

Dr. David Edwin White, Principal Associate

Synapse Energy Economics | 485 Massachusetts Avenue, Suite 2 | Cambridge, MA 02139 | 617-453-7028
dwhite@synapse-energy.com

SUMMARY OF RELEVANT EXPERIENCE

Dr. White has modeled most of the North American Electric Reliability Council (NERC) regions in the United States and Canada. Many of these projects have involved examining proposed mergers and their potential effects on market power and market prices. A recent focus has been on the analysis of long-term generation expansion plans and the role of uncertainty in those analyses.

Dr. White's recent work includes consulting on electric industry restructuring, stranded costs, system benefits, market power, mergers and acquisitions, generation asset valuation and divestiture, power plant costs and performance, renewable resources, power supply contracts and performance standards, green marketing of electricity, environmental disclosure, climate change policy, environmental externalities valuation, energy conservation and demand-side management, electric power system reliability, and electricity market simulation modeling for price forecasting and market power analysis.

PROFESSIONAL EXPERIENCE

Synapse Energy Economics, Inc., Cambridge, MA. *Principal Associate*, 2016 – present, *Senior Consultant*, 1996 – 2016.

Consulting on issues of energy economics, environmental impacts, and utility regulatory policy, including electric industry restructuring, electric power system planning, performance-based regulation, stranded costs, system benefits, market power, mergers and acquisitions, generation asset valuation and divestiture, nuclear and fossil power plant costs and performance, renewable resources, green marketing of electricity, environmental disclosure, climate change policy, environmental externalities valuation, energy conservation and demand-side management, electric power system reliability, avoided costs, fuel prices, dispatch modeling, economic analysis of power plants and resource plans, and risk analysis.

G-W Associates, Arlington, MA. *Principal*, 1985 – 2000

Engineering and environmental analysis. Design and development of computer software for scientific and engineering analysis. Design and implementation of database systems. Consulting on management information systems and operations research applications. Training and documentation for computer applications.

Tellus Institute, Boston, MA. *Associate Scientist*, 1980 – 1986

Participated in a number of electrical demand forecast studies, specializing in the evaluation of the potential for energy conservation and co-generation. Developed methodologies and computer programs

for evaluating energy conservation policies. Developed a computer modeling system (LEAP) for evaluating the resource needs of developing countries. Participated in international energy planning studies and conducted training programs in a number of African and European countries.

Massachusetts Institute of Technology Energy Laboratory, Cambridge, MA. *Research Associate*, 1975 – 1980

Participated in several energy policy studies which evaluated the future demand and supply for electricity in the United States. Designed and developed a mathematical programming model of the U.S. coal and electric utility industries.

EDUCATION

Massachusetts Institute of Technology, Cambridge, Massachusetts

Doctor of Philosophy in Civil and Environmental Engineering

Case-Western Reserve University, Cleveland, Ohio

Master of Science in Physics

The University of Akron, Akron, Ohio

Bachelor of Science in Physics

PUBLICATIONS

White, D., K. Takahashi, A. Napoleon, T. Woolf. 2018. *Value of Energy Efficiency in New York: Assessment of the Range of Benefits of Energy Efficiency Programs*. Prepared by Synapse Energy Economics for Natural Resources Defense Council.

Takahashi, K., A. Allison, D. White. 2017. *Renewable Heating and Cooling Policy Framework: Options to Advance Industry Growth and Markets in New York*. Prepared for the New York State Energy Research and Development Authority.

White, D., B. Biewald. 2016. *Findings Regarding the NSPI 2016 Load Forecast - Reevaluating DSM Impact*. Prepared for the Nova Scotia Utility and Review Board, August 2016.

White, D., P. Peterson, T. Comings, S. Jackson. 2016. *Preliminary Valuation of TransCanada's Hydroelectric Assets*. Prepared for the State of Vermont, August 2016.

White, D., M. Chang, B. Fagan. 2016. *Preliminary 2016 BGS Auction Review – An Analysis of Utility Differences*. Prepared for the New Jersey Division of Rate Counsel, May 2016.

Fagan, B., R. Wilson, D. White, T. Woolf. 2014. *Filing to the Nova Scotia Utility and Review Board on Nova Scotia Power's October 15, 2014 Integrated Resource Plan: Key Planning Observations and Action Plan Elements*. Synapse Energy Economics for the Nova Scotia Utility and Review Board.

