

Thomas Lee

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EDUCATION

University of Pennsylvania, Philadelphia, PA
School of Engineering and Applied Sciences
2016-2017 M.S.E. Electrical Engineering
2013-2017 B.A.S. Computer Science

The Wharton School
2013-2017 B.S. Economics (Concentrations: Statistics, Finance)
Honors: Summa Cum Laude (for B.A.S. and B.S.), IEEE-Eta Kappa Nu

Relevant Coursework

Decision Science: Optimization Theory, Modern Convex Optimization, Control of Systems
Data Science: Probability, Stochastic Processes, Micro-Econometrics, Machine Learning
Physical Systems: Electrical Circuits and Systems, Battery Systems, Ocean-Atmosphere Dynamics
Energy Economics: Environmental & Energy Economics, Energy Finance

PROFESSIONAL EXPERIENCE

Boston Energy Trading and Marketing (Mitsubishi Corp.), Boston, MA
2020- *Senior Trading Analyst, Congestion Trading*
2018-2020 *Senior Trading Analyst, Energy Trading*
Used power flow analysis and graph clustering to manage proprietary FTR portfolio with ~100TWh notional volume. Built fundamental supply-demand and probabilistic valuation models for power and gas futures; executed CAISO strategy achieving 4+ Sharpe ratio. Developed the core LP formulation for company's energy storage optimization and valuation framework. Conceived and researched an original copula-based stochastic weather generator (SWG) including spatial-temporal correlations and forecast-climatology linkages, now used in Monte Carlo valuations of structured transactions.

AQR Capital Management, Greenwich, CT
2017-2018 *Quantitative Research Analyst, Global Asset Allocation*
2016 *Quantitative Research Intern*
Researched option-implied correlations and forecast accuracy for risk modeling. Implemented quantitative global macro signals with international commodity trade data. Derived new closed-form portfolio optimization solution using linear algebra, and conducted quantitative investment research, leading to published journal paper: *(As RA)* **"Optimal Currency Hedging for International Equity Portfolios"** Jacob Boudoukh, Matthew Richardson, Ashwin Thapar, Franklin Wang. *Financial Analysts Journal*. Aug 2019.

Kleinman Center for Energy Policy, University of Pennsylvania
2017-2018 *Research Fellow*
2016-2017 *Research Assistant, Energy Storage Research*
Investigated electricity market design related to energy storage investment and price signals. Published research articles and presented findings. Participated in Raab Associates' *Energy Policy Roundtable in the PJM Footprint* conferences.

2015 **Opower (Oracle)**, San Francisco, CA
 KPCB Engineering Fellow (Summer)
 Helped build R demonstration of diurnal load curve clustering using k-means for residential electric demand. Contributed to AMI data platform for demand response.

RESEARCH

(Work in Progress) **“A Dynamic Programming Approach for Estimating Market Scalability of Energy Storage Arbitrage with Price Impact and Renewables Growth”**

Energy arbitrage at a large scale faces diminishing wholesale market returns. Developed efficient dynamic programming method to quantify profit scalability at varying storage and renewables deployment levels, while incorporating realistic non-convex supply stacks (applied to CAISO numerical study). Derived analytic solutions for social planner and Cournot-Nash cases of storage ownership.

“Optimizing Electricity Generation Portfolios with Intermittency: Does Delayed Externality Pricing Cause Lock-in Regret?” Senior Thesis. December 2017.

Derived closed-form conditions for carbon lock-in to exist in the presence of renewable energy. Built an hourly-resolution capacity expansion model to quantify the extent that ongoing natural gas combined cycle buildout in the PJM system may contribute to carbon lock-in. Presented findings during session of *Energy Economics & Finance Seminar* (May 2018) organized by Professor Arthur van Benthem.

“Energy Storage in PJM: Exploring Frequency Regulation Market Transformation.”

Kleinman Center for Energy Policy. Research Paper. July 2017.

Reviewed the power engineering and regulatory background of frequency regulation, and quantified economic and system reliability impacts of PJM’s “Regulation D” market design and subsequent revisions. Assessed implications for energy storage projects. Presented findings at 2017 *Carnot Prize Student Colloquium* to audience including former EPA Administrator Gina McCarthy.

“A Market for Primary Frequency Response? The Role of Renewables, Storage, and Demand.”

Kleinman Center for Energy Policy. Working Paper. June 2018.

Distinguished between capability and provision for primary frequency response (an essential reliability service), quantified impact of renewables on headroom provision based on a simplified economic dispatch model, and discussed potential market design considerations.

TEACHING

2016 Introduction to Machine Learning (CIS 419/519)
 Formulated exam questions, graded and held weekly office hours for programming assignments. Python-based course covering topics including supervised learning algorithms, neural networks, and reinforcement learning.

LEADERSHIP

2019-2020 **Young Professionals in Energy – Boston Chapter**

Programming Committee Member

Initiated and organized panel on offshore wind in the US Northeast, including panelists from Orsted and MHI Vestas. Organized ISO New England control room site visit.

2016-2017 **Trustees Social Responsibility Advisory Committee**, University of Pennsylvania

Student Representative

One of 12 voting members advising Trustees on endowment proxy voting. Successfully negotiated adoption of 1st GHG Emissions guideline (2017). Led 8-student research team on fossil fuels report (2015) resulting in Trustees mandate to consider climate factors in endowment investments (2017) and de facto coal and tar sands divestment (2020).