Peter Whitman

SUMMARY

Experienced modeler and analyst specializing in policy analyses using integrated energy models with an emphasis on power markets, energy supply, and biofuels.

- Energy subject matter expert modeling energy and climate policy for more than 30 years. Led development of the AIMMS based Hydrogen Market Module. Extensive experience with NEMS, including the Electricity Market Module.
- Senior policy analyst at the Department of Energy, providing analysis on clean energy policy issues related to transportation and alternative fuels. He led the effort to develop the Department of Energy's procedure for evaluating petitions for exemptions from the provisions of the Renewable Fuel Standard.
- Over 15 years' experience modeling and analyzing and regulating competitive power markets. He has also served on the staff of the Market Monitor of the Midcontinent ISO, overseeing markets to prevent market manipulation.

EMPLOYMENT

Whitman Energy Solutions, LLC 2025-

KeyLogic, LLC
Associate Director 2023-2025
Senior Analyst 2021-2023

Federal Energy Regulatory Commission
Senior Operations Research Analyst 2015-2021

Department of Energy
Senior Policy Analyst 2007-2015
Operations Research Analyst 2006-2007

Potomac Economics
Director, Market Modeling 2001-2006

Pace Global Energy Services
Task Manager 2000-2001

Department of Energy
Operations Research Analyst 1994-2000

EDUCATION

M.S. in Finance, The George Washington University	2001
PhD Applied Mathematics, University of Maryland	1993
M.S. Numerical Science, The Johns Hopkins University	1984
B.S. Chemical Engineering, B.S. Systems Science and Mathematics, Washington University	1982

RELEVANT EXPERIENCE

NEMS Modeling

Coal Module.

Updated coal supply market module. Led project to consolidate supply curves into six domestic regions and re-aggregate by sulfur type. Created time series data of coal price, production and other energy prices and macroeconomic conditions. Estimated supply functions with the new regionality. Using EIA data, estimated updated coal transportation rates and arcs. Modified the Coal Market Module to be consistent with the updated regionality.

Hydrogen Module Component Design Report

Incorporation of hydrogen in the National Energy Modeling System. Led team to develop a Component Design Report describing key NEMS enhancements needed to model hydrogen, including incorporation of hydrogen production, demand and use in low-carbon dispatchable resources in the utility sector. Led eff01ts to engage the National Laboratories to contribute data. Developed the technical specification for the hydrogen market module, which includes production, transportation, and storage of hydrogen.

Hydrogen Module.

Incorporation of hydrogen in the National Energy Modeling System. Led the implementation of hydrogen in NEMS. Developed a new module in AIMMS representing the production, transportation, and storage of hydrogen using fossil fuels, power or biomass including carbon capture sequestration. Developed optimization structure and data transfer capability interactions across NEMS and the hydrogen module. Added additional pathways for industrial production of ammonia using clean hydrogen and clean hydrogen in the refining sector. Introduced the capability for clean hydrogen in both light and heavy-duty vehicles. Introduced hydrogen turbines into the utility sector.

Emissions Policy Module.

Continued development of the Emissions Policy Module, which I developed as a contractor for EIA. This module included algorithms for carbon taxes and cap-and-trade policies and included a sectoral carbon emissions accounting framework. Developed a line search algorithm implementing cap and trade within the iterative National Energy Modeling System (NEMS) framework. Added an initial implementation of carbon offsets.

Restructured Electricity Markets.

Introduced competitive pricing algorithms for the electricity sector in the NEMS based on marginal costs and the loss of load probability approach analogous to that used by the U.K. pool. Modified electricity capacity planning algorithms for competitive markets, including impact of technology choices for new capacity. Implemented these algorithms in NEMS. Documented algorithms and demonstrated performance to senior management. Analyzed the effect of contracts when the spot market is not perfectly competitive using the Supply Function Equilibrium (SFE) approach pioneered by Klemperer and Meyer.

Sectoral Pricing in Electricity Markets

Under rate-of-return regulation, electricity is priced by component: generation, transmission, and distribution. As markets were restructured, the generation and transmission components remained regulated. Examined regulatory preferences and their effect on sectoral distribution of costs in a restructured environment. The study used regression analysis to determine regulatory preferences for various sectors of the electricity market. Such preferences were present in the restructured market, though their effects were unknown at the time. The results of the study led to a set of algorithms incorporated in the Utility Electricity Finance and Pricing Submodule of NEMS and were used to forecast electricity prices.

Coal Distribution Submodule.
Modeled cap-and-trade market for S02 permits. While the primary impact of this market was on the power generation, modeling such a market required substantial revisions of the Coal Distribution Submodule (CDS) of the Coal Market Module ofNEMS. Since the majority of coal produced is consumed in the production of electricity, the SO2 market is tightly integrated with electricity market. The original CDS incorporated a heuristic to determine coal distribution; this model could not be modified to accommodate the SO2 market. Worked with a team of consultants and coal industry experts to develop a linear program incorporating the SO2 constraints along with transportation network. Since the SO2 market primarily affects the electricity sector, an iterative process was developed with the Electricity Fuel Dispatch (UEFD) submodule. The results were summarized in the paper "Rebuilding the Coal Model in the Energy Information Administration's National Energy Modeling System."

