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### PROFESSIONAL INTERESTS:

Energy and Environmental Economics  
Business and Public Policy Modeling and Analysis

### EDUCATION:

Cornell University, Ithaca, N.Y. School of Engineering (1962-1964) School of Industrial and Labor Relations (1964-1967)	B.S. 1967
State University of New York, Binghamton, N.Y. Graduate Program in Economics	M.S. 1972, Ph.D. 1974

### PRESENT POSITION:

Department of Management Sciences and Engineering and Energy Modeling Forum (EMF),  
Stanford University, Stanford, CA.  
Executive Director, EMF, 1985-present.  
Senior Research Associate and Director, EMF Affiliates Program, 1980-1985.

### PREVIOUS POSITIONS:

University of Cambridge, Cambridge, England  
Visiting Fellow, Clare Hall, 1996.

Data Resources, Inc., Washington, D.C. (now Global Insight, Inc.)  
Director of Washington Energy Office, 1978-1980.  
Senior Economist, 1977-1978.

Office of Economic Impact, Federal Energy Administration, Washington, D.C.  
Staff Economist, 1974-1977.

Institute for Development Studies, University of Nairobi, Kenya.  
Visiting Research Associate, 1972-1973.

Power Transmission and Distribution Division, Public Utilities Authority, Monrovia, Liberia, West Africa (U.S. Peace Corps Volunteer).

Assistant to the Operations Engineer, 1967-1969.

### **COURSES TAUGHT:**

Applied Energy and Environmental Modeling (Stanford)

Seminar in Energy and Economic Modeling (Stanford)

Economic Analysis Seminar (Stanford)

Economic Analysis Practice (Stanford)

### **HONORS / AWARDS:**

Member, National Petroleum Council, An Oil and Natural Gas Advisory Committee to the United States Secretary of Energy, 2002 - 2019.

Member, International Advisory Board, Shanghai Forum, 2005 - 2019.

Member, Board of Advisors, Center for Commodity Markets and Behavioral Science, Dongbei University of Finance and Economics (DUFE), Dalian, China, 2016 - 2019.

Charter Member, Energy Industry program at RUDN University, Moscow, Russia, 2017 - 2019.

Chairman, External Expert Review Panel for Energy Benefits Forecasts, United States Department of Energy, Washington, D.C., 2006.

Decision Analysis Society Practice Award: Finalist, "An Assessment of Oil Market Disruption Risks," 2005 (joint with Philip Beccue).

Adelman-Frankel Award for outstanding contribution to energy economics, 2004. Presented by the United States Association for Energy Economics to the Energy Modeling Forum.

*Energy Journal*, Best Paper Award for 2002.

Senior Fellow, United States Association for Energy Economics, 2000.

Certificate of Special Achievement, Federal Energy Administration, 1976.

Certificate of Merit, Federal Energy Administration, 1975.

### **PANELS/WORKING GROUPS:**

Chairman, Energy Demand Modeling Expert Panel, California Energy Commission, Sacramento, CA, June 2011 – current.

Member and Study Coordinator, Energy Modeling Forum Working Groups, numerous panels, Stanford University, Stanford, California, 1980-.

Reviewer, Sloan Foundation

Reviewer, National Science Foundation

Reviewer, Social Sciences and Humanities Research Council of Canada

Expert Review Panel for Stochastic Energy Deployment System, Washington, DC, May 7-8, 2009.

External Expert Review Panel for Energy Benefits, United States National Energy Technology Laboratory, Morgantown, WV, March 18-19, 2009.

Panelist, Workshop on Climate Change Policy: Energy, The RAND Corporation, Arlington, VA, June 19, 2008.

Chairman, External Expert Review Panel for Energy Benefits Forecasts, United States Department of Energy, Washington, D.C., December 20, 2006.

National Academy of Sciences Workshop, Oil Peaking and the Government's Role, Washington, DC, May 7, 2005.

National Academy of Sciences Workshop, Strategic Petroleum Reserve, Washington, DC, November 30 to December 1, 2005.

Expert Presentation, Board of Commissioners, California Energy Commission, Natural Gas Modeling and Analysis, Sacramento, CA, December 16, 2004.

Expert Panel, Western Interstate Energy Board, Western Gas Assessment, Rancho Cordova, CA, October 12-13, 2004.

Member, Environmental Assessment Advisory Group, Commission for Environmental Cooperation of North America, 2002-2004.

Member, Expert Peer Review Panel, U.S. Department of Energy Fossil Energy Benefit Analysis, Washington, D.C., February 25, 2004.

Member, Expert Review Panel, U.S. Energy Information Administration, Analysis of Strategies for Reducing Multiple Emissions from Power Plants: Sulfur Dioxide, Nitrogen Oxides, and Carbon Dioxide, 2000.

Member, Advisory Review Panel, Joint National Laboratory Study on the Potential for Reducing Carbon Emissions, 1996-97.

Member, American Statistical Association Committee on Energy Statistics, 1992-94.

Member, American Delegation, Joint USA USSR National Academy of Sciences Panel on Energy Conservation Research and Development, 1986-90.

Participant, U.S. Congressional Budget Office Board of Economic Advisors Meeting, Washington, D.C., December 5, 1990.

Participant, U.S.-Brazil Energy Workshop on survey Design and Projection Methodologies, Washington, D.C., December 4-6, 1990.

Participant, Office of Technology Assessment (OTA) Workshop on Greenhouse Warming and Industrial Energy Use, Washington, D.C., May 11, 1989.

Member, Peer Review Panel, Networks of Centres of Excellence, Government of Canada, Montreal, Canada, March 31, 1989.

Member, Peer Review Panel, National Acid Precipitation Assessment Program, Task Group on Emissions and Control, Boston, Massachusetts, May 25-26, 1988.

