides, Intematix, Darshan Kundaliya*	3.05		X			While high-throughput methods are important to rapidly screen many materials/reactions, there is a need to develop a better data mining technique. There is concern regarding the validity of the detection method. Stronger collaboration with center partners is encouraged.
STP-26	*Thermodynamically Tuned Nanophase Materials for Reversible Hydrogen Storage: Structure & Kinetics of Nanoparticle and Model System Materials, Stanford U, Bruce Clemens*	2.92		X			Expand research focus beyond Mg thin films to materials more relevant to the center. The relevance of thin film reactions to bulk materials needs to be demonstrated. The results of the study need to be communicated with the theory group for inclusion into their models.
STP-27	*Alane Electrochemical Recharging, SRNL, Ragaiy Zidan*	3.12		X			Characterize products. The use of non-aqueous electrolyte was considered a major advancement of the project, however yield, efficiency and energy intensity of the process needs consideration.
STP-28	*Synthesis of Nanophase Materials for Thermodynamically Tuned Reversible Hydrogen Storage, California Institute of Tech, Channing Ahn*	2.71		X			When experimental results do not agree with the theoretical predictions, it is important to feed information back to the theory groups for refinement of their models. The work scope appears very aggressive and may need refinement to better meet the needs of the CoE.

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
STP-29	*Effect of Trace Elements on Long-Term Cycling and Aging Properties of Complex Hydrides for Hydrogen Storage, U of Nevada, Reno, Dhanesh Chandra*	3.35		X			The studies should be more focused on material cycling and impurity effects. Closer integration with the theory group is encouraged.
STP-31	*Metal Hydride-Based Hydrogen Storage, U of Illinois, Ian Robertson*	3.23		X			Expand collaborations beyond the MHCoE. The experimental efforts should also be expanded to include the impact of impurity and oxidation reactions on hydrogenation/dehydrogenation and in situ studies of microstructural changes during hydrogenation/dehydrogenation reactions of complex hydrides.

Fuel Cells:

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
FC-01	*Fuel Cell Systems Analysis, ANL, Rajesh Ahluwalia*	2.91		X			Prioritize impurity modeling. System model should be used. Focus on transient designs/off-design points.
FC-02	*Neutron Imaging Study of the Water Transport in Operating Fuel Cells, NIST, David Jacobson*	3.67		X			Take "snapshots" during freezing process. An additional project to investigate transient phenomena during startup, shutdown, and load-following would be beneficial. Three-dimensional effects are likely to be important.
FC-03	*Microstructural Characterization of PEM Fuel Cell MEAs, ORNL, Karren More*	3.42		X			Should include different cell locations in examinations of used samples. Sub-surface characterization needs to be addressed. Need to characterize changes in carbon support.

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
FC-04	*Novel Approach to Non-Precious Metal Catalysts, 3M, Radoslav Atanasoski*	3.13				X	Progress is significant. Not only relevant to this 3M project, efforts represent a potential high pay-off option in oxygen electrocatalysis.
FC-05	*Novel Non-Precious Metals for PEMFC: Catalyst Selection Through Molecular Modeling and Durability Studies, U of So. Carolina, Branko N. Popov*	2.97				X	Catalyst layers are too thick for reasonable conductivity. PI should run DOE-specified durability tests (as opposed to steady-state low potential tests).
FC-06	*Development of Transition Metal/Chalcogen Based Cathode Catalysts for PEM Fuel Cells, Ballard, Stephen Campbell*	2.77			X		Show results in terms of activity per site and site density (sites/cm^3). Product of these two is A/cm^3 and the target should be 130 A/cm^3.
FC-07	*Applied Science for Electrode Performance, Cost, and Durability, LANL, Bryan Pivovar*	2.79		X			Use higher wt % of Pt (or Pt alloy) on C. Look at effect on durability. Pursue sensitivity measurements to identify factors that affect fuel cell failure before focusing on specific factors. The bonding of electrodes to the membrane should be considered for the project scope.
FC-08	*Development of Polybenzimidazole-based High Temperature Membrane and Electrode Assemblies for Stationary Applications, Plug Power, John Vogel*	3.22				X	Cost predictions for MEA and system are vital – if predictions cannot achieve target values, the need of this program decreases significantly. Excellent work.
FC-09	*Development of a Low-cost, Durable Membrane and MEA for Stationary and Mobile Fuel Cell Applications, Arkema Chemicals, Jung Yi*	3.02				X	Follow-on projects should report more structural characterization, particularly as a function of time in these systems. Lifetime data needs to be presented from fuel cell tests.
FC-10	*MEA and Stack Durability for PEM Fuel Cells, 3M, Mike Yandrasits*	3.17				X	Need to develop in more detail the relationship of materials chemistry to failure modes and lifetime prediction.

