

Jay Apt

POSITIONS HELD

Carnegie Mellon University

PROFESSOR, TEPPER SCHOOL OF BUSINESS 2010 — *PRESENT*
CO-DIRECTOR, CARNEGIE MELLON ELECTRICITY INDUSTRY CENTER
AFFILIATED PROFESSOR IN ENGINEERING & PUBLIC POLICY

ASSOCIATE RESEARCH PROFESSOR, TEPPER SCHOOL OF BUSINESS 2003 — 2010
EXECUTIVE DIRECTOR, CARNEGIE MELLON ELECTRICITY INDUSTRY CENTER
DISTINGUISHED SERVICE PROFESSOR IN ENGINEERING AND PUBLIC POLICY 2000 — 2010

iNetworks, LLC Venture Capital

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

1980 — 1982

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

HARVARD UNIVERSITY

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

STAFF, CENTER FOR EARTH AND PLANETARY PHYSICS 1976 — 1980

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

POST-DOCTORAL FELLOW IN LASER SPECTROSCOPY

EDUCATION

A.B. IN PHYSICS (MAGNA CUM LAUDE), HARVARD, 1971
PH.D. IN EXPERIMENTAL ATOMIC PHYSICS, MASSACHUSETTS INSTITUTE OF TECHNOLOGY, 1976. ADVISOR: DAVID PRITCHARD
THESIS TITLE: "VELOCITY DEPENDENCE OF EXCITATION TRANSFER IN COLLISIONS OF LASER-EXCITED ATOMS"

P R O F E S S I O N A L M E M B E R S H I P S

INTERNATIONAL ASSOCIATION FOR ENERGY ECONOMICS
SOCIETY FOR RISK ANALYSIS
INDUSTRY STUDIES ASSOCIATION
INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS
AMERICAN GEOPHYSICAL UNION
AMERICAN PHYSICAL SOCIETY
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE
ASSOCIATION OF SPACE EXPLORERS

B O A R D S

INDUSTRY STUDIES ASSOCIATION (2012-2014)
EARLY CAREER DEVELOPMENT COMMITTEE – BOARD LIAISON
ELECTRIC POWER RESEARCH INSTITUTE (EPRI) (2007-2013)
AUDIT COMMITTEE
PHIPPS CONSERVATORY AND BOTANIC GARDENS (1997-2003)
CHAIR, FINANCE COMMITTEE
AUDIT COMMITTEE
NATIONAL ASSOCIATION OF ROCKETRY (1998-2007)

C U R R E N T A D V I S O R Y C O M M I T T E E S

CHAIR, SCIENTIFIC ADVISORY COMMITTEE, FUTURE RESILIENT SYSTEMS PROGRAM,
NATIONAL UNIVERSITY OF SINGAPORE/ETH-ZURICH (2015 – PRESENT)

S E L E C T E D H O N O R S A N D A W A R D S

HEINZ HISTORY CENTER HISTORY MAKER'S AWARD FOR INNOVATION (2018)
OUTSTANDING REVIEWER, *ENVIRONMENTAL RESEARCH LETTERS* (2016)
FELLOW, AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE (2013)
FELLOW, THE EXPLORERS CLUB (2008)
METCALF AWARD FOR OUTSTANDING ENGINEERING ACHIEVEMENT (2002)
DAVID L. LAWRENCE AWARD OF VECTORS / PITTSBURGH (2000)
NASA DISTINGUISHED SERVICE MEDAL (1997)
NASA EXCEPTIONAL SERVICE MEDAL (1993 AND 1995)
FEDERATION AERONAUTIQUE INTERNATIONALE V.M. KOMAROV DIPLOMA FOR
OUTSTANDING ACHIEVEMENTS IN THE FIELD OF EXPLORATION OF OUTER SPACE
(1991 AND 1992), SERGEI P. KOROLEV DIPLOMA FOR A NON-PLANNED REPAIR OF
A BROKEN DEVICE TO MAKE POSSIBLE THE CONTINUATION OF A MISSION (1991),
AND DE LA VAULX MEDAL (1998)

