

center for
ENERGY STUDIES

Rice University's Baker Institute for Public Policy

The Shale Revolution: What Do We Know and Where Are We Going?

Thursday, October 30, 2014
8:30 am

James A. Baker III Hall
Rice University





The Shale Revolution

About the Conference

The Center for Energy Studies (CES) at Rice University's Baker Institute for Public Policy is engaged in a study to assess the local and global market impacts of proposed and potential policy actions on the development of shale resources in North America. The study is funded by the Alfred P. Sloan Foundation. The Sloan Foundation has also funded numerous research projects at other institutions in order to contribute to the deeper understanding of the shale resource base and its longer-term potential impacts.

The Center for Energy Studies is hosting a conference on Oct. 30, 2014, to discuss the shale revolution. The conference features speakers from the Center for Energy Studies, The University of Texas' Bureau of Economic Geology, Resources for the Future, Environmental Defense Fund, the University of Colorado Denver, Duke University and Rice University. The speakers will present the latest research on characterizing shale resources and recovery, the environmental impacts of shale development, public perception and policy motivation in different parts of the country, and the economic implications of shale development and associated policy interventions.

About the Center for Energy Studies

The energy industry is undergoing dramatic change. Unconventional energy resource development has shifted traditional paradigms and made the United States one of the fastest-growing oil and natural gas producers in the world for the first time in many years. In fact, developments in Canada, Brazil and the Americas more generally have tilted the center of gravity in energy markets toward the Western Hemisphere. Along with the continued growth of China and India and their projected reliance on energy imports, the developments in the last decade highlight the fact that understanding the global interconnectedness of energy markets is growing ever more important.

At the same time, emerging political and regulatory issues have raised the specter of uncertainty for market developments amid this new energy paradigm. New energy sources propelled by technological advancements will face regulatory hurdles presented by concerns related to environmental quality. This can run headlong into the quickly changing dynamics of energy geopolitics in the Middle East, Africa, Latin America and China, which continue to impact global markets and pricing, thereby affecting broad goals of energy security.

The Baker Institute Center for Energy Studies (CES) explores these and other issues to provide new insights on the role of economics, policy and regulation in the performance and evolution of energy markets. Independently and through collaborations with other Baker Institute programs and fellows, Rice University faculty, and scholars from around the world, the CES builds on the foundation of the institute's globally respected energy program. Economic modeling and forecasting, expanded emphasis on the nexus between energy and environment, and a continued focus on emerging technologies, regulations and geopolitical risk reinforce the center as a key resource for policymakers and the energy industry.



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Thursday, October 30, 2014

- 8:30 am Registration and Breakfast
- 9:00 am Welcome and Study Design
Kenneth B. Medlock III, Ph.D.
James A. Baker III and Susan G. Baker Fellow in Energy and Resource Economics, and Senior Director, Center for Energy Studies, Baker Institute

Resources and Recovery

- 9:15 am “The Role of Shale Gas in the U.S. Energy Transition: Recoverable Resources, Production Rates and Implications”
- Overview and Geology*
Scott W. Tinker, Ph.D.
Director, Bureau of Economic Geology, and Allday Endowed Chair of Subsurface Geology, John A. and Katherine G. Jackson School of Geosciences, The University of Texas at Austin; and State Geologist of Texas
- Well EUR and Technically Recoverable Reserves*
John Browning
Senior Research Fellow, Bureau of Economic Geology, The University of Texas at Austin
- Well Economics and Production Outlook*
Svetlana Ikonnikova, Ph.D.
Research Associate and Energy Economist, Bureau of Economic Geology, The University of Texas at Austin
- Sensitivities and Economic Differences*
Gürcan Gülen, Ph.D.
Senior Energy Economist, Center for Energy Economics, Bureau of Economic Geology, The University of Texas at Austin

- 10:45 am Coffee Break

Environmental Impacts

- 11:00 am “Risks and Regulations of Pits and Tanks”
Alan Krupnick, Ph.D.
Senior Fellow and Director, Center for Energy Economics and Policy, Resources for the Future
- Noon Lunch
- 1:00 pm “EDF’s Scientific Efforts to Quantify Natural Gas Methane Leakage”
David Lyon
Scientist, Environmental Defense Fund

Policy and Public Sentiment

2:00 pm “Understanding the Political Fractures and Seams Around Hydraulic Fracturing in Texas”

Tanya Heikkila, Ph.D.