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
FC-11	*Improved Membrane Materials for PEM Fuel Cell Applications, U of So. Mississippi, Robert Moore*	2.97		X			Compare current approach to the literature. Ensure that enhanced performance is not due to thickness reduction of the membrane. It would be good to use gel permeation chromatography or another analytical technique to verify the theory that the MW is decreasing with degradation due to loss of small fragments.
FC-12	*Poly(p-phenylene Sulfonic Acid)s with Frozen-in Free Volume for Use in High Temperature Fuel Cells, Case Western Reserve University, Morton Litt*	2.95		X			Measure conductivity in the transverse direction. Involve industry partner to comment on manufacturability and cost. Measure through-plane conductivity. It may not be productive to focus on materials that do not yield films. At a minimum, some degradation studies need to be performed on candidate materials.
FC-13	*Poly(cyclohexadiene)-Based Polymer Electrolyte Membranes for Fuel Cell Applications, U of Tennessee, Jimmy Mays*	2.67		X			Explore block chemistry further. Develop monomers with protected sulfonic acid groups to avoid post-sulfonation. Reduce sol-gel chemistry effort. Eliminate crosslinking for at least baselining purposes. Optimize proton conductivity and improve mechanicals later.
FC-14	*NanoCapillary Network Proton Conducting Membranes for High Temperature Hydrogen/Air Fuel Cells, Case Western Reserve University, Peter Pintauro*	2.83		X			Carry out detailed study of active fiber loading in inert matrix to determine conductivity, power, uptake, and stability. Durability and low RH studies to be added.
FC-15	*Lead Research and Development Activity for High Temperature, Low Relative Humidity Membrane Program, U of Central Florida, James Fenton*	3.01		X			Run durability tests on membranes with and without phosphotungstic acid. May be appropriate to set up a "support lab" for conductivity measurements.

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
FC-16	*Protic Salt Polymer Membranes: High-Temperature Water-Free Proton-Conducting Membranes, Arizona State, Dominic Gervasio*	3.05		X			Add evaluation of these protic ionic liquids as catalyst ionomers. Morphology studies are needed for the stable protic salt membranes.
FC-17	*Novel Approaches to Immobilized Heteropoly Acid (HPA) Systems for High Temperature, Low Relative Humidity Polymer-Type Membranes, Colorado School of Mines, Andrew Herring*	3.35		X			Upon blending with polymer "X", significant testing will be necessary to prove this particular concept for the "Go/No-Go" decision. Emphasize low RH conductivity (< 70% RH).
FC-18	*High Temperature Membrane with Humidification-Independent Cluster Structure, FuelCell Energy, Inc., Ludwig Lipp*	3.03		X			Testing that assures stability of the additives in the membrane should be done next year. Obtain *in situ* mechanical cycling protocol from FreedomCAR Fuel Cell Tech Team.
FC-19	*Design and Development of High-Performance Polymer Fuel Cell Membranes, General Electric, Ryo Tamaki*	2.69		X			Develop proper collaborator to identify membrane/electrode interface properties and for fuel cell testing.
FC-20	*Fluoroalkylphosphonic-acid-based Proton Conductors, Clemson, Stephen Creager*	3.39		X			Prepare membranes using the "best" electrolytes for test and evaluation. Select alternative monomer with endgroups compatible with aqueous polymerization.
FC-21	*Dimensionally Stable High Temperature Membranes, Giner, Cortney Mittelsteadt*	3.26		X			The laser drilled 2-D support is impractical and should be used to direct research using the 3D support. Balance the need to understand the poor fuel cell performance against the need to develop new ionomers with low equivalent weight.
FC-22	*New Proton Conductive Composite Materials with Co-continuous Phases Using Functionalized and Crosslinkable TFE/VDF Fluoropolymers, Penn State, Serguei Lvov*	3.08		X			Reduce the number of additive options. The project could benefit from theory/simulation of the conduction mechanism to see how it matches with experiment.