Participant, National Science Foundation Workshop on Model Acceptance, Washington, D.C., April 22-23, 1981.

#### **OTHER PROFESSIONAL ACTIVITIES:**

American Economic Association

Life Member, Clare Hall, University of Cambridge, United Kingdom

*Energy Policy*, International Advisory Board, 2014-.

*International Journal of Global Energy Issues*, Editorial Board, 2004-.

United States Association for Energy Economics

President, 1997

Council Member, 1993-97

Strategic Planning Committee, 2001-7

Presidential Advisory Board, 2009-2012

International Association for Energy Economics

Vice-President for Publications, 1990-92

Program Chairman, International Conference of the International Association for Energy Economics, Washington, D.C., July 1995

Conference Chairman, International Conference of the International Association for Energy Economics, San Francisco, California, September 1997.

Chairman, Best Paper Award Committee, *Energy Journal*, 1989.

Consultant to numerous organizations including:

Abt Associates

Applied Decision Analysis

Argonne National Laboratory (Energy and Environmental Systems Division)

Arthur Andersen, & Co. (Management Information Consulting Division)

Booz Allen Hamilton

California Energy Commission

California Public Utility Commission

Center for Climate Strategies

Data Resources, Inc.

Electric Power Research Institute

ICF Consulting, Inc.

National Energy Policy Institute  
Office of Technology Assessment  
Putnam, Hayes & Bartlett  
RAND  
Shell Oil Company  
United Nations Department of Economic and Social Affairs  
University of Southern California  
U.S. Department of Energy  
Faculty Member, Executive Seminar on Energy Decisionmaking, Stanford University, Stanford, CA, 1981-88.  
Faculty Member, International Atomic Energy Agency Course on Electricity Demand Modeling, Argonne National Laboratories, Argonne, IL, 1985-87.

### **CONGRESSIONAL/COMMISSION TESTIMONY:**

Prepared Testimony, U.S. Senate Committee on Foreign Relations, “The Hidden Costs of Oil,” March 30, 2006. In *Energy Diplomacy and Security: A Compilation of Statements by Witnesses Before the Committee On Foreign Relations*, United States Senate, One Hundred Ninth Congress, Second Session, Washington, DC: US Government Printing Office, June 2006. Available via: <http://www.gpoaccess.gov/congress/index.html>

Expert Presentation, Board of Commissioners, California Energy Commission, “Natural Gas Modeling and Analysis,” Sacramento, CA, December 16, 2004. Available at: [http://www.energy.ca.gov/2005\\_energypolicy/documents/2004-12-16\\_workshop/2004-12-16\\_STANFORD\\_UNIV.PDF](http://www.energy.ca.gov/2005_energypolicy/documents/2004-12-16_workshop/2004-12-16_STANFORD_UNIV.PDF)

Expert Presentation, Board of Commissioners, California Energy Commission, “Natural Gas Modeling and Analysis,” Sacramento, CA, December 16, 2004.

Expert Presentation, Board of Commissioners, California Energy Commission, Oil Security Premium, Sacramento, CA, May 5, 1993.

### **PUBLICATIONS:**

#### **Journal Articles**

“How Energy Prices Shape OECD Economic Growth: Panel Evidence from Multiple Decades,” with Brantley Liddle, *Energy Economics*, Volume 111, 2022, 106082.

“Model Evaluation for Policy Insights: Reflections on the Forum Process,” *Energy Policy* 156, September 2021, 112365.

“On the Road Again’: a 118 Country Panel Analysis of Gasoline and Diesel Demand,” with Brantley Liddle, *Transportation Research Part A: Policy and Practice*, 142:151-167, December 2020.

“There's Technology Improvement, but is there Economy-wide Energy Leapfrogging? A Country Panel Analysis,” with Brantley Liddle, *World Development*, 140, April 2021, 105259.

"How Prices, Income, and Weather Shape Household Electricity Demand in High-Income and Middle-Income Countries." with Brantley Liddle, *Energy Economics*, 95, March 2021, 104995.

“Key Findings from the Core North American Scenarios in the EMF34 Intermodel Comparison,” with Abha Bhargava, David Daniels, John P. Weyant, Charalampos Avraam, John Bistline, James A. Edmonds, Sara Giarola, Adam Hawkes, Matthew Hansen, Peter Johnston, Anahi Molar-Cruz, Michael Nadew, Sauleh Siddiqui, Kathleen Vaillancourt and Nadejda Victor, *Energy Policy* 144 (2020) 111599.

“Revisiting the Income Elasticity of Energy Consumption: A Heterogeneous, Common Factor, Dynamic OECD & non-OECD Country Panel Analysis,” with Brantley Liddle, *Energy Journal* 41(3): 207-229 (2020). DOI: 10.5547/01956574.41.3.blid.

“Review of Key International Demand Elasticities for Major Industrializing Economies,” with James Barrios and Vipin Arora. *Energy Policy*, Volume 133 (2019).

“Oil Supply Disruptions, U.S. Economic Activity and Oil Security,” with Stephen P.A. Brown, *Energy Policy* 116 (2018) 297–298, <https://doi.org/10.1016/j.enpol.2018.02.023>.

“Measuring Oil Supply Disruptions: A Historical Perspective,” *Energy Policy*, 115 (April 2018): 426–433, <https://doi.org/10.1016/j.enpol.2017.12.020>.

“An Updated Assessment of Oil Market Disruption Risks,” with Phillip C. Beccue, Paul N. Leiby, Kenneth R. Vincent, *Energy Policy*, 115 (April 2018): 456–469, <https://doi.org/10.1016/j.enpol.2017.12.013>.