Associate Professor and Director, Doctoral Program, School of Public Affairs,
University of Colorado Denver

Samuel Gallaher

Ph.D. Candidate, School of Public Affairs, University of Colorado Denver

2:30 pm “Policy Outcomes and Political Venues: The Case of Hydraulic Fracturing”

Robert Stein, Ph.D.

Fellow in Urban Politics, Baker Institute; and Lena Gohlman Fox Professor, Department of
Political Science, Rice University

Marvin McNeese

Ph.D. Candidate, Department of Political Science, Rice University

3:00 pm Coffee Break

Economics and Market Response

3:15 pm “Shale Public Finance: Local Government Revenues and Costs Associated with Oil and Gas
Development”

Daniel Raimi

Associate in Research, Duke University Energy Initiative

4:00 pm “The Market Impacts of Shale-Directed Policies in the United States”

Kenneth B. Medlock III, Ph.D.

James A. Baker III and Susan G. Baker Fellow in Energy and Resource Economics, and
Senior Director, Center for Energy Studies, Baker Institute

5:00 pm Closing Remarks

5:15 pm Reception

Wi-Fi access is available on the Rice Visitor network.



The Shale Revolution

Participant Biographies

John Browning is a senior research fellow at The University of Texas' Bureau of Economic Geology, where he focuses on modeling production and reserves in natural gas shales. He is the lead engineer for a research group that is concluding a four-year study to assess the reserves and to forecast production for the four largest gas shale plays in the U.S. (the Barnett, Fayetteville, Haynesville and Marcellus shales). Browning retired after a 33-year career at ExxonMobil, where he was responsible for reservoir management, reserve assessment and development economics. He also worked in gas and power marketing strategic planning, where he developed supply and demand forecasts for the United States and for international regions. He also developed trade flow models to anticipate international movements of natural gas. Browning graduated in 1977 from the University of Tennessee with a B.S. in mechanical engineering.

Samuel Gallaher is a current Ph.D. student at the School of Public Affairs (SPA) at the University of Colorado Denver. His research interests focus on community development through a merger of social and environmental contexts. Specifically, he is interested in local government decision-making processes and their role in neighborhood associations and in promoting stronger community relationships and environmental stewardship. His current research at SPA investigates natural gas development policies and management, school choice policy, and theories of the policy process. Gallaher has also been involved in researching the history of Colorado's water policy, evaluating individual-level behavior during natural disasters and evacuations, and conducting a needs assessment for the Colorado Department of Human Services.

Gürcan Gülen, Ph.D., is a senior energy economist at the Center for Energy Economics at The University of Texas' Bureau of Economic Geology, where he investigates and lectures on energy value chain economics and commercial frameworks. He has worked on oil, natural gas and electric power projects in North America, South Asia, West Africa and the Caucasus, focusing on the economics, policy and regulation of resource development and delivery, as well as power market design. He has been working on unconventional natural gas resource potential, gas use in the power sector, midstream and downstream developments, and CO₂-EOR value chain. Gülen has been published in peer-reviewed and industry publications, and he presents regularly to a wide range of audiences. He served in the U.S. Association for Energy Economics (USAEE) in various positions and was the editor of USAEE Dialogue for several years. He is a member of the International Association for Energy Economics, American Economic Association, Society of Petroleum Engineers and Gulf Coast Power Association. He received a Ph.D. in economics from Boston College and a B.A. in economics from Bosphorus University in Istanbul, Turkey.

Tanya Heikkila, Ph.D., is an associate professor at the School of Public Affairs at the University of Colorado Denver. Her research expertise is in comparative institutional analysis and the management of collaboration and conflict around common-pool resources, with an emphasis on water resources. She has studied institutions for coordinating groundwater and surface water in the western United States, interstate water conflicts and cooperation, the organization of collaborative ecosystem restoration programs, and the political landscape of hydraulic fracturing in the United States. Heikkila is also the director of the doctoral program at the School of Public Affairs and teaches courses in environmental policy and research design. She received her MPA and Ph.D. in public administration and policy from the University of Arizona.

