

# Jay Apt

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## POSITIONS HELD

### Carnegie Mellon University

PROFESSOR *EMERITUS*, TEPPER SCHOOL OF BUSINESS 2022 – PRESENT  
PROFESSOR *EMERITUS*, ENGINEERING & PUBLIC POLICY

PROFESSOR, TEPPER SCHOOL OF BUSINESS 2010 – 2022  
CO-DIRECTOR, CARNEGIE MELLON ELECTRICITY INDUSTRY CENTER  
AFFILIATED PROFESSOR IN ENGINEERING & PUBLIC POLICY M

2003 — 2010

2000 — 2010

MANAGING DIRECTOR AND CHIEF TECHNOLOGY OFFICER 2000 — 2003

### Carnegie Museum of Natural History

DIRECTOR 1997 — 2000

### National Aeronautics and Space Administration

ASTRONAUT 1985 — 1997  
FOUR SPACE SHUTTLE MISSIONS. TWO MISSIONS INVOLVED PARTNERSHIPS  
WITH JAPAN AND RUSSIA; ONE INVOLVED TWO SPACEWALKS.

CHIEF OF MISSION SUPPORT BRANCH 1995 — 1996

FLIGHT CONTROLLER, MISSION CONTROL CENTER 1982 — 1985

### California Institute of Technology

#### Jet Propulsion Laboratory, Pasadena, California

SCIENCE MANAGER OF OPTICAL FACILITIES, TABLE MOUNTAIN OBSERVATORY  
GROUP LEADER, OPTICAL ASTRONOMY GROUP  
PLANETARY SCIENTIST IN EARTH AND SPACE SCIENCES DIVISION

1980 — 1982

### HARVARD UNIVERSITY

ASSISTANT DIRECTOR, DIVISION OF 1978 — 1980  
, PLANETARY IMAGING COMPUTER CENTER

PH D E)ONA

STAFF, CENTER FOR EARTH AND PLANETARY PHYSICS 1976 — 1980

### MASSACHUSETTS INSTITUTE OF TECHNOLOGY

POST-DOCTORAL FELLOW IN LASER SPECTROSCOPY

1976



ARCHIVAL JOURNAL PAPERS

127. Apt, J., D. Epple, and F. Sowell, *Forest Fires: Why The Large Year-to-Year Variation in Forests Burned?*. In review at Journal of Environmental Economics and Management.
126. Forzieri<sup>1</sup>, G., F. Bosello, E. Byers, J. C. J. H. Aerts, S. Alvisi, J. Apt, F. Batista e Silva, A. Bianchi, R. Buizza, C. Carraro, A. Castelletti, F. Castelli, A. Cominola, M. V. Corazza, S. Dasgupta, P. De Girolamo, M. Di Bacco, P. Di Mascio, M. Duca, E

114. Murphy, S., L. Lavin, and J. Apt, *Resource adequacy implications of temperature-dependent electric generator availability*. Applied Energy, 2020. **262**: 114424.
113. Keen, J.F. and J. Apt, *How much capacity deferral value can targeted solar deployment create in Pennsylvania?* Energy Policy, 2019. **134**: 110902.
112. Murphy, S, F. Sowell, and J. Apt, *A time-dependent model of generator failures and recoveries captures correlated events and quantifies temperature dependence*. Applied Energy, 2019. **253**: 113513.
111. Fisher, M., J. Apt, and J. Whitacre, *Can flow batteries scale in the behind-the-meter commercial and industrial market? A techno-economic comparison of storage technologies in California*. Journal of Power Sources, 2019. **420**: 1-8.
110. Klima, K., J. Apt, M. Bandi, P. Happy, C. Loutan, and R. Young, *Geographic smoothing of solar photovoltaic electric power production in the western USA*. Journal of Renewable and Sustainable Energy, 2018. **10**(5): 053504.
109. Freeman, G., J. Apt, and M. Dworkin, *The Natural Gas Grid Needs Better Monitoring*. Issues in Science and Technology, 2018. **34**(4): 79-84.
108. Fisher, M., J. Whitacre, and J. Apt, *A Simple Metric for Predicting Revenue from Electric Peak-Shaving and Optimal Battery Sizing*. Energy Technology, 2018. **6**(4): 649-657.
107. Murphy, S., J. Apt, J. Moura, and F. Sowell, *Resource adequacy risks to the bulk power system in North America*. Applied Energy, 2018. **212**: 1360-1376.
106. Fisher, M.J., F. Sowell, and J. Apt, *The economics of commercial demand response for spinning reserve*. Energy Systems, 2018. **9**(1): 3-23.
105. Kaack, L.H., J. Apt, M.G. Morgan, and P. McSharry, *Empirical Prediction Intervals Improve Energy Forecasting*. Proceedings of the National Academy of Sciences of the United States of America, 2017. **114**(33): 8752-8757.
104. Apt, J., *Forum: Climate Engineering*. Issues in Science and Technology, 2017. **33**(4): 5-8.
103. Clack, C. T. M., S.A. Qvist, J. Apt, M. Bazilian, A.R. Brandt, K. Caldeira, S.J. Davis, V. Diakov, M.A. Handschy, P.D. Hines, P. Jaramillo, D.M. Kammen, J.C.S. Long, M.G. Morgan, A. Reed, V. Sivaram, J. Sweeney, G.R. Tynan, D.G. Victor, J.P. Weyant, and J.F. Whitacre,

