

ASME FY11 Advanced Fuels Peer Review Panel

October 18 – 22, 2010

Daniel J. Kubek – Panel Chair

Mr. Kubek is a consultant specializing in synthesis gas and natural gas purification and separation. His clients include the Electric Power Research Institute—CoalFleet, for whom he provides technical guidance on integrated processes for gasification projects; and the Gasification Technologies Council, for which he serves as an advisor on technical issues related to gasification, particularly in the areas of hydrogen sulfide removal and carbon capture.

Mr. Kubek was with Universal Oil Products LLC (UOP) for 18 years as senior technology manager. His career of technical expertise is based in separations technology and engineering. His primary work was in solvent absorption, molecular sieve thermal-swing adsorption, membrane permeation, and pressure-swing adsorption technologies, as applied to natural gas and synthesis gas processing. He was the process manager responsible for all process design packages for multiple gasification projects and served as development manager for UOP's gas processing business. Before joining UOP LLC, he spent 17 years with Union Carbide.

In 2005, Mr. Kubek was awarded UOP's Don Carlson Award for Career Technical Innovation. From 1996 to 2006 he served as UOP's representative to the Gasification Technologies Council's Board of Directors. He is the holder of 8 patents and has co-authored 17 technical publications. Mr. Kubek received a B.S. degree in chemical engineering from Rutgers University and earned an M.S. in chemical engineering from Purdue University.

Brian Gleeson, Ph.D

Dr. Gleeson is the Henry S. Tack Professor in the Department of Mechanical Engineering and Materials Science at the University of Pittsburgh and an associate senior scientist at Ames Laboratory in the Materials and Engineering Physics Program. His primary research focus is on the thermodynamics and kinetics of gas/solid and solid/solid reactions. Particular emphasis is on the high-temperature degradation of metallic alloys and coatings. Related to this emphasis, his current research interests include active and passive high-temperature oxidation of alloys and coatings, deposition and characterization of metallic coatings, diffusion and thermodynamic treatments of both gas/solid and solid/solid interactions, and structure/property relationships of materials.

Prior to Dr. Gleeson's position at the University of Pittsburgh and his role as associate senior scientist at Ames Laboratory, he was a professor at Iowa State University in the Department of Materials Science and Engineering. He also served numerous roles at Ames Laboratory and was a lecturer in the Department of Materials Science and Engineering at the University of New South Wales.

In 2005, Dr. Gleeson received the Research and Development 100 Award from *R&D Magazine* for *Novel High-Temperature Coatings with Pt-Modified Ni and Ni₃Al Alloy Compositions*. Dr. Gleeson has been a contributing author of over 100 publications, is the editor of the international journal *Oxidation of Metals*, and is an international advisory board member of the international journal *Materials and Corrosion*. Dr. Gleeson has a B.S. and M.S. in materials science and engineering from the University of Western Ontario in Canada, and a Ph.D. in materials science and engineering from the University of California at Los Angeles. He also completed a post-doctoral fellowship at the University of New South Wales in Australia.

Robert N. Miller, Ph.D.

Dr. Miller has a broad interdisciplinary technical background with 32 years of industrial experience and 8 years in academia, primarily in the field of coal and energy science and technology. He currently has leadership responsibility at Air Products for developing and securing Government/industry partnerships to advance strategic technology initiatives. Since 1987, he has successfully led the development of Air Products'

Government-funded research and technology proposals in the fields of gas separation membranes, hydrogen energy, alternative liquid fuels, and many environmental and energy efficiency projects and processes. His principal skills include marketing, presentation and writing proficiency, technical and business proposal preparation, contract negotiation and consultation for procurement processes, and program issues in U.S. Government contracting. In addition, Dr. Miller is currently responsible for managing Air Products Research Alliance with Penn State University. Dr. Miller also represents Air Products on the Vision 2020 Chemical Industry Steering Committee and the Alternative Fuels Renewable Energy Council, and is a member of the Technical Advisory Board of the Pittsburgh Coal Conference.

Dr. Miller has a keen interest in clean alternative energy and hydrogen. Since 1992, Dr. Miller stewarded numerous hydrogen research and development initiatives to support growth of the company's global leadership position in hydrogen. As a member of a cross-functional team formed to investigate advanced concepts for hydrogen, he pioneered hydrogen energy research programs in separation, production, storage, delivery, and infrastructure that today form the backbone of Air Products' emerging hydrogen energy business. For example, he conceptualized and developed the Department of Energy (DOE) Las Vegas hydrogen energy station project, the Nation's first integrated hydrogen coproduction station demonstration, as well as the DOE/Penn State hydrogen refueling station project which demonstrated lowest-cost onsite production/refueling. Currently, Dr. Miller is developing technology opportunities related to climate change and sustainability.