Wilson, R., B. Biewald, D. White. 2014. *Review of BC Hydro's Alternatives Assessment Methodology*. Synapse Energy Economics for BC Hydro.

Stanton, E. A., J. Daniel, T. Vitolo, P. Knight, D. White, G. Keith. 2014. *Net Metering in Mississippi: Costs, Benefits, and Policy Considerations*. Synapse Energy Economics for the Public Service Commission of Mississippi.

White, D., B. Biewald. 2014. *Findings Regarding the NSPI 2014 Load Forecast*. Synapse Energy Economics for the Nova Scotia Utility and Review Board.

White, D., M. Chang, B. Biewald. 2013. *State Energy Efficiency Embedded in Annual Energy Outlook Forecasts: 2013 Update*. Synapse Energy Economics for the US Environmental Protection Agency.

Stanton, E. A., S. Jackson, G. Keith, E. Malone, D. White, T. Woolf. 2013. *A Clean Energy Standard for Massachusetts*. Synapse Energy Economics for the Massachusetts Clean Energy Center and the Massachusetts Departments of Energy Resources, Environmental Protection, and Public Utilities.

Neubauer, M., D. Trombley, S. Kwatra, K. Farley, D. White, S. Grover, and M. Koson. 2013. *A Guide to Growing an Energy-Efficient Economy in Mississippi – Report Number E13M*. American Council for an Energy-Efficiency Economy, Synapse Energy Economics, and Evergreen Economics for American Council for an Energy-Efficient Economy.

Hornby, R., P. Chernick, D. White, J. Rosenkranz, R. Denhardt, E. A. Stanton, J. Gifford, B. Grace, M. Chang, P. Luckow, T. Vitolo, P. Knight, B. Griffiths, B. Biewald. 2013. *Avoided Energy Supply Costs in New England: 2013 Report*. Synapse Energy Economics for the Avoided-Energy-Supply-Component (AESC) Study Group.

Fagan, R., P. Luckow, D. White, R. Wilson. 2013. *The Net Benefits of Increased Wind Power in PJM*. Synapse Energy Economics for Energy Future Coalition.

Neubauer, M., B. Foster, R. N. Elliot, D. White, R. Hornby. 2013. *Ohio's Energy Efficiency Resource Standard: Impacts on the Ohio Wholesale Electricity Market and Benefits to the State*. Synapse Energy Economics for American Council for an Energy-Efficient Economy (ACEEE).

Takahashi, K. et al. 2013. *Economic and Environmental Analysis of Residential Heating and Cooling Systems: A Study of Heat Pump Performance in U.S. Cities*. Proceeding of the 7th International Conference on Energy Efficiency in Domestic Appliances and Lighting (EEDAL'13), September 12, 2013.

Whited, M., D. White, S. Jackson, P. Knight, E.A. Stanton. 2013. *Declining Markets for Montana Coal*. Synapse Energy Economics for Northern Plains Resource Council.

Chang, M., D. White, E. Hausman. 2012. *Risks to Ratepayers: An Examination of the Proposed William States Lee III Nuclear Generation Station, and the Implications of "Early Cost Recovery" Legislation*. Synapse Energy Economics for Consumers Against Rate Hikes.

Woolf, T., M. Whited, T. Vitolo, K. Takahashi, D. White. 2012. *Indian Point Replacement Analysis: A Clean Energy Roadmap: A Proposal for Replacing the Nuclear Plant with Clean, Sustainable Energy Resources*. Synapse Energy Economics for Natural Resources Defence Council (NRDC).

Hornby, R., R. Fagan, D. White, J. Rosenkranz, P. Knight, R. Wilson. 2012. *Potential Impacts of Replacing Retiring Coal Capacity in the Midwest Independent System Operator (MISO) Region with Natural Gas or Wind Capacity*. Synapse Energy Economics for National Association of Regulatory Utility Commissioners.

Chang, M., D. White, P. Knight, B. Biewald. 2012. *Energy Benefits Resulting from the Investment of 2010 RGGI Auction Revenues in Energy Efficiency*. Synapse Energy Economics for Regulatory Assistance Project.