99. Keen, J.F. and J. Apt, *Are high penetrations of commercial cogeneration good for society?* Environmental Research Letters, 2016. **11**: 124014.
98. Rose, S. and J. Apt, *Quantifying Sources of Uncertainty in Reanalysis Derived Wind Speed.* Renewable Energy, 2016. **94**: 157-165.
97. Lueken, R., K. Klima, W.M. Griffin, and J. Apt, *The Climate and Health Effects of a USA Switch from Coal to Gas Electricity Generation.* Energy, 2016. **109**: 1160-1166.
96. Lueken, R., J. Apt and F. Sowell, *Robust Resource Adequacy Planning in the Face of Coal Retirements.* Energy Policy, 2016. **88**: 371-388.
95. Rose, S. and J. Apt, *What Can Reanalysis Data Tell Us About Wind Power?* Renewable Energy, 2015. **83**: 963-969.
94. Klima, K. and J. Apt, *Geographic Smoothing of Solar PV: Results from Gujarat.* Environmental Research Letters, 2015. **10**: 104001.
93. Apt., J., *Recent results on the integration of renewable electric power into the US grid.* MRS Energy & Sustainability - A Review Journal. 2015. **2**: E6.
92. Dowds, J., P. Hines, T. Ryan, W. Buchanan, E. Kirby, J. Apt, and P. Jaramillo, *A Review of Large-Scale Wind Integration Studies.* Renewable & Sustainable Energy Reviews, 2015. **49**: 768-794.
91. Moore, J., K. Borgert and J. Apt, *Could Low Carbon Capacity Standards Be More Cost Effective at Reducing CO<sub>2</sub> than Renewable Portfolio Standards?* Energy Procedia, 2014. **63**: 7459-7470.
90. Moore, J. and J. Apt, *Consumer Cost Effectiveness of CO<sub>2</sub> Mitigation Policies in Restructured Electricity Markets.* Environmental Research Letters, 2014. **9**: 104019.