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
FC-23	*Advanced Materials for Proton Exchange Membranes, Virginia Tech, James McGrath*	3.35		X			Consider doing cost of production study of most promising membranes.
FC-25	*Center for Intelligent Fuel Cell Materials Design Phase 1, Chemsultants International, Denise Katona*	1.72		X			Emphasize investigations of composite membranes and conductivity testing. Add a sound cost analysis. Evaluate membrane stability. Focus on membrane materials characterization.
FC-26	*Economic Analysis of Polymer Electrolyte Membrane Fuel Cell Systems, Battelle, Kathya Mahadevan*	3.31		X			A more detailed but much broader project in the future that focuses on 2-3 very specific market segments like fork trucks and telecom backup power is desirable.
FC-27	*Direct Hydrogen PEMFC Manufacturing Cost Estimation for Automotive Applications, TIAX, Stephen Lasher*	3.34		X			Stack conditioning should be covered in the stack assembly section.
FC-28	*Mass Production Cost Estimation for Direct H_2 PEM Fuel Cell System for Automotive Applications, DTI, Brian James*	3.49		X			Components from a working stack should be considered for the study to reflect the actual manufacturing cost. Evaluate alternative catalyst.
FC-29	*Platinum Recycling Technology Development, Ion Power, Inc., Stephen Grot*	3.13		X			Complete a preliminary economic analysis of the proposed project. Investigate how recovery process must be developed for a unitized assembly including seals, gaskets, adhesives, etc. Work on alloy recycling.
FC-30	*Platinum Group Metal Recycling Technology Development, BASF, Larry Shore*	3.23		X			Complete the economic analysis and prototype process demonstration. Quantify CO_2 emissions from energy usage.
FCP-01	*Component Benchmarking, LANL, Tommy Rockward*	3.07		X			Carry out statistical analysis of durability test results. Recommend putting significant resources and timeline commitments on the impurities work.
FCP-04	*Kettering University Fuel Cell Project, Kettering University, Joel Berry*	2.77		X			Focus work on overcoming key barriers.

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
FCP-08	*University of South Carolina Fuel Cell Design Project, U of So. Carolina, John Van Zee*	2.62		X			Focus on performance and diagnostics rather than modeling. Program should compare PBI fuel cell to a phosphoric acid fuel cell that uses a silicon carbide for matrix.
FCP-09	*Development of a 5 kW Prototype Coal-based Fuel Cell, University of Akron, Steven Chuang*	2.55		X			Suggest system design and efficiency analysis.

Technology Validation:

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
TV-01	*Controlled Hydrogen Fleet and Infrastructure Demonstration and Validation Project, DaimlerChrysler, Klaus BonHoff*	3.46		X			An excellent match with DOE targets and the President's objectives. The project is important effort to demonstrate the feasibility of fuel cell vehicles and hydrogen infrastructure.
TV-02	*Hydrogen Fuel Cell Vehicle & Infrastructure Demonstration Program Review, Ford, Greg Frenette*	3.42		X			An excellent match with the DOE targets and the President's objectives. The project is important effort to demonstrate the feasibility of fuel cell vehicles and hydrogen infrastructure.
TV-03	*Controlled Hydrogen Fleet and Infrastructure Demonstration and Validation Project, Chevron, Dan Casey*	3.28		X			An excellent match with the DOE targets and the President's objectives. The project is important effort to demonstrate the feasibility of fuel cell vehicles and hydrogen infrastructure.
TV-04	*Hydrogen Vehicle and Infrastructure Demonstration and Validation, General Motors, Roz Sell*	3.39		X			An excellent match with the DOE targets and the President's objectives. The project is important effort to demonstrate the feasibility of fuel cell vehicles and hydrogen infrastructure.