Hornby, R., D. White, T. Vitolo, T. Comings, K. Takahashi. 2012. *Potential Impacts of a Renewable and Energy Efficiency Portfolio Standard in Kentucky*. Synapse Energy Economics for Mountain Association for Community Economic Development and Kentucky Sustainable Energy Alliance.

Fisher, J., C. James, N. Hughes, D. White, R. Wilson, and B. Biewald. 2011. *Emissions Reductions from Renewable Energy and Energy Efficiency in California Air Quality Management Districts*. Synapse Energy Economics for California Energy Commission.

White, D., B. Biewald. 2011. *Findings Regarding the NSPI 2011 Load Forecast*. Synapse Energy Economics for Nova Scotia Utility and Review Board.

Chang, M., D. White, E. Hausman, N. Hughes, B. Biewald. 2011. *Big Risks, Better Alternatives: An Examination of Two Nuclear Energy Projects in the US*. Synapse Energy Economics for Union of Concerned Scientists.

White, D., D. Hurley, J. Fisher. 2011. *Economic Analysis of Schiller Station Coal Units*. Synapse Energy Economics for Conservation Law Foundation.

Hornby, R., P. Chernick, C. Swanson, D. White, J. Gifford, M. Chang, N. Hughes, M. Wittenstein, R. Wilson, B. Biewald. 2011. *Avoided Energy Supply Costs in New England: 2011 Report*. Synapse Energy Economics for Avoided-Energy-Supply-Component (AESC) Study Group.

White, D., R. Fagan, A. Napoleon. 2011. *New Jersey 2011 Fixed Price Basic Generation Service Auction*. Synapse Energy Economics for New Jersey Division of the Ratepayer Advocate.

Johnston, L., E. Hausman, B. Biewald, R. Wilson, D. White. 2011. *2011 Carbon Dioxide Price Forecast*. Synapse Energy Economics.

Chang, M., D. White, L. Johnston, B. Biewald. 2010. *Electricity Energy Efficiency Benefits of RGGI Proceeds: An Initial Analysis*. Synapse Energy Economics for Regulatory Assistance Project.

Hornby, R., D. White, B. Biewald, C. James, B. Warfield, M. Chang, P. Chernick, C. Swanson, I. Goodman, B. Grace, J. Gifford. 2009. *Avoided Energy Supply Costs in New England: 2009 Report*. Synapse Energy Economics for Avoided-Energy-Supply-Component (AESC) Study Group.

Biewald, B., D. White, J. Fisher, M. Chang, L. Johnston. 2009. *Incorporating Carbon Dioxide Emissions Reductions in Benefit Calculations for Energy Efficiency: Comments on the Department of Energy's Methodology for Analysis of the Proposed Lighting Standard*. Synapse Energy Economics for New York State Attorney General.

Schlissel, D., R. Wilson, L. Johnston, D. White. 2009. *An Assessment of Santee Cooper's 2008 Resource Planning*. Synapse Energy Economics for Rockefeller Family Fund.

Hornby, R., D. White, P. Peterson. 2008. *Wholesale Natural Gas Prices in New England*. Synapse Energy Economics for the Office of the Attorney General of Massachusetts.

White, D., R. Hornby. 2008. *Energizing Virginia: Efficiency First*. Synapse Energy Economics for The American Council for an Energy-Efficient Economy (ACEEE).

Schlissel, D., L. Johnston, B. Biewald, D. White, E. Hausman, C. James, J. Fisher. 2008. *Synapse 2008 CO² Price Forecasts*. Synapse Energy Economics.

Hornby, R., C. Salamone, S. Perry, D. White, K. Takahashi. 2008. *Advanced Metering Infrastructure- Implications for Residential Customers in New Jersey*. Synapse Energy Economics for New Jersey Division of the Ratepayer Advocate.

Hornby, R., J. Loiter, P. Mosenthal, T. Franks, R. Fagan and D. White. 2008. *Review of AmerenUE February 2008 Integrated Resource Plan*. Synapse Energy Economics for Missouri Department of Natural Resources.

Hurley, D., D. White, R. Hornby. 2008. *Forecast of New England Forward Capacity Market (FCM) Clearing Prices 2008 – 2017*. Synapse Energy Economics.