68. Rose, S., P. Jaramillo, M. Small, I. Grossmann, and J. Apt, *Quantifying the Hurricane Risk to Offshore Wind Turbines*. Proceedings of the National Academy of Sciences of the United States of America, 2012. **109**(9): 3247-3252.
67. Hittinger, E., J. Whitacre, and J. Apt, *What Properties of Grid Energy Storage are Most Valuable?* Journal of Power Sources, 2012. **206**: 436–449.
66. Apt, J., S. Peterson, and J.F. Whitacre, *Battery Vehicles Reduce CO<sub>2</sub> Emissions*. Science, 2011. **333**(6024): 823.
65. Fertig, E. and J. Apt, *Economics of Compressed Air Energy Storage to Integrate Wind Power: A Case Study in ERCOT*. Energy Policy, 2011. **39**(5): 2330–2342.
64. Apt, J., C.T. Hendrickson, and G. Morgan, *Lester Lave, Visionary Economist*. Environmental Science & Technology, 2011. **45**(13): 5457-5458.
63. Peterson, S.B., J.F. Whitacre, and J. Apt, *Net Air Emissions from Electric Vehicles: The Effect of Carbon Price and Charging Strategies*. Environmental Science & Technology, 2011. **45**(5): 1792-1797.
62. Gilmore, E.A., J. Apt, R. Walawalkar, P.J. Adams, and L.B. Lave, *The air quality and human health effects of integrating utility-scale batteries into the New York State electricity grid*. Journal of Power Sources, 2010. **195**(8): 2405-2413.
61. Hittinger, E., J.F. Whitacre, and J. Apt, *Compensating for Wind Variability Using Co-Located Natural Gas Generation and Energy Storage*. Energy Systems, 2010. **1**(4): 417-439.
60. Gresham, R.L., S.T. McCoy, J. Apt, and M.G. Morgan, *Implications of Compensating Property-Owners for Geologic Sequestration of CO<sub>2</sub>*. Environmental Science & Technology, 2010. **44**(8): 2897-2903.
59. Peterson, S.B., J.F. Whitacre, and J. Apt, *The Economics of Using PHEV Battery Packs for Grid Storage*. Journal of Power Sources, 2010. **195**(8): 2377-2384.
58. Peterson, S.B., J. Apt, and J.F. Whitacre, *Lithium-Ion Battery Cell Degradation Resulting from Realistic Vehicle and Vehicle-to-Grid Utilization*. Journal of Power Sources, 2010. **195**(8): 2385-2392.
57. Katzenstein, W., E. Fertig, and J. Apt, *The Variability of Interconnected Wind Plants*. Energy Policy, 2010. **38**(8): 4400-4410.
56. Victor, D.G., M.G. Morgan, J. Apt, J. Steinbruner, and K. Ricke, *The Geoengineering Option: A Last Resort Against Global Warming?* Foreign Affairs, 2009. **88**(2): 64-76.
55. Hines, P., J. Apt, and S. Talukdar, *Large Blackouts in North America: Historical trends and policy implications*. Energy Policy, 2009. **37**(12): 5249-5259.
54. Newcomer, A. and J. Apt, *Near term implications of a ban on new coal-fired power plants in the US*. Environmental Science & Technology, 2009. **43**(11): 3995–4001. \*Paper selected as Best Environmental Policy Paper of 2009 by Environmental Science & Technology\*
53. Katzenstein, W. and J. Apt, *Response to "Comment on 'Air Emissions Due to Wind and Solar Power' "*. Environmental Science & Technology, 2009. **43**(15): 6108-6109.

52. Katzenstein, W. and J. Apt, *Air Emissions Due To Wind And Solar Power*. Environmental Science & Technology, 2009. **43**(2): 253-258.
51. Curtright, A. and J. Apt, *The Character of Power Output from Utility-Scale Photovoltaic Systems*. Progress in Photovoltaics, 2008. **16**(3): 241-247.
50. Walawalkar, R., S. Blumsack, J. Apt, and S. Fernands, *An Economic Welfare Analysis of Demand Response in the PJM Electricity Market*. Energy Policy, 2008. **36**(10): 3692-3702.
49. Newcomer, A. and J. Apt, *Implications of generator siting for CO<sub>2</sub> pipeline infrastructure*. Energy Policy, 2008. **36**(5): 1776-1787.
48. Apt, J., L. Lave, and S. Pattanariyankool, *A National Renewable Portfolio Standard? Not*