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
TV-05	*Controlled Hydrogen Fleet & Infrastructure Analysis, NREL, Keith Wipke*	3.76		X			Critical effort to collect, organize and distribute the fuel cell vehicle and infrastructure data.
TV-06	*Validation of an Integrated Hydrogen Energy Station, Air Products, Dan Tyndall*	3.29		X			Potential to fill real-world data needs for energy stations and bio-waste energy hydrogen production.
TV-07	*California Hydrogen Infrastructure Project, Air Products, Ed Heydorn*	3.54		X			Validation of the technology is on the critical path to establishing a hydrogen energy structure in the US.
TV-08	*Cryogenic Capable Pressure Vessels for Vehicular Hydrogen Storage, LLNL, Salvador Aceves*	3.26		X			Strong relevance to DOE targets for storage volume and weight
TV-10	*Technology Validation: Fuel Cell Bus Evaluations, NREL, Leslie Eudy*	3.67		X			Excellent collaboration with transit companies and international partners, reporting of results and dissemination.
TVP-02	*Geographically Based Hydrogen Infrastructure Scenario Analysis, NREL, Margo Melendez*	3.29				X	Any additional funding will be from Systems Analysis.
TVP-04	*Policy Options for Hydrogen Vehicles and Infrastructure, TIAX, Stefan Unnasch*	3.28				X	Any additional funding will be from Systems Analysis
TVP-08	*Hydrogen Filling Station, UNLV, Rick Hurt and Yitung Chen*	3.11		X			UNLV needs to get some hydrogen consumption to match their production capacity
TVP-11	*Florida Hydrogen Initiative, Florida Hydrogen Initiative, Ed Levine*	2.91		X			This is 3 unrelated projects with some more relevant than others. Distinctions need to be clearer.

Safety Codes and Standards:

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
SA-01	*Codes, Standards and Permitting Materials, NREL, Jim Ohi*	2.99		X			This project is well-organized with broad participation from domestic and international codes and standards development organizations. This project 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. This project has also produced significant contributions from a collaborative effort between Energy providers and the Fire Safety and Building Code community to develop and implement tools for the permitting of hydrogen refueling stations.
SA-02	*Hydrogen Materials R&D, SNL, Brian Somerday*	3.55		X			A Technical Reference Manual of experimental data on hydrogen materials compatibility has been developed to ensure that scientifically sound data are available for the codes and standards development process. This effort will expand to investigate the effects of hydrogen on non-metal materials.
SA-03	*H_2 Incident Reporting Database and H_2 Safety Best Practices Website, PNNL, Linda Fassbender*	3.17		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 database to share the knowledge and experience already attained in industry, aerospace, and elsewhere.

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continue	Discontinue	Project Completed	Summary Comment
SA-04	*Hydrogen Quality, NREL/LANL, Jim Ohi*	3.39		X			This project is developing experimental data on the effects of hydrogen contaminants on fuel cell performance. This project brings a team with strong modeling capabilities, including ANL, LANL, HNEI, Univ. Connecticut, Univ. of South Carolina, Ballard, and NREL. The data from this project and the modeling capabilities of its participants will be leveraged internationally to develop an ISO standard for hydrogen quality.
SA-06	*Hydrogen Safety Panel, PNNL, Steven Weiner*	3.53		X			This project helps ensure the safety of DOE-funded projects and brings expertise from industry, academia, government and the private sector to conduct safety reviews and to make safety recommendations.
SAP-02	*Hydrogen Safety Sensors, Intelligent Optical Systems, Bob Lieberman*	2.68			X		This project aims to develop hydrogen safety sensors based on fiber optic technology. This project was not competitively selected and will not be funded in FY 2008.

Education:

Project #	Project Title, Performing Organization, PI	Final Wt. Score	New	Continued	Discontinued	Project Completed	Summary Comment
ED-01	*Hydrogen Technology and Energy Curriculum (HyTEC), Schatz Energy Research Center, Jim Zoellick*	3.13		X			Aligns well with overall DOE hydrogen education targets; completed a significant amount of work despite limited DOE funding; strong partnerships for real-life demonstration and distribution of classroom materials. Continue, pending FY08 appropriations.
ED-02	*H_2 Educate!, NEED, Rebecca Lamb*	3.45		X			Well linked to address education barriers; strong network and partnerships have worked to achieve great success despite limited DOE funding. Continue, pending FY08 appropriations.
ED-03	*First Responder Education, PNNL, Marylynn Placet*	3.38		X			Long overdue effort; well tested prior to launch, strong approach with review and partnerships, good distribution; good success to date; prop-based training for future will help fill a need, consider certification. Continue, pending FY08 appropriations.
ED-04	*Increasing "H2IQ": A Public Information Program, The Media Network, Henry Gentenaar*	3.21		X			Important outreach effort, although a daunting task; well-defined, flexible approach; focus on metrics to determine effectiveness. Continue, pending FY08 appropriations.