Svetlana Ikonnikova, Ph.D., is a research associate and energy economist at The University of Texas' Bureau of Economic Geology. She conducts research and lectures on energy markets and energy industry developments, focusing on the electric power industry and renewable energy sustainability, natural gas supply, liquefied natural gas trade, and shale gas economics in the U.S. and EU. Ikonnikova also participates in research on the policies and regulations on natural resource supply and transmission. At present, she is leading a study on shale gas and oil production, predicting future production and investigating market implications. She received her B.S. and M.S. in applied mathematics and physics from the Moscow Institute of Physics and Technology and a Ph.D. in economics and management science from the Humboldt University of Berlin.

Alan Krupnick, Ph.D., is a senior fellow and director of the Center for Energy Economics and Policy (CEEP) at Resources for the Future. His research focuses on analyzing environmental and energy issues, in particular the benefits, costs and design of pollution and energy policies, both in the United States and in developing countries, with an emphasis on China. As head of CEEP, he leads research on the risks associated with shale gas development and has developed a portfolio of research on issues surrounding this newly plentiful fuel. His primary research methodology is in the development and analysis of stated preference surveys such as contingent valuation and choice experiments. Krupnick also served as senior economist on the President's Council of Economic Advisers, advising the Clinton administration on environmental and natural resource policy issues. He is the president and a fellow of the Association of Environmental and Resource Economists (AERE). He has been published in various journals, served on a number of editorial boards, and co-chaired a federal advisory committee counseling the U.S. Environmental Protection Agency on the implementation of new ozone and particulate standards. He is a regular member of expert committees from the National Academy of Sciences, the EPA, and various Canadian government and nongovernmental institutions. Krupnick also consults with state governments, federal agencies, private corporations, the Canadian government, the European Union, the Asian Development Bank, the World Health Organization and the World Bank. He received his Ph.D. in economics from the University of Maryland.

David Lyon is a scientist at Environmental Defense Fund (EDF) based in Austin, Texas. As a member of EDF's U.S. Climate and Energy Natural Gas Team, he works on their ground-breaking series of research studies to quantify methane emissions from the natural gas supply chain. His work at EDF includes researching technologies and policies to reduce natural gas leakage and minimize the climate impacts of natural gas development. Lyon previously worked for the Arkansas Department of Environmental Quality (ADEQ) as coordinator of the state's air pollution emissions inventory program. While at ADEQ, he was project manager of an EPA-funded study on emissions and air quality impacts of natural gas development in the Fayetteville Shale. He received a B.A. in biology from Hendrix College and an M.S. in forestry from the University of Kentucky.

Marvin McNeese is a Ph.D. candidate in the Department of Political Science at Rice University. His research interests include American politics, especially interest group activity across national and subnational political institutions. His dissertation focuses on the relative advantages provided to policy advocates by political venues — the institutional settings where policy decisions are made. His research seeks to explain the venue choices policy advocates make, whether those choices affect policy outcomes, and whether policy consensus among advocates is necessary for advancing policy change. He has been an active volunteer in local elections and party politics and has worked in oil and gas servicing, residential housing development, law, and manufacturing. McNeese earned his bachelor's degree in political science and economics from Albion College and completed master's programs at the Lyndon B. Johnson School of Public Affairs and the Teresa Lorenzo Long Institute of Latin American Studies at The University of Texas at Austin.