“OPEC and World Oil Security,” with Stephen P.A. Brown, *Energy Policy* 108: 512–523, September 2017, <https://doi.org/10.1016/j.enpol.2017.06.034>.

“The Historical ‘Roots’ of U.S. Energy Price Shocks,” *Energy Journal*, 38(5): 1-15, forthcoming, 2017, <https://doi.org/10.5547/01956574.38.5.hhun>.

“Introduction: North American Natural Gas Markets in Transition,” *Energy Economics*, 60 (November 2016): 401-404, ISSN 0140-9883, <http://dx.doi.org/10.1016/j.eneco.2016.10.003>.

“Crude Oil Trade and Current Account Deficits,” *Energy Economics*, July 2015, 50: 70–79.

“A Review of Water and Greenhouse Gas Impacts of Unconventional Natural Gas Development in the United States,” with Douglas Arent, Jeffrey Logan, Jordan Macknick, William Boyd, Kenneth Medlock III, Francis O’Sullivan, Jae Edmonds, Leon Clarke, Garvin Heath,

Patricia Statwick, and Morgan Bazilian, *MRS Energy and Sustainability*, 2015, (2): E4 (21 pages).

“Evaluating U.S. Oil Security and Import Reliance,” with Stephen P.A. Brown, *Energy Policy*, April 2015, 79: 9–22.

“Oil Price Drivers and Movements: The Challenge for Future Research,” with Saud M. Al-Fattah, Zhuo Huang, Michael Gucwa, and Ali Nouri, *Alternative Investment Analyst Review*, Winter 2014, 2(4):11-28.

“Assessing the U.S. Oil Security Premium,” with Stephen P.A. Brown, *Energy Economics* 38 (2013) 118–127, July.

“The Policy Implications of Energy-Efficiency Cost Curves,” in *Strategies for Mitigating Climate Change Through Energy Efficiency: A Multi-Model Perspective.*” special issue of the *Energy Journal*, October 2011, 32 (Special Issue 1): 7-21.

“Mitigating Climate Change Through Energy Efficiency: An Introduction and Overview,” with Eric Smith, in *Strategies for Mitigating Climate Change Through Energy Efficiency: A Multi-Model Perspective.*” special issue of the *Energy Journal*, October 2011, 32 (Special Issue 1):1-6.

“OSEMOSYS: The Open Source Energy Modeling System: An Introduction to its Ethos, Structure and Development,” with Mark Howells, Holger Rogner, Neil Strachan, Charles Heaps, Hillard Huntington, Socrates Kypreos, Alison Hughes, Semida Silveira, Joe DeCarolis, Morgan Bazillian, and Alexander Roehr, *Energy Policy*, 39(10): 5850-5870, October 2011.

“Backcasting U.S. Oil Demand over a Turbulent Decade,” *Energy Policy* 39 (2011) 5674–5680.

“Structural Change and U.S. Energy Use: Recent Patterns,” *Energy Journal*, 2010, 31(3): 25-39.

“Oil Demand and Technical Progress,” *Applied Economics Letters*, 2010, 17: 18, 1747 — 1751.

“Short- and Long-Run Adjustments in U.S. Petroleum Consumption,” *Energy Economics*, 32: 63-72, January 2010.

“Natural Gas Across Country Borders: An Introduction and Overview,” in *World Natural Gas Markets and Trade: A Multi-Modeling Perspective*, Special Issue of *The Energy Journal*, 2009. pp. 1-8.

“Creating Jobs With ‘Green’ Power Sources,” United States Association for Energy Economics *Dialogue*, 17(1), March 2009.

“Energy Security and Climate Change Protection: Complementarity or Tradeoff?” with Stephen P.A. Brown, *Energy Policy*, September 2008, 36(9): 3510-3513.

“Overview of EMF 23: World Natural Gas Markets and Trade,” in *World Natural Gas Markets and Trade: A Multi-Modeling Perspective*, special issue of *Energy Journal*, forthcoming.

“The Oil Security Problem: ‘Deja Vu All Over Again’.” *Resources*, 2008.

“Oil Shocks and Real U.S. Income,” *Energy Journal*, 2007, 28(4): 31-46.

“Industrial Natural Gas Consumption in the United States: An Empirical Model for Evaluating Future Trends,” *Energy Economics*, July 2007, 29(4): 743-759.

“A Note on Price Asymmetry As Induced Technical Change,” *Energy Journal*, July 2006, 27(3): 1-7.

“U.S. Carbon Emissions, Technological Progress and Economic Growth Since 1870,” *International Journal of Global Energy Issues*, 2005, 23(4): 292-306.

“After the Natural Gas Bubble: An Economic Evaluation of the Recent U.S. National Petroleum Council Study,” with Ken Costello and James F. Wilson, *Energy Journal*, April 2005, 26(2): 89-109.

“Shares, Gaps and the Economy’s Response to Oil Disruptions,” *Energy Economics*, Volume 26, Issue 3, May 2004, Pages 415-424.

“Energy Security and Global Climate Change Mitigation,” with Stephen P.A. Brown, *Energy Policy*, 2004, 32(6): 715-718.

“Terms of Trade and OECD Policies to Mitigate Global Climate Change,” with Stephen P. A. Brown, Federal Reserve Bank of Dallas *Economic and Financial Policy Review*, 2003, Vol. 2, No. 1, [http://www.dallasfed.org/assets/documents/research/efpr/v02\\_n01\\_a01.pdf](http://www.dallasfed.org/assets/documents/research/efpr/v02_n01_a01.pdf).

“Energy Disruptions, Interfirm Price Effects and the Aggregate Economy,” *Energy Economics*, March 2003, 25(2): 119-136.