35. Apt, J., L.B. Lave, and M.G. Morgan, *Power Play: A More Reliable U.S. Electric System*. Issues in Science & Technology, 2006. **22**(4): 51-58.
34. Blumsack, S., J. Apt, and L.B. Lave, *Response to Andy Ott's letter on "Lessons from the Failure of U.S. Electricity Restructuring"*. The Electricity Journal, 2006. **19**(5): 4-6.
33. Blumsack, S., J. Apt, and L.B. Lave, *Lessons from the Failure of U.S. Electricity Restructuring*. The Electricity Journal, 2006. **19**(2): 15-32.
32. Dobesova, K., J. Apt, and L.B. Lave, *Are renewables portfolio standards cost-effective emission abatement policy?* Environmental Science & Technology, 2005. **39**(22): 8578-8583.
31. Blumsack, S., J. Apt, and L. Lave, *A Cautionary Tale: U.S. Electricity Reform*. Economic and Political Weekly (Special Issue: Power Sector Reform - International Experience), 2005. **40**(50): 5279-5290.
30. Apt, J., *Competition Has Not Lowered US Industrial Electricity Prices*. The Electricity Journal, 2005. **18**(2): 52-61.
29. Apt, J., L.B. Lave, S. Talukdar, M.G. Morgan, and M. Ilic, *Electrical blackouts: A systemic problem*. Issues in Science and Technology, 2004. **20**(4): 55-61.
28. Ilic, M., J. Apt, P. Khosla, L.B. Lave, M.G. Morgan, and S. Talukdar, *Introducing electric power into a multidisciplinary curriculum for network industries*. IEEE Transactions on Power Systems, 2004. **19**(1): 9-16.
27. Lal, R., M. Griffin, J. Apt, L. Lave, and G. Morgan, *Response to comments on "Managing soil carbon"*. Science, 2004. **305**(5690).
26. Lal, R., M. Griffin, J. Apt, L. Lave, and M.G. Morgan, *Ecology - Managing soil carbon*. Science, 2004. **304**(5669): 393.
25. Lave, L., J. Apt, and S. Blumsack, *Rethinking Electricity Deregulation*. The Electricity Journal, 2004. **17**(8): 11-26.
24. Talukdar, S., J. Apt, M. Ilic, L. Lave, and M.G. Morgan, *Cascading Failures: Survival vs. Prevention*. The Electricity Journal, 2003. **16**(9): 25-31.
23. Apt, J. and L.B. Lave, *Electric Gridlock: A National Solution*. Public Utilities Fortnightly, 2003. **141**(18): 14-16.
22. Apt, J., *Toward a natural history museum for the 21st Century: Measuring effectiveness - Challenges and strategies*. Museum News, 1997. **76**(6): 43-46.
21. Amsbury, D.L., J. Wilkinson, K. Lulla, S. Ackleson, F.R. Brumbaugh, C. Evans, M.R. Helfert, D. Helms, W. Muehlburger, R.L. Gibson, C.L. Brown, M.C. Lee, J. Apt, J. Davis, M.C. Jamison, and M. Mohri, *Earth Observations during Space Shuttle Mission STS-47: Endeavor's Mission to Planet Earth*. Geocarto International, 1994. **9**(3): 69-80.
20. Neff, J.S., T.A. Ellis, J. Apt, and J.T. Bergstralh, *Bolometric Albedos of Titan, Uranus, and Neptune*. Icarus, 1985. **62**(3): 425-432.

19. Cruikshank, D.P. and J. Apt, *Methane on Triton - Physical State and Distribution*. Icarus, 1984. **58**(2): 306-311.
18. Apt, J., N.P. Carleton, and C.D. Mackay, *Methane on Triton and Pluto - New CCD Spectra*. Astrophysical Journal, 1983. **270**(1): 342-350.
17. Nisenson, P., J. Apt, R. Goody, and C. Papaliolios,

3. Goody, R. and J. Apt, *Observations of Sodium Emission from Jupiter, Region-C*. Planetary and Space Science, 1977. **25**

## SELECTED REPORTS

Holliday, C., J. Apt, F. Beinecke, N. Brownell, P. Centolella, D. Garman, C. Gellings, B. Gordon, W. Hogan, R.K. Lester, A. Ritter, J. Rogers, T. Roosevelt, P. Rothstein, G. Roughead, M. Savitz, and M. Williams, *The Power of Change: Innovation for Development and Deployment of Increasingly Clean Electric Power Technologies*. 2016, National Research Council of the National Academies: Washington. 320 pp.

Schnitzer, D., D.S. Launsbury, J.P. Carvallo, R. Deshmukh, J. Apt, and D.M. Kammen, *Microgrids for Rural Electrification: A critical review of best practices based on seven case studies*. 2014. United Nations Foundation, New York. 122 pp.