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Kenneth B. Medlock III, Ph.D., is the James A. Baker, III, and Susan G. Baker Fellow in Energy and Resource Economics at Rice University's Baker Institute for Public Policy and the senior director of the Center for Energy Studies, as well as an adjunct professor and lecturer in the Department of Economics and adjunct assistant professor of civil and environmental engineering at Rice University. He is a principal in the development of the Rice World Natural Gas Trade Model, aimed at assessing the future of international natural gas trade. He has published numerous scholarly articles in his primary areas of interest: natural gas markets, energy commodity price relationships, gasoline markets, transportation, national oil company behavior, economic development and energy demand, and energy use and the environment. He also teaches courses in energy economics and supervises Ph.D. students in the energy economics field. Medlock is currently the vice president for conferences for the United States Association for Energy Economics (USAEE), and previously served as vice president for academic affairs. In 2001, he won (joint with Ron Soligo) the International Association for Energy Economics Award for Best Paper of the Year in the *Energy Journal*. In 2011, he was given the USAEE's Senior Fellow Award, and in 2013 he accepted on behalf of the Center for Energy Studies the USAEE's Adelman-Frankel Award. In 2012, Medlock received the prestigious Haydn Williams Fellowship at Curtin University in Perth, Australia. He is also an active member of the American Economic Association and the Association of Environmental and Resource Economists, and is an academic member of the National Petroleum Council (NPC). Medlock has served as an advisor to the U.S. Department of Energy and the California Energy Commission in their respective energy modeling efforts. He was the lead modeler of the Modeling Subgroup of the 2003 NPC study of long-term natural gas markets in North America, and was a contributing author to the recent NPC study "North American Resource Development." Medlock received his Ph.D. in economics from Rice in 2000, and held the MD Anderson Fellowship at the Baker Institute from 2000 to 2001.

Daniel Raimi is an associate in research at the Duke University Energy Initiative. He works on a range of energy policy issues, including the public finance effects of unconventional oil and gas production, state fiscal policy design for oil and gas production, the climate implications of shale gas development, and federal climate policy design. He has published articles in several academic journals, including *Science*, *Environmental Science and Technology*, and the *Journal of Economic Perspectives*. He has given numerous presentations for policymakers, industry and other stakeholders around the United States. He has worked with the North Carolina Department of Environment and Natural Resources and Research Triangle International (RTI). He received his master's degree in public policy from Duke University's Sanford School of Public Policy and his bachelor's degree in music from Wesleyan University.

Robert M. Stein, Ph.D., is the fellow in urban politics at the Baker Institute and the Lena Grohlman Fox Professor of Political Science at Rice University. He also is the faculty director of Rice's Center for Civic Engagement. Stein's current research focuses on alternative modes of elections and voting procedures in the United States; emergency preparedness, behavioral response to severe weather events, and risk assessment; and home weatherization programs in low- and moderate-income households. His work has been supported by the National Science Foundation, the City of Houston's Office of Public Safety and Homeland Security, the Environmental Defense Fund and Pew Charitable Trusts, among others. Stein is co-author of "Perpetuating the Pork Barrel: Policy Subsystems and American Democracy" (Cambridge University Press, 1995) and author of "Urban Alternatives: Public and Private Markets in the Provision of Local Services" (Pittsburgh Press, 1990). He has received the Outstanding Reviewer Award from *Political Research Quarterly* and the Best Paper Award on Federalism and Intergovernmental Relations (with Kenneth Bickers) from the American Political Science Association. He teaches courses on public policy, urban politics and political behavior at Rice, where twice he has been awarded the George R. Brown Award for Superior Teaching. Stein received his bachelor's degree from Ohio Wesleyan University. He earned his master's and doctoral degree from the University of Wisconsin-Milwaukee.

Scott W. Tinker, Ph.D., is the director of The University of Texas' Bureau of Economic Geology and Advanced Energy Consortium, as well as the state geologist of Texas. He is also the acting associate dean for research and holds the Allday Endowed Chair in the Jackson School of Geosciences at the university. Tinker spent 17 years in the oil and gas industry before coming to UT in 2000. He is president-elect of the American Geosciences Institute and former president of the American Association of Petroleum Geologists (AAPG), the Association of American State Geologists, and the Gulf Coast Association of Geological Societies. Tinker has been a distinguished lecturer for the AAPG, the Society of Petroleum Engineers (SPE) and Geological Society of America (GSA). He is an honorary member of the AAPG, a GSA fellow, an advisory trustee at Southwest Research Institute, and sits on advisory boards at Sandia National Lab, Trinity University and Shell Oil Company. He holds appointments on the National Petroleum Council and the Interstate Oil and Gas Compact Commission. He earned a B.S. from Trinity University, an M.S. from the University of Michigan, and a Ph.D. from the University of Colorado.