

# ASME FY13 Carbon Storage Peer Review Panel

## October 22–26, 2012

### **Ravi Prasad, Ph.D. – Panel Co-Chair**

Dr. Ravi 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 is a founding member of an alliance involving Praxair, British Petroleum, Amoco, Phillips Petroleum, Statoil, and Sasol to develop ceramic membrane 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's technical areas of expertise include membranes and separations, hydrogen and helium, industrial gas production and application, ceramic membranes and solid oxide fuel cells, new technology development, technology roadmapping, intellectual property strategy development, technology due diligence, combustion, nanotechnology, gas-to-liquids, coal-to-liquids, and silane pyrolysis reactors.

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 for 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, NY.

### **James C. Sorensen – Panel Co-Chair**

Mr. James 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, in 2004, he worked for Air Products & Chemicals, Inc., 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, 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. He is also well published in the area of clean coal.

He received a B.S. in chemical engineering from the California Institute of Technology, an M.S. in chemical engineering from Washington State University, and an M.B.A. from the Harvard Business School.

### **Ian J. Duncan, Ph.D.**

Dr. Ian Duncan is the manager of the Gulf Coast Carbon Center of the University of Texas at Austin's Bureau of Economic Geology (BEG) as well as a Program Director for BEG. He leads the Earth Systems and Environment group. He is also principal investigator for multiple water resources, environmental geology, and natural resource investigations. Prior to this position, he served as the Associate Director and Research Scientist of BEG from 2004 to 2010. Prior to his work at the University of Texas at Austin, Dr. Duncan worked as Scientist Manager at the Virginia Department of Mines, Minerals, and Energy Division of Mineral Resources for 10 years. As a geology professor, he taught at Southern Methodist University and Washington University in St. Louis.

Dr. Duncan's areas of expertise include carbon management based on geologic carbon dioxide sequestration, development and management of large-scale pilot projects for carbon capture and long-term storage, remote sensing (geologic applications of multispectral, radar, and lidar data sets), geoinformatics, and implementation of clean technologies. Based on this expertise, Dr. Duncan has presented Congressional Testimony to the House Natural Resources Committee on "CO<sub>2</sub> Enhanced Oil Recovery: A Key Bridge to Large Scale CO<sub>2</sub> Sequestration"; to the House Committee on Energy and Commerce on "Carbon Sequestration: Risks, Opportunities, and Protection of Drinking Water"; and to the House Committee on Energy and Commerce on "Carbon Sequestration Risks, Opportunities, and Learning from the CO<sub>2</sub>-EOR Industry."

Dr. Duncan has authored 18 peer-reviewed articles and 15 other published articles. He is a member of the Structural Geology Division, Coal Division, and Hydrogeology Division of the Geological Society of America and previously served as a member of the Virginia State Agency Technical Remote Sensing Data Needs Advisory Committee through the George Mason University and Virginia Economic Development Partnership; Virginia Gap Analysis (Remote Sensing) Advisory Committee at Virginia Tech; Technical Advisory Committee of the Virginia Geographic Information Systems Network State Agency; and the Digital Geologic Mapping Committee, Data Information Exchange and Data Capture Work Groups of the Association of American State Geologists.

Dr. Duncan received a B.A. in earth sciences from Macquarie University in Australia and a Ph.D. in geology from the University of British Columbia.

### **Scott M. Frailey, Ph.D.**

Dr. Scott M. Frailey is a senior reservoir engineer at the Illinois State Geological Survey, where he has worked for nearly 10 years. Prior to this position, Dr. Frailey taught undergraduate and graduate courses in petroleum engineering at Texas Tech University for 11 years, primarily within the general area of reservoir engineering and formation evaluation, including courses in core analysis laboratory, reservoir rock properties, petroleum property evaluation and management, well test analysis, formation evaluation, and enhanced oil recovery. Dr. Frailey also worked at BP Exploration (Alaska) Inc. for 3 years as a reservoir engineer. In this position he was responsible for designing and analyzing pressure transient tests in Prudhoe Bay and performed compositional and black oil simulation of the Prudhoe Bay field.

Dr. Frailey's areas of expertise include carbon dioxide enhanced oil recovery, carbon sequestration, well log analyses, pressure transient analyses, reservoir simulation; and pressure, volume, and temperature experiments.

Dr. Frailey holds a Ph.D., M.S., and B.S. in petroleum engineering, all from the University of Missouri-Rolla.