Apt, J., G. Morgan, E. Rubin, and H. Zhai,



Danish Technical University (DTU), Risø, Denmark, "Characteristics of Wind and Solar Power", March 9, 2016

Vermont Law School, "Are Renewables a Practical Answer?", July 24, 2015

Columbia University, "Variable Renewable Electricity", February 13, 2015

University of California at San Diego, "Prospects for Low-CO<sub>2</sub> Electric Power", August 29, 2014

Vermont Law School, "Are Renewables a Practical Answer?", June 13, 2014

Harvard University, "New Findings on Variable Renewable Energy and the Electricity Grid", February 5, 2014

University of California at Los Angeles, "Energy – What's Next?", March 1, 2013

Columbia University, "Grid-level electricity storage and markets", May 2, 2012

University of Texas, Austin, "What the Characteristics of Wind and Solar Electric Power Production Mean for Their Future", March 1, 2012

#### SELECTED CONFERENCE PAPERS

Apt, J., "What has been learned from frequency-domain analysis of wind and solar power", 2019 FISE-IEEE/CIGRE Conference - Living the energy Transition (FISE/CIGRE), Medellin, Colombia, December 5, 2019. Best paper award.  
DOI: 10.1109/FISECIGRE48012.2019.8984982

Lavin, L., J. Apt, and S. Murphy, *Resource Adequacy and Scarcity Pricing Implications of Correlated Generator Failures*, United States Association of Energy Economists, Denver, November 3, 2019.

Freeman, G.M., J. Apt, and J. Moura, *Natural gas fuel starvation at large power plants in the U.S. and the effect of gas supply arrangements on reliability and resilience*, International Association of Energy Economists North American Conference, Washington DC September 23, 2018.

Freeman, G.M. and J. Apt, *Are U.S. Federal Reporting Thresholds Adequate to Address an Interdependent Electricity and Natural Gas Grid?* United States Association of Energy Economists, Houston. December 14, 2017.

Murphy, S. and J. Apt, *Resource adequacy risks to the bulk power system in North America*. Society for Risk Analysis annual meeting, San Diego, California. December 13, 2016.

Kaack, L., J. Apt, and M.G. Morgan, *The Applicability of Empirical Prediction Intervals to Energy Forecasting*. International Association for Energy Economics 39<sup>th</sup> International Conference, Bergen, Norway. June 20, 2016.

Klima, K. and J. Apt, *Geographic Smoothing of Solar PV: Results from Gujarat*. American Meteorological Society Seventh Conference on Weather, Climate, Water and the New Energy Economy, New Orleans. January 11, 2016.

Apt, J., *What the characteristics of wind power mean for integration into power grids*. Invited Keynote address at The International Colloquium On Large Wind-Power Plants: Interaction, Control and Integration, Leuven, Belgium. July 9, 2015.

Rose, S. M. Handschy, and J. Apt, *Modeling Extreme Low-Wind Speed Events for Large-Scale Wind Power*. *Technology, Management, and Policy Consortium*, Lisbon. June 23, 2014.

Moore, J. and J. Apt, *Energy and Capacity Market Effects of Carbon Policies in Restructured Markets*. *United States Association of Energy Economists*, New York. June 16, 2014.