Petroleum Market Submodule
Development of the Petroleum Market submodule of the National Energy Modeling System. Improved algorithms for analysis of Renewable Fuel Standards (RFS) and evaluation of capital costs of cellulosic ethanol production. Justified approach and analysis to senior management.

Department of Energy Policy Analysis

Crude and Product Market Modeling
Developed a linear programming model of domestic crude transportation and refinery infrastructure to examine the effect of crude export policy on crude flows and domestic production. The model comprised approximately 30 refinery nodes and over 60 transportation routes. Coordinated a team of laboratory employees and consultants to integrate this model with refinery specific modeling from Jacobs consultancy. Results were used in the Quadrennial Energy Review (QER).

Clean Energy Petroleum Market Analysis
Analysis of clean energy policy issues for transportation and alternative fuels. Helped coordinate Departmental response for rule-makings involving vehicle fuel economy, greenhouse gas (GHG) emissions and renewable fuels. Provided analysis and Departmental position for waivers, including waivers for environmental requirements under the Clean Air Act and volumetric waivers for the Renewable Fuels Mandate. Compared and evaluated vehicle consumer choice models. Evaluated cost, performance and GHG profile of alternative and renewable fuel technology pathways. Performed analysis of the impact of rulemakings on refineries using industry standard linear programming models. Provided responses to Questions for the Record (QFR) on transportation fuels and vehicle issues. Supported Department of State on the Keystone XL Environmental Impact Statement. In particular, reviewed Lifecycle Greenhouse Gas Emissions for petroleum products using various crudes relative to oil sands. Through modeling evaluated global and domestic impact on GHG emissions of changes in crude distribution with the Keystone XL pipeline.

Small Refinery Exemption Analyses
Evaluated market analysis leading to the Small Refinery Exemption study. Led a statutorily required study examining whether compliance with the Renewable Fuel Standard (RFS) would cause disproportionate economic hardship for certain small refineries. The results of this study would require EPA to implement its recommendations by waiving the requirements for compliance with the RFS

under EPAct 2005 and EISA 2007. Due to Congressional interest, the study was on an accelerated schedule. Through meetings with interested parties, developed an OMB-cleared survey instrument to identify conditions leading to economic hardship.

Identified, procured, and managed a contractor team to implement the survey, manage data collection and support the evaluation process, and develop a report with a total level of effort over $350,000. Led the effort to develop metrics for determining disproportionate hardship and managed the inter-agency review process. As part of this study, undertook development of an econometric model of ethanol prices, using market factors such as corn crop size, gasoline prices, and production capacity to forecast ethanol prices. This was an important element in determining potential economic hardship.
Led and evaluated study of the benefits of increasing distribution capability of the Strategic Petroleum Reserve. Results were communicated to senior management for the QER.

Natural Gas Market Modeling
Designed a small model of natural gas storage injections to forecast final storage for the 2014 season based on econometric analysis of storage injections and weather deviations, implemented in Eviews.
Designed and sponsored a research project examining the origins of oil price volatility during disruptions. This model, using an Auto-Regressive Distributed Lag (ARDL) algorithm to relate implied volatility in the oil futures market to physical and financial proxies, such as the Baltic Dry Goods shipping index for demand and the VIX (a measure of volatility in the equity market). The goal of this project was to see if the implied volatility in the futures market had any information on the market's perception of the length or severity of oil supply disruptions.

FERC Rulemaking

Price Formation
Led and served on teams developing price formation rulemakings, including settlement and shortage pricing, enhanced pricing of fast-start resources, and allocation of real-time uplift. Led, reviewed, coached, or served on teams evaluating tariff changes and waivers for MISO and SPP involving the day-ahead and real-time markets. Participated in inter- office teams developing memos for the Chairman reviewing demand response and incentivizing innovative technologies.

Market and Tariff Analysis
Operations Research Analyst at FERC. Served on teams developing price formation rulemakings, including settlement and shortage pricing, enhanced pricing of fast-start resources, and allocation of real-time uplift. Reviewed generation interconnection agreements. Led development of revised Common Metrics report plan and revised survey instrument. Gave presentations to OEMR staff on price formation topics, including the role of virtual transaction, uplift allocation, and shortage pricing. Led, reviewed, coached, or served on teams evaluating tariff changes and waivers for MISO and SPP involving the day-ahead and real-time markets. Participated in inter- office teams developing memos for the Chairman reviewing demand response and incentivizing innovative technologies.