Drunic, M., D. White, R. Hornby. 2008. *Impacts of Distributed Generation on Wholesale Electric Prices and Air Emissions in Massachusetts*. Synapse Energy Economics for Massachusetts Technology Collaborative.

White, D., R. Hornby, J. Wallach, P. Chernick. 2008. *Risk Analysis of Procurement Strategies for Residential Standard Offer Service*. Synapse Energy Economics and Resource Insight for Maryland Office of the People's Counsel.

Hornby, R., C. James, K. Takahashi, D. White. 2008. *Increasing Demand Response in Maine*. Synapse Energy Economics for the Maine Public Utilities Commission.

Hornby, R., C. Swanson, M. Drunic, D. White, P. Chernick, B. Biewald, J. Kallay. 2007. *Avoided Energy Supply Costs in New England: 2007 Final Report*. Synapse Energy Economics for Avoided-Energy-Supply-Component (AESC) Study Group.

Peterson, P., D. Hurley, D. White. 2007. *ISO New England Scenario Analysis Companion Report Constructing a Future that Meets Regional Goals*. Synapse Energy Economics for Conservation Law Foundation and the Northeast Energy Efficiency Partnerships.

Johnston, L., E. Hausman, A. Sommer, B. Biewald, T. Woolf, D. Schlissel, A. Roschelle, D. White. 2007. *Climate Change and Power: Carbon Dioxide Emissions Costs and Electricity Resource Planning*. Synapse Energy Economics.

Hausman, E., R. Fagan, D. White, K. Takahashi, A. Napoleon. 2007. *LMP Electricity Markets: Market Operations, Market Power, and Value for Consumer*. Synapse Energy Economics for the American Public Power Association.

Steinhurst, W., B. Biewald, D. White, K. Takahashi, A. Napoleon, A. Roschelle, A. Sommer, E. Hausman. 2006. *Ensuring Delaware's Energy Future: A Response to Executive Order No. 82*. Synapse Energy Economics and Delaware Cabinet Committee on Energy for the Delaware Public Service Commission Staff.

Fagan, R., A. Napoleon, A. Rochelle, A. Sommer, W. Steinhurst, D. White, K. Takahashi. 2006. *Mohave Alternatives and Complements Study: Assessment of Carbon Sequestration Feasibility and Markets*. Synapse Energy Economics for Southern California Edison.

Woolf, T., D. White, C. Chen, A. Sommer. 2005. *Potential Cost Impacts of a Renewable Portfolio Standard in New Brunswick*. Synapse Energy Economics for New Brunswick Department of Energy.

Hausman, E., P. Peterson, D. White, B. Biewald. 2005. *An RPM Case Study: Higher Costs for Consumers, Windfall Profits for Exelon*. Synapse Energy Economics for Illinois Citizens Utility Board.

White, D., B. Biewald. 2005. *Electric Price Forecasts for St. Lawrence Hydroelectric Generation*. Synapse Energy Economics for International Joint Commission (IJC).

Peterson, P., D. White, A. Roschelle, B. Biewald. 2004. *Capacity for the Future: Kinky Curves and Other Reliability Options*. Synapse Energy Economics.

Biewald, B., D. White, G. Keith, T. Woolf. 2004. *A Responsible Energy Future: an efficient, cleaner and balanced scenario for the US electrical system*. Synapse Energy Economics for National Commission on Energy Policy and National Association of State PIRGs.

Biewald, B., W. Steinhurst, D. White, A. Roschelle. 2004. *Electricity Prices in PJM: A Comparison of Wholesale Power Costs in the PJM Market to Indexed Generation Service Costs*. Synapse Energy Economics for PJM Interconnection, LLC.

White, D. 2004. *A Balanced Energy Plan for the Interior West*. Synapse Energy Economics, Western Resource Advocates, and Tellus Institute for Hewlett Foundation Energy Series.

Biewald, B., C. Chen, A. Sommer, W. Steinhurst, D. White. 2003. *Comments on the RPS Cost Analyses of the Joint Utilities and the DPS Staff*. Synapse Energy Economics for the Renewable Energy Technology and Environment Coalition.