Lueken, R., K. Klima, W.M. Griffin, and J. Apt,

- Apt, J. (2012) Smart Integration of Variable and Intermittent Renewables. *Hawaii International Conference on System Science*, Maui.
- Rose, S., Jaramillo, P., Small, M. J., Grossmann, I., Apt, J. (2011) Quantifying the Hurricane Risk to Offshore Wind Turbines. *Society for Risk Analysis 2011 Annual Meeting*, Charleston, SC.
- Rose, S. and J. Apt, *The Cost of Curtailing Wind Turbines for Frequency Regulation and Ramp-Rate Limitation*, in *29th USAEE/IAEE North American Conference*. 2010: Calgary.
- Katzenstein, W. and J. Apt, *The Cost of Wind Power Variability*, in *29th USAEE/IAEE North American Conference*. 2010: Calgary.
- Hittinger, E., J.F. Whitacre, and J. Apt, *Compensating for Wind Variability Using Co-Located Natural Gas Generation and Energy Storage*, in *29th USAEE/IAEE North American Conference*. 2010: Calgary.
- Apt, J., *Geoengineering: Will an infrastructure for global dimming be desirable or possible?* *Gordon Research Conference on Industrial Ecology*. 2010: New London, New Hampshire.
- Apt, J. *The Character of Electric Power Produced by Wind and Solar Plants (invited talk)*. Indo-US Conference on Climate Change. 2009. Chennai, India.
- Peterson, S., J. Whitacre, and J. Apt. *PHEV Battery Performance in a Vehicle to Grid (V2G) Utilization Scenario: a Technological and Economic Analysis*. 5th Annual Lithium Mobile Power Conference. 2009. Boston.
- Gilmore, E.A., P.J. Adams, J. Apt, and L.B. Lave. *The air quality effects of integrating electrical energy storage into electricity grids*. Society for Risk Analysis 2009 Annual Meeting: Baltimore.
- Apt, J., L. Lave, and M.G. Morgan, *Worst Case Electricity Scenarios: The Benefits & Costs of Prevention (invited talk)*, Society for Risk Analysis 2008 Annual Meeting: Boston.
- Blumsack, S., L. Lave, and J. Apt, *Costs and Prices for Electric Utilities Under Regulation and Restructuring*. Sloan Industry Studies Conference. 2008: Boston.
- Apt, J. and W. Katzenstein. *The Character of Wind Power Variability and its Effects on Fill-In Power*. 7th International Workshop on Large-Scale Integration of Wind Power into Power Systems. 2008. Madrid.
- Walawalkar, R., S. Blumsack, J. Apt, and S. Fernands. *Analyzing PJM's Economic Demand Response Program*. IEEE Power Engineering Society General Meeting. 2008. Pittsburgh.
- Hines, P., J. Apt, and S. Talukdar. *Trends in the History of Large Blackouts in the United States*. IEEE Power Engineering Society General Meeting. 2008. Pittsburgh.
- Newcomer, A., S. Blumsack, J. Apt, L. Lave, and M.G. Morgan. *Electricity Load and Carbon Dioxide Emissions: Effects of a Carbon Price in the Short Term*. 41st Annual Hawaii International Conference on System Sciences. 2008. Waikoloa, Hawaii: Computer Society Press.



- Apt, J., *Controlling Carbon in the US Electricity Sector (Invited talk)*, American Association for the Advancement of Science (AAAS) Annual Meeting, Special Session on Carbon Management. 2007: San Francisco.
- Curtright, A. and J. Apt. *Power Fluctuations from Large Solar Photovoltaic Arrays*. National Solar Energy Conference. 2007. Cleveland, Ohio.
- Rubin, E.S., S.T. McCoy, and J. Apt. *Regulatory and Policy Needs for Geological Sequestration of Carbon Dioxide*. Sixth Annual Conference on Carbon Capture & Sequestration. 2007. Pittsburgh.
- Peters, G., T. DiGioia, C.T. Hendrickson, and J. Apt. *Transmission Line Reliability: Climate Change and Extreme Weather*. American Society of Civil Engineers 2006 Electrical Transmission Conference: Structural Reliability in a Changing World. 2006. Birmingham.
- Apt, J., The risks of integrating wind power into an electric power system. Society for Risk Analysis 2006 Annual Meeting: Risk Analysis in a Dynamic World: Making a Difference. Baltimore.
- Apt, J., J. Bergerson, S. Blumsack, S. Eggers, and L.B. Lave, Managing electricity infrastructure in an era of frequent hurricanes. Society for Risk Analysis 2006 Annual Meeting: Risk Analysis in a Dynamic World: Making a Difference. Baltimore.
- Hines, P., J. Apt, H. Liao, and S. Talukdar, *The Frequency of Large Blackouts in the U.S. Electrical Transmission System*. Monitoring, Sensing, Software and Its Valuation for the Changing Electric Power Industry. 2006. Pittsburgh, PA.
- Talukdar, S., P. Hines, and J. Apt. *Can Cascading Failures be Eliminated?* Monitoring, Sensing, Software and Its Valuation for the Changing Electric Power Industry. 2006. Pittsburgh, PA.
- Florig, H.K., J. Apt, A. Eng, and T. Cochran. *Managing Safety Risks of Amateur Rocketry*. Society For Risk Analysis Annual Meeting 2005. Orlando.
- Lave, L. B., J. Apt, and M.G. Morgan. *Worst Case Electricity Scenarios: The Benefits & Costs of Prevention*. CREATE 2005, University of Southern California, Los Angeles.
- Marriott, J., H. S. Matthews, J. Apt, and L.B. Lave. *Creating an Electricity-Focused Economic Input-Output Tool for Life-Cycle Analysis*. 2005 International Society for Industrial Ecology Conference, Stockholm, Sweden
- Liao, H., J. Apt, and S. Talukdar. *Phase Transitions in the Probability of Cascading Failures Electricity Transmission in Deregulated Markets: Challenges, Opportunities, and Necessary R&D Agenda*. 2004. Pittsburgh, PA.