ARCHIVAL JOURNAL PAPERS

114. Keen, J. F. and J. Apt, *Can solar PV reliably reduce loading on distribution networks?*. In review at Applied Energy.
113. Murphy, S, F. Sowell, and J. Apt, *A model of correlated power plant failures and recoveries*. In review at Applied Energy.
112. Kirchen, K., W. Harbert, J. Apt, and M.G. Morgan, *A Solar-Centric Approach to Improving Estimates of Exposure Processes for Coronal Mass Ejections*. In revision after first review at Risk Analysis.
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. H. 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, *Evaluation of a proposal for reliable low-cost grid power with 100% wind, water, and solar*. Proceedings of the National Academy of Sciences of the United States of America, 2017. **114**(26): 6722-6727.
102. Fisher, M.J. and J. Apt, *Emissions and Economics of Behind-the Meter Electricity Storage*. Environmental Science & Technology, 2017. **51**(3): 1094-1101.
101. Handschy, M.A., S. Rose and J. Apt, *Is It Always Windy Somewhere? Occurrence of Low-Wind-Power Events over Large Areas*. Renewable Energy, 2017. **101**: 1124-1130.

100. Bandi, M. and J. Apt, *Variability of the wind turbine power curve*. Applied Sciences, 2016. **6**: 262.
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.
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69. Rose, S. and J. Apt, *Generating Wind Time Series as a Hybrid of Measured and Simulated Data*. Wind Energy, 2012. **15**(5): 699-715.

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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 CO₂ Emissions*. Science, 2011. **333**(6024): 823.
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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.
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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.

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43. Walawalkar, R., J. Apt, and R. Mancini, *Economics of electric energy storage for energy arbitrage and regulation in New York*. Energy Policy, 2007. **35**(4): 2558–2568.
42. Apt, J., D.W. Keith, and M.G. Morgan, *Promoting Low-Carbon Electricity Production*. Issues in Science & Technology, 2007. **24**(3): 37-44.
41. Patiño-Echeverri, D., B. Morel, J. Apt, and C. Chen, *Should a Coal-Fired Power Plant be Retrofitted or Replaced?* Environmental Science & Technology, 2007. **41**(23): 7980-7986.
40. Apt, J., *The Spectrum of Power from Wind Turbines*. Journal of Power Sources, 2007. **169**(2): 369-374.
39. Newcomer, A. and J. Apt, *Storing syngas lowers the carbon price for profitable coal gasification*. Environmental Science & Technology, 2007. **41**(23): 7974 - 7979.
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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.
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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.
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BOOKS

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Global Forum on Innovation for the Future of Nuclear Energy, Gyeongju, South Korea, June 11, 2019

Danish Technical University (DTU), Lyngby, Denmark, "New Techniques to Analyze Variable Renewable Energy", May 23, 2018

National Academy of Sciences Annual Meeting Symposium: The Energy Transition, "The Changing Character of the Electric Power Grid: Variable Renewable Power", April 30, 2018

National Academy of Engineering-American Association of Engineering Societies Convocation of the Professional Engineering Societies, "The Growing Challenge of Integrating Variable and Intermittent Sources of Power", April 23, 2018

University of Michigan Joint Seminar Series Electrical and Computer Engineering, Industrial and Operations Engineering, and School for Environment and Sustainability, "Variable Renewable Energy", March 15, 2018

Rice University, "Variable Solar and Wind Electric Power Production", May 10, 2016

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-CO₂ 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

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- Kaack, L., J. Apt, and M.G. Morgan, *The Applicability of Empirical Prediction Intervals to Energy Forecasting*. International Association for Energy Economics 39th International Conference, Bergen, Norway. June 20, 2016.
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C U R R E N T E D I T O R I A L A P P O I N T M E N T S

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