Dr. Miller's participation in hydrogen and clean energy activities cuts across many national and international meetings and forums, where he has lectured on all aspects of hydrogen energy technology. He has been an invited lecturer on hydrogen energy technology at various private and public forums nationwide, and has been active in numerous Government-sponsored hydrogen workshops, including the Hydrogen Roadmap Workshop in 2003, which defined the hydrogen vision for the Nation. Dr. Miller serves periodically as a peer reviewer for the DOE Basic Energy Sciences and Small Business Innovation Research programs, the DOE Hydrogen Program, the DOE Biomass Program, and the DOE University Coal Research programs. He currently is an elected member of the Technical Advisory Board of the International Pittsburgh Coal Conference where he has served as session chair and organizer of the hydrogen-to-coal and carbon management topics for the past 5 years. In 2008, as a member of the Technical Oversight Committee he chaired a symposium on "Hydrogen Storage via Glass Microspheres," held at the 2008 American Ceramic Society Conference "Material Innovations in an Emerging Hydrogen Economy". In 2008, he was on the technical oversight committee for the Advanced Materials for Hydrogen Conference and participated as session chair. He also served on the Governor's Energy Advisory Board in Pennsylvania from 2003–2004 which advised the Environmental Secretary on clean energy technology pathways, including hydrogen and fuel cell technologies.

Before Air Products, Dr. Miller worked for Exxon Research and Engineering Co. where he utilized his expertise in coal science to develop fundamental property correlations that could predict multidimensional coal utilization performance in support of Exxon's coal acquisition objectives. Dr. Miller's work at Exxon inspired the creation of the DOE's National Premium Coal Bank in 1983, for which Dr. Miller served as both peer reviewer and panelist.

Between 1969 and 1978, Dr. Miller held various research staff, graduate assistant, and post-doctoral positions in the College of Earth and Mineral Sciences at Penn State University. His research interests focused on the inorganic matter of coal and its impact on coal utilization and on the organic geochemistry of low-rank coal and peats. His doctoral research, "A Geochemical Study of the Inorganic Constituents of Some Low Rank Coals," dealt with the origin and associations of inorganic elements in coals and their relationship to processes in coal-forming environments.

William R. Owens, Ph.D.

Dr. Owens was formerly vice president of fossil energy projects at Princeton Energy Resources International. He has over 46 years of engineering expertise in energy related industries, with 27 years as a director, planner, and manager of 13 task order contracts for the U.S. Department of Energy. Dr. Owens has extensive experience in system engineering principles, cost estimation, project economics, environmental control technologies, project management, and project control of power generation systems including conventional and emerging technologies. This experience includes fuel cells, turbines, gasifiers, and fluidized bed combustors. Instrumental

in the success of international programs, Dr. Owens has a strong appreciation for the understanding of the relevance of international activities. Dr. Owens' experience includes systems with bituminous coal, anthracite coal, and sub-bituminous western coals. He has worked with alternate fuel systems, including natural gas, hydrogen, gasifier fuel-gas, oil, and oil-shale systems.

Dr. Owens was a senior director in a Clean Coal Technology proposal. He was responsible for the project coordination; project economics; financial plan, which included the negotiations with venture capitalists; and the commercialization plan. Dr. Owens has provided DOE with detailed support in outreach programs, deregulation of the electric utility industry, and international programs. He is the author of more than 50 technical publications and reports in the research, engineering, and application of advanced fossil energy power generation systems. He has a B.S. from Pennsylvania State University, a M.S. from Drexel University, and a Ph.D. from the University of Maryland. All of his degrees are in mechanical engineering.

Ravi Prasad, Ph.D.

Dr. Prasad of Helios-NRG, LLC and formerly a corporate fellow of Praxair Inc., has 60 U.S. patents and broad industrial experience in developing and commercializing new technologies, launching technology programs (\$2–50 million), supporting business development, building cross-functional teams, and setting up joint development alliances. He was a founding member of an alliance involving Praxair, British Petroleum, Amoco, Phillips Petroleum, Statoil, and Sasol to develop ceramic membrane synthesis gas (syngas) technology for gas-to-liquid processes.

Dr. Prasad also established and led programs for ceramic membrane oxygen technology; co-developed proposals to secure major DOE programs worth \$35 million in syngas and \$20 million in oxygen; identified novel, solid-state oxygen generation technology; and conceived and implemented a coherent corporate strategy in nanotechnology. He has championed many initiatives in India, including small onsite hydrogen plants, small gasifiers, and aerospace business opportunities; and developed implementation plans resulting in a new research and development center in Shanghai.