#### SELECTED TESTIMONY AND GOVERNMENT FILINGS

- Apt, J. *Testimony on How the Domestic Nuclear Industry Boosts Local Economies, Curbs Emissions, and Strengthens National Security*. U.S. House of Representatives Committee on Science, Space, and Technology, Subcommittee on Energy, May 3, 2019.
- Apt, J. *Testimony on EPA's Clean Power Plan Proposed Rule*, U.S. Environmental Protection Agency Docket No. EPA-HQ-OAR-2013-0602, July 31, 2014.

Oates, D.L., J. Apt and P. Jaramillo, Comments of the Carnegie Mellon Electricity Industry Center on Proposed Energy Information Administration Collection Extensions with Changes, January 22, 2014.

Jaramillo, P., J. Apt and P. Hines, Comments of the RenewElec Project on Integration of Variable Energy Resources Federal Energy Regulatory Commission



Sinnott Murphy, 2019 (now at the National Renewable Energy Laboratory)  
Gerad Freeman, 2019 (now at the Pacific Northwest National Laboratories)  
Luke Lavin, 2021 (now at the National Renewable Energy Laboratory)  
Yamit Lavi, 2023 (now at the US Department of Energy)  
Sean Smillie, 2023 (now at Energy+Environmental Economics, E3)

#### Co-Advisor

Paul Hines, 2007 (now at EnerNoc)  
Graham William Strauss, 2005 (now at the Naval Air Warfare Center)  
Robert Lee Gresham, 2010 (now at National Grid)  
Scott Peterson, 2012 (now at Shady Side Academy)  
Eric Hittinger, 2012 (now at Rochester Institute of Technology)

#### PhD Committee (at Carnegie Mellon University except as noted)

Elisabeth Gilmore, 2009 (now at Carleton University)  
Inês Margarida Lima de Azevedo, 2009 (now at Stanford University)  
Hari Chandan Mantripragada, 2009 (now at the University of Pittsburgh)  
Kathleen Spees, 2008 (now at The Brattle Group)  
Melissa Chan, 2008 (now at the Kennedy School of Government, Harvard)  
Seth Adam Blumsack, 2006 (now at the Pennsylvania State University)  
Dalia Patiño-Echeverri, 2006 (now at Duke University)  
Joseph Frank DeCarolis, 2005 (now Director, US Energy Information Administration)  
Chao Chen, 2005 (now at Worley-Parsons)  
Dmitri Perekhodtsev, 2004 (now at LECG Paris)  
Sompop Pattanariyankool, 2010 (now at the Energy Ministry, Government of Thailand)  
Sharon Wagner, 2011 (now at The University of Maine)  
Vanessa Schweitzer, 2011 (now at the National Center for Atmospheric Research)  
Kyle Meisterling, 2011 (now at UC Santa Barbara)  
Yangfang (Helen) Zhou, 2012 (now at Singapore Management University)  
Kyle Siler-Evans, 2012 (now at RAND)  
Nicholas Siefert, 2013 (now at the US Department of Energy)  
Hossein Safaei, 2014 (Harvard University; now at IHS Energy)  
Tuhfe Göcmen Bozkurt, 2016 (Danish Technical University; now at DTU Risø)  
Lynn Kaack, 2019 (now at ETH Zurich)  
Siddharth Singh, 2019 (now at University College, London)  
Cristiana Lopes Lara, 2019 (now at Amazon)  
Adam F. Abdin, 2019 (Université Paris-Saclay; now at CentraleSupélec)  
Marko Jereminov, 2019 (now at Pearl Street Technologies)  
Naeem Turner Bandeale, 2023 (now attending business school)