“The Asymmetric Effects of Changes in Price and Income on Energy and Oil Demand” with Dermot Gately, *Energy Journal*, 23 (1), January 2002.

“Crude Oil Prices and U.S. Economic Performance: Where Does the Asymmetry Reside?” *Energy Journal*, 1998, 19(4): 107-132.

“Some Implications of Increased Cooperation in World Oil Conservation,” with Stephen P.A. Brown, Federal Reserve Bank of Dallas *Economic Review*, 2nd Quarter, 1998.

- “Introduction,” special issue, *Utilities Policy*, September 1997, 6(3).
- “Been Top Down So Long Looks Like Bottom Up to Me,” *Energy Policy*, November 1994, 22(10): 833-839.
- “LDC Cooperation in World Oil Conservation Policies,” with Stephen P.A. Brown, *Energy Journal*, Fall 1994, pp. 310-328.
- “The Economic Cost of U.S. Oil Conservation,” with Stephen P.A. Brown, *Contemporary Economic Policy*, July 1994, Vol. 12, pp. 42-53.
- “Oil Price Forecasting in the 1980s: What Went Wrong?” *Energy Journal*, June 1994, 15(2): 1-22 (feature article, also published in *The Economics of Energy*, edited by Paul Stevens, Northampton, MA: Edward Elgar, 2000).
- “Limiting Oil Imports: Cost Estimates,” *Contemporary Policy Issues*, July 1993, Vol. 11, pp. 12-29.
- “OECD Oil Demand: Estimated Response Surfaces for Nine World Oil Models,” *Energy Economics*, January 1993, pp. 49-56.
- “A Comparison of Aggregate Energy Demand Models for Global Warming Policy Analyses,” with Ronald D. Beaver, *Energy Policy*, June 1992, 20(6): 568-574.
- “U.S. Natural Gas Markets: A Structural Model Comparison,” *Journal of Policy Modeling*, Volume 14, Issue 1, February 1992, Pages 13-39.
- “Substitution Between Activities with Different Energy Intensities,” *Resources and Energy*, April 1991, Vol. 13, No. 1, pp. 23-37.
- “North American Natural Gas Markets: A Summary of an Energy Modeling Forum Study,” with G.E. Schuler, *Energy Journal*, April 1990, Vol. 11, No. 2, pp. 1-21.
- “On Economic Policy Responses to Disruptions: A Reply to Harry Saunders,” with B.G. Hickman and J.L. Sweeney, *Energy Journal*, October 1989, Vol. 10, No. 4, pp. 189-198.
- “The Impact of Sectoral Shifts in Industry on U.S. Energy Demands,” *Energy*, June 1989, Vol. 14, No. 6, pp. 363-372.
- “Should GNP Impacts Preclude Oil Tariffs?” *Energy Journal*, April 1988, Vol. 9, No. 2, pp. 31-44.
- “A Reply: The U.S. Dollar and the World Oil Market,” *Energy Policy*, April 1987.
- “The U.S. Dollar and the World Oil Market,” *Energy Policy*, August 1986, pp. 299-306.

“Oil Prices and Inflation,” *Annual Review of Energy*, Volume 10, 1985, pp. 317-339.

“Real Oil Prices During 1980-82,” *Energy Journal*, July 1984, Volume 5, No. 3, pp. 119-131.

“Modeling for Insights, Not Numbers: The Experiences of the Energy Modeling Forum,” with J.P. Weyant and J.L. Sweeney, *Omega: The International Journal of Management Science*, Volume 10, No. 5 (feature article), 1982, pp. 449-462.

“Federal Price Regulation and the Supply of Natural Gas in a Segmented Field Market,” *Land Economics*, August 1978, Volume 54, No. 3, pp. 337-347.

“Time Allocation, Time Value and Factor Intensity,” with A.C. DeSerpa, *Australian Economic Papers*, June 1978, pp. 124-131.

“An Empirical Study of Ethnic Linkages in Kenyan Rural Urban Migration,” Nairobi, Kenya: Institute for Development Studies Discussion Paper Series, No. 260, December 1977 (Refereed series).

“The Rate of Return on the Basseri's Livestock Investment,” *Man: Journal of the Royal Anthropological Institute*, September 1972, Volume 7, No. 3.

### **Journals Edited**

*North American Energy Integration: Lessons from EMF 34*, with John Weyant, Abha Bhargava, and David Daniels, special issue of *Energy Policy*, 151, March 2021.

*North American Natural Gas Markets in Transition*, special issue of *Energy Economics*, 60, November 2016.

*Strategies for Mitigating Climate Change Through Energy Efficiency: A Multi-Model Perspective.*” special issue of the *Energy Journal*, October 2011, 32 (Special Issue 1).

*World Natural Gas Markets and Trade: A Multi-Modeling Perspective*, special issue of *Energy Journal*, October 2009 (Special Issue).

*Transmission Policy*, special issue, *Utilities Policy*, September 1997, 6(3).

*Markets for Energy Efficiency*, special issue, *Energy Policy*, November 1994, 22(10), with Lee Schipper and Alan Sanstad.

### **Books and Contributions to Books**

“Climate & Energy: Back to Black?” in *The World in 2022*, Italian Institute for International Political Studies (ISPI), December 2021, <https://www.ispionline.it/en/publication/climate-energy-back-black-32624>.

“Prices, Income and Energy Demand,” with Brantley Liddle, in *Research Handbook on Environmental Sociology*, edited by Axel Franzen and Sebastian Mader, Edward Elgar Publishing Ltd., forthcoming 2021.

“The Oil Security Problem: ‘Deja Vu All Over Again,’” in *Issues of the Day: 100 Commentaries on Climate, Energy, the Environment, Transportation, and Public Health Policy*, edited by Ian Parry and Felicia Day, Washington, DC: Resources for the Future, 2010.