Dr. Prasad is the director and a board member of the National Hydrogen Association, a member of the steering committee for Chemical Industry V2020, and has been a recipient of Chairman's & Corp Fellows awards for technology leadership. He has authored or coauthored 30 publications, is coauthor of a book on membrane gas separation, and has presented at over 20 conferences and invited lectures. Dr. Prasad has a B.S. in mechanical engineering from the Indian Institute of Technology in Kanpur, India, and an M.S. and Ph.D. in mechanical engineering and chemical engineering from the State University of New York, Buffalo, New York.

James C. Sorensen

Mr. Sorensen is a consultant with a primary focus on clean coal and supporting technologies, including integrated gasification combined cycle (IGCC), oxyfuel combustion, and coal-to-liquids. Prior to founding Sorensenergy, LLC, he worked for Air Products & Chemicals, including positions as director of New Markets with responsibility for Syngas Conversion Technology Development and Government Systems; and director of Gasification and Energy Conversion. In the latter position, he had commercial responsibility for numerous studies involving air separation unit (ASU)/gas turbine integration for IGCC. Mr. Sorensen was responsible for the sale of the ASU for the Tampa Electric Polk County IGCC facility, which included the first commercial application of the Air Products cycle for nitrogen integration of the ASU with the gas turbine. He was also involved with gas turbine integration associated with Air Products' ion transport membrane oxygen program. Prior responsibilities included project management of Air Products' baseload liquid natural gas projects, commercial management of synthetic natural gas production, and general management of the membrane systems department.

Mr. Sorensen's technical interests include IGCC, oxyfuel combustion, gas-to-liquids, and air separation and hydrogen/syngas technology. His programmatic interests include Electric Power Research Institute CoalFleet, Fossil Energy Research and Development, DOE's Clean Coal Power Initiative, DOE's FutureGen program, and commercial projects. His areas of expertise include project conception and development, consortium

development and management, technology and Government sales and contracting, research and development program management, technology consulting and training, proposal preparation and review, commercial contract development, and intellectual property.

Mr. Sorensen is the founding chairman of the Gasification Technologies Council and is vice chairman of both the Council on Alternate Fuels and Energy Futures International. Mr. Sorensen holds eight U.S. patents, one of which involves ASU/gas turbine integration for IGCC. He has international experience with customers and partners in Algeria, Chile, China, Germany, Great Britain, Indonesia, Japan, The Netherlands, and elsewhere; and is also well published in the area of clean coal. He received a B.S. in chemical engineering from the California Institute of Technology, a M.S. in chemical engineering from Washington State University, and a M.B.A. from the Harvard Business School.

Michael R. von Spakovsky, Ph.D

Dr. von Spakovsky has over 18 years of teaching and research experience in academia and over 17 years of industry experience in mechanical engineering, power utility systems, aerospace engineering, and software engineering. In January of 1997, Dr. von Spakovsky joined the Mechanical Engineering faculty at Virginia Polytechnic Institute and State University as professor and director of the Energy Management Institute (now the Center for Energy Systems Research). He teaches undergraduate and graduate level courses in thermodynamics, kinetic theory, fuel cell systems, and energy system design. Prior to teaching at the Virginia Polytechnic Institute and State University, Dr. Spakovsky worked at the National Aeronautics and Space Administration, in the power utility industry first as an engineer and then as a consultant, and as both an educator and researcher at the Swiss Federal Institute of Technology in Lausanne Switzerland where he led a research team in the modeling and systems integration of complex energy systems and taught classes in the thermodynamics of indirect and direct energy conversion systems.

His research interests include computational methods for modeling and optimizing complex energy systems, methodological approaches for the integrated synthesis, design, operation, control, and diagnosis of such systems (stationary power as well as, for example, high performance aircraft systems), theoretical and applied thermodynamics with a focus on the unified quantum theory of mechanics and thermodynamics, and fuel cell applications for both transportation and distributed power generation.

Dr. von Spakovsky has been a contributing author of more than 170 publications, including articles in scholarly journals and conference proceedings, and has given talks, seminars, and short courses (e.g., on fuel cells) worldwide. Included among his various professional activities and awards is membership in the American Institute of Aeronautics and Astronautics, fellow of the ASME, member of the Executive Committee for the ASME's Advanced Energy Systems Division, elected member of Sigma Xi and Tau Beta Pi, associate editor of the *International Journal of Fuel Cell Science and Technology*, editor-in-chief of the *International Journal of Thermodynamics*, and chairman of the executive committee for the International Center of Applied Thermodynamics. Dr. von Spakovsky holds a B.S. in aerospace engineering from Auburn University and a M.S. and Ph.D. in mechanical engineering from the Georgia Institute of Technology.