Analysis:

Project No.	Project Title, Performing Organization, PI	Final Score	New	Continued	Discontinued	Project Completed	Summary Comment
AN-01	*Hydrogen Production Infrastructure Options Analysis, Directed Techs., Brian D. James*	3.29				X	The model has been completed, peer reviewed, and available for analysis applications. The model provides an optimized infrastructure build out to meet hydrogen demand. Potential project additions may be to incorporate risk analysis and linkage to the Macro-System Model.
AN-02	*Impact of Hydrogen Production on U.S. Energy Markets, EEA, Harry Vidas*	2.84		X			Incorporation of new technologies, resources, and carbon capture and sequestration strengthens the national MARKAL model's representation and modeling of hydrogen with other fuels. More analysis of policy and impact of government decisions should be provided.
AN-03	*Analysis of the Hydrogen Production and Delivery Infrastructure as a Complex Adaptive System, RCF, Inc., George Tolley*	2.80		X			Model provides a novel approach to understanding uncertainty and consumer choice for a hydrogen system and rollout scenarios in non-optimal analysis. The model is complex and not very transparent. The model and assumptions need to be clear and peer reviewed.
AN-04	*HyDRA - Resource Analysis, NREL, Johanna Levene*	3.37		X			Mapping resource supply to demand based on a Geographic Information System (GIS) is a strong tool. Provides valuable information in a visual format for decision makers. The model and analysis is in the early phases of development.
AN-05	*Macro-System Model, NREL, Mark Ruth*	3.52		X			Providing analysis and modeling of production, delivery and emissions provides for consistency of assumptions and results. Project will critical for R&D and planning decisions. Good work.

Project No.	Project Title, Performing Organization, PI	Final Score	New	Continued	Discontinued	Project Completed	Summary Comment
AN-06	*Hydrogen Quality Analysis: Production to Fuel Cell, ANL, Romesh Kumar*	3.19		X			The project complements other efforts to determine the effects of fuel contaminants on fuel cell components, and to set standards for fuel purity. The project is addressing a critical issue and has a reasonable approach.
AN-07	*Well to Wheel Analysis of Hydrogen Pathways with GREET Model, ANL, Michael Wang*	3.14		X			The model and analysis provides a clear understanding of well to pump, pump to wheels and well to wheels energy use, petroleum use and greenhouse gas emissions for many hydrogen pathways. The model assumptions should continue to be updated.
AN-08	*HyTrans Model, ORNL, David Greene*	3.47		X			The model provides the ability to investigate realistic strategies to enable the hydrogen rollout and explore the impact of policy on these strategies.
ANP-01	*Impact of Renewables on Hydrogen Transition Analysis, TIAX, Stephen Lasher*	3.43				X	The model is complete and will be used to analyze the most economic attractive renewable hydrogen production pathways. Additional work would involve the addition of coal gasification and natural gas reforming to the model technology portfolio.
ANP-02	*Hydrogen Analysis: H2A Update 2007, NREL, Todd Ramsden*	3.16		X			Excellent model for economic analysis of hydrogen production technologies. Provides for consistency and transparency of analysis. The model is being updated for scaling and updated technology information.
ANP-03	*System Dynamics: HyDIVE – Hydrogen Dynamic Infrastructure and Vehicle Evolution Model, NREL, Cory Welch*	2.78		X			The model is in the early phases of development. The project will help understand the number of refueling sites required for sustainable growth as a function of consumer choice and behavior. Representation of consumer actions and choice will be a significant determinant for the model.

Project No.	Project Title, Performing Organization, PI	Final Score	New	Continued	Discontinued	Project Completed	Summary Comment
ANP-05	*Analysis Repository, ATS, Melissa Lott*	3.21		X			Provides a single location for researchers to search for prior work/analysis associated with hydrogen related topics. The repository will dependent on the submission or retrieval of information.