“Financing the Future: Investments Into Alternative Sources of Energy,” with Christine Jojarth, in *Global Energy Governance: The New Rules of the Game*, edited by Andreas Goldthau and Jan Martin Witte. Washington, DC: Brookings Press, 2010.

“The Oil Security Problem,” in *International Handbook on the Economics of Energy*, edited by Joanne Evans & Lester C Hunt, Edward Elgar Publishing Ltd, 2009.

“The Geopolitics of Natural Gas: An Energy Modeling Forum Study,” in Shanghai Forum, *Economic Globalization and the Choice of Asia*, edited by the Shanghai Forum Organizing Committee, Shanghai, China: Fudan University Press, 2008.

“Modeling Energy Markets and Climate Change Policy,” with John P. Weyant, in *Encyclopedia of Energy*, edited by Cutler J. Cleveland, Academic Press/Elsevier Science, 2004, Pages 41–53. <http://dx.doi.org/10.1016/B0-12-176480-X/00230-8>

“Market-Based U.S. Electricity Prices: A Multi-Model Evaluation,” in *Electricity Pricing in Transition*, edited by Kelly Eakin and Ahmad Faruqi, Boston: Kluwer Academic Press, 2002.

“Projecting Energy Trends Into the Twenty First Century,” with Mark Rodekoher, in *Our Fragile World: Challenges and Opportunities for Sustainable Development*, forerunner to the Encyclopedia of Life Support Systems by Koïchiro Matsuura, Director-General of UNESCO, May 2001, UNESCO, Paris, Eolss Publishers.

*Designing Competitive Electricity Markets*, Co-Editor (with Hung-po Chao), Boston: Kluwer Academic Press, 1998.

*International Symposium on Transmission Pricing*, Editor, *Utilities Policy*, September 1997, 6(3).

*Markets for Energy Efficiency*, Co-Editor (with Lee Schipper and Alan Sanstad), *Energy Policy*, Special Issue, November 1994.

“Oil: Alternative Perspective on the Decade,” in *An Economic Perspective of the Southwest: Defining the Decade*, edited by Gerald P. O'Driscoll, Jr., and Stephen P.A. Brown, Boston: Kluwer Academic Press, 1992.

“The Effects of Changes in the Economic Structure on Energy Demand in the USSR and the U.S.,” with Yu D. Kononov, E.A. Medvedeva, and G.A. Boyd, in *International Energy Economics*, edited by Thomas Sterner, London: Chapman & Hall, 1992.

“Inferred Demand and Supply Elasticities from a Comparison of Nine World Oil Model,” in *International Energy Economics*, edited by Thomas Sterner, London: Chapman & Hall, 1992.

*Energy Markets in the 1990s and Beyond*, edited with A.B. Baker, *Proceedings of the 11th Annual North American Conference*, International Association for Energy Economics, October 16-18, 1989.

*North American Natural Gas Markets: Selected Technical Studies*, edited with G.E. Schuler, Energy Modeling Forum, Stanford University, Stanford, California, April 1989.

“Energy Economics.” In *The New Palgrave*, edited by J. Eatwell, M. Milgate, and P. Newman. London: Macmillan Press, 1987.

“Sectoral Shift and Industrial Energy Demand: Key Findings from an Energy Modeling Forum Study,” with J.G. Myers. In *Papers and Proceedings of the Eighth Annual North American Conference: The Changing World Energy Economy*, edited by David O. Wood, Massachusetts Institute of Technology, Cambridge, Massachusetts, May 1987.

“Sectoral Shift and Industrial Energy Demand: What Have We Learned?” with J.G. Myers. In *Forecasting Industrial Structural Change and its Impact on Electricity Consumption*, edited by A. Faruqui and J. Broehl, Battelle Press, 1987.

*Macroeconomic Impacts of Energy Shocks*. Editor (with B.G. Hickman and J.L. Sweeney). Contribution to Economic Analysis Series No. 163, Amsterdam: North Holland, 1987.

“Study Design for Macroeconomic Impacts of Energy Shocks,” with B.G. Hickman. In *Macroeconomic Impacts of Energy Shocks*, Amsterdam: North Holland, 1987.

“Energy Policy Issues and Macroeconomic Models,” with J.E. Eschbach. In *Macroeconomic Impacts of Energy Shocks*, Amsterdam: North Holland, 1987.

*Macroeconomic Impacts of Energy Shocks: Contributions from Participating Modelers*, Editor (with B.G. Hickman), Energy Modeling Forum, Stanford University, Stanford, California, 1987.

*Macroeconomic Impacts of Energy Shocks*, Energy Modeling Forum Report 7, Volume I, Stanford University, Stanford, California, 1986 (Principal Contributor); also published in *Macroeconomic Impacts of Energy Shocks*, Amsterdam: North Holland, 1987, pp. 1-123.

“OPEC and the U.S. Economy: Insights From a Comparison of Macroeconomic Models.” In *The Energy Industries in Transition: 1985-2000*, edited by J.P. Weyant and D.B. Sheffield. Boulder, Colorado: Westview Press, 1985.

“Integration of Energy/Economic Models For Environmental Assessments and Policy Analysis,” with D.A. Hanson, C.M. Macal, and H.W. Hochheiser. In *The Energy Industries in Transition: 1985-2000*, edited by J.P. Weyant and D.B. Sheffield. Boulder, Colorado: Westview Press, 1985.