Other Policy Analysis

Market Monitoring: Potomac Economics
The company serves as Independent Market Monitor (IMM) for the Midwest (now Mid-Continent) ISO (MISO) and ERCOT, market advisor for the NY ISO and ISO-NE, and contractor for the CA ISO. Interpreted tariffs for the jurisdictional ISOs and ensured compliance through development and implementation of statistical screens on market data, with particular focus on identifying the exercise of market power in the Midwest ISO.

Developed annual reports characterizing markets and recommending improvements in market design. Developed and implemented methodologies using production costs determine plant-level reference prices for the MISO. Developed various statistical screens to characterize market efficiency for the NY ISO and ERCOT and to identify anomalous behavior (such as withholding leading to exercise of market power) for the MISO and other ISOs using the SAS statistical software, Python and Visual Basic. Developed reference prices for the CA ISO. Developed initial data requirements and validated database development for IMM ERCOT. This work required in-depth knowledge of SAS, the tariff requirements, and daily use of statistical analysis and software over the entire period.

Real-time Mitigation Software
Development of real-time mitigation software. Interpreted tariff and implemented a design in SAS to automate market power mitigation for the Real-Time market. The two-part conduct-impact test is used to determine and prospectively mitigate market power. Only if both tests are passed are the default bids used and the unit mitigated. Developed and implemented the real-time conduct-impact test, which required an automated data transfer system and a parallel implementation of the market clearing engine (an AIMMS based LP application) using the SAS system. The system ran on the production market servers of the MISO and was robust and independent of manual intervention.

Day-Ahead Mitigation Software
Interpreted tariff requirements and lead initial development for the Day-Ahead Mitigation software for the Midwest ISO. This system was a combination of manual evaluation and automated software on the MISO production servers. Both systems had significant visibility both internally and with the client, as it monitored a hundred million dollar plus daily market.

PUBLICATIONS

D. P. O'Leary and P. Whitman, "Parallel QR Factorization by Householder and Modified Gram-Schmidt Algorithms", Parallel Computing, 16(1990), 99-112.

Whitman, P. C., "Estimation Ranges in Stochastic Linear Programming", PhD thesis, University of Maryland, College Park.

Energy Information Administration, “Electricity Prices in a Competitive Environment: Marginal Cost Pricing of Generation Services and Financial Status of Electric Utilities”, DOE/EIA-0614, August 1997, (Mathematical Specifications)

Whitman, Peter, “Sectoral Pricing in a Restructured Electricity Market”, Issues in Mid-Term Forecasting, DOE/EIA-0607(99).

Hobbs, Melinda; Michael Mellish; Frederic Murphy; Richard Newcombe; Reginald Sanders; Peter Whitman, “Rebuilding the Coal Model in the Energy Information Administration's National Energy Modeling System”, Interfaces Special Issue: Wagner Prize Papers, September-October 2001.

Gabriel, Steven, Kydes, Andy, Whitman, Peter, "The National Energy Modeling System: A Large-Scale Energy Economic Equilibrium Model", Operations Research, Volume 41 No. 1, January –February 2001.

“Market Power Mitigation at the Midwest ISO”, presented at the INFORMS annual meeting November, 2006.

“The Energy Independence and Security Act (EISA) 2007 and Future Refining Needs”, Haverly Annual Model User’s Group (MUG), September 2008

“Refinery Modeling, Dieselization and The Energy Independence and Security Act (EISA) 2007”, presented at the INFORMS annual meeting November 2007

“Carbon Emissions, Heavy Crude and Future Refining Needs “, Presented at Global Refining Strategies 2008, October 2008

”Projected Biofuels Supply under the U.S. Renewable Fuel Standard”, Presented at Biomass 2009, March 2009

"International Aspects of US Climate Change Policies", Platts European Emissions Trading, September 29, 2009

“Refining Emissions in a Carbon Constrained World”, The GREEN FORUM: 1st Green Refining & Petrochemicals Forum, London England, October 2010.

“The National Program and Other Petroleum and Emissions Reduction Initiatives”, SAE 2011 Government Industry Meeting, January 2011.

Moderator, “Beyond EISA: Policy and Regulatory Mechanisms to Expand the Bioeconomy”, Biomass 2011, July 26, 2011.

"Managing Midstream Mayhem: Mixing New Oil with Old Infrastructure", Presented at the IAEE 2014 Annual Meeting, June 17, 2014.

"Convex Hull Pricing in Power Markets: Recent Development in Theory Computational Efficiency and Practice", Presented at INFORMS 2018 Annual Meeting, November 4, 2018.

Chen, Yonghong, O'Neill, Richard, Whitman, Peter, "A Unified Approach to Solve Convex Hull Pricing and Average Incremental Cost Pricing", Optimization Online, Sept., 2020 (eprint).

Chen, Yonghong, O'Neill, Richard, Whitman, Peter, "A Comparison of Three Methods for ISO Pricing", IEEE Transactions on Energy Markets, Policy and Regulation, March, 2025, doi: 10.1109/TEMPR.2024.3417954