Keith, G., B. Biewald, D. White, M. Drunsic. 2003. *Modeling Demand Response and Air Emissions in New England*. Synapse Energy Economics for US Environmental Protection Agency.

Keith, G., B. Biewald, D. White, A. Sommer, C. Chen. 2003. *Cleaner Air, Fuel Diversity and High-Quality Jobs: Reviewing Selected Potential Benefits of an RPS in New York State*. Synapse Energy Economics for the Renewable Energy Technology and Environment Coalition.

Synapse Energy Economics. 2003. *The New England Experiment: An Evaluation of the Wholesale Electricity Markets*. Prepared for Connecticut Office of Consumer Counsel, Maine Office of the Public Advocate, and New Hampshire Office of Consumer Advocate.

Woolf, T., G. Keith, D. White, M. Drunsic, M. Ramiro, J. Ramsey, J. Levy, P. Kinney, S. Greco, K. Knowlton, C. Komanoff, D. Gutman. 2003. *Air Quality in Queens: Cleaning Up the Air in Queens County and Neighboring Regions*. Synapse Energy Economics, Konheim & Ketcham and Komanoff Energy Associates for Natural Resources Defense Council (NRDC), Keyspan Energy, and the Coalition Helping to Organize a Kleaner Environment.

Chen, C., D. White, T. Woolf, L. Johnston. 2003. *The Maryland Renewable Portfolio Standard: An Assessment of Potential Cost Impacts*. Synapse Energy Economics for the Maryland Public Interest Research Group.

Woolf, T., D. White. 2002. *Powering the South: A Clean and Affordable Energy Plan for the Southern United States*. Synapse Energy Economics for Renewable Energy Policy Project and a coalition of Southern environmental advocates.

Chernick, P., S. Geller, B. Biewald, and D. White. 2001. *Updated Avoided Energy-Supply Costs for Demand-Side Management Screening in Massachusetts*. Resource Insight, Synapse Energy Economics for Avoided-Energy-Supply-Component (AESC) Study Group.

Biewald, B., D. White, M. Ramiro. 2001. *Electricity Market Analysis of Coal Waste Regulations: An Illustrative Midwest Case Study*. Synapse Energy Economics for US Environmental Protection Agency.

Synapse Energy Economics. 2001. *Repowering the Midwest: The Clean Energy Development Plan for the Heartland*. Prepared for Environmental Law and Policy Center and a coalition of Midwest environmental advocates.

Brailove, R., P. Chernick, S. Geller, B. Biewald, D. White. 1999. *Avoided Energy-Supply Costs for Demand-Side Management Screening in Massachusetts*. Resource Insight, Synapse Energy Economics for Avoided-Energy-Supply-Component (AESC) Study Group.

Biewald, B., D. White, T. Woolf. 1999. "Follow the Money: A Method for Tracking Electricity for Environmental Disclosure." *The Electricity Journal* 12 (4): 55—60.

Biewald, B., D. White. 1999. *Stranded Nuclear Waste: Implications of Electric Industry Deregulation for Nuclear Plant Retirements and Funding for Decommissioning and Spent Fuel*. Synapse Energy Economics.

Woolf, T., D. White, B. Biewald, and W. Moomaw. 1998. *The Role of Ozone Transport In Reaching Attainment in the Northeast: Opportunities, Equity and Economics*. Synapse Energy Economics for Northeast States for Coordinated Air Use Management.

Biewald, B., D. White, T. Woolf, F. Ackerman, W. Moomaw. 1998. *Grandfathering and Environmental Comparability: An Economic Analysis of Air Emission Regulations and Electricity Market Distortions*. Synapse Energy Economics for National Association of Regulatory Utility Commissioners.

Biewald, B., D. White. 1998. *Analysis of Market Power in the APS and Duquesne Service Territories*. Synapse Energy Economics for Maryland Office of People's Counsel.

Moskovitz, D., T. Austin, C. Harrington, B. Biewald, D. White, R. Bigelow. 1997. *Full Environmental Disclosure for Electricity: Tracking and Reporting Key Information*. Synapse Energy Economics for Regulatory Assistance Project, funded by Pew Charitable Trusts, Joyce-Mertz Gilmore Foundation, US Environmental Protection Agency, and US Department of Energy.