### **Selected Technical Reports**

“‘On the Road Again’: A 118 Country Panel Analysis of Gasoline and Diesel Demand,” with Brantley Liddle (March 11, 2020). USAEE Working Paper No. 20-435. Available at SSRN: <https://ssrn.com/abstract=3552662> or <http://dx.doi.org/10.2139/ssrn.3552662>

“Leap-Frogging and Energy Consumption: A Country Panel Analysis,” with Brantley Liddle (January 10, 2019). USAEE Working Paper No. 19-381. Available at SSRN: <https://ssrn.com/abstract=3313710> or <http://dx.doi.org/10.2139/ssrn.3313710>.

*North American Natural Gas Markets in Transition*, Energy Modeling Forum Working Group Report 31 (principal contributor), October 2015.

“Oil Markets and Price Movements: A Survey of Determinants,” with Zhuo Huang, Saud M. Al-Fattah, Michael Gucwa and Ali Nouri, Social Science Research Network Working Paper Series, July 5, 2012.

“Oil Markets and Price Movements: A Survey of Models,” with Saud M. Al-Fattah, Zhuo Huang, Michael Gucwa and Ali Nouri, USAEE Working Paper No. 13-129, June 10, 2013.

*Changing the Game? Emissions and Market Impacts of New Natural Gas Supplies*, Energy Modeling Forum Working Group Report 26 (principal contributor).

*Energy Efficiency and Climate Change Mitigation*, Energy Modeling Forum Working Group Report 25 (principal contributor).

*Prices and Trade in a Global Natural Gas Market*, Energy Modeling Forum Working Group Report 23 (principal contributor).

*Macroeconomic Consequences of Higher Oil Prices*, Energy Modeling Forum Special Report 9, Stanford University, Stanford, California, August 2005.

*Oil Disruption Risk Assessment*, with Phillip Beccue, Energy Modeling Forum Special Report 8, Stanford University, Stanford, California, August 2005.

*Natural Gas, Fuel Diversity and North American Energy Markets*, Energy Modeling Forum Report 20, Summary Report, Stanford University, Stanford, California, September 2003 (principal contributor).

*Review of the Current Status of Power Market Reforms in the United States and Europe*, with Hung-po Chao, Robert Entriken, Shmuel Oren, Alexis Papalexopoulos, Steven Wan, and Robert Wilson, EPRI, Palo Alto, CA: 2002. 1007332.

*Prices and Emissions in a Restructured Electricity Market*, Energy Modeling Forum Report 17, Summary Report, Stanford University, Stanford, California, April 2001 (principal contributor).

“An International Comparison of Market Power Models,” with J. Bushnell, C. Day, M. Duckworth, R. Green, A. Halseth, E.G. Read, S. Rogers, A. Rudkevich, T. Scott, and Y. Smeers, Energy Modeling Forum Working Paper 17.1 (revised WP 15.1), Stanford University, Stanford, CA, March 1999.

*A Competitive Electricity Industry*, Energy Modeling Forum Report 15, Summary Report, Stanford University, Stanford, California, April 1998 (principal contributor).

“Quantifying Oil Disruption Risks Through Expert Judgment” with John Weyant, Antje Kann and Phil Beccue, Energy Modeling Forum Special Report 7, Stanford University, Stanford, California, April 1997.

*Markets for Energy Efficiency*, Energy Modeling Forum Report 13, Summary Report, Stanford University, Stanford, California, February 1996 (principal contributor).

*International Oil Supplies and Demands*, Report 11, Summary Report, Energy Modeling Forum, Stanford University, Stanford, CA, September 1991 (principal contributor).

“International Oil Supplies and Demands: An Analysis of the Results,” Energy Modeling Forum, Stanford University, Stanford, CA, February 1991 (principal contributor).

“Economic Impacts of U.S. Oil-Replacement Policies: Methodology and Results for the OTA Analysis,” with John P. Weyant, Energy Modeling Forum, Stanford University, Stanford, CA, April 1991.

“Emerging Competition in California Gas Markets,” Prepared for the California Energy Commission, February 1991.

*North American Natural Gas Markets*, Energy Modeling Forum Report 9, Volumes I & II, Stanford University, Stanford, California, February 1989 (Principal Contributor).

*The Demand for Energy in the Commercial Sector*, with E. Soffer, Palo Alto, California: Electric Power Research Institute, EA 2330, 1982.

*A Price Forecasting System for Refined Petroleum Products*, with G.R. Doenges, E.R. Novicky, and J.L. Sweeney, Washington, D.C.: Data Resources, Inc., July 1978.

“Analysis of the Natural Gas Compromise,” *Data Resources Topics in Energy*, June 1978.

“Natural Gas Outlook,” *Data Resources Energy Review*, various issues, 1977-80.

"Energy Prices, Factor Reallocation and Regional Growth," with D.M. Smith, Federal Energy Administration Working Paper 76-WPA-53, January 1977. <http://1.usa.gov/1x0eWw6>.

*Natural Gas Deregulation Analysis*, co authored with W.W. Hogan, J. Kraft, National Energy Information Center, Federal Energy Administration, Washington, D.C., December 1976, Technical Report PB 261-599.

*The Natural Gas Market in 1974*, with J.A. Neri, National Energy Information Center, Federal Energy Administration, Washington, D.C., May 1976, Technical Report PB 253-038.

*Project Independence Report*, contributor, Federal Energy Administration, Washington, D.C., November 1974.

### **CONFERENCES (since 2003)**

“North American Natural Gas Markets in Transition: The Future of Shale Gas,” International Association for Energy Economics, International Conference, Groningen, Netherlands, plenary presentation, June 13, 2018.

“Revisiting the Income Elasticity of Energy Demand in OECD and Non-OECD Countries,” JP Morgan Center for Commodity Research, Colorado University at Denver, Denver, CO, April 19, 2018.

“Modeling the Economics of the Shale Revolution: What Have We Learned?” Natural Gas Initiative Annual Research Review, Stanford University, Stanford, CA, November 8, 2017.