### **Neeraj Gupta, Ph.D.**

Dr. Neeraj Gupta is a geologist at Battelle Memorial Institute and has been one of the leaders in Battelle's efforts to evaluate the feasibility of geologic storage of carbon dioxide in sedimentary formations since 1996. During this time, Dr. Gupta has played a key role in formation of several public-private joint projects on geologic sequestration. Dr. Gupta developed and led a unique \$8 million field project funded by major government and energy industry organizations at American Electric Power's Mountaineer Plant. Following completion of the site characterization work, this project is now transitioning into a larger effort involving geologic storage of carbon dioxide captured from the plant.

Dr. Gupta also leads a complex program of geologic storage demonstrations hosted by major energy companies as part of the Midwestern Regional Carbon Sequestration Partnership, a \$23 million multi-client program led by Battelle. His current and previous work includes field investigations, regional hydrogeology, reservoir simulations of CO<sub>2</sub> storage, geochemical modeling and experiments, seismic assessments, cost and regulatory aspects, and development of CO<sub>2</sub> capture technologies. Dr. Gupta also plays a significant technical advisory role on Battelle's FutureGen project team and has had a major role in development of the research agenda for carbon management technologies through his extensive participation in government, private, and international dialogues.

Dr. Gupta has written more than 40 reports and papers and has made invited presentations at numerous meetings, workshops, and expert panels.

Dr. Gupta earned a B.S. and an M.S. in geology from Panjab University, India, an M.S. in geochemistry from George Washington University, and a Ph.D. in hydrogeology from the Ohio State University.

## **John A. Rupp**

Mr. John Rupp is the Assistant Director for Research and section head of Subsurface Geology at Indiana University's Indiana Geological Survey. Mr. Rupp serves as the project director for Indiana on two of the U.S. Department of Energy's Regional Carbon Sequestration Partnerships: the 7-state Midwest Regional Carbon Sequestration Partnership and the 3-state Midwestern Geological Sequestration Consortium.

Mr. Rupp specializes in energy issues related to petroleum, coal, and natural gas; including subsurface geology, unconventional reservoir analysis, and carbon sequestration. His current topics of research include subsurface stratigraphy, reservoir analysis, and operations development in the deep subsurface of the Illinois Basin for carbon sequestration and the evaluation of coal bed methane for gas shale enhanced production using CO<sub>2</sub> injection.

Mr. Rupp co-chaired the 2008 Indiana Carbon Capture and Storage Summit and has served on external review panels for research activities of the Department of Energy's National Energy Technology Laboratory and the Advanced Research Project Agency-Energy.

Mr. Rupp is a member of the American Association of Petroleum Geologists, the Indiana Academy of Science, and also serves on the Governors' Task Force on Carbon Sequestration Legislation.

Mr. Rupp earned a B.S. in geology from the University of Cincinnati and an M.S. in geology from Eastern Washington University.

## **Edward N. Steadman**

Mr. Edward Steadman is a Senior Research Advisor at the University of North Dakota's Energy & Environmental Research Center. He is responsible for directing a multidisciplinary team of researchers on a carbon sequestration project that has included inventorying CO<sub>2</sub> sources, geologic and terrestrial sinks, and sequestration infrastructure; identifying CO<sub>2</sub> capture and separation technologies; investigating monitoring, verification, and accounting technologies and permitting requirements; and defining the most promising opportunities for carbon sequestration in nine states and four Canadian provinces. Some of Mr. Steadman's other responsibilities include development, marketing, management, and dissemination of commercially oriented research and development for programs focused on the environmental effects of power and natural resource production.

Mr. Steadman also currently serves as the program manager for the Plains CO<sub>2</sub> Reduction (PCOR) Partnership, one of seven regional partnerships funded by the U.S. Department of Energy's National Energy Technology Laboratory Regional Carbon Sequestration Partnership Program. The PCOR assesses the technical and economic feasibility of capturing and storing CO<sub>2</sub> emissions from stationary sources in the northern Great Plains and adjacent area.

Mr. Steadman's principal areas of expertise are carbon sequestration, watersheds, sustainable development, chemical transformations during coal combustion, and materials science. He has authored or coauthored numerous publications and given presentations on these topics to audiences throughout the United States and around the world.

Mr. Steadman holds a B.S. in geology from the University of Pennsylvania-Edinboro and an M.A. in geology from the University of North Dakota.