Rowe, R.D., C.M. Lang, L.G. Chestnut, D.A. Latimer, D.A. Rae, S.M. Bernow, D. White. 1995. *New York State Environmental Externalities Cost Study*, ed. Empire State Electric Energy Research Corporation (ESEERCO). New York: Oceana Publications.

PRESENTATIONS

Whited, M., T. Vitolo, N. Santen, D. Hurley, D. White. 2015. "Benefits of Long Term Wind Contracts." Prepared for RENEW Northeast, June 2015.

White, D., Environmental Futures, and Tellus Institute. 1998. "New England Tracking System, a methodology for a region-wide electricity tracking system to support the implementation of restructuring-related policies." Presentation for the New England Governors' Conference, October 1998.

Synapse Energy Economics. 1998. "Implications of Premature Nuclear Plant Closures: Funding Shortfalls for Nuclear Plant Decommissioning and Spent Fuel Transportation and Storage." Presentation at the United States Association for Energy Economics and International Association for Energy Economics 19th Annual North American Conference in Albuquerque, NM, October 1998.

Biewald, B., D. White, W. Steinhurst. 1997. "Horizontal Market Power in New England Electricity Markets: Simulation Results and a Review of NEPOOL's Analysis." Synapse Energy Economics presentation for the New England Conference of Public Utility Commissioners, June 1997.

Bernow, S., B. Biewald, W. Dougherty, D. White. 1995. "Counting the Costs: Scientific Uncertainty and Valuation Perspective in EXMOD." Presentation at the technical meeting of International Atomic Energy Agency in Vienna, Austria, December 1995.

TESTIMONY

New Jersey Board of Public Utilities (Docket No. EM01050308): Analysis of the proposed merger between Conectiv and PEPCo. On behalf of New Jersey Division of Ratepayer Advocate. September 2001.

New Jersey Board of Public Utilities (Docket No. EM00110870): Analysis of the proposed merger between FirstEnergy and GPU. On behalf of New Jersey Division of Ratepayer Advocate. April 2001.

Vermont Public Service Board (Dockets Nos. 6120 and 6460): Analysis of used and useful policy issues, electricity market prices, and above market costs of the purchase from Hydro Quebec. On behalf of Vermont Public Service Department. March 2001.

Department of Energy (Docket No. EE-RM-500): Submitted expert comments *Marginal Price Assumptions for Estimating Customer Benefits of Air Conditioner Efficiency Standards* regarding the Department of Energy's proposed rules for efficiency standards for central air conditioners and heat pumps. On behalf of the Appliance Standards Awareness Project. December 2000.

Massachusetts Department of Environmental Protection: Submitted comments on reliability implications of proposed emission standards for power plants. July 2000.

Arkansas Public Service Commission (Docket No. 00-048-R): Submitted comments regarding requirements for electricity market power analyses. On behalf of Arkansas Public Service Commission Staff. June 2000.

West Virginia Public Service Commission (Case No. 98-0452-E-GI): Analysis regarding AEP and Allegheny Power restructuring, market power, divestiture of generation, electric system market price modeling, statistical analysis of comparable sales, and responsibility for stranded costs and gains. On behalf of West Virginia Consumer Advocate. August 1999.

Connecticut Department of Public Utility Control (Docket No. 99-03-36): Testimony regarding Connecticut Light and Power Company standard offer service, market prices for electricity and the influence of market power, simulation analysis of the New England electricity market. July 1999.

Connecticut Department of Public Utility Control (Docket No. 99-02-05): Testimony regarding market power, market prices, and simulation modeling as related to the application of Connecticut Light & Power Company for recovery of stranded costs. April 1999.

Maryland Public Service Commission (Case No. 8797): Testimony on the topic of simulation analysis of the ECAR market and projected market prices for electricity for estimation of Potomac Electric Company's stranded generation costs and unbundled rates. January 1999.

Maryland Public Service Commission (Case No. 8795): Testimony on the topic of simulation analysis of the PJM market and projected market prices for electricity for estimation of Delmarva Power and Light Company's stranded generation costs and unbundled rates. December 1998.

Vermont Public Service Board (Docket No. 6107): Testimony regarding excess capacity, used & useful, and the economics of Green Mountain Power's purchase from Hydro Quebec. September 1998.

Resume dated March 2018