“The Road to China’s Climate-Friendly Future,” 2016 US-China New Energy Economy Forum, San Francisco, CA, September 21-22, 2016.

“Improving Energy Demand Forecast and Energy Saving Evaluation Practices,” IEPR Joint Agency Workshop on Energy Demand Forecast and Doubling of Energy Efficiency – Data and Analytical Needs, California Energy Commission, Sacramento, CA, July 11, 2016.

“The U.S. Oil Renaissance and Global Markets,” Primary Commodity Markets Conference, Dongbei University of Finance and Economics (DUFE), Dalian, China, June 19-20, 2016.

“Modelling Energy Demand: Advantages and Limitations,” King Abdullah Petroleum Studies and Research Center (KAPSARC) Workshop on Energy Demand and Efficiency, London, UK, March 22, 2016.

“North American Natural Gas Markets in Transition,” Annual Electric Power Research Institute Seminar on Fuels, Power Markets and Resource Planning, Washington, DC, Nov 4-5, 2015.

Program Chair, Evaluating Oil Disruption Risks, Washington, DC, October 28-29, 2015

Program Chair, Oil Disruption Risk Workshop, September 23, 2015, Washington, DC

“Shale Gas and Energy Markets in Transition: Lessons from North America,” Plenary Session, International Association for Energy Economics International Conference, Antalya, Turkey, May 25-27, 2015.

“Changing the Game? Energy Market and Emissions Impacts of New North American Natural Gas Supplies,” Various presentations at Gaidar Forum, Moscow, Russia, January 15-17, 2014; Precourt Institute of Energy, Stanford University, Stanford, CA, December 2, 2013; and School of Resource and Environmental Management, Simon Fraser University, Vancouver, British Columbia, November 25, 2013.

“Modeling for Insights not Numbers: The Experiences of the Energy Modeling Forum,” Gaidar Forum, Moscow, Russia, January 15-17, 2014.

Forum Participant, 2020 Foresight – Ensuring Educational Excellence for Upstream Engineering Resources, Coeur d’Alene, Idaho, Coeur d’Alene Resort August 4-9, 2013.

“Abundant Natural Gas and a Low Carbon Economy,” Resources for the Future, Washington, DC, July 10, 2013.

“Building America's Energy Future: A Portfolio of Promising Policies,” New York University Washington Center, Washington, DC, June 27, 2013.

“Shale Gas Revolution and U.S. and Global Competitiveness,” The Conference Board, New York, NY, May 28, 2013.

“Exploring Options for Natural Gas in Transportation,” UC Davis Institute for Transportation Studies, February 4-5, 2013.

Natural Gas and the Transformation of the U.S. Energy Sector: A Program Studying Multi-Sector Opportunities and Impacts Workshop, National Renewable Energy Laboratory, Golden, Colorado, December 10-11, 2012

“Oil Markets and the Growth of Light Vehicles in Emerging Economies,” 2011 NABE Annual Meeting, Dallas, Texas, September 13, 2011.

“Oil Price Drivers and Movements,” King Abdullah Petroleum Studies and Research Center, Dammam, Saudi Arabia, July 23, 2011.

Chairman, Special Session on OSeMOSYS (Open Source Energy Modelling System, International Energy Workshop, Stanford University, Stanford, CA, July 6-8, 2011.

“Assessing the U.S. Oil Security Premium,” with Stephen P.A. Brown, International Energy Workshop, Stanford University, Stanford, CA, July 6-8, 2011.

“World Oil Modeling in Retrospection,” National Energy Policy Institute Conference on OPEC at 50: Its Past, Present and Future in a Carbon-Constrained World, Tulsa, OK, March 23, 2011.

Chairman and Keynote Presentation, “Deciphering Environmental Regulatory Reform and Anticipating What New Laws Are on the Horizon,” Marcus Evans Energy CFO Summit, Hollywood, Florida, February 16-18, 2011.

Panelist, Climate Analysis and the Role of Energy Efficiency, Policy Conference of the American Council for an Energy-Efficient Economy (ACEEE), Washington, DC, December 7-8, 2010.

Chairman and Organizer, Forum on Oil Price Determinants, Washington, DC, September 16-17, 2010.

“USA Gasoline Demand: A Structural Time Series Analysis,” with Lester Hunt and Zafer Dilaver, 33rd International Association for Energy Economics (IAEE) International Conference, The Future of Energy: Global Challenges, Diverse Solutions, June 6-9, 2010, Rio de Janeiro, RJ, Brazil.

Discussant, Uses and Abuses of Marginal Abatement Supply Curves, National Academy of Science Workshop on Assessing the Economic Impacts of Climate Change, Washington, DC, April 15-16, 2010.

Panelist, Oil and the US Economy, Workshop on Reassessing Energy Security for Oil & Gas, Council on Foreign Relations, New York, NY, April 12-13, 2010.

“Geopolitics and Oil Independence in the New Decade,” Minot State University Energy Impact Symposium, Minot, ND, March 15-16, 2010.

UK Energy Research Centre, Open Source Energy Modelling SYStem (OSEMOSYS) workshop, Oxford University, Oxford, UK, February 22-24, 2010.

Renewable Energy Economics, American Council on Renewable Energy (ACORE) and the United States Association for Energy Economics (USAEE) webinar, January 27, 2010.

Evaluating America’s Energy Policies One Year into the Obama Administration, Hoover Institute Workshop, Stanford University, January 19-20, 2010.

“Reassessing the Energy Security Premium,” with Stephen P.A. Brown, American Economic Association Meetings, Atlanta, Georgia, January 3-5, 2010.

“Electricity Demand Outlook: Now and in the Future,” National Conference of State Legislatures (NCSL) Task Force on Energy Supply, San Diego, CA, December 9-10, 2009.

“Short- and Long-Run Adjustments in U.S. Petroleum Consumption,” 2nd International Workshop on Empirical Methods in Energy Economics (EMEE09), Jasper, Alberta, Canada, August 28-29, 2009.

"Efficiency and the Shape of Future Energy Demand: Initial Findings from Energy Modeling Forum Study 25," International Energy Workshop, Venice, Italy, June 18-20, 2009.

“Energy Security,” with Stephen P.A. Brown, Toward a New National Energy Policy: Assessing and Ranking the Options, Resources for the Future, Washington, DC, March 12-13, 2009.

Speaker, Global Economic Symposium, Plön Castle, Schleswig-Holstein, Germany, September 4-5, 2008.

“World Natural Gas Markets and the Need for West Coast LNG, West Coast LNG Conference,” The Canadian Institute, Vancouver, BC, Nov 14-15, 2007.

“Findings of the EMF Study 23: World Natural Gas Markets,” International Association for Energy Economics, Houston, TX, September 18, 2007.

“EMF World Natural Gas Study: Some Initial Conclusions,” International Energy Workshop, Stanford, CA, June 26, 2007.

“The Economic Consequences of High Oil Prices and Oil Shocks,” US Energy Information Administration Workshop on Macroeconomic Impacts of Energy Shocks, Washington, D.C., July 11, 2006.

Chairman/Organizer, World Natural Gas Markets and Trade, invited session, International Conference of the International Association for Energy Economics, Potsdam, Germany, June 8-10, 2006.

National Academy Sciences of Workshop, Oil Peaking and the Government’s Role, Washington, DC, May 5, 2006.

“Economic Effects of the Peaking of Conventional Oil Supply,” EPA/DOE Workshop on Modeling the Oil Transition, Washington, DC, April 20-21, 2006.

“Oil Security Risks,” presentation to Energy Industry Study Group of the Industrial College of the Armed Forces, Stanford, CA, April 18, 2006

National Academy of Sciences Workshop, Strategic Petroleum Reserve, Washington, DC, November 30 to December 1, 2005.

Asia Economics and Finance Seminar for the U.S. Central Intelligence Agency, San Francisco, CA, November 1-2, 2005.

Energy Security and the L20 Workshop, Stanford University, October 13-14, 2005.

“U.S. Natural Gas Markets: A Bridge or a Chasm?” Presentation sponsored by Resources for the Future and delivered at the U.S. Senate, Washington, DC, July 17, 2005.

“Geopolitics of Natural Gas: An Energy Modeling Forum Study,” Shanghai Forum 2005: Economic Globalization and the Choice of Asia, Shanghai, China, May 16-17, 2005, Plenary Speaker.

Conference Organizer, “Technology, Markets and California’s Energy Plans,” Stanford University Energy Modeling Forum, January 20, 2005.

“Geopolitics of Natural Gas,” ChevronTexaco Workshop on Natural Gas, Woodlands, Texas, October 27, 2004, Plenary Dinner Speaker.

“Long-Term Drivers of Energy Demand,” Assessing Energy Demand in China to 2020, Expert Conference for the U.S. Central Intelligence Agency, San Francisco, CA, July 13-14, 2004.

“After the Natural Gas Bubble: A Critique of the Modeling and Policy Evaluation Contained in the National Petroleum Council’s 2003 Natural Gas Study,” Plenary Session, International Association for Energy Economics, 24th North American Conference, Washington, D.C., July 8-10, 2004.

“World Natural Gas Markets and Trade: A New EMF Study,” Plenary Session, International Energy Workshop, International Energy Agency, Paris, France, June 22-24, 2004.

“Prices, LNG and North American Natural Gas Markets,” Strategic Research Institute, Houston, Texas, January 2004.

“Natural Gas and Fuel Diversity in North America: A Comparison of Market Models,” Baker Institute, Rice University, Houston, Texas, January 2004.

“Supply, Resources and Costs,” North American Regional Gas (NARG) Model User Group Meeting, Rancho Cordova, California, January 2004.

“The Strategic Petroleum Reserve as a Policy for Addressing the Externality Problem,” American Economic Association Meetings, San Diego, California, January 2004.

“Natural Gas, Fuel Diversity and North American Energy Markets,” National Chapter of the International Association for Energy Economics, Washington, DC, November 2003.

“Natural Gas: Prospects and Policies for the Nation,” Resources for the Future, Washington, DC, November 2003.

Other professional presentations to the following conferences/groups: International Energy Workshop (Vienna, Honolulu, Paris, Stanford), Western Economic Association, Electric Power

Research Institute's Workshop on Markets for Electricity - Economics and Technology (MEET), International Conference of the International Association for Energy Economics, North American Conference of the International Association for Energy Economics, Joint Statistical Meetings of the American Statistical Association, National Association of Business Economists, Unocal Science & Technology Research Center, Federal Reserve Bank of Dallas Annual Conference, California Energy Commission Conference on Emerging Competition in California Gas Markets, Conference on Soviet Energy Options and Global Environmental Issues (Georgetown University), Joint American-Soviet National Academy of Sciences Symposium on Energy Conservation Research and Development (Wingspread, Racine, WI; Moscow; Atlanta), Electric Power Research Institute Fuel Supply Seminar, Energy Technology Conference, Electric Power Research Institute Load Forecasting Symposium, Conference on Energy Taxation (Center for Economic Policy Research, Stanford University), American Economic Association Meetings, Trinational Energy Policy Conference (Center for Economic Policy Research, Stanford University), Joint National Meeting of the Institute of Management Sciences/Operations Research Society of America.

*Revised June 2022.*